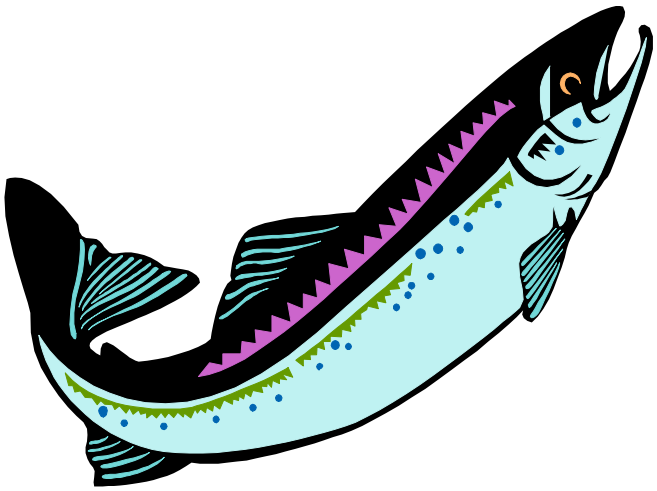
Qualitative Monitoring of Fisheries Habitat Restoration

Final Report



Prepared for:

California Department of Fish and Game
Salmon and Steelhead Trout Restoration Account Agreement No. P0210566

Prepared by:

Center for Forestry, University of California, Berkeley
Richard R. Harris, Principal Investigator

March 2005

TABLE OF CONTENTS

ACKNOWLEDGMENTS iii

INTRODUCTION 1

THE NATURE OF QUALITATIVE MONITORING 2

RESTORATION OBJECTIVES 3

MONITORING QUESTIONS AND DESIGN 4
- Pre-Treatment (<1 year before project completion) 5
- Implementation (<2 years after project implementation) 5
- Short-Term Effectiveness (3 to 10 years after implementation) 6
- Combining Qualitative and Quantitative Data 7
- Assigning Project Performance Ratings 9
- Feature Sampling 10
- Interpreting Project Performance Ratings 11
- Monitoring Study Design 11

DATA QUALITY 12

REPORTING AND ANALYSIS 12

HISTORY OF METHOD DEVELOPMENT AND REVISIONS 13

FIELD METHODS 13
- Completion of Monitoring Checklists 13
- Assembling Project Documentation 13
- Assembling Monitoring Checklists 14
- Completing Checklists 15
- Pre-treatment 15
- Implementation 15
- Effectiveness 15
- Identifying Sampling Segments 17
- Taking Photographs 17
- Completing Summary Sheets 17
- Instructions for Completing Checklists 19
- Field Method 1: Fish Passage Projects 30
  - Field Method 30
- Field Method 2: Instream Habitat Restoration Projects 41
  - Field Method 41
- Field Method 3: Streambank Stabilization Projects 51
  - Field Method 51
- Field Method 4: Land Use Control Restoration Projects 61
  - Field Method 61
- Field Method 5: Water Conservation/Purchase Projects 72
  - Field Method 72
- Field Method 6: Vegetation Control Projects 83
  - Field Method 84
- Field Method 7: Riparian Planting Projects 94

Field Method 94
Field Method 8: Erosion Control/Slope Stabilization Projects 105
Field Method 105
Field Method 9: Stream Crossing Upgrading Projects 116
Field Method 116
Field Method 10: Stream Crossing Decommissioning Projects 127
Field Method 127
Field Method 11: Road Segment Upgrading Projects 138
Field Method 139
Field Method 12: Road Segment Decommissioning 150
Field Method 150

LITERATURE CITED 161

APPENDIX 162

TABLE OF FIGURES

Figure 1. Wolf Creek Before Treatment, 1999. 2
Figure 2. Wolf Creek After Treatment, 2004. 2
Figure 3. Monitoring Effectiveness of a Log/Boulder Structure. 7
Figure 4. Use of Checklists to Document Effectiveness of an Instream Structure. 8
Figure 5. Overall Project Effectiveness Monitoring Checklist Summary. 9
Figure 6. Completion of a Sample Effectiveness Checklist. 16
Figure 7. Completion of a Sample Effectiveness Monitoring Checklist Summary. 18
Figure 8. Arundo growing along the Napa River in Calistoga. 83
Figure 9. Same Area After Vegetation Removal Project. 83

TABLE OF TABLES

Table 1. Correspondence of Project Monitoring Categories and FRGP Project Types. 4
Table 2. Overall Project Implementation and Effectiveness Rating Formula Based on Feature Ratings. 10
Table 3. Interpreting Project Performance Ratings. 11
Table 4. Correspondence of FRGP Project Types to Project Monitoring Categories. 14
Table 5. Header Information for Monitoring Segments when Lumping Answers to Monitoring Questions. 19

ACKNOWLEDGMENTS

Development of this report could not have been possible without the cooperation and commitment of contract managers and restoration monitoring staff of the California Department of Fish and Game. Contract managers helped develop implementation and effectiveness criteria, provided feedback on realistic expectations and collected implementation data for the pilot phase. Monitoring staff were critical to organizing and developing the pilot testing phase in 2004 and effectiveness data collection. Barry Collins, Senior Biologist Specialist at the Northern California & North Coast Region's Coastal Restoration Monitoring & Evaluation program provided overall guidance and assistance in the development process. Special thanks go to Brooke Budnick, Senior Fish Technician for ground truthing the methods and for the many thoughtful comments that improved the report. Pete Cafferata, the Lead Monitoring Study Group Staff Person at the California Department of Forestry and Fire Protection reviewed the report and provided many useful insights. Thanks also to John LeBlanc, University of California Center for Forestry, who cheerfully revised and managed the database after each of the many revisions. Any errors or omissions are the authors' alone.

This report should be cited as:

Kocher, S.D. and Harris, R.R. 2005. *Qualitative Monitoring of Fisheries Habitat Restoration.* University of California, Center for Forestry, Berkeley, CA. 166 pages.

INTRODUCTION

The Fisheries Restoration Grant Program (FRGP) is a multi-million dollar competitive grants program. Its primary goal is to restore anadromous fish habitat in coastal California. From 1998 to 2001 alone, over 345 habitat restoration projects were funded, totaling $14.5 million.

These field methods provide a systematic approach for monitoring the implementation and effectiveness of FRPG projects. They include methods for collecting qualitative information to be used by DFG for rating project performance. Information is collected prior to implementation (pre-treatment), after project completion (implementation) and at one or more future times (effectiveness). An assessment immediately after project completion permits evaluation of whether or not the project complied with design and contract specifications (implementation monitoring). Effectiveness monitoring is accomplished by comparisons of pre-treatment conditions to conditions after effects and performance have manifested.

This approach consists of a series of pre-treatment, implementation and effectiveness checklists. The checklists are to be completed in the field, based on systematic observations. Implementation monitoring is recommended for all projects. Pretreatment and effectiveness monitoring may be applied to approximately 10 percent of all completed projects, using random sampling. DFG contract managers, dedicated FRGP staff, and/or professional consultants will conduct the monitoring.

Successful use of these methods depends on the availability of adequate information about projects at all stages of implementation. Initially, project applications and contracts must be sufficiently complete to allow collection of pre-treatment data and evaluation of implementation success. At future points in time, follow-up monitoring needs to be guided by the information collected earlier. These requirements can be met by: 1) requiring project sponsors to provide accurate project descriptions, including locations of and specific objectives for each proposed treatment; 2) providing access for monitors to information on what actually occurred on the ground rather than just what was proposed (official contract files) and 3) assuring that future monitors have access to information collected by their predecessors.

These methods provide DFG with a basis for reporting on the overall FRGP. Implementation monitoring determines the percentage of funded projects that meet contract specifications. Effectiveness monitoring provides an estimate of the percentage of projects that meet their objectives. Metrics included in the report also provide information that DFG needs to report to federal funding authorities.

THE NATURE OF QUALITATIVE MONITORING

This approach is based on using systematic qualitative observations to evaluate restoration. It is based on the premise that proper implementation and effectiveness of a project is often visually obvious and that most determinations do not require extensive quantitative measurements. This is especially true when projects attempt to change a targeted habitat parameter by 50 percent or more.

For example, consider a riparian restoration project attempting to increase the cover of riparian vegetation along an eroded channel bank. The project involved planting numerous willows on previously bare banks. This condition (captured by a pre-project photograph in Figure 1) can be compared with the post project condition in which vigorous willow growth covers most of the treatment area (Figure 2). If other objectives were met and no deleterious effects are found, this project would be rated excellent for short term effectiveness.

Figure 1. Wolf Creek Before Treatment, 1999.

The qualitative judgment that this project met its objective of increasing riparian cover is visually obvious because photographs showing pre-project conditions are available. Extensive data collection is not needed in this case to produce a reliable qualitative judgment. The opposite case, in which the project failed and no or very few willows remain alive would also be fairly easy to judge without measurement.

Figure 2. Wolf Creek After Treatment, 2004.
Source: Feather River Coordinated Management group.

Qualitative judgments of this type rely heavily on well planned out sequential photographs taken over time that show changes in site conditions.

The timing and number of photos needed for an effective photo sequence depends on the project type. At minimum, photos should be taken at three different times, before project implementation, directly after project implementation, and again at a later date appropriate to the particular project type and goals. For more guidance on photo monitoring, see the companion *Photographic Monitoring of Salmonid Habitat Restoration Projects* (2005) and the *Photo Point Monitoring Handbook (*Hall 2002). Although effective photographic monitoring can be time consuming, it is still much more efficient and inexpensive than extensive gathering of quantitative data. This time savings allows evaluation of many more projects than would be feasible if only quantitative data are used.

Because qualitative assessments rely on the possibility of visually detectable changes, these methods may not be suitable for evaluating projects with objectives that attempt to cause very small changes in some channel characteristic. For example, a project that attempts to increase the cover of willows along channel banks by 10 percent may not lead to a result that is visually evident even for a trained observer. In this case, methods from *Monitoring the Effectiveness of Riparian Vegetation Restoration* should be used instead. A water conservation project that attempts to add only small quantities of flow to a stream may not produce a visually obvious result, or may only be visible for a very short time period. In this case, a stream gauging system would be required to document any change in flow.

RESTORATION OBJECTIVES

These methods apply to all project types that involve physical habitat changes. They do not apply to project types that provide technical support to watershed groups or educational activities. The ten FRGP project categories have been modified and expanded here to twelve monitoring categories. Additional categories are needed because some FRGP project types condense many different types of practices into one project category. Several FRGP project types have also been collapsed because the practices have very similar monitoring elements. Each monitoring category covers treatments similar enough to allow judgment based on a set of uniform implementation and effectiveness criteria.

For example, a diverse array of road, crossing and slope treatments are condensed into one project category known as watershed restoration (HU). This method includes five different monitoring categories to cover watershed restoration (HU) project types. These are slope stabilization and erosion control, stream crossing upgrading, stream crossing removal, road segment upgrading, and road segment decommissioning. Conversely, three FRGP project categories, instream barrier modification (HB), fish ladders (FL) and fish screens (FS), involve goals that are similar enough to allow condensing into one monitoring category – fish passage.

The correspondence of project monitoring categories to the FRGP project types is shown in Table 1. Each monitoring category listed has three associated checklists, one for collection of pre-treatment information, one for implementation information and one for effectiveness information. Each checklist requires systematic observations about the project's success at meeting implementation and effectiveness criteria developed by DFG and peer reviewers.

An FRGP restoration project, as currently administered by DFG, is composed of a number of different practices occurring as part of one contract with an implementing agency. We have adopted the term "feature" to represent each individual action or treatment to occur under a project contract, regardless of its location. A feature may consist of an instream structure, a riparian planting block, or a section of outsloped road, for example.

Table 1. Correspondence of Project Monitoring Categories and FRGP Project Types.

Monitoring Category	FRGP Project Category
Field Method 1: Fish Passage	HB - Instream Barrier Modification, FL - Fish Ladder, SC - Fish Screens
Field Method 2: Instream Habitat Restoration	HI - Instream Habitat Restoration
Field Method 3: Stream Bank Stabilization	HS - Streambank Stabilization
Field Method 4: Land Use Control	HA – Habitat Acquisition and Conservation Easements
Field Method 5: Water Conservation/Purchase	WC – Water Conservation, WP – Water Purchase
Field Method 6: Vegetation Control	HR – Riparian Restoration
Field Method 7: Riparian Management/Planting	HR – Riparian Restoration
Field Method 8: Slope Stabilization and Erosion Control	HU – Watershed Restoration (Upslope)
Field Method 9: Stream Crossing Upgrade	HU – Watershed Restoration (Upslope)
Field Method 10: Stream Crossing Removal	HU – Watershed Restoration (Upslope)
Field Method 11: Road Segment Upgrading	HU – Watershed Restoration (Upslope)
Field Method 12: Road Segment Decommissioning	HU – Watershed Restoration (Upslope)

A broad array of possible objectives for features within a monitoring category is listed on each pre-treatment checklist. The specific objectives for each project feature must be identified from documentation in project proposals or contracts because these are used to guide observations during pre-treatment data collection and later phases. Observations are required to assess the feature's stated objectives only, not all possible objectives listed on the checklists.

MONITORING QUESTIONS AND DESIGN

The basic questions to be answered using these methods are:

- What are the specific objectives of each feature proposed for the project? (pre-treatment checklists)
- What are the conditions at each treatment site prior to project implementation? (pre-treatment checklists)
- Were the project and its features properly implemented? (implementation checklists)
- What are the conditions at each site immediately after the treatment is completed? (implementation checklists)
- What are the conditions at each treatment site after enough time has passed to evaluate effectiveness? (effectiveness checklists)
- Were the project and its features effective in achieving its objectives? (effectiveness checklists)

Implementation monitoring may be done on every DFG funded restoration project involving physical environmental changes. Qualitative pre-treatment and effectiveness monitoring is currently planned for approximately 10 percent of all funded projects. Monitoring will be performed by DFG staff and/or professional consultants after training in the use of these methods.

Pre-Treatment (<1 year before project completion)

Pre-treatment data collection includes completion of pre-treatment checklists and photo-documentation of pre-project conditions. Checklists require identification of specific objectives for each individual project feature. This is a critical step that allows later evaluation of whether the project met its goals.

The primary use of pre-treatment information is for comparison with post-project conditions. For example, prior to installation of an instream structure to improve habitat, data collection (Field Method 2) documents current conditions in the location of the future structure. Current habitat conditions are recorded on the pre-treatment checklist (e.g., a 1.5 foot deep pool) and the objective of the structure is specified (e.g., create a 3 foot deep pool). Photographs are taken from known points of the current habitat and structure location and recorded on the Photo Description Form (see *Photographic Monitoring of Salmonid Habitat Restoration Project Locations*) to allow for later re-location and re-photographing. Coordinates of the project features are recorded on the Onsite Navigation Form (see *Documenting Salmonid Habitat Restoration Project Locations*) to allow locating them in the future.

Data collection should occur after the project design and layout is finalized but before ground and/ or channel disturbance occurs. This information may be collected by restoration contractors, by DFG contract managers or DFG monitoring staff.

Implementation (<2 years after project implementation)

Implementation monitoring includes visiting each project feature to assess whether implementation has occurred as specified in the contract. This is a necessary step to increase the validity of effectiveness monitoring, since ineffective projects may be a result of incomplete or improper implementation even when potentially effective designs are used.

Data collection includes completion of implementation checklists, photo-documentation from established photo points, and documentation of feature coordinates in as-built condition. Implementation checklists require a summary judgment of excellent, good, fair, or poor implementation for each feature and for the overall project and recommendations for needed

remedial actions. For example, after completion of a willow planting project, adherence to the project contract in the number and spacing of willows planted as well as the timing and location of planting and use of required irrigation is verified. Deviations from the project design, such as plants installed in incorrect locations, are noted and remedial actions, including additional plantings, are recommended. Deviations that were beneficial are also noted.

Monitoring should occur immediately after implementation is complete but before the close out of the contract, to allow time for any needed remedial actions to occur. Monitoring is done by DFG contract managers.

Short-Term Effectiveness (3 to 10 years after implementation)

For selected projects, effectiveness monitoring includes revisiting each project feature (or a sample of features) to assess whether its objectives, as specified in the pre-treatment checklist, have been achieved. Effectiveness data collection includes completion of effectiveness checklists and photo-documentation of current conditions. Documentation of project and photo point coordinates completed during previous phases of monitoring are used to relocate hard to find project features. Effectiveness checklists require a summary judgment of excellent, good, fair, or poor effectiveness for each project feature. Project evaluators must have access to pre-treatment and implementation checklists and photographs to determine success.

For example, evaluating the success of a slope stabilization project at reducing sediment input into streams (Field Method 8) involves first locating the surviving project features using location documentation. Photos from permanent photo points are taken and compared with earlier project photos. The condition and performance of stabilization treatments is then assessed, areas of current slope instability problems are identified, and erosion and sedimentation from the treatment site since implementation is estimated. The stability of spoils, survival and vigor of any planted vegetation, and increase in vegetation cover are also evaluated. An effectiveness rating of excellent, good, fair, poor or failed, based on specific objectives is given for each project feature.

Timing. The timing of effectiveness monitoring visits will depend on specific project objectives. Examples are fish passage questions that are pertinent at high flows, re-vegetation success questions that may require several seasons, or culvert upgrading questions that require exposure to stressing events before answers are evident and definitive. The ideal utilization of these checklists, therefore, would involve repeated visits to such sites after the project has had adequate time to meet its objective. For projects with multiple objectives, multiple visits would be made at the times appropriate for each type of feature and objective.

It is not likely that the FRGP will have adequate staffing or access to make repeat visits to all restoration projects or to delay effectiveness monitoring visits until adequate time has passed for evaluation. Current restoration contracts grant the FRGP access to private lands for only 10 years. Riparian restoration projects with the objective to increase cover over a channel typically require more than 10 growing seasons to be effective. It also cannot be assured that instream structures and upgraded culverts will experience a stressing stream flow or rainfall event within 10 years of implementation. For this reason, effectiveness monitoring using these checklists can only render judgments on short-term project effectiveness. The checklist summary does require information on the largest stormflow and the largest size rainfall event that has been experienced in the project area. This should allow some determination of whether the effectiveness level assigned to the project is definitive.

Another way to use the effectiveness monitoring checklists would be to initiate a pulse of monitoring on restoration projects after a stressing event. A qualitative study of the long-term effectiveness of a project type, such as culvert upgrading can be conducted after a large rainfall or high flow event occurs within a basin with many projects. This would involve revisiting FRGP funded culvert upgrading features and re-completion of the effectiveness checklist. Information gathered could then be compared to that already on file for pre-treatment, implementation, and short term effectiveness monitoring. This type of study would allow the long-term effectiveness of culvert upgrading projects in the basin to be evaluated.

Combining Qualitative and Quantitative Data

Although qualitative in nature, these methods allow for documentation of effectiveness using associated quantitative data. Most of the field methods presented here include quantitative sub-questions along with primary qualitative questions. Some of this quantitative data is rudimentary enough to be collected in the field while doing qualitative monitoring. An example of this is measurement of residual pool depth associated with an instream structure (see Figure 3).

Figure 3. Monitoring Effectiveness of a Log/Boulder Structure.

Because stream conditions may make visual estimation of residual pool depth difficult, a simple measurement is requested in the checklist. Consider again the instream structure example given as part of the description of pre-treatment monitoring above (Field Method 2). In this case, a structure was installed to increase pool depth. The residual depth of the pool caused by the installed structure is measured during effectiveness monitoring and found to be 3.5 feet. This is deeper than the pre-construction depth (1.5 feet) and is also deeper than the objective of 3 feet. This change in pool depth is used to answer the qualitative checklist question "*Did the treatment increase water depth in a pool?"* (see Figure 4). In the figure, this question (number 5) is answered Y for yes. If other objectives were met and no deleterious effects are found, this instream structure would be rated excellent for short term effectiveness.

INSTREAM HABITAT RESTORATION - PRETREATMENT CHECKLIST Page _1__ of _1__

Contract name: Deer Creek Watershed Site 12 **Contract #:** P0585012

Stream/Road: Deer Creek **Drainage:** Eel River

Date (mm/dd/yy): 05/12/2005 **Evaluation crew:** J. Doe, J. Smith

	Project Feature	#:	11	#:		#:		
	Type of treatment: (see code sheet)		343					
			Photo #		**Photo #**		**Photo #**	
Anticipated Habitat Effects	1. Is change in habitat unit a goal of the treatment?	Y						
	a. Current habitat: FLT, POO, RIF	POO						
	b. Desired habitat: BCK, FLT, POO, RIF, SDC, UCB, OTH	POO						
	2. Is increasing water depth in a pool a goal of the treatment?	Y	D912					
	a. Current residual pool depth (feet):	1.5						

INSTREAM HABITAT RESTORATION - EFFECTIVENESS CHECKLIST Page _1__ of _1__

Contract name: Deer Creek Watershed Site 12 **Contract #:** P0585012

Stream/Road: Deer Creek **Drainage:** Eel River **Maintenance?** No

Date (mm/dd/yy): 06/01/2008 **Evaluation crew:** J. Brown, D. White

	Project Feature	#:	11	#:		#:		
	Type of treatment: (see code sheet)		343					
			Photo #		**Photo #**		**Photo #**	
Treatment	1. Is the treatment still in its original position?	Y	111					
	a. Treatment condition: Excellent, Good, Fair, Poor, Failed	Excellent						
	2. Are problems with the instream treatment visible?	N						
	a. Type: ANC, BUR, CBL, SHF, STR, UND, OTH							
Habitat Effects	3. Did the treatment create the desired instream habitat?	Y						
	a. Habitat created: BCK, FLT, POO, RIF, SDC, UCB, OTH	POO						
	4. Did the treatment have an undesirable effect on instream habitat?	N						
	a. Undesirable effect: POF, RFS, OTH							
	5. Did the treatment increase water depth in a pool?	Y	112					
	a. Residual pool depth (feet):	3.5						

Figure 4. Use of Checklists to Document Effectiveness of an Instream Structure.

It should be stressed that the quantitative data collected using these methods are not intended to produce a rigorous data set for further analysis, but are only intended to allow for a qualitative effectiveness judgment to be made.

Not all project types or conditions may be suitable for qualitative monitoring. Some may require more rigorous quantitative data to judge effectiveness. The effectiveness of a fish passage

feature may be judged qualitatively if there are reports of a previously blocked species now populating the area above a former passage barrier. However, in many cases, effectiveness at passing salmonids cannot be judged without fish surveys to determine whether the species and life stage are now passing through. Another example of an inherently quantitative effect may be improvement in water quality for which direct measurements of dissolved oxygen or nutrient loading would probably be required.

In these cases, effectiveness must be determined by quantitative methods that may or may not already be in use in that area. If data are available, this should be noted on the checklists and used to make the qualitative effectiveness judgment. If no quantitative data are available, the effectiveness of the feature at meeting its objective may not be known. In these cases, the response category of 'don't know' is used on the checklists.

Assigning Project Performance Ratings

The main reason to evaluate each individual project feature is to develop an overall implementation or effectiveness performance rating for the entire restoration project. After all individual features in the project have been evaluated, a monitoring checklist summary is used to tally all the types of features monitored and assign an overall project performance rating (see Figure 5).

EFFECTIVENESS MONITORING CHECKLIST SUMMARY

Contract Name: Deer Creek Instream Habitat Project **Contract #:**P0585012 **Reporting Date***:* 05/12/05
Drainage Basin: Eel River **Stream(s):** Deer Creek, Mill Creek
Contract Manager: Jane Brown **Reviewers:** Jill Doe, John Smith **Implementation Date:** 03/04
Is this a maintenance project? No **Original Contract #:** _____

	HB	FL	SC	HI	HS	HA	WC/WP	HR		HU				
	Fish Passage			Instream Habitat Restoration	Streambank Stabilization	Habitat Acquisition		Riparian Restoration		Watershed Restoration (Upslope)				
	Instream Barrier Modification	Fish Ladder	Fish Screens			Land Use Control	Water Conservation / Water Purchase	Riparian Planting	Vegetation Control	Slope Stabilization / Erosion Control	Crossing Upgrading	Crossing Decommissioning	Road Upgrading	Road Decommissioning
	FP			HI	HS	LU	WC	RP	VC	EC	CU	CD	RU	RD
# checklist pages				5				2			1			
Total # project features				15				6			1			
# features monitored				15				6			1			
# EXCELLENT				11				5			1			
# GOOD				3				1						
# FAIR				1										
# POOR														
# FAILED														

Overall Project Effectiveness Rating: ***GOOD***

Figure 5. Overall Project Effectiveness Monitoring Checklist Summary.

This project was comprised of 22 individual project features (15 instream, 6 planting, and 1 stream crossing upgrading feature), all of which were monitored and assigned an effectiveness rating. Based on the proportion of features that was rated at each level, the overall project was assigned an effectiveness rating of good. FRGP staff developed an overall project rating formula

based on the proportions of performance ratings assigned to project features. The current method is shown in Table 2.

Table 2. Overall Project Implementation and Effectiveness Rating Formula Based on Feature Ratings.

Feature Rating		Overall Project Rating				
		Excellent	***Good***	***Fair***	***Poor***	***Failed***
Cumulative percentage of features rated at	***Excellent***	>/80%				
	Good		>/80%			
	Fair			>/80%	>/50%	<50%
	Poor	0	/<10%			
	Failed	0	0	/<10%	>/25%	

For the project shown in Figure 5, 17 of 22 project features were rated excellent (77 percent), 4 were rated good (18 percent), and 1 was rated as fair (5 percent). In this case, more than 80 percent of project features were rated as good or better and less than 10 percent (none) were rated as poor. This leads to an overall project rating of good.

These methods involve evaluating every feature of each project monitored for implementation and effectiveness. Some projects, however, may consist of so many project features as to make monitoring them all infeasible. In these cases, sampling of project features is possible.

Feature Sampling

Every feature of a project should be monitored whenever possible. This should be relatively efficient for some small projects, such as installation of a single culvert, bridge, or fish ladder. However, for projects with a large number of features, this may be an overwhelming task. For large road projects with scores of project features (including installation of multiple rolling dips, outsloping, and culvert upgrades) time constraints may require sampling features for monitoring. This may also be true for projects with extensive instream habitat work involving many structures, riparian plantings, or bank stabilization measures.

Special care must be taken when sampling features. Effectiveness cannot be easily interpreted for features when there is no assessment of whether implementation was done correctly (see discussion below). Therefore features not monitored for implementation should not be monitored later for effectiveness.

Sampling may be done in one of two ways, both of which involve grouping features of one type into linear segments and choosing a subset of features for monitoring. An example is an instream habitat modification project with 25 instream structures over a mile of stream. Structures chosen for monitoring could be determined at random, or systematically e.g., choosing every fifth structure to evaluate. Alternatively, the mile could be broken down into segments of 5 structures each, and all structures within one randomly chosen segment monitored. In either case, the choice of what to monitor should consider how representative the chosen features are of the project as a whole.

Another alternative potentially applicable to projects such as road upgrades is to select features for monitoring based on their relative importance or risk. For example, on a road upgrade where numerous cross drains are installed, the monitor could select the ones that appear to pose the

most risk of downslope erosion. This would render overall project ratings that are conservative, or in other words, weighted towards projects more likely to fail.

Making these decisions requires both expert judgment as well as all available information about the project. Consultation with project contractors and DFG colleagues while making these decisions is encouraged.

Interpreting Project Performance Ratings

In most cases, effectiveness of projects should be assessed only when they have been properly implemented. This maximizes the possibility that results will be interpreted unambiguously. If projects that were not properly implemented are assessed for effectiveness, four different ratings of results emerge rather than two (effective or not effective) (Table 3).

Table 3. Interpreting Project Performance Ratings.

Implementation	**Project Effective** ***(Excellent or Good)***	**Project Not Effective** ***(Fair, Poor, or Failed)***
Project properly implemented ***(Excellent or Good)***	Result 1: Project Effective	Result 2: Project Not Effective
Feature not properly implemented ***(Fair, Poor, Failed)***	Result 3: Project Not Needed	Result 4: Don't Know

In Table 3, result 1 occurs when the project was well implemented and effective, at least in the short term. Long-term effectiveness is only assured if the project area has experienced a stressing precipitation or stream flow event before effectiveness monitoring occurred. In result 2, the project was properly implemented, but was not effective at reaching its stated goals. This may be due to deficiencies in project design, unrealistic goals, or poor choices in project location or type. Occasionally, stochastic events may occur that compromise the project.

Interpretation of result 3 is more difficult. The project was effective, at least in the short term, despite poor implementation. It's possible the project was not needed if goals were reached even without well implemented project features. Interpretation of result 4 is not possible. Since the project was not implemented correctly, effectiveness of the project design cannot be judged.

Monitoring Study Design

These implementation and effectiveness monitoring methods are currently in use to allow reporting by DFG to the U.S. Army Corps of Engineers (ACOE), the National Oceanic and Atmospheric Administration (NOAA), and the State Water Resources Control Board (SWRCB). The ACOE has granted DFG a Regional General Permit which authorizes minor fill discharge of clean earth, gravel, and rock and wood associated with anadromous salmonids habitat restoration projects. The ACOE permit is conditional upon compliance with mandatory terms and conditions set forth in the NOAA Biological Opinion. The implementation checklists were used during the pilot phase (2004) to collect the non-biological data necessary for reporting to ACOE and NOAA. Implementation monitoring was integrated with DFG's contract administration process. DFG contract managers completed the implementation checklists and summaries for all project features completed in 2004.

Prior to each field season, a list of projects to be worked on under the Regional General Permit is given to NOAA by DFG. During the pilot year, the list included 207 proposed and ongoing

projects. By the end of the construction season, 59 had not yet begun implementation and 5 were cancelled. A total of 143 had been begun (74) or been completed (69). Of these 143, 101 projects (71%) were rated as having excellent or good or good implementation, 1 project was rated as fair (1%). No projects were rated as poor or failed. Another 19 (13%) had no features completed to rate. No information was available on the final 22 projects (15%)

NOAA also mandates effectiveness monitoring of ten percent of restoration projects. During the pilot phase (2004), the ten percent were chosen through stratified random sampling. A list of 273 projects completed during the last three years was assembled and stratified first by ACOE region and then by project type. Ten percent of each of these projects (by stratum) was chosen randomly for effectiveness monitoring. The four ACOE regions included (in 2004) were the North Coast, South Coast, Central Coast and the San Francisco Bay Regions. The three overall project types were instream work (HB, FL, SC, HI, and HS), riparian (HR and HA) and upslope projects (HU). A total of 29 individual contracts were monitored for effectiveness representing 38 projects (some contracts included multiple projects). Of these, 27 projects (71%) were rated as excellent or good for effectiveness. Four projects (11%) were rated as fair, 2 projects (5%) earned a poor rating and 2 projects (5%) were rated as failed.

As permitting requirements change, future study designs using these methods will probably also change. Effectiveness monitoring will probably draw on a list of projects completed during one year instead of three, and will be stratified by updated ACOE regions and project types. In addition, projects chosen for future sampling pools should include only those rated good or excellent on implementation to allow effectiveness conclusions to be drawn more definitively, as discussed above in Table 3.

These methods can also be applied to program wide reporting not tied to permitting. In this case, a different study design may be appropriate.

DATA QUALITY

It is assumed that these methods will be used by agency staff or professional consultants with expertise in project design, implementation and contracting. Data quality objectives include repeatability by and between observers. Generally, a goal of variability of plus or minus 10 percent in measurements and assessments is desirable. Quality control will be achieved through a combination of: 1) initial training; 2) repeat surveys by independent surveyors; and 3) follow-up training. Field reviewers must meet minimum qualifications in order to maintain data quality.

REPORTING AND ANALYSIS

The information collected using these methods can be used to report to a wide variety of audiences. Information collected in the 2004 pilot phase was used to report to the U.S. Army Corps of Engineers, the State Water Resources Control Board, and NOAA. Other potential uses are to report to Congress on effectiveness of federal funds expended for fish restoration and to report to the California State legislature on effectiveness of state funds. Reports would also be useful to internal DFG audiences and the research community. Reports generated from these data allow evaluation of the overall restoration grant program as well as implementation and effectiveness of individual projects, project types or monitoring categories.

Completion of the suite of pre-treatment, implementation, and effectiveness checklists for projects will allow analysis of whether individual projects have been implemented correctly and

met their stated goals. In addition, percentages and frequencies of projects that improve habitat characteristics of interest such as habitat accessibility, conditions of the channel bed and banks, etc., can be produced. This information may be compiled to analyze the percentage and type of projects that are most effective and the goals they are most likely to achieve.

It is possible some effectiveness criteria may not be easily evaluated in a qualitative manner. Compilation of information indicating that achievement of specific objectives is unknown should be considered a useful part of qualitative effectiveness monitoring. For example, if it is not possible to evaluate the ability of in-stream projects to improve channel substrate, this may indicate the need for a quantitative study of substrate effects. Inability to answer many effectiveness questions may also point to the need for improvement in storage and access to project records, implementation documentation, or the specification of objectives in the project application.

HISTORY OF METHOD DEVELOPMENT AND REVISIONS

These methods were tested by DFG staff in the 2004 field season based on a draft report completed in May 2004. These data was used for reporting to the Army Corps of Engineers in March 2005 (Collins 2005). The field methods were modified based on this initial testing period. This version was completed March 2005.

FIELD METHODS

Completion of Monitoring Checklists

Completion of monitoring checklists involves assembling relevant project information, visiting the project site and answering checklist questions, taking permanent photo point and opportunistic photos, and making a summary judgment of implementation or effectiveness of each feature. Preparation of implementation checklists may be a mandatory step in contract closure.

Assembling Project Documentation

The first step is compiling adequate project documentation. Information assembled should include:

- Project application and assessments
- Project contract
- Environmental permits and mitigation measures required
- Onsite Navigation Form including how to find the project and the location of permanent markers of project coordinates
- Photo Description Form showing location of permanent photo points
- Available pre-project, implementation, and post-project “opportunistic” photos and photos from permanent photo points
- Previously completed pre-treatment, implementation, and effectiveness checklists

Assembling Monitoring Checklists

The number and type of project features to be monitored must be determined prior to going into the field in order to assemble the appropriate number of monitoring checklists. The twelve different monitoring categories and the corresponding FRGP funded project types are listed in Table 4. One checklist form can accommodate assessment of three individual project features.

Table 4. Correspondence of FRGP Project Types to Project Monitoring Categories.

Project Category	Monitoring Checklist Category
HB – Instream Barrier Modification, FL - Fish Ladder, SC – Fish Screens	Checklist FP - Fish Passage Improvement (Field Method 1)
HI - Instream Habitat Restoration	Checklist HI - Instream Habitat Restoration (Field Method 2)
HS - Streambank Stabilization	Checklist HS - Streambank Stabilization (Field Method 3)
HA - Habitat Acquisition and Conservation Easements	Checklist LU - Land Use Control (Field Method 4)
WC – Water Conservation, WP – Water Purchase	Checklist WC – Water Conservation / Water Purchase (Field Method 5)
HR – Riparian Restoration	Checklist VC -Vegetation Control (Field Method 6) Checklist RP - Riparian Planting (Field Method 7)
HU – Watershed Restoration (Upslope)	Checklist EC - Slope Stabilization and Erosion Control (Field Method 8) Checklist CU – Stream Crossing Upgrading (Field Method 9) Checklist CR – Stream Crossing Removal (Field Method 10) Checklist RU – Road Segment Upgrading (Field Method 11) Checklist RD – Road Segment Decommissioning (Field Method 12)
PM - Project Maintenance	Use the checklist that applies

Most projects include treatments from a number of different monitoring categories. For example, a project that has been designated as an instream project (HI) by the sponsor and DFG may actually involve installation of eleven instream structures along with other types of treatments including stream bank stabilization (HS) (installation of eight bank treatments) and riparian restoration (HR) (planting of four riparian areas). Monitoring is done on all of these types of features, not just the instream structures. In this case, the checklists needed are in the monitoring categories of HI/instream restoration, HS/streambank stabilization, and RP/riparian planting.

Since each checklist page accommodates three features, four in-stream habitat (HI) checklist pages are needed to record eleven features (3+3+3+2). Three bank stabilization (HS) checklist pages are needed to record eight stabilization features (3+3+2), and two riparian planting (RP) checklists are needed to record the four planting features (3+1). Therefore, a total of nine checklist pages will be needed in the field.

The fish passage monitoring checklist is a special case and should be used every time a treatment is done to benefit fish passage, regardless of project type. Instream restoration, water conservation, vegetation control, stream crossing upgrading, and stream crossing decommissioning are all monitoring categories for practices that may also require completion of a fish passage checklist for a feature. For example, a culvert upgrading project done solely to reduce sediment input to a stream should be monitored using only the culvert upgrading checklist. A culvert upgrading project done to improve fish passage should be monitored using both the culvert upgrading checklist and the fish passage checklist.

Completing Checklists

Once the project has been located (or documented) using information from the On Site Navigation Form, checklists can be completed. Visit each project feature and answer as many questions on the checklist as possible, referring to the instructions in the next section. Each checklist contains questions for a wide range of implementation and effectiveness criteria, not all of which will apply to every feature.

Pre-treatment

Goals of pre-treatment monitoring are to identify objectives for each project feature and to document project conditions for comparison during future monitoring. At each location where a treatment/ feature will be installed, identify the specific goals of that feature and answer the appropriate questions on the checklist. When a goal has been specified by answering *Yes* to a question, also answer the sub-questions. Answering sub-questions below goals that are not applicable to the feature (with the answer *No*) is not required. Instead, enter a diagonal slash (/) in that space on the checklist.

Quantitative sub-questions may be answered using a variety of means. For some project types, this information is readily available in project applications. For example, road projects are required to have completed road assessments (see DFG Restoration Manual Chapter 10). Sub-questions for crossing and road upgrading and decommissioning have been written to accommodate these data. For projects in which these data has not already been collected, some basic data collection should be done during checklist completion.

Implementation

Goals of implementation monitoring are to evaluate whether the project meets the specifications in the project contract and to collect some basic quantitative performance measures. Monitoring questions ask whether project features such as culverts, structures, or plantings were installed as approved. In some cases, questions will require monitoring of an aspect of the project that was not specified in the contract. In these cases, monitors should evaluate whether the project was implemented according to accepted design standards, usually contained within the *DFG Stream Habitat Restoration Manual* or Weaver and Hagans (1994).

Quantitative sub-questions on the checklists ask for performance measures required for reporting to the Pacific Coastal Salmonid Restoration Fund. Answering all of the appropriate sub-questions is required.

Effectiveness

The goal of effectiveness monitoring is to gauge whether the project feature has achieved its objectives. In order to do this, current conditions must be compared to pre-treatment conditions. Visually judge whether the desired improvement has occurred. If this is possible, it is not necessary to complete quantitative sub-questions. Leave these fields blank and enter a diagonal slash (/) in that space on the checklist.

An exception to this rule may be in order if repeat effectiveness monitoring using these checklists is anticipated.

RIPARIAN PLANTING - EFFECTIVENESS CHECKLIST Page ___ of ___

Contract name: Howe Creek riparian plantings **Contract #:** P0010538

Stream/Road: Howe Creek **Drainage:** Redwood Creek **Maintenance?** Yes or No

Date *(mm/dd/yy)* **:** 08/16/04 **Evaluation crew:** Brown, J.; White, R.

		Project Feature	#: 1		#: 2		#: 3	
		Type of treatment: (see code sheet)	555		555		555	
				Photo #		**Photo #**		**Photo #**
Riparian Cover Effects	1.	Was survival of planted vegetation adequate?	Y	414	P	417	Y	419
	2.	Is growth and vigor of planted vegetation acceptable?	Y		N	418	Y	
	3.	Did the treatment lead to an increase in vegetation cover on banks?	Y	415	N		Y	420
		a. Length of bank with increased vegetation cover (ft):	150		----------		100	
		b. Current total vegetation cover on banks (percent):	40		0		80	
		c. Dominant bank cover type: NON, HRB, SHR, TREE	SHR		NON		SHR	
	4.	Did the treatment reduce the size of the gaps in bank vegetation?	A		N		Y	421
		a. Length of largest gap in vegetation >3 ft tall (ft):	----------		15		3	
	5.	Did the treatment lead to an increase in floodplain vegetation cover?	A		A		A	
		a. Area of floodplain with increased cover (ft²)	----------		----------		----------	
		b. Total vegetation cover on floodplain (percent):	----------		----------		----------	
		c. Dominant floodplain cover: HRB, SHR, TREE, OTH	----------		----------		----------	
	6.	Did the treatment lead to an increase in over channel canopy cover?	N		N		N	
		a. Length of channel with increased canopy cover (feet):	----------		----------		----------	
		b. Current over channel canopy cover (percent):	0		0		0	
Composition Effects	7.	Did species composition change as a result of the treatment?	Y		N		Y	
		a. Current dominant species (enter 4 letter species code):	SALX		----------		SALX	
	8.	Did the project increase large wood recruitment potential?	Y		N		Y	
		a. LWD recruitment method: EXC, INT, PLC, RPR, OTH	INT		----------		INT	
Channel and Bank Effects	9.	Did the treatment lead to desirable bank condition changes?	Y	416	N		Y	422
		a. Improved: ANG, BAR, CHS, ERO, MIG, SMP, STB, VEG, OTH	STB		----------		STB	
	10.	Did the treatment lead to undesirable bank conditions?	N		N		P	
		a. Impaired: ANG, BAR, CHS, ERO, MIG, SMP, STB, VEG, OTH	----------		----------		----------	
	11.	Did the project lead to desirable channel changes?	P		N		Y	423
		a. Type: AGG, FPD, GRC, HDC, INC, NAR, SDC, SIN, STB, OTH	STB		----------		FPD	
	12.	Did the project cause undesirable channel conditions?	N		N		N	
		a. Type: AGG, BRD, HDC, INC, NAR, SDC, SIN, STB, WID, OTH	----------		----------		----------	
Overall Effectiveness Rating *(Excellent, Good, Fair, Poor, Failed)*			GOOD		POOR		EXCELLE	

Comments and details for entry of OTH for other or P for partially:

11. Willow plantings appear to have stabilized about half the bank length. Rest of planting area shows some erosion.	1. About 75% of willow sprigs were planted above water line and have died.	10. Willow growth and deposition has led the stream to flow around the treatment area at the lower portion of the treatment area. The end run is causing erosion in that area.

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Figure 6. Completion of a Sample Effectiveness Checklist.

For some features, it may not be visually obvious whether or not the feature's goals have been reached. In these cases, either respond *D* for don't know or collect some quantitative data. Road projects in particular may require some estimation of erosion volumes and comparison to pre-treatment quantities to allow effectiveness judgments.

Identifying Sampling Segments

The manner in which the sampled features to be monitored are chosen and their locations must be recorded so that further evaluation will include the same features. The spatial dimensions of sampled segments should be identified by established landmarks or by the feature numbers at each end of the segment. For example, a section of road to be monitored for drainage upgrading may be defined as reaching from either road mile 0.12 to mile 0.18 or from culvert 102 to culvert 115. Sampling segments should be assigned numbers and their locations should be noted on the On Site Navigation form. Project maps should be consulted to ensure correct identification of feature numbers and thus, a well-defined segment that can be relocated for future monitoring. The total number of features in the segment and the number sampled should be denoted on the checklist header information. The method of sampling (risk, random, every 5th structure, etc) should be denoted in the checklist notes. One checklist column should be completed for each feature to be monitored under the sampling scheme.

Taking Photographs

Photos from permanent photo points should be taken during monitoring visits to capture the overall condition of the project or feature before and after treatment. Although establishing permanent photo points can be time consuming, having good photos in hand will save future monitors much time and can help them avoid the time consuming need to collect quantitative data. Copies or print outs of the Photo Description Forms along with site maps and sketches can be used to re-occupy photo point locations. Photos (or color copies/prints of photos) taken during the previous round of photography should be laminated, brought to the field and used to re-frame photos from the previous round of photo point monitoring.

Opportunistic photos can also be taken to document aspects of interest to implementation or effectiveness issues. Record photo numbers on the associated checklist next to the most appropriate question or next to several if the photo provides insight into several monitoring questions.

Completing Summary Sheets

The Monitoring Checklist Summary is completed after questions have been addressed and photos taken for all (or the determined sample of) project features on implementation and effectiveness monitoring visits (see Figure 7). The summary requires a cumulative judgment on the implementation or effectiveness of the entire project, based on the ratings all of its features (see Table 2 above). Recommendations for any needed repairs and the timing for the next monitoring visit are made at this time.

PROJECT EFFECTIVENESS MONITORING CHECKLIST SUMMARY

Contract Name: Seely Creek **Contract#:** 0010544 **Reporting Date** *(mm/dd/yy):* 02/11/05

Drainage Basin: Russian River **Stream(s):** Seely Creek, Mill Creek, Green Creek

Contract Manager: L. Jones **Reviewers:** B. Budnick **Implementation Date** *(mm/yy):* 06/03

Is this a maintenance project? No **Original Contract #:** _____

	HB	FL	SC	HI	HS	HA	WC/ WP	HR		HU				
	Fish Passage			Instream Habitat Restoration	Streambank Stabilization	Habitat Acquisition		Riparian Restoration		Watershed Restoration (Upslope)				
	Instream Barrier Modification	Fish Ladder	Fish Screens			Land Use Control	Water Conservation / Water Purchase	Riparian Planting	Vegetation Control	Slope Stabilization / Erosion Control	Crossing Upgrading	Crossing Decommissioning	Road Upgrading	Road Decommissioning
	FP			HI	HS	LU	WC	RP	VC	EC	CU	CD	RU	RD
# checklist pages														
Total # project features	2									2	14	2	8	3
# features monitored	2									2	14			
# EXCELLENT	1										4	1	6	1
# GOOD	1									2	8	1	1	2
# FAIR											2		1	
# POOR														
# FAILED														

Overall Project Effectiveness Rating: ***GOOD***

Rationale/Recommendations: Effectiveness of this project was excellent for some features, but only good overall. This is because upgrades on the section of road between culvert 15 and 28, however, appear to have been underdesigned, and so rate only fair for effectiveness.

Stressing Event:

Size of the largest flow event the project area has experienced since implementation: 10 year flow Date: 01/11/04

Size of the largest rainfall event the project area has experienced since implementation: 5 year event Date: 01/11/04

Information source: USGS gaging station at nearby Cow Creek

Date For Next Monitoring Visit: Next 10 year flow

Objective: The next monitoring visit should occur after the next 10 year flood flow to assess the long-term effectiveness of culverts #15 and 28 which show some signs of undermining.

Figure 7. Completion of a Sample Effectiveness Monitoring Checklist Summary.

Instructions for Completing Checklists

There are 36 individual checklists, three each (pre-treatment, implementation, and effectiveness) for 12 different monitoring categories. In addition there are two summary checklists, one for implementation and one for effectiveness. Each checklist is similar in formatting and style and has elements in common with the others. These include the header, question, sub-question, and note sections, as well as three answer columns. In general, each column should be used to report on one individual feature.

There may be some projects which have multiple features consisting of the exact same treatment. When this occurs, answers to checklist questions for multiple features may be combined (lumped) into one column. Since summary judgments are required on the status of the lumped features, it is most accurate to lump only when features have similar goals, pre and post treatment conditions, and implementation and/or effectiveness ratings. During analysis, the responses to the questions in the answer column will be multiplied by the number of features lumped into one checklist column.

For example, an instream project that involves 8 boulder weirs and 2 boulder clusters may have monitoring answers recorded in fewer than 10 checklist columns when answers are lumped according to goals and conditions (See Table 5).

Table 5. Header Information for Monitoring Segments when Lumping Answers to Monitoring Questions.

	Column a	*Column b*	*Column c*
Project Feature #	----------	----------	----------
OR Monitoring Segment Beginning Feature #	Structure 1	Structure 1	Structure 1
Monitoring Segment Ending Feature #	Highway 89 bridge	Highway 89 bridge	Highway 89 bridge
Total # of Features in Segment/ # of Features Evaluated	6/6	2/2	2/2
Type of Instream Feature	310 (boulder weir)	310 (boulder weir)	312 (boulder cluster)

In this example, the evaluator has examined 8 boulder weirs, all with identical goals. He found that six had excellent implementation and two had only good implementation due to use of undersized rock. He then lumped the six with excellent implementation into one answer column and answered the checklist questions in column a based on their aggregate condition. The two with only good implementation were lumped and answers to questions for both were entered into column b. Both boulder clusters were lumped in column c because they had identical goals and conditions. Answers to questions in each will be multiplied by the number of features in each column (6, 2, and 2 respectively) during analysis.

Lumping answers to checklist questions from multiple features into one column should not be confused with sampling. In sampling, only a subset of features are monitored, while in lumping, all features are monitored but similar answers are combined into one checklist column in order to save time and space on checklists while in the field. When lumping or sampling, the header information section of the checklist is used slightly differently to indicate how features have been combined or omitted.

Section 1- Header Information for Monitoring Checklists

1) **Page ___ of ___**: Number the page. For example, if this is page 2 out of 3 total pages used to monitor a contract, enter: Page 2 of 3. For Monitoring Checklist Summaries, this should be page 1 of 1.
2) **Contract Name**: Enter the name of the contract assigned to the project by the California Habitat Restoration Project database (CHRPD).
3) **Contract #**: Enter the contract number assigned by the California Department of Fish and Game. If no contract number has yet been assigned, contact the database manager for a temporary number.
4) **Project Type** - Enter the project type assigned by the CHRPD for the Fish Passage Checklist only. This checklist may be used for instream barrier removal projects (HB), fish ladders (FL), or fish screening (SC) projects. Circle the type of project being monitored.
5) **Stream**: Enter the stream name as it appears on the 7.5 Minute United States Geological Survey (USGS) quadrangle. If unnamed, enter as *tributary of [parent stream] and LLID if known*..
6) **Drainage**: Enter the name of the main drainage basin that the stream is located in.
7) **Maintenance**? If the contract funds maintenance on a project completed under an earlier contract, circle YES. If not, circle NO.
8) **Date -** For monitoring checklists, enter the date of the site visit (*mm/dd/yy).* /
9) **Evaluation Crew**: Enter the full names of people conducting the monitoring survey (*last name, first name).*
10) **Feature Number**: Enter the project feature number assigned during the project planning and implementation phase. Refer to the On Site Navigation Form to identify features numbers. Be aware that pre-treatment feature numbers may not be the same as the feature numbers from the final implemented restoration project. This option should be used when checklist questions are answered for one project feature at a time, not when lumping features together. It may also be used when sampling is being done and a sampled segment has been given an individual number. Refer to the On Site Navigation form for definitions of sampling segments.

OR

Monitoring Segment –Beginning/Ending Feature Number: This option should be used only when identical features are lumped for monitoring, not when features are sampled. Enter the feature number at the beginning and end of the monitoring segment. Do not fill out the Feature # cell above. Define the monitoring segment as stretching from two project features with discrete feature numbers. For example, a road upgrading segment may be defined as the road between rolling dip 20 and 35 or between outsloping treatment 1 and 4.

11) **Total Number of Features in Segment / Number of Features Evaluated in Segment**: When sampling, enter the total number of features within the monitoring segment, whether or not they will all be monitored. Then enter the total number of features that will be monitored. For example, if only 15 out of 60 rolling dips in a road drainage project are to be monitored, enter 60/15. When lumping features, enter the total number of features being combined for the monitoring segment. For example, if 3 unanchored log structures are examined and found to have similar goals and conditions, the answers to checklist questions may be combined into one column. Enter 3/3.

12) **Type of Treatment**: Identify the specific practice which was or will be implemented at that location. Use the code sheet in the Appendix.

Section 2- Checklist Questions and Responses

All blanks for each feature or segment surveyed must be filled in with an appropriate response. Begin with the first question and fill in the responses in the appropriate column.

13) **Primary question** - Answer checklist qualitative questions with: **Y** = *Yes*, **P** = *Partially*, **N** = *No*, **D** = *Don't Know*, **A** = *Not Applicable*. Do not write N/A for not applicable. Write neatly, P and D and even N can easily be made to look alike through bad penmanship. Each primary question should be answered with one of these choices.

- Pre-treatment – Questions require identification of project goals. Answer **Y** for *Yes* if the question lists a goal of that feature. If the question lists a goal that is not part of that feature, answer **N** for *No*. Answer **A** for *Not Applicable* only if that question is not a possible goal for that type of feature. Do not answer **D** for *Don't Know*.
- Implementation - Answer all appropriate sub-questions for collection of performance measures required by the Pacific Coastal Salmonid Restoration Fund
- Effectiveness – If a goal specified in the pre-treatment checklist was not reached, enter **N** for *No*. If the question asking about desirable impact was achieved answer **Y** for *Yes*, or **P** for *Partially*. Answer **A** for *Not Applicable* if it was not a goal. For questions asking about negative impacts / unintended consequences, do not answer **A** for *Not Applicable*. Instead, document whether the negative impact occurred by entering **Y, P, N** or **D**.

14) **Photo #**: If a photograph was taken which illustrates the aspect of the project feature in question, enter the photo number. An individual photo number may be entered for more than one question if it illustrates multiple aspects of a project feature. Not all feature/segment questions need to have a photo taken.

15) **Sub-questions** – Answer sub-questions by specifying the goals, values, or problems of interest. When a field is left blank, enter a diagonal slash (/) in that space on the checklist. If the needed choice is not available enter **OTH** = *Other*, and specify what this means in the comment section. Special cases may be encountered when the needed answer code is not available, but exists on the checklist. Use the code only if you are sure it applies, otherwise use **OTH** and explain.

- Pre-treatment - Answering sub-questions below goals that are not applicable to the feature (with the answer *No*) is not required.
- Implementation - Answer all appropriate sub-questions for collection of performance measures required by the Pacific Coastal Salmonid Restoration Fund
- Effectiveness - In instances where judgments can be made without measurement, sub-questions may be left blank. Answering sub-questions below primary questions that are not applicable to the feature (with the answer **A** for *Not Applicable*) is not required. If the answer to the primary question is **D** for *Don't Know* or **N** (for *No*), you may or may not be able to answer the sub-questions. Read the sub-question carefully.

Overall Performance Ratings
Implementation Checklist Answers Are:

16) **Overall rating:** After completing all the questions on the checklist, provide an overall judgment of each project feature. Implementation checklist answers are:
    - *EXCELLENT* - Installation of the project feature meets all requirements.
    - *GOOD* –There are some deficiencies in the project feature, but these will not affect its overall effectiveness. Deficiencies are not enough to lead to failure.
    - *FAIR* – There are some deficiencies in the project feature, and these may cause problems in the future. Some characteristics of project feature, although not enough to cause corrective action at this time, require further scrutiny. The feature will probably hold up.
    - *POOR* – Implementation was not done correctly. There are deficiencies in the project feature, and these are enough to cause problems in the future. Remedial action is required.
    - *FAILED* – Implementation was not done correctly. Deficiencies in the project feature have already caused enough problems that its objectives will not be met. Remedial action is required.

Effectiveness Checklist Answers Are:

- *EXCELLENT* - The project feature is performing according to objectives.
- *GOOD* –There are some deficiencies in the project feature's performance, but it is still performing in a satisfactory manner.
- *FAIR* – There are some deficiencies in the project feature's performance, and these may cause problems in the future. Some characteristics of the project feature, although not enough to cause corrective action at this time, require further scrutiny.
- *POOR* – The feature is not performing in a satisfactory manner. Remedial action is required.
- *FAILED* – The feature has completely failed to meet objectives and/or is causing deleterious effects on habitat.

17) **Comments:** Enter any pertinent comments about the feature or its performance. Provide information on how the monitoring segment was sampled, the feature numbers of features that were lumped, and/or justification for how a project feature was rated or information on any responses of OTHER in the checklist questions. If remedial action is needed, comment on this.

Instructions for Completing Project Monitoring Checklist Summaries:

After all project features have been monitored for implementation or effectiveness, complete a monitoring summary sheet to summarize the overall implementation or effectiveness of the entire project. Provide the following information:

Projection Implementation Monitoring Checklist Summary

Section 1- Header Information:
See header information under checklist instructions above. Additional fields are:

1) **Contract Manager –E**nter the name of the DFG employee managing the restoration contract.
2) **Project Status –**If implementation of the project has not yet begun, circle 'Not Started'. If project implementation has begun but not yet been completed, circle 'Ongoing'. If all implementation activities have been completed, enter 'Completed'.
3) **Implementation Date -** Enter the final month and year of implementation for this project.
4) **Reporting Date** - Enter the date on which the reporting is being filled out *(mm/dd/yy.)*
5) **Is this a Maintenance Project**? If the contract funded maintenance on a project completed under an earlier contract, circle YES. If not, circle NO.
6) **Original Contract #:** If the answer to question 10 is yes, enter the contract number of the original project for which maintenance is being done.

Section 2 – Implementation Information:

7) **Project Description** – Write a brief description of the overall project and associated features.
8) **Project Goals** – Indicate whether the project has clearly stated goals by which effectiveness may be judged. If the project was developed based on a watershed plan or a limiting factors analysis, identify the name of the plan and the code for the factors limiting fish habitat that are addressed by the project. Choose all limiting factors from the following list:
   1 Water quantity – lack of flow, diversions, or runoff
   2 Water quality – temperature, chemistry, or turbidity
   3 Riparian dysfunction – lack of shade, excessive nutrients, roughness elements, large wood
   4 Excessive sediment yield – pools and gravel quality
   5 Spawning requirements – passage, gravel, resting area-pools
   6 Rearing requirements – velocity, lack of woody debris, pools
   7 Estuary/lagoon issues – closure during migration periods
9) **Project Goals and Objectives -** Write in the general project goal and any specific objectives found in the project application. Examples may include increasing the number of primary pools or expanding willow cover within the project reach. Identifying the specific objectives of the project is critical to evaluating effectiveness in the future.
10) **Implementation Rating** – Taking into account the implementation ratings from all the individual project features monitored and the rating formula in Table 2, provide an overall rating on the implementation of the entire project. Possible answers are: *EXCELLENT, GOOD, FAIR, POOR, FAILED*

11) **Rationale/Recommendations –** Provide a rationale for your overall rating of contract implementation. If maintenance or improvements to this project are needed to help it meet its objectives, please write your recommendations here.
12) **Objective for next visit/ Date for next visit -** If some important information was not available due to timing of the monitoring visit(s), make a recommendation of when a return visit would be necessary to gather information to adequately monitor project implementation.

Side 2

This side of the summary form allows for tallying of project features, area treated, stream miles affected, road miles treated and other performance metrics. If the quantity was not a component of the project, do not enter number in the blank and place a cross mark diagonally in the box.

13) **# of Checklist Pages Attached** – Total the number of implementation monitoring checklist pages completed and attached to the Monitoring Summary Sheet.
14) **Total # project features implemented** - Enter the total number of features within the project. This should equal number of features evaluated on attached checklists unless sampling has occurred.
15) **# of Features Monitored –** Enter the total number of features monitored using the checklists. This number will be smaller than the total number of project features if sampling has occurred.
16) **# EXCELLENT, # GOOD, # FAIR, # POOR, # FAILED** - Enter the number of project features that received each rating into the appropriate project type column. A total of all of these should equal the total number of features monitored.
17) **Performance Measures –**Enter the totals of the performance measures for the project in the appropriate box. Each project type/column only requires a few of all the measures listed. Those required for a project type are marked by a star (*) in the required box. Boxes containing performance measures that were not part of the project should be left empty except for a diagonal mark (/) placed in the box. Some performance measure totals may be arrived at by summing the quantities in the sub-questions of each checklist completed. Care should be taken not to count the same quantity more than once especially when two monitoring checklists (including a Fish Passage checklist) have been used for the same feature.
    - *Miles of stream/habitat improved/affected*- Enter the total number of stream miles and/or acres treated within the entire project to the nearest 0.1 mile. This should equal the sum of the stream miles affected from the type subtotals below, unless treatments have occurred in the same area. For example, if ½ mile of stream was treated with instream structures (HI), and the SAME half mile was treated with riparian plantings (RP), the total would be ½ mile, not 1 mile.
    - *Miles of stream bank stabilized/fenced* Enter the total number of miles of stream fenced or stabilized. Add the length treated on both sides when both sides were stabilized or fenced. Add one side when one side only was treated.
    - *Acres protected* - Enter the total number of acres prevented from impacts within the entire project.
    - *Acres treated* – Enter the total number of acres treated with different project types within the entire project. This should equal the sum of the acres treated from the type subtotals below, unless treatments have occurred in the same area. For example, if 5 acres of riparian vegetation was planted (RP), and the SAME five

acres was treated to control exotic vegetation (VC), the total would be 5 acres, not 10 acres.

- *Acres planted* – Enter the total number of acres planted as a result of the project.
- *Acres of invasive species controlled* – Enter the total number of acres treated for invasive species.
- *Miles of road treated* - Enter the total number road miles treated with different project types within the entire project. This should equal the sum of the road miles treated from the type subtotals below, unless treatments have occurred in the same area. For example, if ¼ mile of road was upgraded with improved drainage (RU), and the SAME ¼ mile had all crossings upgraded (CU), the total would be ¼ mile, not ½ mile.
- *# of structures installed/upgraded* – Enter the total number of stream crossing and road drainage structures installed or upgraded as a part of the project.
- *# of structures removed* - Enter the total number of stream crossing and road drainage structures permanently removed as a part of the project.
- *# of barriers modified/removed* - Report a count of all blockages to fish passage that were actually removed or improved as part of this project.
- *Miles made accessible to salmonids* - The miles of stream, to the nearest 0.1 mile, that were actually opened to improved salmon production upstream of the barrier(s).
- *Miles made inaccessible to salmonids* –Enter the miles of stream, to the nearest 0.1 mile, that were actually closed off to salmon as a result of the screen(s).
- *Miles made inaccessible to non-natives* - Enter the miles of stream, to the nearest 0.1 mile, that were actually closed off to non-native fish that would compete with salmonids.
- *Acre feet of water protected by screen* – Enter the amount of water actually protected by the screen, as stated in the water right in terms of acre-feet per year.
- *Average/range of flow diversion screened* – Enter the high and low flows and/or the average flow of water actually protected from salmonid entrapment by the screen.
- *Water returned/maintained in stream:* Enter the amount of water returned to the stream (not including water that is maintained in the stream).
- *Water purchased/leased:* Enter the amount of water that was purchased or leased as part of the project.
- *# of gauges installed* Enter the number of gauges proposed and installed as a part of the project. Water withdrawal projects require a gauge to measure water use.

PROJECT IMPLEMENTATION MONITORING CHECKLIST SUMMARY

Contract Name:_____Contract#:_____ Reporting Date *(mm/dd/yy):* **_____**
Drainage Basin:_____ Stream(s):_____
Contract Manager: _____ Reviewer Names: _____
Project Status:*(circle)* Not Started Ongoing Completed **Implementation Date** *(mm/yy)* :_____
Is this a maintenance project? *(circle)* Yes or No **Original Contract #: _____**

Project Description:

Project Goals: *(Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable)*
Does the project have clearly stated goals?
Does the project address issues contained in watershed plans/ limiting factors analysis?
Name of watershed plan *(enter name)* : _____
Priority limiting factors addressed *(enter codes)* :_____

Project Goals and Objectives:

Overall Project Implementation Rating: *(circle) EXCELLENT GOOD FAIR POOR FAILED*

Rationale/Recommendations:

Date For Next Monitoring Visit:_____

Objective For Next Visit:

PROJECT IMPLEMENTATION MONITORING CHECKLIST SUMMARY (continued) **Contract #:_____**

	FP			HI	HS	HA		HR		HU				
	Fish Passage					Riparian Conservation		Riparian Restoration		Watershed Restoration				
	Instream Barrier Modification	Fish Ladder	Fish Screens	Instream Habitat Restoration	Streambank Stabilization	Land Use Control / Easements	Water Conservation / Purchase	Riparian Planting	Vegetation Control	Slope Stabilization / Erosion Control	Crossing Upgrading	Crossing Decommissioning	Road Upgrading	Road Decommissioning
	HB	FL	SC	HI	HS	LU	WC	RP	VC	EC	CU	CD	RU	RD
Total # checklist pages attached														
Total # project features														
# features monitored														
# EXCELLENT														
# GOOD														
# FAIR														
# POOR														
# FAILED														
Miles of stream/habitat improved/affected	*	*	*	*		*	*		*	*	*	*	*	*
Miles of streambank stabilized/fenced					*	*								
Acres protected					*	*				*				
Acres planted					*			*						*
Acres of invasive species controlled									*					
Miles of road treated											*	*	*	*
# of structures installed/upgraded	*	*									*		*	
# of structures removed												*		*
# of barriers modified/removed	*	*												
Miles made accessible to salmonids	*	*												
Miles made inaccessible to salmonids			*											
Miles made inaccessible to non-natives			*											
Acre feet of water protected by screen			*											
Average/range of flow diversion screened			*											
Water returned/maintained in stream:							*							
Water leased/purchase:							*							
# of gauges installed							*							

** Entry into this field is required for this project monitoring type*

Project Effectiveness Checklist Summary Instructions:

Section 1 - Header Information
See instructions for Implementation Checklist Summary above.

Section 2 – Effectiveness Information
This section of the summary form allows for tallying of the effectiveness of all individual project features to allow assignment of an overall effectiveness rating to the project.

1) **# of Checklist Pages**– Total the number of effectiveness monitoring checklist pages completed and attached to the Monitoring Summary Sheet.
2) **Total # project features** - Enter the total number of features within the project. This should equal number of features evaluated on attached checklists unless sampling has occurred.
3) **# of Features Monitored –** Enter the total number of features monitored using the checklists. This number will be smaller than the total number of project features if sampling has occurred.
4) **# EXCELLENT, # GOOD, # FAIR, # POOR, # FAILED** - Enter the number of project features that received each rating into the appropriate project type column. A total of all of these should equal the total number of features monitored.
5) **Overall Project Effectiveness Rating** – Taking into account the effectiveness ratings from all the individual project features monitored and the rating formula in Table 2, provide an overall rating of the effectiveness of the entire project. How well did the project meet its objectives for improving salmonid habitat? Possible answers are: *EXCELLENT, GOOD, FAIR, POOR, FAILED*
6) **Rationale/Recommendations –** Provide a rationale for your overall effectiveness rating. If factors other than those described in the checklists affect this rating, explain. If maintenance or improvements to this project are needed to help it meet its objectives, write your recommendations here.
7) **Stressing Event: -** Enter the **s**ize of the largest stream flow event/and or largest rainfall event that the project area has experienced since implementation. Specify the source of these data. This allows judgment of whether the effectiveness rating assigned is definitive.
8) **Objective for next visit/ Date for next visit -** If some important information was not available due to timing of the monitoring visit(s), make a recommendation of when a return visit would be necessary to gather information to adequately monitor project effectiveness.

PROJECT EFFECTIVENESS MONITORING CHECKLIST SUMMARY

Contract Name:_____**Contract#:**_____ **Reporting Date** *(mm/dd/yy):*_____ _____
Drainage Basin:_____ **Stream(s):**_____
Contract Manager: _____ **Reviewers:** _____**Implementation Date** *(mm/yy):*_ _____
Is this a maintenance project? *(circle)* Yes or No **Original Contract #:** _____

	HB	FL	SC	HI	HS	HA	WC/ WP	HR		HU				
	Fish Passage							Riparian Restoration		Watershed Restoration (Upslope)				
	Instream Barrier Modification	Fish Ladder	Fish Screens	Instream Habitat Restoration	Streambank Stabilization	Habitat Acquisition: Land Use Control	Habitat Acquisition: Water Conservation / Water Purchase	Riparian Planting	Vegetation Control	Slope Stabilization / Erosion Control	Crossing Upgrading	Crossing Decommissioning	Road Upgrading	Road Decommissioning
	FP			HI	HS	LU	WC	RP	VC	EC	CU	CD	RU	RD
# checklist pages														
Total # project features														
# features monitored														
# EXCELLENT														
# GOOD														
# FAIR														
# POOR														
# FAILED														

Overall Project Effectiveness Rating: *(circle)* *EXCELLENT GOOD FAIR POOR FAILED*

Rationale/Recommendations:

Stressing Event:
Largest flow event the project area has experienced since implementation:_____ Date: _____
Largest rainfall event the project area has experienced since implementation:_____ Date: _____
Information source: _____

Date For Next Monitoring Visit:_____

Objective:

Field Method 1: Fish Passage Projects

Fish passage is the monitoring category developed to encompass the DFG project types of - instream barrier modification (HB), fish ladders (FL), and fish screens (SC). All of project types attempt to affect accessibility to habitat by:

Source: http://stream.fs.fed.us/fishxing/gbu/photos.html

- Installing fish ladders to circumvent barriers
- Modifying natural channels with step pool approaches to culverts or back flooding weirs
- Removing natural barriers by modifying logjams or blasting
- Modifying artificial barriers by means of culvert baffles, repositioning, or size upgrades
- Installing fish screens to prevent fish passage into stream reaches or man-made facilities

Effectiveness of these types of projects is judged based on their success at affecting habitat accessibility and the absence of unforeseen adverse effects on habitat such as channel incision, instability, or excessive sedimentation caused by the project. Short-term effectiveness monitoring should occur during periods of fish migration, typically at highest flows, after at least one winter has passed.

For more information on the importance of fish passage and the physical parameters that characterize passage, see the companion *Monitoring the Effectiveness of Culvert Fish Passage Restoration* (2005), and the *DFG Restoration Manual Chapter 9* (Flosi 1998).

Field Method

Pre-treatment monitoring requires identification of the current passage problem and barrier category (temporal, partial, or complete) as well as the specific goals of the project including:

- Facilitating/impeding fish passage
- Targeted fish species
- Targeted life stage
- Improving movement of watershed products
- Changing channel and bank conditions

Implementation monitoring centers on the adherence of the contract implementers to contract provisions. Checklist questions ask for evaluation of:

- Structure location, position, and alignment
- Structure materials and condition
- Increased/decreased accessibility of habitat to fish
- Length of habitat with affected accessibility
- Any remaining passage barriers

Source: http://stream.fs.fed.us/fishxing/gbu/photos.html

Effectiveness monitoring consists of evaluating whether the project reached the goals identified in the pre-treatment checklist. This is facilitated by collection of the same basic information about the site as collected during the pre-treatment phase. This allows evaluation of:

- Structure condition and position
- Increased/decreased accessibility of habitat to fish of targeted species and age
- Any remaining passage barriers
- Condition of banks and channels in the vicinity of the structure before and after implementation
- Improved movement of watershed products downstream

Checklists also allow recording of fish observations during monitoring visits.

Sampling is not recommended for fish passage projects. Each individual passage structure or modification made to improved passage should be evaluated. This is because these types of projects are typically high in value and strategic importance.

Fish Passage Pre-treatment Checklist

Anticipated Passage Effects

1. Is removal of an obstacle to fish passage a project goal? – Enter Y, N, A.
1a. Type structure causing barrier: - Enter the target species of fish for which a barrier will be removed.
1a. Treatment condition: **–** Specify the current condition of the passage treatment: *EXCELLENT* = The treatment is intact and structurally sound, *GOOD* = The treatment is intact and generally sound but some wear or undermining is evident. Components may have shifted slightly, but the treatment is intact, *FAIR* = The treatment position or condition has been altered significantly, *POOR* = The treatment is visible but has suffered significant movement or damage, *FAILED* = The treatment is not visible or remnants are not in any form of designed configuration.
1c. Type of passage problem: Specify the current type of passage problem(s); *CGA* = culvert gravel absent, *FJH* = fish jump height, *WTD* = water depth**,** *WTV* = water velocity or turbulence, *OTH* = other, specify in Comments section.
1d. Current barrier category: Specify the extent of current barrier to fish passage (see Restoration Manual, Part IX): *COM* = complete barrier, *PAR* = partial barrier**,** *TEM* = temporal barrier, *OTH* = other, specify in Comments section.

2. Is impeding fish passage a goal of the treatment? – Enter Y, N, A.
2a. Type of passage problem: Specify the current type of problem requiring passage impedance or screening; *NNS* = non-native species, *STR* = stranding, *OTH* = other, specify in Comments section.

3. Is fish passage impedance related to a flow diversion? – Enter Y, N, A.
3a. Average flow rate of diversion (cfs): Enter the average amount of the diverted stream flow that will be screened.
3b. Range of flow diverted (cfs): Enter the range of diverted stream flow that will be screened. Express this range as the low flow to high flow [e.g. 30 -1200 cfs].

4. Is the treatment targeted to affect a specific fish species? **–** Enter Y, N, A.
4a. Targeted fish species: Enter the DFG code for the species of fish that is targeted for passage impedance or improvement.
4b. Targeted life stage: Enter the life stage of the targeted species; *ADT* = adult, *JUV* = juvenile.
.
5. Were adults of the targeted species observed near the treatment area? **–** Examine likely habitat on either side of the future passage treatment. Data from quantitative studies may be used to answer this question. Enter Y, N, or D.
5a. Species: Enter the DFG code for the species of adult fish that was/were observed.
5b. Location: Enter the location where the targeted species was observed; *UPS* = upstream**,** *DNS* = downstream**,** *OTH* = other.

6. Were juveniles of the targeted species observed near the treatment area? – Examine likely habitat on either side of the future passage treatment. Data from quantitative studies may be used. Enter Y, N, or D.
6a. Species: Enter the DFG code for the species of juvenile fish that was observed.
6b. Location: Enter the location where the targeted species was observed; *UPS* = upstream**,** *DNS* = downstream**,** *OTH* = other.

Anticipated Channel Effects

7. Is improving downstream movement of watershed products a goal? – Enter Y, N, A.
7a. Watershed product(s) of concern: Specify the watershed product(s) of concern (list additional products in Comments section); *LWD* = large wood, *SBM* = substrate movement**,** *WTR* = unimpeded water flow**,** *OTH* = other, specify in Comments section.

8. Is changing channel conditions a goal of the treatment? – Enter Y, N, A.
8a. Problem: Specify the channel problem(s) of concern; *AGG* = aggradation, *BRD* = channel braiding, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = channel sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.
8b. Desired: Specify the channel improvement(s) targeted by the treatment: *AGG* = channel aggradation, *FPD* = floodplain deposition, *GRC* = grade control, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

9. Is change in channel bank conditions a goal of the treatment? – Enter Y, N, A.
9a. Current bank conditions: Specify the bank problem(s) of concern; *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.
9b. Desired problem reductions: Specify the bank improvement(s) targeted by the treatment: *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

FISH PASSAGE - PRETREATMENT CHECKLIST Page ___ of ___

Contract name: **Contract #:** **Project Type** *(circle)* **: HB** or **FL** or **SC**

Stream/Road: **Drainage:**

Date (mm/dd/yy): **Evaluation crew:**

	Project Feature	#:			#:		#:	
	Type of treatment: (see code sheet)							
			Photo #		**Photo #**		**Photo #**	
Anticipated Passage Effects	1. Is removal of an obstacle to fish passage a goal of the treatment?							
	a. Type structure causing barrier:							
	b. Structure condition: Excellent, Good, Fair, Poor, Failed							
	c. Type of passage problem: CGA, FJH, WTD, WTV, OTH							
	d. Current barrier category: COM, PAR, TEM, OTH							
	2. Is impeding fish passage a goal of the treatment?							
	a. Type of passage problem: NNS, STR, OTH							
	3. Is fish passage impedance related to a flow diversion?							
	a. Average flow rate of diversion (cfs):							
	b. Range of flow diverted (cfs):							
	4. Is the treatment targeted to affect a specific fish species?							
	a. Targeted fish species:							
	b. Targeted life stage: ADT, JUV							
	5. Were **adults** of the targeted species observed near the treatment area?							
	a. Species:							
	b. Location: UPS, DNS, OTH							
	6. Were **juveniles** of the targeted species observed near the treatment area?							
	a. Species:							
	b. Location: UPS, DNS, OTH							
Anticipated Channel Effects	7. Is improving downstream movement of watershed products a goal?							
	a. Watershed product(s) of concern: LWD, SBM, WTR, OTH							
	8. Is changing channel conditions a goal of the treatment?							
	a. Problem(s): AGG, BRD, HDC, INC, IST, NAR, SDC, SIN, STB, WID, OTH							
	b. Desired: AGG, FPD, GRC, HDC, INC, NAR, SDC, SIN, STB, OTH							
	9. Is change in channel bank conditions a goal of the treatment?							
	a. Current bank conditions: ANG, BAR, CHS, ERO, MIG, SMP, OTH							
	b. Desired problem reductions: ANG, BAR, CHS, ERO, MIG, SMP,OTH							

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Fish Passage Implementation Checklist

Treatment Installation

1. Was the treatment installed in the approved location? – Enter Y if the treatment location was as approved or P if some changes were made and note in Comments section. If location was obviously deficient, enter N. Enter D for Don't Know.

2. Was the treatment installed in the approved position and alignment*?* **–** Enter Y if the treatment position/alignment was as proposed or P if some changes were made and note in Comments section. If the position was obviously deficient, enter N. Enter D for Don't Know.
2*a. Structure condition:* Specify the current condition of the structure: *EXCELLENT* = The structure is intact and structurally sound, *GOOD* = The structure is intact and generally sound but some wear or undermining is evident, *FAIR* = The structure position or condition has been altered significantly, *POOR* = The structure is visible but has suffered major movement or damage, *FAILED* = The structure is not visible or remnants are not in any form of designed configuration.

3. Were approved materials used for the structure? – Enter Y if materials used were as approved or P if some changes were made. If materials were obviously deficient, enter N. Enter D for Don't Know.
*3a. Materials***:** Enter the type of materials used: *CON* = concrete, *CBL* = cable, *MTL* = metal, *NTR* = native rock, *OFR* = off-site rock, *REB* = rebar, *RTW* = Root wads, *WOO* = Wood, *OTH* = other, specify in Comments section.

4. Are problems with the project treatment visible? – Enter Y, N, P, D, or A.
4a. Type: Specify the current problem: *BUR* = buried, *CRS* = crushed, *DIV* = diversion, *OVT* = overtopping, *PLG* = plugging, *SDC* = sidecutting, *UND* = undermining, *WSH* = washout, *NON* = none, *OTH* = other, specify in Comments section.

Fish passage effects

5. Did the treatment improve passage for the targeted fish species? – Enter Y, N, P, or D. If improved passage was not a goal, enter A.
5a. Targeted fish species: - If *Y* or *P*, enter the target species of fish for which a barrier has been removed.
5b. Targeted life stage: - If *Y* or *P*, enter the life stage of the fish species for which a barrier has been removed; *ADT* = adult, *JUV* = juvenile.
5c. Length of habitat made accessible (miles): - If *Y* or *P*, enter the length of stream made accessible to the targeted species and life stage by the treatment.

6. Did the treatment decrease passage for the targeted fish species? – Enter Y, N, P, or D. If decreased passage was not a goal, enter A.
6a. Targeted fish species: - If *Y* or *P*, enter the target species of fish for which a barrier has been installed.
6b. Targeted life stage: - If *Y* or *P*, enter the life stage of the fish species for which a barrier has been installed; *ADT* = adult, *JUV* = juvenile.
6c. Length of habitat made inaccessible (miles): - If *Y* or *P*, enter the length of stream made inaccessible to the targeted species and life stage by the treatment.
6d. Average flow rate of diversion (cfs): Enter the average amount of the diverted stream flow that was screened.
6e. Range of flow diverted (cfs): Enter the range of diverted stream flow that was screened. Express this range as the low flow to high flow [e.g. 30 -1200 cfs].
6f. Quantity of water protected by screen: Enter the overall quantity of water protected by the screen in acre feet.

7. Does any barrier to the targeted adult fish species remain at the treatment site? – Enter Y, N, D, or A.

7a. Barrier category: If *Y*, specify the extent of current barrier to fish passage (see Restoration Manual, Part IX): *COM* = complete barrier, *PAR* = partial barrier**,** *TEM* = temporal barrier, *OTH* = other, specify in Comments.
7b. Passage problem: If *Y*, specify the current type of passage problem(s); *CGA* = Culvert gravel absent, *FJH* = fish jump height, *WTD* = water depth**,** *WTV* = water velocity or turbulence, *OTH* = other, specify in Comments.

8. Does any barrier to the targeted juvenile fish remain at the treatment site? – Enter Y, N, D, or A.
8a. Barrier category: If *Y*, specify the extent of current barrier to fish passage (see Restoration Manual, Part IX): *COM* = complete barrier, *PAR* = partial barrier**,** *TEM* = temporal barrier, *OTH* = other, specify in Comments.
8b. Passage problem: If *Y*, specify the current type of passage problem(s); *CGA* = Culvert gravel absent, *FJH* = fish jump height, *WTD* = water depth**,** *WTV* = water velocity or turbulence, *OTH* = other, specify in Comments.

9. Were adults of the targeted species observed near the treatment area? **–** Examine likely habitat on either side of the treatment. Data from quantitative studies may be used to answer this question. Enter Y, N, or D.
9a. Species: If *Y*, enter the DFG code for the species of adult fish that was/were observed.
9b. Location: If *Y*, enter the location where the targeted species was observed; *UPS* = upstream**,** *DNS* = downstream**,** *OTH* = other.

10. Were juveniles of the targeted species observed near the treatment area? – Examine likely habitat on either side of the passage treatment. Data from quantitative studies may be used. Enter Y, N, or D.
10a. Species: If *Y*, enter the DFG code for the species of juvenile fish that was observed.
10b. Location: If *Y*, enter the location where the targeted species was observed; *UPS* = upstream**,** *DNS* = downstream**,** *OTH* = other.

Implementation
11. Did the as-completed treatment comply with design? - Enter Y, N, P, D, or A.
11a. If not, were modifications beneficial to performance? - Enter Y, N, P, D, or A.
11b. Was non-compliance significant enough to jeopardize performance? - Enter Y, N, P, D, or A.
11c. Are corrections needed? - Enter Y, N, P, D, or A.

Overall Implementation Rating: Rate the overall installation of the project feature. (see Completion of Monitoring checklists section).

FISH PASSAGE - IMPLEMENTATION CHECKLIST

Page ___ of ___

Contract name: **Contract #:** **Project Type** *(circle)* **: HB** or **FL** or **SC**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

	Project Feature	#:		#:		#:		
	Type of treatment: (see code sheet)							
			Photo #		**Photo #**		**Photo #**	
Treatment	1. Was the treatment installed in the approved location?							
	2. Was the treatment installed in the approved position and alignment?							
	a. Structure condition: Excellent, Good, Fair, Poor, Failed							
	3. Were approved materials used for the treatment?							
	a. Materials: CON, CBL, REB, MTL, NTR, OFR, RTW, WOO, OTH							
	4. Are problems with the project treatment visible?							
	a. Type: BUR, CRS, DIV, OVT, PLG, SDC, UND, WSH, NON, OTH							
Fish Passage Effects	5. Did the treatment improve passage for the targeted fish species?							
	a. Targeted fish species:							
	b. Targeted life stage: ADT, JUV							
	c. Length of habitat made accessible (miles):							
	6. Did the treatment decrease passage for the targeted fish species?							
	a. Targeted fish species:							
	b. Targeted life stage: ADT, JUV							
	c. Length of habitat made inaccessible (miles):							
	d. Average flow rate of diversion (cfs):							
	e. Range of flow diverted (cfs):							
	f. Quantity of water protected by screen (acre feet):							
	7. Does any barrier to targeted **adult** fish remain at the treatment site?							
	a. Barrier: COM, PAR, TEM, OTH							
	b. Type of passage problem: CGA, FJH, WTD, WTV, OTH							
	8. Does any barrier to targeted **juvenile** fish remain at the treatment site?							
	a. Barrier: PAR, TEM, TOT, OTH							
	b. Type of passage problem: CGA, FJH, WTD, WTV, OTH							
	9. Were **adults** of the targeted species observed near the treatment area?							
	a. Species:							
	b. Location: UPS, DNS, BTH							
	10. Were **juveniles** of the targeted species observed near the treatment area?							
	a. Species:							
	b. Location: UPS, DNS, BTH							
Implementation	11. Did the as-completed treatment comply with design?							
	a. If not, were modifications beneficial to performance?							
	b. Was non-compliance significant enough to jeopardize performance?							
	c. Are corrections needed?							
	Overall Implementation Rating *(Excellent, Good, Fair, Poor, Failed)*							

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Fish Passage Effectiveness Checklist

Treatment

1. Is the treatment still in its original position? – Enter Y, N, P, A or D.
1a. Treatment condition: – Specify the current condition of the treatment: *EXCELLENT* = The treatment is intact and structurally sound, *GOOD* = The treatment is intact and generally sound but some wear or undermining is evident, *FAIR* = The treatment position or condition has been altered significantly, *POOR* = The treatment is visible but has suffered major movement or damage, *FAILED* = The treatment is not visible or remnants are not in any form of designed configuration.

2. Are problems with the passage treatment visible? – Enter Y, N, P, A or D.
2a. Type: Specify the current problem: *BUR* = buried, *CRS* = crushed, *DIV* = diversion, *OVT* = overtopping, *PLG* = plugging, *SDC* = sidecutting, *UND* = undermining, *WSH* = washout, *NON* = none, *OTH* = other, specify in Comments section.

Fish passage effects

3. Did the treatment improve passage for the targeted fish species? – Answer Y, N, P, D if pre-project conditions were documented and/or the change was a feature goal, otherwise answer A.
3a. Targeted fish species: - If *Y* or *P*, enter the target species of fish for which a barrier was removed.
3b. Targeted life stage: - If *Y* or *P*, enter the life stage of the fish species for which a barrier was removed; *ADT* = adult, *JUV* = juvenile.

4. Did the treatment decrease passage for the targeted fish species? – Answer Y, N, P, D if pre-project conditions were documented and/or the change was a feature goal, otherwise answer A.
4a. Targeted fish species: - If *Y* or *P*, enter the species of fish for which a barrier was installed.
4b. Targeted life stage: - If *Y* or *P*, enter the life stage of the fish species for which a barrier was installed; *ADT* = adult, *JUV* = juvenile.

5. Is there currently a barrier to the targeted fish species at the site? – Enter Y, N, A or D.
5a. Barrier category: If *Y*, specify the extent of current barrier to fish passage (see Restoration Manual, Part IX): *COM* = Complete barrier, *PAR* = Partial barrier**,** *TEM* = Temporal barrier, *OTH* = other, specify in Comments.
5b. Passage problem: If *Y*, specify the current type of passage problem(s); *CGA* = Culvert gravel absent, *FJH* = fish jump height, *WTD* = water depth**,** *WTV* = water velocity or turbulence, *OTH* = other, specify in Comments.
5*c. Barrier to life stage:* Enter the life stage of the fish species for which a barrier remains; *ADT* = adult, *JUV* = juvenile.

6. Were adults of the targeted species observed near the treatment area? **–** Examine likely habitat on either side of the treatment. Data from quantitative studies may be used to answer this question. Enter Y, N, or D.
6a. Species: If *Y*, enter the DFG code for the species of adult fish that was/were observed.
6b. Location: If *Y*, enter the location where the targeted species was observed; *UPS* = upstream**,** *DNS* = downstream**,** *OTH* = other.

7. Were juveniles of the targeted species observed near the treatment area? – Examine likely habitat on either side of the treatment. Data from quantitative studies may be used to answer this question. Enter Y, N, or D.
7a. Species: If *Y*, enter the DFG code for the species of juvenile fish that was observed.
7b. Location: Enter the location where the targeted species was observed; *UPS* = upstream**,** *DNS* = downstream**,** *OTH* = other.

8. Did the treatment provide access to habitat for undesirable species? – Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, D, or A.
8a. Undesirable fish species: - If *Y*, list the undesirable fish that have gained access due to the project.

Channel effects
9. Did the treatment improve watershed product movement downstream? – Answer Y, N, P, D if pre-project conditions were documented and/or the change was a feature goal, otherwise answer A.
9a. Product(s) with improved movement: If *Y*, specify the watershed product(s) with improved passage (list additional products in Comments section); *LWD* = large woody debris, *SBM* = substrate movement**,** *WTR* = unimpeded water flow**,** *OTH* = other.

10. Did the treatment impair movement of watershed products downstream? – Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, A, or D.
10a. Product(s) with impaired movement: If *Y* or *P*, Specify the watershed product(s) with impaired movement (list additional products in Comments section); *LWD* = large woody debris, *SBM* = substrate movement**,** *WTR* = unimpeded water flow**,** *OTH* = other.

11. Did the treatment lead to desirable channel changes? – Answer Y, N, P, D if pre-project conditions were documented and/or the change was a feature goal, otherwise answer A.
11a. Improved: If *Y* or *P*, specify the channel improvement(s) after the treatment: *AGG* = channel aggradation, *FPD* = floodplain deposition, *GRC* = grade control, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

12. Did the treatment lead to undesirable channel change? – Answer regardless of the project goals to document unintended negative consequences. Enter Y, N, P, A, or D.
12a. Impaired: If *Y* or *P*, specify the channel impairment(s) after the treatment; *AGG* = aggradation, *BRD* = channel braiding, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = channel sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

13. Did the treatment lead to desirable bank condition changes? – Answer Y, N, P, D if pre-project conditions were documented and/or the change was a feature goal, otherwise answer A.
13a. Improved: If *Y* or *P*, specify the bank improvement(s) after the treatment: *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

14. Did the treatment lead to undesirable bank conditions? – Answer regardless of the project goals to document unintended negative consequences. Enter Y, N, P, A, or D.
14a. Impaired: If *Y* or *P*, specify the bank problem(s) after the treatment; *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

Overall Effectiveness Rating: Specify the overall effectiveness of the passage feature (see Completion of Monitoring checklists section). How well did the feature meet objectives stated in pre-treatment checklists?

FISH PASSAGE - EFFECTIVENESS CHECKLIST Page ___ of ___

Contract name: **Contract #:** **Project Type** *(circle)* **: HB** or **FL** or **SC**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

	Project Feature			#:		#:		
	Type of treatment: (see code sheet)							
			Photo #		**Photo #**		**Photo #**
Treatment	1. Is the treatment still in its original position?						
	a. Treatment condition: Excellent, Good, Fair, Poor, Failed						
	2. Are problems with the treatment visible?						
	a. Type: BUR, CRS, DIV, OVT, PLG, SDC, UND, WSH, NON, OTH						
Fish Passage Effects	3. Did the treatment increase passage for the targeted fish species?						
	a. Targeted fish species:						
	b. Targeted life stage: ADT, JUV, OTH						
	4. Did the treatment decrease passage for the targeted fish species?						
	a. Targeted fish species:						
	b. Targeted life stage: ADT, JUV, OTH						
	5. Is there currently a barrier to the targeted fish species at the site?						
	a. Current barrier category: COM, PAR, TEM, OTH						
	b. Current barrier: CGA, FJH, WTD, WTV, OTH						
	c. Barrier to life stage: ADT, JUV, OTH						
	6. Were **adults** of the targeted species observed near the treatment area?						
	a. Species:						
	b. Location: UPS, DNS, OTH						
	7. Were **juveniles** of the targeted species observed near the treatment area?						
	a. Species:						
	b. Location: UPS, DNS, OTH						
	8. Did the treatment provide access to habitat for undesirable species?						
	a. Undesirable fish species:						
Channel Effects	9. Did the treatment improve watershed product movement downstream?						
	a. Improved: LWD, SBM, WTR, OTH						
	10. Did the treatment impair movement of watershed products downstream?						
	a. Impaired: LWD, SBM, WTR, OTH						
	11. Did the treatment lead to desirable channel change?						
	a. Improved: AGG, FPD, GRC, HDC, INC, IST, NAR, SDC, SIN, STB, OTH						
	12. Did the treatment lead to undesirable channel change?						
	a. Impaired: AGG, BRD, HDC, INC, IST, NAR, SDC, SIN, STB, WID, OTH						
	13. Did the treatment lead to desirable bank condition changes?						
	a. Improved: ANG, BAR, CHS, ERO, MIG, SMP, STB, VEG, OTH						
	14. Did the treatment lead to undesirable bank conditions?						
	a. Impaired: ANG, BAR, CHS, ERO, MIG, SMP, STB, VEG, OTH						
Overall Effectiveness Rating *(Excellent, Good, Fair, Poor, Failed)*							

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Field Method 2: Instream Habitat Restoration Projects

Instream habitat restoration projects aim to improve instream habitat by:

- Installing boulders, logs, and rootwads to increase cover, habitat complexity, and instream habitat types
- Installing gravel to increase quality of spawning habitat
- Removing structures such as dams or concrete riprap to increase stream interaction with the floodplain and increase habitat complexity
- Constructing channels, breaching dikes, removing levees to improve stream interaction with floodplains, increase habitat complexity and types or improve flood control.

For more information on the importance of instream characteristics for fish habitat, see the companion *Monitoring the Effectiveness of Instream Habitat Restoration* (2005), and the *DFG Restoration Manual* (Flosi 1998).

Effectiveness of these types of projects is judged based on the improvement of targeted habitat parameters and re-establishment of properly functioning stream geometry and pattern, including interactions with the floodplain. The project's benefits must also be weighed against any unforeseen adverse effects on habitat features, substrate, channel geometry or fish passage, or impairment of natural movement of large wood, substrate or nutrients downstream. Short-term effectiveness monitoring should occur after at least one winter has passed.

Sampling is not generally recommended for instream restoration projects. However, it may become necessary for some projects which include installation of a very large number of structures. If sampling of structures is done, the spatial definition of the sampling segment should be recorded on the On Site Navigation Form, as well as the checklist header. The method of sampling should be recorded in the checklist notes.

Field Method

Pre-treatment monitoring requires identification of the specific goals of the instream restoration project from the following choices:

- Changing habitat unit type
- Increasing water depth in pools
- Increasing instream shelter
- Changing channel conditions

- Changing substrate composition
- Increasing large wood volume at the site

Pre-treatment monitoring also requires collection of basic information about channel and habitat conditions to allow comparison to post-treatment conditions. Implementation monitoring centers on the adherence of the contract implementers to contract provisions. Checklist questions ask for evaluation of:

- Habitat modification during implementation
- Structure material size and origin
- Structure placement, orientation and anchoring (if applicable)

Effectiveness monitoring consists of evaluating whether the project reached the goals identified in the pre-treatment checklist. This is facilitated by collection of the same basic information about the site as collected during the pre-treatment phase. This allows evaluation of:

- Structure condition
- Habitat type in the vicinity of the structure before and after implementation
- Water depth in the affected habitat unit before and after implementation
- Instream shelter before and after implementation
- Dominant substrate component before and after implementation
- Condition of banks and channels in the vicinity of the structure before and after implementation
- Increased volume of large wood at the site after implementation

Instream Habitat Improvement Pre-treatment Checklist

1. Is change in habitat a goal of the treatment? – Enter Y, N, or A.
1a. Current habitat: - Enter the current type of habitat; *FLT* = flat water, *POO* = pool, *RIF* = riffle, *OTH* = other, specify in Comments section.
1b. Desired habitat: **-** Enter the type of habitat desired; *BCK* = Backwater, *FLT* = flat water, *POO* = pool, *RIF* = riffle, *SDC* = side channel, *UCB* = undercut bank, *OTH* = other, specify in Comments section.

2. Is increasing water depth in a pool a goal of the treatment? – Enter Y, N, or A.
2a. Current residual pool depth: **-** Use the DFG habitat typing method for making residual pool depth measurements *(feet).*

3. Is increasing instream shelter a goal of the structure? – Enter Y, N, or A.
3a. Current shelter value: (ZER, ONE, TWO, THR): Enter the shelter value of the channel at the site currently, using standard DFG habitat typing methods.
3b. Desired shelter value: (ZER, ONE, TWO, THR): Enter the shelter value desired for the channel at the site as a result of implementation of the project feature.
3c. Percent habitat unit covered by shelter (percent): Estimate the percent of instream shelter in the structure's future location using DFG habitat typing procedures.
3d. Current dominant shelter component: Identify the dominant component of instream shelter; *BNK*= bank, *BUB* = bubble curtain, *ROC* = rock, *RTW* = rootwad, *VEG* = vegetation, *WOO* = wood, *OTH* = other, specify in Comments section.
3e. 2nd most dominant component: Identify the second most dominant component of instream shelter; *BNK*= bank, *BUB* = bubble curtain, *ROC* = rock, *RTW* = rootwad, *VEG* = vegetation, *WOO* = wood, *OTH* = other, specify in Comments section.
3f. Desired percent habitat unit covered by shelter: Specify the percent of instream shelter hoped for as a result of the treatment using DFG habitat typing procedures.
3g. Desired dominant shelter component: Identify the desired dominant component of instream shelter. Enter the code for the component; *BNK*= bank, *BUB* = bubble curtain, *ROC* = rock, *RTW* = rootwad, *VEG* = vegetation, *WOO* = wood, *OTH* = other, specify in Comments section.

<u>Anticipated Channel Effects</u>
4. Is changing channel conditions a goal of the treatment? – Enter Y, N, or A.
4a. Problem: Specify the channel problem(s) of concern; *AGG* = aggradation, *BRD* = channel braiding, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = channel sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.
4b. Desired: Specify the channel improvement(s) targeted by the treatment: *AGG* = channel aggradation, *FPD* = floodplain deposition, *GRC* = grade control, *HDC* = headcutting, *INC* = channel incision, *IST* = channel

5. Is changing substrate composition a goal of the treatment? – Enter Y, N, or A.
5a. Current dominant substrate: Identify the dominant component of substrate; *SLC* = silt/clay, *SND* = sand, *GRV* = gravel, *COB*= cobble, *BOL* = boulder, *BED* = bedrock, *OTH* = other, specify in Comments section.
5b. Desired dominant substrate: Identify the desired dominant component of substrate; *SLC* = silt/clay, *SND* = sand, *GRV* = gravel, *COB*= cobble, *BOL* = boulder, *BED* = bedrock, *OTH* = other, specify in Comments section.

6. Is increasing large wood volume at the site a goal of the treatment? – Enter Y, N, or A.

6a. LWD recruitment method: Identify the primary large wood recruitment method; *EXC* = excavation/exhumation of wood already in the channel, *INT* = interception of wood moving downstream in channel, *PLC* = placement, *RPR* = riparian recruitment, *OTH* = other, specify in Comments section.

INSTREAM HABITAT RESTORATION - PRETREATMENT CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Anticipated Habitat Effects	1. Is change in habitat unit a goal of the treatment?							
	a. Current habitat: FLT, POO, RIF							
	b. Desired habitat: BCK, FLT, POO, RIF, SDC, UCB, OTH							
	2. Is increasing water depth in a pool a goal of the treatment?							
	a. Current residual pool depth (feet):							
	3. Is increasing instream shelter a goal of the treatment?							
	a. Current shelter value: (ZER, ONE, TWO, THR)							
	b. Desired shelter value: (ZER, ONE, TWO, THR)							
	c. Percent habitat unit covered by shelter (percent):							
	d. Dominant shelter: BNK, BUB, ROC, RTW, VEG, WOO, OTH							
	e. 2nd most dominant component: (same as above)							
	f. Desired percent habitat unit covered by shelter:							
	g. Desired dominant: BNK, BUB, ROC, RTW, VEG, WOO, OTH							
Anticipated Channel Effects	4. Is changing channel conditions a goal of the treatment?							
	a. Problem: AGG, BRD, HDC, INC, NAR, SDC, SIN, STB, WID, OTH							
	b. Desired: AGG, FPD, GRC, HDC, INC, NAR, SDC, SIN, STB, OTH							
	5. Is changing substrate composition a goal of the treatment?							
	a. Current dominant substrate type: SLC, SND, GRV, COB, BOL, BED							
	b. Desired dominant substrate type: SLC, SND, GRV, COB, BOL, BED							
	6. Is increasing large wood volume at the site a goal of the treatment?							
	a. LWD recruitment method: EXC, INT, PLC, RPR, OTH							

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Instream Habitat Improvement Implementation Checklist

Treatment

1. Was an approved instream structure installed? – Enter Y if the treatment type was as approved or P if some changes were made and note in Comments section. If the treatment type was obviously deficient, enter N.

1a. Length of habitat improved: Specify the length of the in stream habitat that was improved as a result of the treatment (*feet*).

2. Was approved habitat modification done during installation? – If construction created the proposed habitat type, enter Y. Enter P if some changes were made. If habitat construction was obviously deficient, enter N. If this was not a goal of the feature, enter A.

2a. Habitat created: - Enter the type of habitat created: *BCK* = Backwater, *FLT* = flat water, *POO* = pool, *RIF* = riffle, *SDC* = side channel, *UCB* = undercut bank, *OTH* = other, specify in Comments section.

3. Were approved materials used for the treatment? – Enter Y if the materials used were as approved or P if some changes were made and note in Comments section. If materials were obviously deficient, enter N.

3a. Materials: - Enter the type of materials used: *CON* = concrete, *CBL* = cable, *MTL* = metal, *NTR* = native rock, *OFR* = off-site rock, *REB* = rebar, *RTW* = Root wads, *WOO* = Wood, *OTH* = other, specify in Comments section.

4. Were the sizes of materials used the same as approved? – Enter Y if the material size was as approved or P if some changes were made and note in Comments section. If material size was obviously deficient, enter N.

Treatment Placement

5. Was the treatment placed in the approved position? - If the treatment was placed as approved, enter Y. Enter P if some changes were made. If the position was obviously deficient, enter N. Enter D for don't know.

*5a. Placement***:** Specify the structure location: *BNK* = bank, MDC = mid-channel, SDC = side-channel, SPN = spanning, OTH = other, specify in Comments section.

6. Was the treatment anchored as approved? – If anchoring was as approved, enter Y. Enter P if some changes were made. If anchoring was obviously deficient, enter N. If this was not a component of the feature, enter A.

6a. Anchoring: Specify the anchoring materials: *BUR* = Buried, *CBL* = Cabled, *REB* = rebar, *STK* = staked, *NON* = none, *OTH* = other, specify in Comments section.

7. Was the treatment oriented as approved? – If the treatment was oriented was as approved, enter Y. Enter P if some changes were made. If orientation was obviously deficient, enter N.

7a. Orientation: Specify the structure orientation: *ANG* = angled, *DNS* = downstream, *PRL* = parallel to flow, *PRP* = perpendicular to flow, *SPN* = Spanning, *UPS* = upstream, *OTH* = other, specify in Comments section.

Implementation

8. Did the as-completed treatment comply with design? - Enter Y, N, P, D, or A.

8a. If not, were modifications beneficial to performance? - Enter Y, N, P, D, or A.

8b Was non-compliance significant enough to jeopardize performance? - Enter Y, N, P, D, or A.

8c. Are corrections needed? - Enter Y, N, P, D, or A.

Overall Implementation Rating: Rate the overall installation of the project feature. (see Completion of Monitoring checklists section).

INSTREAM HABITAT RESTORATION - IMPLEMENTATION CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Treatment	1. Was an approved instream treatment installed?							
	a. Length of habitat improved (feet):							
	2. Was approved habitat modification done during installation?							
	a. Habitat created: BCK, FLT, POO, RIF, SDC, UCB, OTH							
	3. Were approved materials used for the treatment?							
	a. Materials: CON, CBL, MTL, NTR, OFR, REB, RTW, WOO, OTH							
	4. Were the sizes of materials used the same as approved?							
Treatment Placement	5. Was the treatment placed in the approved location?							
	a. Placement: BNK, MDC, SDC, SPN, OTH							
	6. Was treatment anchoring as approved?							
	a. Anchoring: BUR, CBL, REB, STK, NON, OTH							
	7. Was the treatment oriented as approved?							
	a. Orientation: ANG, DNS, PRL, PRP, SPN, UPS, OTH							
Implementation	8. Did the as-completed treatment comply with design?							
	a. If not, were modifications beneficial to performance?							
	b. Was non-compliance significant enough to jeopardize performance?							
	c. Are corrections needed?							
	Overall Implementation Rating *(Excellent, Good, Fair, Poor, Failed)*							

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Instream Habitat Restoration Effectiveness Checklist

Structure stability and function

1. Is the treatment still in its original position? – Enter Y, N, P, A or D.

1a. Treatment condition: **–** Specify the current condition of the instream treatment: *EXCELLENT* = The treatment is intact and structurally sound, *GOOD* = The treatment is intact and generally sound but some wear or undermining is evident. Components may have shifted slightly, erosion cloth is visible, one or two anchor pins or cables are loose, but the treatment is intact, *FAIR* = The treatment position or condition has been altered significantly, *POOR* = The treatment is visible but has suffered significant movement or damage, *FAILED* = The treatment is not visible or remnants are not in any form of designed configuration.

2. Are problems with the instream treatment visible? – Enter Y, N, P, A or D.

2a. Treatment problem: Specify the current problem: *ANC* = anchoring problems, *BUR* = buried, *CBL* = cable problems, *MAT* = materials failure, *REB* = rebar problems, *SHF* = shifting, *STR* = stranding, *UND* = undermining, *WSH* = washout, *OTH* = other, specify in Comments section.

Habitat effects

3. Did the treatment create the desired instream habitat? – Answer Y, N, P, D if pre-project conditions were documented and/or the change was a feature goal, otherwise answer A.

3a. Habitat created: **-** Enter the type of habitat created; *BCK* = backwater, *FLT* = flat water, *POO* = pool, *RIF* = riffle, *SDC* = side channel, *UCB* = undercut bank, *OTH* = other, specify in Comments section.

4. Did the treatment have an undesirable effect on instream habitat? – Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, P, A, or D.

4a. Undesirable effect: **-** Enter the undesirable effect: *POF* = pool filling, *RFS* = riffle sedimentation, *OTH* = other, specify in Comments section.

5. Did the treatment increase water depth in a pool? – Answer Y, N, P, D if pre-project conditions were documented and/or the change was a feature goal, otherwise answer A.

5a. Residual pool depth: **-** Use the DFG habitat typing method for making residual pool depth measurements *(feet).*

6. Did the treatment increase in instream shelter? - Answer Y, N, P, D if pre-project conditions were documented and/or the change was a feature goal, otherwise answer A.

6a. Current shelter value: (ZER, ONE, TWO, THR): Enter the shelter value of the channel at the treatment site using standard DFG habitat typing methods.

6b. Percent habitat unit covered by shelter (percent): Estimate the percent of instream shelter in the treatment location using DFG habitat typing procedures.

6c. Dominant shelter component: Identify the dominant component of instream shelter; *BNK* = bank, *BUB* = bubble curtain, *ROC* = rock, *RTW* = rootwad, *VEG* = vegetation, *WOO* = wood, *OTH* = other, specify in Comments section.

6d. 2nd most dominant component: Identify the second most dominant component of instream shelter; *BNK* = bank, *BUB* = bubble curtain, *ROC* = rock, *RTW* = rootwad, *VEG* = vegetation, *WOO* = wood, *OTH* = other, specify in Comments section.

Channel Effects

7. Did the treatment lead to desirable channel changes? – Answer Y, N, P, D if pre-project conditions were documented and/or the change was a feature goal, otherwise answer A.

7a. Improved: Specify the channel improvement(s) after the treatment: *AGG* = channel aggradation, *FPD* = floodplain deposition, *GRC* = grade control, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

8. Did the treatment cause undesirable channel change? – Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, P, A, or D.
8a. Impaired: Specify the channel impairment(s) after the treatment; *AGG* = aggradation, *BRD* = channel braiding, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = channel sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

9. Did the treatment cause desirable change in substrate composition? – Answer Y, N, P, D if pre-project conditions were documented and/or the change was a feature goal, otherwise answer A.
9a. Dominant substrate type: Identify the dominant component of substrate; *SLC* = silt/clay, *SND* = sand, *GRV* = gravel, *COB*= cobble, *BOL* = boulder, *BED* = bedrock, *OTH* = other, specify in Comments section.

10. Did the treatment cause undesirable change in substrate composition? –Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, P, A, or D.

11. Did the treatment lead to increased volume of large wood at the site? – Answer Y, N, P, D if pre-project conditions were documented and/or the change was a feature goal, otherwise answer A.
11a. LWD recruitment method: Identify the primary large wood recruitment method; *EXC* = excavation/exhumation of wood already in the channel, *INT* = interception of wood moving downstream in channel, *PLC* = placement, *RPR* = riparian recruitment, *OTH* = other, specify in Comments section.

Overall Effectiveness Rating: – Specify the overall effectiveness of the instream project. (see Completion of Monitoring checklists section). How well did the feature meet objectives stated in pre-treatment checklists?

INSTREAM HABITAT RESTORATION - EFFECTIVENESS CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Treatment	1. Is the treatment still in its original position?							
	a. Treatment condition: Excellent, Good, Fair, Poor, Failed							
	2. Are problems with the instream treatment visible?							
	a. Type: ANC, BUR, CBL, MAT, REB, SHF, STR, UND, WSH, OTH							
Habitat Effects	3. Did the treatment create the desired instream habitat?							
	a. Habitat created: BCK, FLT, POO, RIF, SDC, UCB, OTH							
	4. Did the treatment have an undesirable effect on instream habitat?							
	a. Undesirable effect: POF, RFS, OTH							
	5. Did the treatment increase water depth in a pool?							
	a. Residual pool depth (feet):							
	6. Did the treatment increase instream shelter?							
	a. Current shelter value: ZER, ONE, TWO, THR							
	b. Percent habitat unit covered by shelter (percent):							
	c. Dominant component: BNK, BUB, ROC, RTW, VEG, WOO, OTH							
	d. 2nd most dominant component: (same as above)							
Channel Effects	7. Did the treatment lead to desirable channel changes?							
	a. Improved: AGG, FPD, GRC, HDC, INC, IST, NAR, SDC, SIN, STB, OTH							
	8. Did the treatment cause undesirable channel conditions?							
	a. Impaired: AGG, BRD, HDC, INC, IST, NAR, SDC, SIN, STB, WID, OTH							
	9. Did the treatment cause desirable change in substrate composition?							
	a. Dominant substrate type: SLC, SND, GRV, COB, BOL, BED							
	10. Did the treatment cause undesirable change in substrate composition?							
	11. Did the treatment lead to increased volume of large wood at the site?							
	a. LWD recruitment method: EXC, PLC, RPR, INT, OTH							
Overall Effectiveness Rating *(Excellent, Good, Fair, Poor, Failed)*								

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Field Method 3: Streambank Stabilization Projects

Streambank stabilization projects attempt to improve bank stability by protecting erodible surfaces through:

- Installation of hardened structures or deflectors to deflect streamflow
- Bioengineering treatments such as willow baffles, brush mattresses, willow stakes, grading and revegetating cut banks
- Armoring with rock (rip-rap)

Effectiveness of these types of projects is judged based on reduced bank erosion, improved channel geometry, reduced fine sediment in the reach, and increased riparian vegetation, as well avoidance of negative impacts to channels or habitat. Short-term effectiveness monitoring should occur after at least one winter for hardened structures, or after one winter and one growing season for bioengineering treatments.

For more information on the importance of bank stability to high quality fish habitat, see the companion *Monitoring the Effectiveness of Bank Stabilization Restoration* (2005), and the *DFG Restoration Manual* (Flosi 1998).

Sampling is not generally recommended for bank stabilization projects. However, it may be necessary for some projects which include installation of a very large number of structures or bank treatment areas. If sampling of treatments is done, the spatial definition of the sampling segment should be recorded on the On Site Navigation Form, as well as the checklist header. The method of sampling should be recorded in the checklist notes.

Field Method

Pre-treatment monitoring requires identification of the specific goals of the streambank stabilization project from the following choices:

- Changing bank conditions
- Changing channel conditions
- Changing substrate composition
- Increasing riparian vegetation cover

Pre-treatment monitoring also requires collection of basic information about channel and bank conditions and vegetation cover to allow comparison to post-treatment conditions. Implementation monitoring centers on the adherence of the contract implementers to contract provisions. Checklist questions ask for evaluation of:

- Length of bank treated
- Bank excavation volume and constructed angle
- Installation of hardened and bio-engineered structures
- Structure material size and origin
- Structure placement, orientation, and anchoring
- Irrigation of planted vegetation
- Erosion control measures

Effectiveness monitoring consists of evaluating whether the project reached the goals identified in the pre-treatment checklist. This is facilitated by collection of the same basic information about the site as collected during the pre-treatment phase. This allows evaluation of:

- Condition of banks and channels in the vicinity of the structure before and after implementation
- Stabilization structure condition and stability
- Survival and growth of planted vegetation
- Dominant substrate component before and after implementation
- Bank and floodplain vegetation cover before and after implementation

Streambank Stabilization Pre-treatment Checklist

Anticipated Bank Effects

1. Is change in channel banks a goal of the treatment? – Enter Y, N, or A.
1a. Current bank conditions: Specify the bank problem(s) of concern; *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks due to livestock/wildlife, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.
1b. Desired problem reductions: Specify the bank improvement(s) targeted by the treatment: *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

2. Is change in bank angle a goal of the treatment? – Enter Y, N, or A.
2a. Current bank angle: Specify the current angle of the bank at the future treatment location.
2b. Desired bank angle: Specify the desired angle of the bank at to be established through the treatment.

Anticipated Channel Effects

3. Is changing channel conditions a goal of the treatment? – Enter Y, N, or A.
3a. Problem: Specify the channel problem(s) of concern; *AGG* = aggradation, *BRD* = channel braiding, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = channel sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.
3b. Desired: Specify the channel improvement(s) targeted by the treatment: *AGG* = channel aggradation, *FPD* = floodplain deposition, *GRC* = grade control, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

4. Is changing substrate composition a goal of the treatment? – Enter Y, N, or A.
4a. Current dominant substrate: Identify the dominant component of substrate; *SLC* = silt/clay, *SND* = sand, *GRV* = gravel, *COB*= cobble, *BOL* = boulder, *BED* = bedrock, *OTH* = other, specify in Comments section.
4b. Desired dominant substrate: Identify the desired dominant component of substrate; *SLC* = silt/clay, *SND* = sand, *GRV* = gravel, *COB*= cobble, *BOL* = boulder, *BED* = bedrock, *OTH* = other, specify in Comments section.

Anticipated Riparian Cover Effects

5. Is increase in vegetation cover on banks a goal of the treatment? – Enter Y, N, or A.
5a. Length of bank to be treated: Estimate the length of channel bank that may be expected to have increased vegetation cover as a result of the treatment *(feet)*
5b. Current vegetation cover on banks: Estimate the current vegetation cover within the area to be treated *(percent).*
5c. Current dominant bank cover type: Specify the dominant type of vegetation that currently covers the bank in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

6. Is increase in floodplain vegetation cover a goal of the treatment? – Enter Y, N, or A.
6a. Area of floodplain to be treated: Estimate the area of floodplain that may be expected to have increased vegetation cover as a result of the treatment *(square feet).*
6b. Current vegetation cover on floodplain: Estimate the current vegetation cover within the area of floodplain to be treated specified above *(percent).*
6c. Current floodplain cover type: Specify the dominant type of vegetation that currently covers the floodplain in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

STREAMBANK STABILIZATION - PRETREATMENT CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Anticipated Bank Effects	1. Is change in channel bank conditions a goal of the treatment?							
	a. Current bank conditions: ANG, BAR, CHS, ERO, MIG, SMP, OTH							
	b. Desired problem reductions: ANG, BAR, CHS, ERO, MIG, SMP,OTH							
	2. Is change in bank angle a goal of the treatment?							
	a. Current bank angle:							
	b. Desired bank angle:							
Anticipated Channel Effects	3. Is changing channel conditions a goal of the treatment?							
	a. Problem: AGG, BRD, HDC, INC, NAR, SDC, SIN, STB, WID, OTH							
	b. Desired: AGG, FPD, GRC, HDC, INC, NAR, SDC, SIN, STB, OTH							
	4. Is changing channel substrate type a goal of the treatment?							
	a. Current dominant substrate: SLC, SND, GRV, COB, BOL, BED							
	b. Desired dominant substrate: SLC, SND, GRV, COB, BOL, BED							
Anticipated Cover Effects	5. Is increase in vegetation cover on banks a goal of the treatment?							
	a. Length of bank to be treated (feet):							
	b. Current vegetation cover on banks (percent)							
	c. Current dominant bank cover: NON, HRB, SHR, TREE							
	6. Is increase in floodplain vegetation cover a goal of the treatment?							
	a. Area of floodplain to be treated (ft²):							
	b. Current vegetation cover on floodplain (percent):							
	c. Current dominant floodplain cover: NON, HRB, SHR, TREE							

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Streambank Stabilization Implementation Checklist

Treatment

1. Was the length of bank treated the same as proposed? – If the length of the treatment was as approved, enter Y. Enter P if some changes were made. If the length was obviously deficient, enter N.
1a. Length of streambank stabilized: Specify the length of the streambank stabilized by the treatment (feet).

2. Was vegetation planted in association with the treatment? – If the treatment had biotechnical components, enter Y. If not, enter N.
2a. Species: If Y, enter the DFG code for the species that was planted.

3. Were approved irrigation provisions installed for plantings? – Enter Y if the proposed irrigation methods were used, or P if a different method was used. If the irrigation system was obviously deficient, enter N. If no vegetation is involved or irrigation is not needed, answer A.
3a. Method: Specify the irrigation method: *001* = Hand crew, *003* = Irrigation system, *OTH* = other, specify in Comments section.

4. Was the treatment installed in the approved location? – If the treatment location was as approved, enter Y. Enter P if some changes were made and note in the comments section. If location was obviously deficient, enter N.

5. Were approved materials used for the treatment? – If the materials used were as approved, enter Y. Enter P if some changes were made. If materials were obviously deficient, enter N. If this was not a component of the feature, enter A.
5a. Materials: Enter the type of materials used: *BIO* = bioengineering, *NTR* = native rock, *OFR* = off-site rock, *RTW* = root wads, *VEG* = vegetation, *WOO* = wood, *OTH* = other, specify in Comments section.

6. Were the sizes of materials used the same as approved? – If the materials' sizes were as approved, enter Y. Enter P if some changes were made and note in the comments section. If sizes were obviously deficient, enter N. If not applicable, enter A.

Treatment Placement

7. Was the treatment placed in the approved position? – If the treatment was placed as approved, enter Y. Enter P if some changes were made. If positioning were obviously deficient, enter N.
7a. Placement: Specify the treatment location: *ACT* = in active channel, *BNK* = on bank, *FLD* = on floodplain, *OTH* = other, specify in Comments section.

8. Was the treatment anchored as approved? – If anchoring was as approved, enter Y. Enter P if some changes were made. If anchoring was obviously deficient, enter N. If no anchoring was proposed or needed, enter A.
8a. Anchoring: Specify the anchoring materials: *BUR* = buried, *CBL* = cabled, *REB* = rebar, *STK* = staked, *TIE* = tied, *NON* = none, *OTH* = other, specify in Comments section.

9. Was the treatment oriented as proposed? – If the treatments were oriented as approved, enter Y. Enter P if some changes were made and note in the comments section. If orientation was obviously deficient, enter N.
9a. Orientation: Specify the structure orientation: *ANG* = angled to bank/floodplain, *PRL* = parallel to bank/floodplain, *PRP* = perpendicular to flow, *OTH* = other, specify in Comments section.

Excavation

10. Was the approved excavation carried out? – If the excavation was as approved, enter Y. Enter P if some changes were made and note in the comments section. If excavation was obviously deficient, enter N. If no excavation was required or needed, enter A.
11. Was the excavation volume equal to the amount proposed? – Check the excavation volume proposed in the project contract. If the volume was as approved, enter Y. Enter P if some changes were made and note in the comments section. If excavation was obviously deficient, enter N. If no excavation was required, enter A.

12. Was the bank constructed to the approved angle? – Check the bank angle proposed in the project contract. If the bank angle was as approved, enter Y. Enter P if some changes were made and note the actual bank angle in the comments section. If excavation was obviously deficient, enter N. If no construction was required, enter A.

13. Were approved erosion control measures (other than structures) used? – If the erosion control measures were as approved, enter Y. Enter P if some changes were made and note in the comments section. If measures were obviously deficient, enter N. If no measures were required, enter A.
13a. Type: Specify the type of erosion control methods used: *FAB* = fabric, *MUL* = native mulching, *PLN* = planting, *ROC* = rock, *SEE* = seeding, *SLF* = silt fence, *STW* = straw mulching, *OTH* = other, specify in Comments section.

Implementation
14. Did the as-completed treatment comply with design? - Enter Y, N, P, D, or A.
14a. If not, were modifications beneficial to performance? - Enter Y, N, P, D, or A.
14b. Was non-compliance significant enough to jeopardize performance? - Enter Y, N, P, D, or A.
14c. Are corrections needed? - Enter Y, N, P, D, or A.

Overall Implementation Rating: Rate the overall installation of the project feature. (see Completion of Monitoring checklists section).

STREAMBANK STABILIZATION - IMPLEMENTATION CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Treatment	1. Was the length of bank treated the same as proposed?							
	a. Length of streambank stabilized (feet):							
	2. Was vegetation planted in association with the treatment?							
	a. Species:							
	3. Were approved irrigation provisions installed?							
	a. Method: 001, 003, OTH							
	4. Was the treatment installed in the approved location?							
	5. Were approved materials used for the treatment?							
	a. Materials: BIO, NTR, OFR, RTW, VEG, WOO, OTH							
	6. Were the sizes of materials used the same as approved?							
Treatment Placement	7. Was the treatment placed in the approved location?							
	a. Placement: ACT, BNK, FLD, OTH							
	8. Was the treatment anchored as approved?							
	a. Anchoring: BUR, CBL, REB, STK, TIE, NON, OTH							
	9. Was the treatment oriented as approved?							
	a. Orientation: ANG, PRL, PRP, OTH							
Excavation	10. Was the approved excavation carried out?							
	11. Was the excavation volume equal to the amount approved?							
	12. Was the bank constructed to the approved angle?							
	13. Were approved erosion control measures (other than structures) used?							
	a. Type: FAB, MUL, PLN, ROC, SEE, SLF, STW, OTH							
Implementation	14. Did the as-completed treatment comply with design?							
	a. If not, were modifications beneficial to performance?							
	b. Was non-compliance significant enough to jeopardize performance?							
	c. Are corrections needed?							
	Overall Implementation Rating *(Excellent, Good, Fair, Poor, Failed)*							

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Streambank Stabilization Restoration Effectiveness Checklist

Treatment

1. Is the treatment still in its original position? – Enter Y, N, P, A or D.
1a. Treatment condition: **–** Specify the current condition of the treatment: *EXCELLENT* = The treatment is intact and structurally sound, *GOOD* = The treatment is intact and generally sound but some wear or undermining is evident. Pieces may have shifted slightly, erosion cloth is visible, one or two anchor pins or cables are loose, but the treatment is intact, *FAIR* = The treatment position or condition has been altered significantly, *POOR* = The treatment is visible but has suffered significant movement or damage, *FAILED* = The treatment is not visible or remnants are not in any form of designed configuration.

2. Are problems with the stream stability treatment visible? – Enter Y, N, P, A or D.
2a. Treatment problem: Specify the current problem: *ANC* = anchoring problems, *BUR* = buried, *CBL* = cable problems, *MAT* = materials failure, *REB* = rebar problems, *SHF* = shifting, *STR* = stranding, *UND* = undermining, *WSH* = washout, *OTH* = other, specify in Comments section.

3. Was survival of planted vegetation adequate? – Enter Y, N, P, A, or D. Use the survival goals stated in the contract's statement of work or the current standard of success: 80% survival after three years.

4. Is growth and vigor of planted vegetation acceptable? – Enter Y, N, P, A, or D. Use the goals stated in contract's statement of work for growth/vigor. If no standard has been set, use professional judgment based on species and planting site.

Bank Effects

5. Did the treatment lead to desirable bank condition changes? – Answer Y, N, P, D if pre-project conditions were documented and/or the change was a feature goal, otherwise answer A.
5a. Improved: Specify the bank improvement(s) after the treatment: *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

6. Did the treatment lead to undesirable bank conditions? – Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, P, A, or D.
6a. Impaired: Specify the bank problem(s) after the treatment; *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

7. Did the treatment lead to a desirable change in bank angle? – Enter Y, N, P, A, or D.
7a. Current bank angle: Specify the current angle of the bank in the treatment area.

Channel Effects

8. Did the treatment lead to desirable channel changes? – Enter Y, N, P, A, or D.
8a. Improved: Specify the channel improvement(s) after the treatment: *AGG* = channel aggradation, *FPD* = floodplain deposition, *GRC* = grade control, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

9. Did the treatment lead to undesirable channel change? – Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, P, A, or D.
9a. Impaired: Specify the channel impairment(s) after the treatment; *AGG* = aggradation, *BRD* = channel braiding, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = channel sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

10. Did the treatment cause desirable change in substrate composition? – Enter Y, N, P, A, or D.
10a. Dominant substrate type: Identify the dominant component of substrate; *SLC* = silt/clay, *SND* = sand, *GRV* = gravel, *COB*= cobble, *BOL* = boulder, *BED* = bedrock, *OTH* = other, specify in Comments section.

11. Did the treatment cause undesirable change in substrate composition? – Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, P, A, or D.

Riparian Cover Effects
12. Did the treatment lead to an increase in vegetation cover of banks? – Enter Y, N, P, A, or D.
12a. Length of bank with increased cover: Estimate the total length of the bank with increased cover as a result of the treatment *(feet)*
12b. Total vegetation cover on banks: Estimate the total vegetation cover within the treatment area *(percent).*
12c. Dominant bank cover type: Specify the dominant type of vegetation that covers the bank in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

13. Did the treatment lead to an increase in floodplain vegetation cover? – Enter Y, N, P, A, or D.
13a. Area of floodplain with increased cover: Estimate the area of floodplain with increased cover as a result of the treatment *(ft^2).*
13b. Current vegetation cover on floodplain: Estimate the total vegetation cover within the floodplain treatment area above *(percent).*
13c. Dominant floodplain cover type: Specify the dominant type of vegetation that covers the floodplain in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

Overall Effectiveness Rating: – Specify the overall effectiveness of the streambank stabilization treatment. (see Completion of Monitoring checklists section). How well did the feature meet objectives stated in pre-treatment checklists?

STREAMBANK STABILIZATION - EFFECTIVENESS CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

	Project Feature	#:	#:	#:
OR	*Monitoring Segment -Beginning Feature Number:*	#:	#:	#:
	Monitoring Segment -Ending Feature Number:	#:	#:	#:
	Total # of Features in Segment/# of Features Evaluated in Segment:	/	/	/
	Type of treatment: (see code sheet)			

			Photo #		Photo #		Photo #
Treatment	1. Is the treatment still in its original position?						
	a. Treatment condition: Excellent, Good, Fair, Poor, Failed						
	2. Are problems with the stream stability treatment visible?						
	a. Type: ANC, BUR, CBL, MAT, REB, SHF, STR, UND, WSH, OTH						
	3. Was survival of planted vegetation adequate?						
	4. Is the growth and vigor of planted vegetation acceptable?						
Bank Effects	5. Did the treatment lead to desirable bank condition changes?						
	a. Improved: ANG, BAR, CHS, ERO, MIG, SMP, STB, VEG, OTH						
	6. Did the treatment lead to undesirable bank conditions?						
	a. Impaired: ANG, BAR, CHS, ERO, MIG, SMP, STB, VEG, OTH						
	7. Did the treatment lead to a desirable change in bank angle?						
	a. Current bank angle:						
Channel Effects	8. Did the treatment lead to desirable channel change?						
	a. Type: AGG, FPD, GRC, HDC, INC, NAR, SDC, SIN, STB, OTH						
	9. Did the treatment lead to undesirable channel change?						
	a. Type: AGG, BRD, HDC, INC, NAR, SDC, SIN, STB, WID, OTH						
	10. Did the treatment cause desirable change in substrate composition?						
	a. Dominant substrate type: SLC, SND, GRV, COB, BOL, BED						
	11. Did the treatment cause undesirable change in substrate composition?						
Vegetation Effects	12. Did the treatment lead to an increase in vegetation cover of banks?						
	a. Length of bank with increased vegetation cover (ft):						
	b. Total vegetation cover on banks (percent):						
	c. Dominant bank cover type: NON, HRB, SHR, TREE						
	13. Did the treatment lead to an increase in floodplain vegetation cover?						
	a. Area of floodplain with increased cover (ft^2)						
	b. Total vegetation cover on floodplain (percent):						
	c. Dominant floodplain cover: HRB, SHR, TREE, OTH						
Overall Effectiveness Rating *(Excellent, Good, Fair, Poor, Failed)*							

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Field Method 4: Land Use Control Restoration Projects

Land use control projects attempt to reduce the stressors to natural riparian vegetation and channels by altering land uses. Projects include:

- Livestock or wildlife grazing exclusion through fencing streams and riparian zones.
- Watering site installations
- Grazing management plans
- Conservation easements

Effectiveness of these types of projects is judged based on successful exclusion of the land use, increased riparian vegetation, increased bank stability, and improved channel geometry. Short-term effectiveness monitoring should occur after at least one growing season, typically in the fall. Long-term monitoring visits should occur during the growing season when full foliage is present, five to ten years after project implementation to allow adequate time for success of plant establishment and growth.

For more information on the importance of riparian vegetation to high quality fish habitat, see the companion *Monitoring the Effectiveness of Riparian Vegetation Restoration* (2005).

Sampling is not recommended for land use control projects. Each individual treatment location or area should be evaluated. This is because these types of projects are typically high in value and strategic importance.

Field Method

Pre-treatment monitoring requires identification of the specific goals of the land use control project from the following choices:

- Restricting building, farming, grazing, road building or use, timber harvesting, or water withdrawal
- Increasing riparian vegetation cover
- Reducing gaps in riparian vegetation
- Changing channel and bank conditions
- Changing substrate composition

Pre-treatment monitoring also requires collection of basic information about vegetation cover, channel and bank conditions to allow comparison to post-treatment conditions. Implementation

monitoring centers on the adherence of the contract implementers to contract provisions. Checklist questions ask for evaluation of:

- Compliance with terms of easements and agreements
- Exclusion of land uses such as livestock grazing
- Installation of fences including location and materials and fence height and length
- Installation and location of watering stations

Effectiveness monitoring consists of evaluating whether the project reached the goals identified in the pre-treatment checklist. This is facilitated by collection of the same basic information about the site as collected during the pre-treatment phase. This allows evaluation of:

- Achievement of the desired land use control
- Condition of any installed fencing
- Bank and floodplain vegetation cover before and after implementation
- Gaps in riparian vegetation before and after implementation
- Condition of banks and channels before and after implementation
- Dominant substrate component before and after implementation

Land Use Control / Easements Pre-treatment Checklist

Anticipated Land Use Restrictions

1. Is land use restriction a goal of the project? – Enter Y, N, or A**.**
1a. Land use control type: Specify the type of land use to be excluded; *BLD* = building, *FRM* = farming, *GRZ* = grazing, *RDS* = road building or use, *TMB* = timber harvesting, *WTR* = water withdrawal, *OTH* = other, specify in Comments section.

Anticipated Riparian Cover Effects

2. Is increase in vegetation cover on banks a goal of the treatment? – Enter Y, N, or A.
2a. Length of bank to be treated: Estimate the length of channel bank that may be expected to have increased vegetation cover as a result of the treatment *(feet)*
2b. Current vegetation cover on banks: Estimate the current vegetation cover within the area to be treated *(percent).*
2c. Current dominant bank cover type: Specify the dominant type of vegetation that currently covers the bank in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

3. Is reduction of the size of gaps in bank vegetation a goal? – Enter Y, N, or A.
3a. Length of largest gap in vegetation > 3 feet tall (ft): Estimate the length (along the stream) of the largest opening in riparian vegetation that is at least three feet tall within the treatment area *(feet).*

4. Is increase in floodplain vegetation cover a goal of the treatment? – Enter Y, N, or A.
4a. Area of floodplain to be treated: Estimate the area of floodplain that may be expected to have increased vegetation cover as a result of the treatment *(square feet).*
4b. Current vegetation cover on floodplain: Estimate the current vegetation cover within the area of floodplain to be treated specified above *(percent).*
4c. Current dominant floodplain cover type: Specify the dominant type of vegetation that currently covers the floodplain in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

5. Is increase in canopy cover over the channel a goal of the treatment? – Enter Y, N, or A.
5a. Linear feet of channel to be treated: Estimate the length of the channel with vegetation treatments along it (*feet).*
5b. Current over channel canopy cover (percent): Estimate the current canopy cover over the channel within the area to be controlled *(percent*).

Anticipated Bank and Channel Effects

6. Is change in channel banks a goal of the treatment? – Enter Y, N, or A.
6a. Current bank conditions: Specify the bank problem(s) of concern; *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.
6b. Desired problem reductions: Specify the bank improvement(s) targeted by the treatment: *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

7. Is changing channel conditions a goal of the treatment? – Enter Y, N, or A.
7a. Problem: Specify the channel problem(s) of concern; *AGG* = aggradation, *BRD* = channel braiding, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = channel sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

7b. Desired: Specify the channel improvement(s) targeted by the treatment: *AGG* = aggradation, *BRD* = channel braiding, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = channel sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

8. Is changing substrate composition a goal of the treatment? – Enter Y, N, or A.
8a. Current dominant substrate: Identify the dominant component of substrate; *SLC* = silt/clay, *SND* = sand, *GRV* = gravel, *COB*= cobble, *BOL* = boulder, *BED* = bedrock, *OTH* = other, specify in Comments section.
8b. Desired dominant substrate: Identify the desired dominant component of substrate; *SLC* = silt/clay, *SND* = sand, *GRV* = gravel, *COB*= cobble, *BOL* = boulder, *BED* = bedrock, *OTH* = other, specify in Comments section.

LAND USE CONTROL / EASEMENTS - PRETREATMENT CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Land Use	1. Is land use restriction a goal of the treatment?							
	a. Type: BLD, FRM, GRZ, RDS, TMB, WTR, OTH							
Anticipated Riparian Cover Effects	2. Is increase in vegetation cover on banks a goal of the treatment?							
	a. Length of bank to be treated (feet):							
	b. Current vegetation cover on banks (percent)							
	c. Current dominant bank cover: NON, HRB, SHR, TREE							
	3. Is reduction of the size of gaps in bank vegetation a goal?							
	a. Length of largest gap in vegetation > 3 feet tall (ft):							
	4. Is increase in floodplain vegetation cover a goal of the treatment?							
	a. Area of floodplain to be treated (ft²):							
	b. Current vegetation cover on floodplain (percent):							
	c. Current dominant floodplain cover: NON, HRB, SHR, TREE							
	5. Is increase in canopy cover over the channel a goal of the treatment?							
	a. Length of channel to be treated:							
	b. Current over channel canopy cover (percent):							
Anticipated Bank and Channel Effects	6. Is change in channel banks a goal of the treatment?							
	a. Current bank conditions: ANG, BAR, CHS, ERO, MIG, SMP, OTH							
	b. Desired problem reductions: ANG, BAR, CHS, ERO, MIG, SMP,OTH							
	7. Is changing channel conditions a goal of the treatment?							
	a. Problem: AGG, BRD, HDC, INC, NAR, SDC, SIN, STB, WID, OTH							
	b. Desired: AGG, FPD, GRC, HDC, INC, NAR, SDC, SIN, STB, OTH							
	8. Is changing channel substrate type a goal of the treatment?							
	a. Current dominant substrate: SLC, SND, GRV, COB, BOL, BED							
	b. Desired dominant substrate: SLC, SND, GRV, COB, BOL, BED							

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Land Use Control / Easements Implementation Checklist

Treatment

1. Are land use restrictions or a conservation easement in effect? – Enter Y, N, P, A, or D.
1a. Type: Specify the type of land use excluded; *BLD* = building, *FRM* = farming, *GRZ* = grazing, *RDS* = road building or use, *TMB* = timber harvesting, *WTR* = water withdrawal, *OTH* = other, specify in Comments section.
1b. Length of stream treated/protected: Specify the length of the stream that was protected by the control of land use or easement *(miles).*

2. Are the terms of the agreement / easement being followed? – Enter Y, N, P, or D. If the project does not involve an agreement, enter A.

3. Have animals / livestock been excluded as approved? – Enter Y, N, P, or D. If the project does not involve an exclusion, enter A.

4. Was fencing installed as approved? – If the fencing was as approved, enter Y. Enter P if some changes were made and note in the comments section. If fencing was deficient, enter N. If no fencing was required, enter A.
4a. Fence condition: Specify the current condition of the fencing: *EXCELLENT* = The fence is intact and materials are in excellent condition, *GOOD* = The fence is intact and materials are in good condition, *FAIR* = The fence is intact and materials are in fair condition, *POOR* = The fence is intact but in very poor condition and in danger of being breached, *FAILED* = The fence is not preventing access.

5. Were approved materials used? – If materials used for fencing were as approved, enter Y. Enter P if some changes were made. If materials were deficient, enter N. If no fencing was required, enter A.
5a. Type: Specify the type or types of fencing material used: *BRW* = barbed wire, *CHL* = chain link, *ELC* = electric, *WOO* = wood, *OTH* = other, specify in Comments section.

6. Is the height of the fencing as approved? – If the fencing height was as approved, enter Y. Enter P if some changes were made and note in the comments section. If the height was deficient, enter N. If no fencing was required, enter A.

7. Is the spacing of the fence materials as approved? – If the spacing between fence components (e.g. space between wires) was as approved, enter Y. Enter P if some changes were made and note in the comments section. If spacing was deficient, enter N. If no fencing was required, enter A.

Treatment Placement

8. Was the exclusion area the same as approved? – Enter Y, N, P, A, or D.
8a. Area protected: Specify the area of land that was protected by the control of land use or easement *(acres).*

9. Was the fencing installed in the approved location? – If the fence location was as approved, enter Y. Enter P if some changes were made and note in the comments section. If the location was deficient, enter N. If no fencing was required, enter A.

10. Was the length of fence installed the same as approved? – If the fence length was as approved, enter Y. Enter P if some changes were made. If length was deficient, enter N. If no fencing was required, enter A.
10a. Length of stream fenced: Specify the length of the stream that was protected by installing fencing *(miles).* Add the length treated on both sides when both sides were stabilized or fenced. Enter one side when one side only was treated.

11. Were watering stations installed as approved? – If the stations were installed was as approved, enter Y. Enter P if some changes were made and note in the comments section. If installation was clearly deficient, enter N. If no water stations were required, enter A.

12. Were watering stations placed in the approved locations? – If the station location was as approved, enter Y. Enter P if some changes were made and note in the comments section. If locations were deficient, enter N. If no watering stations were required, enter A.

13. Does the fencing cross the creek? – Enter Y, N, P, A, or D.
13a. Type of crossing: Specify the type of stream crossing installed with the fence: *FLS* = floating segments, *SPS* = spanning, *NON* = none, *OTH* = other, specify in Comments section.
13b. Streamflow accommodation: Specify the portion of the stream flow that is accommodated by the fence crossing: *COM* = complete, *PAR* = partial, *NON* = none, *OTH* = other, specify in Comments section.

Implementation
14. Did the as-completed treatment comply with design? - Enter Y, N, P, D, or A.
14a. If not, were modifications beneficial to performance? - Enter Y, N, P, D, or A.
14b. Was non-compliance significant enough to jeopardize performance? - Enter Y, N, P, D, or A.
14c. Are corrections needed? - Enter Y, N, P, D, or A.

Overall Implementation Rating: Rate the overall installation of the project feature. (see Completion of Monitoring checklists section).

LAND USE CONTROL / EASEMENTS - IMPLEMENTATION CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Treatment	1. Are land use restrictions or a conservation easement in effect?							
	a. Type: GRZ, FRM, RDS, BLD, TMB, WTR, OTH							
	b. Length of stream treated/protected (miles):							
	2. Are the terms of the agreement / easement being followed?							
	3. Have animals / livestock been excluded as approved?							
	4. Was fencing installed as approved?							
	a. Fence condition (Excellent, Good, Fair, Poor, Failed):							
	5. Were approved materials used?							
	a. Type: BRW, CHL, ELC, WOO, OTH							
	6. Is the height of the fencing as approved?							
	7. Is the spacing of the fence materials as approved?							
Treatment Placement	8. Was the exclusion area the same as approved?							
	a. Area protected (acres):							
	9. Was the fencing installed in the approved location?							
	10. Was the length of fence installed the same as approved?							
	a. Length of stream fenced (miles):							
	11. Were watering stations installed as approved?							
	12. Were watering stations placed in the approved locations?							
	13. Does the fencing cross the creek?							
	a. Type of crossing: SPS, FLS, OTH							
Implementation	14. Did the as-completed treatment comply with design?							
	a. If not, were modifications beneficial to performance?							
	b. Was non-compliance significant enough to jeopardize performance?							
	c. Are corrections needed?							
	Overall Implementation Rating *(Excellent, Good, Fair, Poor, Failed)*							

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Land Use Control / Easements Effectiveness Checklist

Treatment

1. Did the treatment achieve the desired land use control? – Enter Y, N, P, A, or D.

2. Is any evidence of prohibited use of the controlled area visible? – Enter Y, N, P, A, or D.

3. Is fencing installed still intact? – Enter Y, N, P, A, or D.
3a. Fence condition: Specify the current condition of the fencing: *EXCELLENT* = The fence is intact and materials are in excellent condition, *GOOD* = The fence is intact and materials are in good condition, *FAIR* = The fence is intact and materials are in fair condition, *POOR* = The fence is intact but in very poor condition and in danger of being breached, *FAILED* = The fence is not preventing access.

Riparian Cover Effects

4. Did the treatment lead to an increase in vegetation cover of banks? – Enter Y, N, P, A, or D.
4a. Length of bank with increased cover: Estimate the total length of the bank with increased cover as a result of the treatment *(feet)*
4b. Total vegetation cover on banks: Estimate the total vegetation cover within the treatment area *(percent).*
4c. Dominant bank cover type: Specify the dominant type of vegetation that covers the bank in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

5. Did the treatment reduce the size of the gaps in bank vegetation? – Enter Y, N, or D.
5a. Length of largest gap in vegetation > 3 feet tall (ft): Estimate the length (along the stream) of the largest opening in riparian vegetation that is at least three feet tall within the treatment area *(feet).*

6. Did the treatment lead to an increase in floodplain vegetation cover? – Enter Y, N, P, A, or D.
6a. Area of floodplain with increased cover: Estimate the area of floodplain with increased cover as a result of the treatment *(ft^2).*
6b. Current vegetation cover on floodplain: Estimate the total vegetation cover within the floodplain treatment area above *(percent).*
6c. Dominant floodplain cover type: Specify the dominant type of vegetation that covers the floodplain in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

7. Did the treatment lead to an increase in over channel canopy cover? – Enter Y, N, P, A, or D.
7a. Length of channel with increased canopy cover (feet): Estimate the length of stream channel with increased cover as a result of the treatment *(ft).*
7b. Current over channel canopy cover: Estimate the total vegetation cover within the floodplain treatment area above *(percent).*

Channel and Bank Effects

8. Did the treatment lead to desirable bank condition changes? – Enter Y, N, P, A or D.
8a. Improved: Specify the bank improvement(s) after the treatment: *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

9. Did the treatment lead to undesirable bank conditions? – Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, P, A, or D.

9a. Impaired: Specify the bank problem(s) after the treatment; *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

10. Did the treatment lead to desirable channel changes? – Enter Y, N, P, A, or D.
10a. Improved: Specify the channel improvement(s) after the treatment: *AGG* = channel aggradation, *FPD* = floodplain deposition, *GRC* = grade control, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

11. Did the treatment lead to undesirable channel change? – Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, P, A, or D.
11a. Impaired: Specify the channel impairment(s) after the treatment; *AGG* = aggradation, *BRD* = channel braiding, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = channel sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

12. Did the treatment cause desirable change in substrate composition? – Enter Y, N, P, A, or D.
12a. Dominant substrate type: Identify the dominant component of substrate; *SLC* = silt/clay, *SND* = sand, *GRV* = gravel, *COB*= cobble, *BOL* = boulder, *BED* = bedrock, *OTH* = other, specify in Comments section.

13. Did the treatment cause undesirable change in substrate composition? – Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, P, A, or D.

Overall Effectiveness Rating: – Specify the overall effectiveness of the land use control project. (see Completion of Monitoring checklists section). How well did the feature meet objectives stated in pre-treatment checklists?

LAND USE CONTROL / EASEMENTS - EFFECTIVENESS CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Use Control	1. Did the treatment achieve the desired land use control?							
	2. Is any evidence of prohibited use of the controlled area visible?							
	3. Is fencing installed still intact?							
	a. Fencing condition: Excellent, Good, Fair, Poor, Failed							
Riparian Cover Effects	4. Did the treatment lead to an increase in vegetation cover of banks?							
	a. Length of bank with increased vegetation cover (ft):							
	b. Total vegetation cover on banks (percent):							
	c. Dominant bank cover type: NON, HRB, SHR, TREE							
	5. Did the treatment reduce the size of the gaps in bank vegetation?							
	a. Length of largest gap in vegetation >3 ft tall (ft):							
	6. Did the treatment lead to an increase in floodplain vegetation cover?							
	a. Area of floodplain with increased cover (ft^2)							
	b. Total vegetation cover on floodplain (percent):							
	c. Dominant floodplain cover type: HRB, SHR, TREE, OTH							
	7. Did the treatment lead to an increase in over channel canopy cover?							
	a. Length of channel with increased canopy cover (feet):							
	b. Current over channel canopy cover (percent):							
Channel Effects	8. Did the treatment lead to desirable bank condition changes?							
	a. Improved: ANG, BAR, CHS, ERO, MIG, SMP, STB, VEG, OTH							
	9. Did the treatment lead to undesirable bank conditions?							
	a. Impaired: ANG, BAR, CHS, ERO, MIG, SMP, STB, VEG, OTH							
	10. Did the project lead to desirable channel changes?							
	a. Type: AGG, FPD, GRC, HDC, INC, NAR, SDC, SIN, STB, OTH							
	11. Did the treatment lead to undesirable channel change?							
	a. Type: AGG, BRD, HDC, INC, NAR, SDC, SIN, STB, WID, OTH							
	12. Did the treatment lead to desirable change in substrate composition?							
	a. Dominant substrate type: SLC, SND, GRV, COB, BOL, BED							
Overall Effectiveness Rating *(Excellent, Good, Fair, Poor, Failed)*								

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Field Method 5: Water Conservation/Purchase Projects

Water conservation and purchase projects attempt to increase flow in a stream at times critical to a salmonid population's life cycle development, and to benefit aquatic and riparian communities. Projects include:

- Obtaining/purchasing water rights
- Managing stream flows
- Developing facilities that conserve water use

Effectiveness of these types of projects is judged based on the actual attainment of stream flow objectives such as increased low flows, achievement of natural peak flow regime, or decreased water temperature during low flows. Projects may also be judged effective if they alter habitat through sediment transport (e.g., flushing flows), if this is an objective. Projects should not cause adverse changes in downstream stream flows. Effectiveness monitoring should occur at times that flows are targeted for change. In cases where flushing flows are proposed, monitoring should occur after the first sediment flushing event. Monitoring visits should occur at periods of highest and lowest flows, according to project objectives. No distinction between short and long term effectiveness monitoring is needed, since flow changes caused by projects should occur rapidly, within the first year.

Sampling is not recommended for water conservation projects. Each individual conservation feature should be evaluated. This is because these types of projects are typically high in value and strategic importance.

Field Method

Pre-treatment monitoring requires identification of the specific goals of the project including:

- Improving fish passage for a targeted species and life stage
- Changing habitat unit type
- Improving water quality
- Increasing riparian vegetation cover on banks or floodplains
- Reducing vegetation encroachment within the bankfull channel
- Changing channel conditions
- Changing substrate composition

Implementation monitoring centers on the adherence of the contract implementers to contract provisions. Checklist questions ask for evaluation of:

- Formal agreements for increasing stream flow and violations of agreements

- Designated management entities and enforcement procedures
- Channel treatments made to accommodate additional streamflow
- Installation of streamflow measurement systems
- Installation of water conservation systems and erosion prevention measures
- Flow reaching the stream

Effectiveness monitoring consists of evaluating whether the project reached the goals identified in the pre-treatment checklist. This is facilitated by collection of the same basic information about the site as collected during the pre-treatment phase. This allows evaluation of:

- Flow management agreements and measurement systems
- Flow management enforcements and violations
- Improved accessibility of habitat to fish
- Instream habitat unit type before and after implementation
- Water quality before and after implementation
- Vegetation cover on channel banks, floodplains and within the bankfull channel before and after implementation
- Condition of banks and channels before and after implementation
- Substrate composition before and after implementation

Water Conservation / Purchase Pre-treatment Checklist

Anticipated Flow Effects

1. Is increasing instream flow to benefit salmonids a goal of the treatment? – Enter Y, N, or A.

2. Is increasing flow to improve fish passage a project goal? – Enter Y, N, or A.

3. Is increasing instream flow to change habitat types a goal of the project? – Enter Y, N, or A**.**
3a. Current habitat: **-** Enter the current type of habitat; *FLT* = flat water, *POO* = pool, *RIF* = riffle, *OTH* = other, specify in Comments section.
3b. Desired habitat: **-** Enter the type of habitat desired; *BCK* = Backwater, *FLT* = flat water, *POO* = pool, *RIF* = riffle, *SDC* = side channel, *UCB* = undercut bank, *OTH* = other, specify in Comments section.

4. Is increasing instream flow to improve water quality a project goal? – Enter Y, N, or D.
4a. Improved: Enter the type of improvement desired; *DOX* = Dissolved oxygen, *NUT* = Nutrient loading, *TMP* = Water temperature, *OTH* = other, specify in Comments section.

Anticipated Vegetation Effects

5. Is reducing vegetation within the bankfull channel a goal of the project? – Enter Y, N, or A.
5a. Length of channel with vegetation to be reduced: Estimate the length of channel with vegetation within the bankfull channel to be treated with removal *(feet).*
5b. Current cover within channel: Estimate the current percent cover of vegetation within the bankfull channel in the treatment area *(percent).*
5c. Current dominant channel cover type: Specify the type of vegetation that currently covers the channel in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

6. Is increase in vegetation cover on banks a goal of the treatment? – Enter Y, N, or A.
6a. Length of bank to be treated: Estimate the length of channel bank that may be expected to have increased vegetation cover as a result of the treatment *(feet)*
6b. Current vegetation cover on banks: Estimate the current vegetation cover within the area to be treated *(percent).*
6c. Current dominant bank cover type: Specify the dominant type of vegetation that currently covers the bank in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

7. Is increase in floodplain vegetation cover a goal of the treatment? – Enter Y, N, or A.
7a. Area of floodplain to be treated: Estimate the area of floodplain that may be expected to have increased vegetation cover as a result of the treatment *(square feet).*
7b. Current vegetation cover on floodplain: Estimate the current vegetation cover within the area of floodplain to be treated specified above *(percent).*
7c. Current dominant floodplain cover type: Specify the dominant type of vegetation that currently covers the floodplain in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

Anticipated Channel Effects

8. Is changing channel conditions a goal of the treatment? – Enter Y, N, or A.
8a. Problem: Specify the channel problem(s) of concern; *AGG* = aggradation, *BRD* = channel braiding, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = channel sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.
8b. Desired: Specify the channel improvement(s) targeted by the treatment: *AGG* = channel aggradation, *FPD* = floodplain deposition, *GRC* = grade control, *HDC* = headcutting, *INC* = channel incision, *IST* =

channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

9. Is changing substrate composition a goal of the treatment? – Enter Y, N, or A.
9a. Current dominant substrate: Identify the dominant component of substrate; *SLC* = silt/clay, *SND* = sand, *GRV* = gravel, *COB*= cobble, *BOL* = boulder, *BED* = bedrock, *OTH* = other, specify in Comments section.
9b. Desired dominant substrate: Identify the desired dominant component of substrate; *SLC* = silt/clay, *SND* = sand, *GRV* = gravel, *COB*= cobble, *BOL* = boulder, *BED* = bedrock, *OTH* = other, specify in Comments section.

WATER CONSERVATION/PURCHASE - PRETREATMENT CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Anticipated Habitat Effects	1. Is increasing instream flow to benefit salmonids a goal of the treatment?							
	2. Is increasing flow to improve fish passage a treatment goal?*							
	3. Is increasing instream flow to change habitat types a treatment goal?							
	a. Current habitat: BCK, FLT, POO, RIF, SDC, UCB, OTH							
	b. Desired habitat: BCK, FLT, POO, RIF, SDC, UCB, OTH							
	4. Is increasing instream flow to improve water quality a treatment goal?							
	a. Improved: DOX, NUT, TMP, OTH							
	5. Is reducing vegetation within the bankfull channel a goal of the treatment?							
	a. Length of channel to be treated (feet)							
	b. Current cover within channel (percent):							
	c. Current dominant channel cover type: NON, HRB, SHR, TREE							
Anticipated Vegetation Effects	6. Is increase in vegetation cover on banks a goal of the treatment?							
	a. Length of bank to be treated (feet):							
	b. Current vegetation cover on banks (percent)							
	c. Current dominant bank cover: NON, HRB, SHR, TREE							
	7. Is increase in floodplain vegetation cover a goal of the treatment?							
	a. Area of floodplain to be treated (ft²):							
	b. Current vegetation cover on floodplain (percent):							
	c. Current dominant floodplain cover: NON, HRB, SHR, TREE							
Anticipated Channel Effects	8. Is changing channel conditions a goal of the treatment?							
	a. Problem: AGG, BRD, ENC, HDC, INC, NAR, SDC, SIN, STB, WID, OTH							
	b. Desired: AGG, FPD, GRC, HDC, INC, NAR, SDC, SIN, STB, OTH							
	9. Is changing substrate composition a goal of the treatment?							
	a. Current dominant substrate type: SLC, SND, GRV, COB, BOL, BED							
	b. Desired increase in substrate type: SLC, SND, GRV, COB, BOL, BED							

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

* If fish passage improvement is a goal of the treatment, complete an FP - Fish Passage checklist as well.

Water Conservation / Purchase Implementation Checklist

Instream Flow

1. Has a formal agreement for increasing stream flow been signed? – Enter Y, N, P, A, or D.
1 *a. Length of stream affected:* Specify the length of stream for which the formal agreement has been signed, or for that the water conservation project will affect *(miles).*

2. Is a flow measurement system in place to monitor the agreement? – Enter Y, N, P, A, or D.
2a. Measurement system: Specify the type of measurement system in place: *CRL* = controlled release, *STG* = stream gauge, *OTH* = other, specify in Comments section.
2b. # of gauges/measurement systems installed: Specify the number of stream gauges or water measurement systems installed to monitor the water agreement.

3. Is a designated person or entity charged with managing streamflow? – Enter Y, N, P, A, or D.
3a. Flow manager: Specify the management entity: *DFG* = Department of Fish and Game, *DWR* = Department of Water Resources, *OTH* = other, specify in Comments section.

4. Has augmented stream flow reached the stream? – Enter Y, N, P, A, or D.
4a. Water returned to/maintained in stream: Specify the amount of water returned to or maintained in the stream as a result of the treatment *(cfs).*
4b. Water leased/purchased: Specify the amount of water leased or purchased as a result of the treatment *(cfs).*

5. Have appropriate channel treatments been made to accommodate additional streamflow? – If the channel treatments were as approved, enter Y. Enter P if some changes were made and note in the comments section. If treatments were deficient, enter N. If no watering stations were required, enter A.

6. Is enforcement against non-compliance with the agreement possible? – Enter Y, N, P, A, or D.

7. Have incidents of non-compliance occurred? – Enter Y, N, P, A, or D.
7a. Number since project implementation: Specify the number of incidents of non-compliance with the water conservation/purchase agreement that have occurred since implementation of the project.

Erosion Control

8. Have the water facilities/structures been completed as approved? – – If the facilities were completed as approved, enter Y. Enter P if some changes were made and note in the comments section. If facilities were deficient, enter N. If no facilities were required, enter A.

9. Have required surface erosion control measures been applied to bare areas? – If erosion control measures were as approved, enter Y. Enter P if some changes were made and note in the comments section. If measures were deficient, enter N. If no measures were required, enter A.
9a. Type: Specify the type of erosion control measure that has been used; *PLN* = planting, *SEE* = seeding, *MUL* = mulching, *ROC* = rocking, *FAB* = erosion control fabric, *OTH* = other, specify in Comments section.

10. Were sediment delivery prevention measures installed as approved? – If sediment prevention measures were as approved, enter Y. Enter P if some changes were made and note in the comments section. If measures were deficient, enter N. If no measures were required, enter A.
10a. Type: Specify the type of sediment delivery prevention method used on the project; *SET* = settling basin, *SLF* = silt fence, *250* = check dam, *OTH* = other, specify in Comments section.

Implementation

11. Did the as-completed treatment comply with design? - Enter Y, N, P, D, or A.
11a. If not, were modifications beneficial to performance? - Enter Y, N, P, D, or A.
11b. Was non-compliance significant enough to jeopardize performance? - Enter Y, N, P, D, or A.
11c. Are corrections needed? - Enter Y, N, P, D, or A.

Overall Implementation Rating: Rate the overall implementation of the project. (see Completion of Monitoring checklists section).

WATER CONSERVATION/PURCHASE - IMPLEMENTATION CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Instream Flow	1. Has a formal agreement for increasing stream flow been signed?							
	a. Length of stream affected (miles):							
	2. Is a flow measurement system in place to monitor the agreement?							
	a. Measurement system: CRL, STG, OTH							
	b. # of gauges/measurement systems installed:							
	3. Is a designated person or entity charged with managing the agreement/flow?							
	a. Manager: DFG, DWR, OTH							
	4. Has augmented flow reached the stream?							
	a. Water returned to/maintained in stream (cfs):							
	b. Water leased/purchased (cfs):							
	5. Have appropriate channel treatments been made to accommodate flow?							
	6. Is enforcement against non-compliance with the agreement possible?							
	7. Have incidents of non-compliance occurred?							
	a. Number since project implementation:							
Erosion Control	8. Have the water facilities/structures been completed as approved?							
	9. Have required surface erosion control measures been applied to bare areas?							
	a. Type: PLN, SEE , MUL, ROC, FAB, OTH							
	10. Were sediment delivery prevention measures installed as approved?							
	a. Type: SET, SLF, 250, OTH							
Implementation	11. Did the as-completed treatment comply with design?							
	a. If not, were modifications beneficial to performance?							
	b. Was non-compliance significant enough to jeopardize performance?							
	c. Are corrections needed?							
	Overall Implementation Rating *(Excellent, Good, Fair, Poor, Failed)*							

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Water Conservation / Purchase Effectiveness Checklist

Water Agreement

1. Is the formal agreement for increasing stream flow still in place? – Enter Y, N, P, A, or D.

2. Has augmented flow reached the stream? – Enter Y, N, P, A, or D.

3. Is a flow measurement system in place to monitor the agreement? – Enter Y, N, P, A, or D.

4. Is a designated person or entity charged with managing streamflow? – Enter Y, N, P, A, or D.

5. Is enforcement against non-compliance with the agreement possible? – Enter Y, N, P, A, or D.

6. Have incidents of non-compliance occurred? – Enter Y, N, P, A, or D.
*6a. Number since project implementation***:** Enter the number of documented incidents of non-compliance with the agreement since the project took place.

Habitat effects

7. Did the project improve passage for the targeted fish species? – Enter Y, N, P, A, or D.

8. Did the project create the desired instream habitat? – Enter Y, N, P, A, or D.
8a. Habitat created: - Enter the type of habitat(s) created; *BCK* = backwater, *FLT* = flat water, *POO* = pool, *RIF* = riffle, *SDC* = side channel, *UCB* = undercut bank, *OTH* = other, specify in Comments section.

9. Did the project have an undesirable effect on instream habitat? – Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, P, A, or D.
9a. Undesirable effect: - Enter the undesirable effect: *POF* = Pool filling, *RFS* = Riffle sedimentation, *OTH* = other, specify in Comments section.

10. Did the project improve water quality? – Enter Y, N, P, A, or D.
10a. Improved: Enter the type of water quality improvement: *DOX* = dissolved oxygen, *NUT* = nutrient loading, *TMP* = water temperature, *OTH* = other, specify in Comments section.

11 Did the project reduce vegetation within the bankfull channel? – Enter Y, N, P, A, or D.
11a. Length of channel with reduced cover: Estimate the length of channel with vegetation within the bankfull channel with decreased vegetation *(feet).*
11b. Current cover within channel: Estimate the current percent cover of vegetation within the bankfull channel in the treatment area *(percent).*
11c. Dominant channel cover type: Specify the dominant type of vegetation that currently covers the channel in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

Vegetation Effects

12. Did the treatment lead to an increase in vegetation cover of banks? – Enter Y, N, P, A, or D.
12a. Length of bank with increased cover: Estimate the total length of the bank with increased cover as a result of the treatment *(feet)*
12b. Total vegetation cover on banks: Estimate the total vegetation cover within the treatment area *(percent).*
12c. Dominant bank cover type: Specify the dominant type of vegetation that covers the bank in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

13. Did the treatment lead to an increase in floodplain vegetation cover? – Enter Y, N, P, A, or D.
13a. Area of floodplain with increased cover: Estimate the area of floodplain with increased cover as a result of the treatment *(ft²).*
13b. Current vegetation cover on floodplain: Estimate the total vegetation cover within the floodplain treatment area above *(percent).*
13c. Dominant floodplain cover type: Specify the dominant type of vegetation that covers the floodplain in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

Channel Effects
14. Did the treatment lead to desirable channel changes? – Enter Y, N, P, A, or D.
14a. Improved: Specify the channel improvement(s) after the treatment: *AGG* = channel aggradation, *FPD* = floodplain deposition, *GRC* = grade control, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

15. Did the treatment cause undesirable channel change? Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, P, A, or D.
15a. Impaired: Specify the channel impairment(s) after the treatment; *AGG* = aggradation, *BRD* = channel braiding, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = channel sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

16. Did the treatment cause desirable change in substrate composition? – Enter Y, N, P, A, or D.
16a. Dominant substrate type: Identify the dominant component of substrate; *SLC* = silt/clay, *SND* = sand, *GRV* = gravel, *COB*= cobble, *BOL* = boulder, *BED* = bedrock, *OTH* = other, specify in Comments section.

17. Did the treatment cause undesirable change in substrate composition? Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, P, A, or D.
Overall Effectiveness Rating: – Specify the overall effectiveness of the stream flow augmentation project. (see Completion of Monitoring checklists section). How well did the feature meet objectives stated in pre-treatment checklists?

WATER CONSERVATION/PURCHASE - EFFECTIVENESS CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

	Project Feature	#:		#:		#:		
OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:		
	Monitoring Segment -Ending Feature Number:	#:		#:		#:		
	Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/		
	Type of treatment: (see code sheet)							
			Photo #		**Photo #**		**Photo #**	
Water Agreement	1. Is a formal agreement for increasing stream flow still in place?							
	2. Has augmented flow reached the stream?							
	3. Is a flow measurement system in place to monitor the agreement?							
	4. Is a designated person or entity charged with managing streamflow?							
	5. Is enforcement against non-compliance with the agreement possible?							
	6. Have incidents of non-compliance occurred?							
	a. Number since project implementation:							
Habitat effects	7. Did the project improve passage for the targeted fish species?*							
	8. Did the project create the desired instream habitat?							
	a. Habitat created: BCK, FLT, POO, RIF, SDC, UCB, OTH							
	9. Did the project have an undesirable effect on instream habitat?							
	a. Undesirable effect: POF, RFS, OTH							
	10. Did the project improve water quality?							
	a. Improved: DOX, NUT, TMP, OTH							
	11. Did the project reduce vegetation within the bankfull channel?							
	a. Length of channel with reduced cover (feet):							
	b. Cover within channel (percent):							
	c. Dominant channel cover type: NON, HRB, SHR, TREE							
Vegetation Effects	12. Did the treatment lead to an increase in vegetation cover on banks?							
	a. Length of bank with increased vegetation cover (ft):							
	b. Current total vegetation cover on banks (percent):							
	c. Dominant bank cover type: NON, HRB, SHR, TREE							
	13. Did the treatment lead to an increase in floodplain vegetation cover?							
	a. Area of floodplain with increased cover (ft^2)							
	b. Total vegetation cover on floodplain (percent):							
	c. Dominant floodplain cover: HRB, SHR, TREE, OTH							
Channel Effects	14. Did the project lead to desirable channel changes?							
	a. Type: AGG, FPD, GRC, HDC, INC, NAR, SDC, SIN, STB, OTH							
	15. Did the project cause undesirable channel changes?							
	a. Type: AGG, BRD, HDC, INC, NAR, SDC, SIN, STB, WID, OTH							
	16. Did the project cause desirable change in substrate composition?							
	a. Dominant substrate type: SLC, SND, GRV, COB, BOL, BED							
	17. Did the project cause undesirable change in substrate composition?							
Overall Effectiveness Rating *(Excellent, Good, Fair, Poor, Failed)*								

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

* If fish passage improvement is a goal of the treatment, complete an FP - Fish Passage checklist as well.

Field Method 6: Vegetation Control Projects

Vegetation control projects attempt to restore native riparian vegetation and reduce encroachment into channels by:

- Removing exotic plants including noxious weeds
- Planting native species to replace exotics
- Removing vegetation from the channel to increase the quantity and quality of spawning gravels
- Applying vegetation management to change the composition of riparian vegetation, mainly to increase the abundance of coniferous trees

Figure 8. Arundo growing along the Napa River in Calistoga. *Source:* Allan Renger

This category of project can be distinguished from the riparian restoration projects described in Field Method 7 by the general goal of changing riparian species composition rather than increasing the extent or cover of riparian vegetation. This category of checklist is also appropriate for projects with the goal of removing vegetation. Effectiveness of vegetation control projects is judged based on increased native riparian plant cover, increased relative abundance of native plants and reduced abundance of exotics. If clearing encroachment is involved, effectiveness is judged by reduced vegetation within the bankfull channel and the increased availability of spawning gravels. Short-term effectiveness monitoring should occur after at least one growing season has occurred, preferably in the fall. Long-term effectiveness visits should occur five to ten years after project implementation to allow adequate time for success of plant establishment and growth and/or control efforts to manifest. Visits should be timed during the growing season when full foliage is present.

Figure 9. Same Area After Vegetation Removal Project.
Source: Dan Resnik

For more information on the importance of native riparian vegetation to high quality fish habitat, see the companion *Monitoring the Effectiveness of Riparian Vegetation Restoration* (2005).

If sampling of treatments is done, the spatial definition of the sampling segment should be recorded on the On Site Navigation Form, as well as the checklist header. The method of sampling should be recorded in the checklist notes.

Field Method
Pre-treatment monitoring requires identification of the specific goals of the vegetation control project from the following choices:

- Changing riparian plant species composition
- Increasing native riparian cover
- Decreasing cover of undesirable species
- Increasing recruitment of large wood
- Reducing vegetation within the bankfull channel
- Changing substrate composition
- Changing stream habitat units
- Changing channel bank conditions

Pre-treatment monitoring also requires collection of basic information about channel and bank conditions and vegetation cover extent and type to allow comparison to post-treatment conditions. Implementation monitoring centers on the adherence of the contract implementers to contract provisions. Checklist questions ask for evaluation of:

- Length of bank or channel treated, size of treatment area
- Species, quantity, and location of planted or removed species
- Treatment timing and methods including irrigation, weed control, and slash removal

Effectiveness monitoring consists of evaluating whether the project reached the goals identified in the pre-treatment checklist. This is facilitated by collection of the same basic information about the site as collected during the pre-treatment phase. This allows evaluation of:

- Riparian species composition before and after implementation
- Bank, floodplain, and over channel vegetation cover before and after implementation
- Large wood recruitment potential after implementation
- Vegetation encroachment within the channel before and after implementation
- Instream habitat and substrate before and after implementation
- Condition of banks and channels before and after implementation

Vegetation Control Pre-treatment Checklist

Anticipated Plant Composition Effects

1. Is change in species composition a goal of the treatment? – Enter Y, N, or A.
1a. Current dominant species: Enter the 4-letter species code (genus – species) of the dominant species.
1b. Desired dominant species: Enter the 4-letter species code (genus – species) of the desired dominant species.

2. Is increasing native riparian cover a goal of the treatment? - Enter Y, N, or A.
2a. Desired location of increase: Specify the location where an increase in native cover is desired; *ABC* = above the channel/over channel canopy, *BNK* = bank, *FLD* = floodplain, *OTH* = other, specify in Comments section.

3. Is decreasing cover of undesirable species a goal of the treatment? - Enter Y, N, or A.
3a. Desired location of decrease: Specify the location where a decrease in exotics is desired; *ABC* = above the channel/over channel canopy, *BNK* = bank, *FLD* = floodplain, *OTH* = other, specify in Comments section.

4. Is increasing large wood recruitment a goal of the project? – Enter Y, N, or A.
4a. LWD recruitment method: Identify the primary large wood recruitment method; *EXC* = excavation/exhumation of wood already in the channel, *INT* = interception of wood moving downstream in channel, *PLC* = placement, *RPR* = riparian recruitment, *OTH* = other, specify in Comments section.

Anticipated Channel and Bank Effects

5. Is reducing vegetation within the bankfull channel a goal of the treatment? – Enter Y, N, or A**.**
5a. Length of channel with vegetation to be reduced: Estimate the length of channel with vegetation within the bankfull channel to be treated with removal *(feet).*
5b. Current cover within channel: Estimate the current percent cover of vegetation within the bankfull channel in the treatment area *(percent).*
5c. Current dominant channel cover type: Specify the type of vegetation that currently covers the channel in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

6. Is changing substrate composition a goal of the treatment? – Enter Y, N, or A.
6a. Current dominant substrate: Identify the dominant component of substrate; *SLC* = silt/clay, *SND* = sand, *GRV* = gravel, *COB*= cobble, *BOL* = boulder, *BED* = bedrock, *OTH* = other, specify in Comments section.
6b. Desired dominant substrate: Identify the desired dominant component of substrate; *SLC* = silt/clay, *SND* = sand, *GRV* = gravel, *COB*= cobble, *BOL* = boulder, *BED* = bedrock, *OTH* = other, specify in Comments section.

7. Is change in habitat unit a goal of the project? – Enter Y, N, or A.
7a. Current habitat: - Enter the current type of habitat; *FLT* = flat water, *POO* = pool, *RIF* = riffle, *OTH* = other, specify in Comments section.
7b. Desired habitat: - Enter the type of habitat desired; *BCK* = Backwater, *FLT* = flat water, *POO* = pool, *RIF* = riffle, *SDC* = side channel, *UCB* = undercut bank, *OTH* = other, specify in Comments section.

8. Is change in channel banks a goal of the treatment? – Enter Y, N, or A.
8a. Current bank conditions: Specify the bank problem(s) of concern; *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

8b. Desired problem reductions: Specify the bank improvement(s) targeted by the treatment: *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

VEGETATION CONTROL- PRETREATMENT CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:**

Date (mm/dd/yy): **Evaluation crew:**

	Project Feature	#:	#:	#:
OR	*Monitoring Segment -Beginning Feature Number:*	#:	#:	#:
	Monitoring Segment -Ending Feature Number:	#:	#:	#:
	Total # of Features in Segment/# of Features Evaluated in Segment:	/	/	/
	Type of treatment: (see code sheet)			

			Photo #		Photo #		Photo #
Anticipated Composition Effects	1. Is change in species composition a goal of the treatment?						
	a. Current dominant species (enter 4 letter species code):						
	b. Desired dominant species (enter 4 letter species code):						
	2. Is increasing native riparian cover a goal of the treatment?						
	a. Desired location of increase: ABC, BNK, FLD, OTH						
	3. Is decreasing cover by undesirable species a goal of the treatment?						
	a. Desired location of decrease: ABC, BNK, FLD, OTH						
	4. Is increasing large wood recruitment a goal of the treatment?						
	a. LWD recruitment method: EXC, INT, PLC, RPR, OTH						
Removal Effects	5. Is reducing vegetation within the bankfull channel a goal of the treatment?						
	a. Length of channel to be treated (feet)						
	b. Current cover within channel (percent):						
	c. Current dominant channel cover type: NON, HRB, SHR, TREE						
Anticipated Channel and Bank Effects	6. Is changing substrate composition a goal of the treatment?						
	a. Current dominant substrate: SLC, SND, GRV, COB, BOL, BED						
	b. Desired dominant substrate: SLC, SND, GRV, COB, BOL, BED						
	7. Is change in instream habitat a goal of the treatment?						
	a. Current habitat: BCK, FLT, POO, RIF, SDC, UCB, OTH						
	b. Desired habitat: BCK, FLT, POO, RIF, SDC, UCB, OTH						
	8. Is change in channel banks a goal of the treatment?						
	a. Current bank problems: BKE, BRB, BNG, OTH						
	b. Desired reductions in bank problems: BKE, BRB, BNG, OTH						

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Vegetation Control Implementation Checklist

Vegetation Control Characteristics

1. Were the proposed species planted, removed or treated? – Enter Y if the plant species was/were as proposed or P if some but not all of the approved species were planted or removed. If the treatment did not affect most of the proposed species, enter N. Enter D for Don't Know.
1a. Species of plants planted or removed: Specify the species of plants that were planted or removed as part of that project feature. Use the DFG four letter codes.

2. Was vegetation planted, removed or treated in the approved locations? – Enter Y if the treatment location was as proposed or P if a different location was used and specify the deviations in the Comments section. If the location was obviously deficient, enter N. Enter D for Don't Know.
2a. Length of stream channel treated/protected: If *Y* or *P*, specify the length of the stream channel improved by the treatment (*feet*).

3. Was the treated area the same as proposed? – Enter Y if the area treated was the same as proposed or P if a different are was treated. If the area was obviously deficient, enter N. Enter D for Don't Know.
3a. Area of invasive species controlled: If the project involved removing invasive species, enter the area of channel, bank, and floodplain treated *(acres).*
3b. Area of riparian plantings: If the project involved planting, enter the area of bank and floodplain area treated *(acres).*

4. Was the treatment done during the specified time period or season? - Enter Y if the treatment was done during the specified time period or P if a different time period was used and specify the deviations in the Comments section. If the time period used was obviously deficient, enter N. Enter D for Don't Know.

5. Did the treatment occur using the specified methods? – Enter Y if the treatment used the proposed methods or P if a different method was used. If the method was obviously deficient, enter N. Enter D for Don't Know.
5a. Method: Specify the control method: *001* = Hand crew, *002* = Machine/Heavy equipment, *004* = Chemical spray, *OTH* = other, specify in Comments section.

6. Were cuttings or slash removed or disposed of as approved? - Enter Y if the materials were disposed of as approved or P if a different method was used and specify the deviations in the Comments section. If the method was obviously deficient, enter N. Enter D for Don't Know. If no disposal was specified or needed, enter A.

7. Were erosion control methods used as approved? – Enter Y if the proposed erosion control methods were used, or P if a different method was used. If approved erosion control was omitted, enter N. Enter D for Don't Know. If no erosion control was proposed, answer A.
7a. Type: Specify the type of erosion control methods used: *FAB* = fabric, *MUL* = native mulching, *PLN* = planting, *ROC* = rock, *SEE* = seeding, *SLF* = silt fence, *STW* = straw mulching, *OTH* = other, specify in Comments section.

Riparian Planting

8. Was the proposed number of plants planted? – Enter Y if the proposed number of plants were planted or P if a different number was planted. If required planting was omitted, enter N. Enter D for Don't Know. If no planting was proposed, answer A.
8a. Number of plants planted: Specify the number of plants planted for this project feature.

9. Was the spacing of plantings as intended? – Enter Y if the spacing of plants was as proposed or P if a different spacing was used and specify deviations in the Comments section. If spacing was obviously deficient, enter N. Enter D for Don't Know. If no planting was proposed, answer A.

10. Were approved irrigation provisions installed? – Enter Y if irrigation was installed as proposed or P if a different system was used. If required irrigation was omitted, enter N. Enter D for Don't Know. If no irrigation was proposed or needed, answer A.
10a. Method: Specify the irrigation method: *001* = hand crew, *003* = irrigation system, *OTH* = other, specify in Comments section.

11. Were approved weed control measures installed? – Enter Y if weed control was installed as proposed or P if different measures were used and specify deviations in the Comments section. If required weed control was omitted, enter N. Enter D for Don't Know. If no weed control was proposed or needed, answer A.

12. Were approved herbivore control methods installed? – Enter Y if herbivore control was installed as proposed or P if different measures were used and specify deviations in the Comments section. If required herbivore control was omitted, enter N. Enter D for Don't Know. If no herbivore control was proposed or needed, answer A.

13. Were approved provisions for plant shading installed? – Enter Y if plant shading was done as proposed or P if different measures were used and specify the deviations in the Comments section. If required shading was omitted, enter N. Enter D for Don't Know. If no shading was proposed or needed, answer A.

Implementation
14. Did the as-completed treatment comply with design? - Enter Y, N, P, D, or A.
14a. If not, were modifications beneficial to performance? - Enter Y, N, P, D, or A.
14b. Was non-compliance significant enough to jeopardize performance? - Enter Y, N, P, D, or A.
14c. Are corrections needed? - Enter Y, N, P, D, or A.

Overall Implementation Rating: Rate the overall installation of the project feature. (see Completion of Monitoring checklists section).

VEGETATION CONTROL - IMPLEMENTATION CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Treatment Characteristics	1. Were the proposed species planted, removed, or treated?							
	a. Species of plants planted or removed:							
	2. Was vegetation planted, removed, or treated in the approved locations?							
	a. Length of stream treated/protected (miles):							
	3. Was the treated area the same as approved?							
	a. Area of invasive species control (acres):							
	b. Area of riparian plantings (acres):							
	4. Was the treatment done during the specified time period or season?							
	5. Did the treatment occur using the specified methods?							
	a. Method: 001, 002, 004, OTH							
	6. Were cuttings or slash removed or disposed of as approved?							
	7. Were erosion control methods used as approved?							
	a. Type: FAB, MUL, PLN, ROC, SEE, SLF, STW, OTH							
Riparian Planting	8. Was the proposed number of plants planted?							
	a. Number of plants planted:							
	9. Was the spacing of plantings as approved?							
	10. Were approved irrigation provisions installed?							
	a. Method: 001, 003, OTH							
	11. Were approved weed control measures installed?							
	12. Were approved herbivore control methods installed?							
	13. Were approved provisions for plant shading installed?							
Implementation	14. Did the as-completed treatment comply with design?							
	a. If not, were modifications beneficial to performance?							
	b. Was non-compliance significant enough to jeopardize performance?							
	c. Are corrections needed?							
	Overall Implementation Rating *(Excellent, Good, Fair, Poor, Failed)*							

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Vegetation Control Effectiveness Checklist

Plant Composition Effects

1. Was survival of planted vegetation adequate? – Enter Y, N, P, A, or D. Use the survival goals stated in the contract's statement of work or the current standard of success: 80% survival after three years.

2. Is growth and vigor of planted vegetation acceptable? – Enter Y, N, P, A, or D. Use the goals stated in contract's statement of work for growth/vigor. If no standard has been set, use professional judgment based on species and planting site.

3. Did species composition change as a result of the treatment? – Enter Y, N, P, A, or D.
3a. Current dominant species: Enter the 4-letter species code (genus – species) of the dominant species.

4. Did cover by native riparian species increase as a result of the treatment? – Enter Y, N, P, A, or D.
4a. Location: Specify the location where an increase in native cover occurred; *ABC* = above the channel, *BNK* = bank, *FLD* = floodplain, *OTH* = other, specify in Comments section.

5. Did cover by undesirable species decrease as a result of the project? Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, P, A, or D.
5a. Location: Specify the location where undesirable species decreased; *ABC* = above the channel, *BNK* = bank, *FLD* = floodplain, *OTH* = other, specify in Comments section.

6. Did the project increase large wood recruitment potential? – Enter Y, N, P, A, or D.
6a. Recruitment method: Identify the primary large wood recruitment method; EXC = excavating/exhumation of wood already in the channel, INT = interception of wood moving downstream in channel, PLC = placement of wood directly in the stream, RPR = recruitment of large wood from adjacent riparian areas, OTH = other, specify in Comments section.

Channel Vegetation Removal Effects

7. Did the treatment reduce vegetation within the bankfull channel? – Enter Y, N, P, A, or D.
7a. Length of channel with reduced cover: Estimate the current percent cover of vegetation within the bankfull channel in the treatment area *(feet).*
7b. Cover within channel: Estimate the current percent cover of vegetation within the bankfull channel in the treatment area *(percent).*
7c. Channel cover type: Specify the type of vegetation that covers the channel in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

8. Did the treatment cause desirable change in substrate composition? – Enter Y, N, P, A, or D.
8a. Dominant substrate type: Identify the dominant component of substrate; *SLC* = silt/clay, *SND* = sand, *GRV* = gravel, *COB*= cobble, *BOL* = boulder, BED = bed, OTH = other, specify in Comments section.

Channel and Bank Effects

9. Did the treatment create the desired instream habitat? – Enter Y, N, P, A, or D.
9a. Habitat created: - Enter the type of habitat created; *BCK* = backwater, *FLT* = flat water, *POO* = pool, *RIF* = riffle, *SDC* = side channel, *UCB* = undercut bank, *OTH* = other, specify in Comments section.

10. Did the treatment lead to desirable bank changes? – Enter Y, N, P, A or D.
10a. Improved: Specify the bank improvement(s) after the treatment: *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

Overall Effectiveness Rating: – Specify the overall effectiveness of the vegetation control project. (see Completion of Monitoring checklists section). How well did the feature meet objectives stated in pre-treatment checklists?

VEGETATION CONTROL - EFFECTIVENESS CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Composition Effects	1. Was survival of planted vegetation adequate?							
	2. Is growth and vigor of planted vegetation acceptable?							
	3. Did species composition change as a result of the treatment?							
	a. Current dominant species (enter 4 letter species code):							
	4. Did cover by native riparian species increase as a result of the treatment?							
	a. Location: ABC, BNK, FLD, OTH							
	5. Did cover by undesirable species decrease as a result of the treatment?							
	a. Location: ABC, BNK, FLD, OTH							
	6. Did the project increase large wood recruitment potential?							
	a. Recruitment method: EXC, INT, PLC, RPR, OT							
Vegetation Removal Effects	7. Did the treatment reduce vegetation within the bankfull channel?							
	a. Length of channel with reduced cover (feet):							
	b. Cover within channel (percent):							
	c. Dominant channel cover type: NON, HRB, SHR, TREE							
	8. Did the treatment cause desirable change in substrate composition?							
	a. Dominant substrate type: SLC, SND, GRV, COB, BOL, BED							
Channel and Bank Effects	9. Did the treatment create the desired instream habitat?							
	a. Habitat created: BCK, FLT, POO, RIF, SDC, UCB, OTH							
	10. Did the treatment lead to desirable bank condition changes?							
	a. Improved: ANG, BAR, CHS, ERO, MIG, SMP, STB, VEG, OTH							
	11. Did the treatment lead to undesirable bank conditions?							
	a. Impaired: ANG, BAR, CHS, ERO, MIG, SMP, STB, VEG, OTH							
Overall Effectiveness Rating *(Excellent, Good, Fair, Poor, Failed)*								

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Field Method 7: Riparian Planting Projects

Riparian planting projects aim to increase stream shading, bank stability, or future inputs of large wood to stream channels. Projects include:

- Planting vegetation to increase riparian cover

This category of project can be distinguished from the vegetation control projects described in Field Method 6 by the general goal of increasing the area, cover, or successional stage of riparian vegetation rather than of changing its species composition. Effectiveness of planting projects is judged based on increased riparian canopy cover and continuity. Short-term effectiveness monitoring should occur after at least one growing season, typically in the fall. Ideally, long-term effectiveness monitoring visits should occur during the growing season when full foliage is present, up to ten years after project implementation to allow adequate time for success of plant establishment and growth.

For more information on the importance of riparian vegetation to high quality fish habitat, see the companion *Monitoring the Effectiveness of Riparian Vegetation Restoration* (2005).

Sampling is not generally recommended for riparian planting projects. However, some projects may include a very large number of treatment areas, and so require sampling. If sampling of treatments is done, the spatial definition of the sampling segment should be recorded on the On Site Navigation Form, as well as the checklist header. The method of sampling should be recorded in the checklist notes.

Field Method

Pre-treatment monitoring requires identification of the specific goals of the riparian planting project from the following choices:

- Increasing vegetation cover on banks, floodplains or over the channel
- Changing species composition
- Reducing the size or number of gaps in riparian vegetation
- Increasing volume of large wood at the site
- Changing channel and bank conditions

Pre-treatment monitoring also requires collection of basic information about vegetation cover extent and

channel and bank conditions to allow comparison to post-treatment conditions. Implementation monitoring centers on the adherence of the contract implementers to contract provisions. Checklist questions ask for evaluation of:

- Species, quantity, and location of plants planted
- Planting timing and methods including irrigation, weed and herbivore control, and shading
- Length of bank or channel treated, size of area planted

Effectiveness monitoring consists of evaluating whether the project reached the goals identified in the pre-treatment checklist. This is facilitated by collection of the same basic information about the site as collected during the pre-treatment phase. This allows evaluation of:

- Bank, floodplain, and over channel vegetation cover before and after implementation
- Species composition before and after implementation
- Size or number of gaps in riparian vegetation along the stream before and after implementation
- Large wood recruitment potential before and after implementation
- Condition of banks and channels before and after implementation

Riparian Planting Pre-treatment Checklist

Anticipated Riparian Cover Effects

1. Is increase in vegetation cover on banks a goal of the treatment? – Enter Y, N, or D.
1a. Length of bank to be treated: Estimate the length of channel bank that may be expected to have increased vegetation cover as a result of the treatment *(feet)*
1b. Current vegetation cover on banks: Estimate the current vegetation cover within the area to be treated *(percent).*
1c. Current dominant bank cover type: Specify the dominant type of vegetation that currently covers the bank in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

2. Is increase in floodplain vegetation cover a goal of the treatment? – Enter Y, N, or D.
2a. Area of floodplain to be treated: Estimate the area of floodplain that may be expected to have increased vegetation cover as a result of the treatment *(square feet).*
2b. Current vegetation cover on floodplain: Estimate the current vegetation cover within the area of floodplain to be treated specified above *(percent).*
2c. Current dominant floodplain cover type: Specify the dominant type of vegetation that currently covers the floodplain in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

3. Is increase in canopy cover over the channel a goal of the treatment? – Enter Y, N, or D.
3a. Length of channel to be treated: Estimate the length of the channel with vegetation treatments along it (*feet).*
3b. Current over channel canopy cover (percent): Estimate the current canopy cover over the channel within the area to be controlled (*percent*).

4. Is reduction of the size of gaps in bank vegetation a goal? – Enter Y, N, or D.
4a. Length of largest gap in vegetation > 3 feet tall (ft): Estimate the length (along the stream) of the largest opening in riparian vegetation that is at least three feet tall within the treatment area *(feet).*

Composition Effects

5. Is change in species composition a goal of the treatment? – Enter Y, N, or D.
5a. Current dominant species: Enter the 4-letter species code (genus – species) of the dominant species.
5b. Desired dominant species: Enter the 4-letter species code (genus – species) of the desired dominant species.

6. Is increasing large wood recruitment a goal of the project? – Enter Y, N, or D.
6a. LWD recruitment method: Identify the primary large wood recruitment method; *EXC* = excavation/exhumation of wood already in the channel, *INT* = interception of wood moving downstream in channel, *PLC* = placement, *RPR* = riparian recruitment, *OTH* = other, specify in Comments section.

Anticipated Bank and Channel Effects

7. Is change in channel banks a goal of the treatment? – Enter Y, N, or D.
7a. Current bank conditions: Specify the bank problem(s) of concern; *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.
7b. Desired problem reductions: Specify the bank improvement(s) targeted by the treatment: *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

8. Is changing channel conditions a goal of the treatment? – Enter Y, N, or D.
8a. Problem: Specify the channel problem(s) of concern; *AGG* = aggradation, *BRD* = channel braiding, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = channel sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.
8b. Desired: Specify the channel improvement(s) targeted by the treatment: *AGG* = channel aggradation, *FPD* = floodplain deposition, *GRC* = grade control, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

RIPARIAN PLANTING - PRETREATMENT CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:**

Date (mm/dd/yy): **Evaluation crew:**

	Project Feature	#:	#:	#:
OR	*Monitoring Segment -Beginning Feature Number:*	#:	#:	#:
	Monitoring Segment -Ending Feature Number:	#:	#:	#:
	Total # of Features in Segment/# of Features Evaluated in Segment:	/	/	/
	Type of treatment: (see code sheet)			

			Photo #		Photo #		Photo #
Anticipated Cover Effects	1. Is increase in vegetation cover on banks a goal of the treatment?						
	a. Length of bank to be treated:						
	b. Current vegetation cover on banks (percent):						
	c. Current dominant bank cover: NON, HRB, SHR, TREE						
	2. Is increase in floodplain vegetation cover a goal of the treatment?						
	a. Area of floodplain to be treated (ft²):						
	b. Current vegetation cover on floodplain (percent):						
	c. Current dominant floodplain cover: NON, HRB, SHR, TREE						
	3. Is increase in canopy cover over the channel a goal of the treatment?						
	a. Length of channel to be treated:						
	b. Current over channel canopy cover (percent):						
	4. Is reduction of the size of gaps in bank vegetation a goal?						
	a. Length of largest gap in vegetation > 3 feet tall (ft):						
Composition Effects	5. Is change in species composition a goal of the treatment?						
	a. Current dominant species (enter 4 letter species code):						
	b. Desired dominant species (enter 4 letter species code):						
	6. Is increasing large wood recruitment a goal of the project?						
	a. LWD recruitment method: EXC, INT, PLC, RPR, OTH						
Anticipated Channel and Bank Effects	7. Is change in channel banks a goal of the treatment?						
	a. Current bank conditions: ANG, BAR, CHS, ERO, MIG, SMP, OTH						
	b. Desired problem reductions: ANG, BAR, CHS, ERO, MIG, SMP,OTH						
	8. Is changing channel conditions a goal of the treatment?						
	a. Problem: AGG, BRD, HDC, INC, NAR, SDC, SIN, STB, WID, OTH						
	b. Desired: AGG, FPD, GRC, HDC, INC, NAR, SDC, SIN, STB, OTH						

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Riparian Planting Implementation Checklist

Treatment Characteristics

1. Were the approved riparian species planted? – Enter Y if the plant species was/were as proposed or P if some but not all of the approved species were used. If no species planted were as approved, enter N. Enter D for Don't Know.
1a. Species of plants planted: Enter the species of the plants planted for this feature. Use the DFG four letter code.

2. Was the approved number of plants planted? – Enter Y if the number of plants planted was as proposed or P if the quantity was similar to that proposed. If the number of plants planted was obviously deficient, enter N. Enter D for Don't Know.
2a. Number of plants planted: Specify the number of plants planted for this project feature.

3. Was the spacing of planting as approved? – Enter Y if plant spacing was as proposed or P if different spacing was used and specify the deviations in the Comments section. If spacing was obviously deficient, enter N. Enter D for Don't Know. If no planting was proposed or needed, answer A.

4. Were the plants planted in approved locations? – Enter Y if plant were planted in the approved locations or P if a different location was used and specify the deviations in the Comments section. If the location was obviously deficient, enter N. Enter D for Don't Know.
4*a. Length of stream treated/protected:* Specify the length of stream along which riparian species were planted *(miles).*

5. Was the treated area the same as approved? – Enter Y if the treatment area was as proposed or P if the area planted was different. If the area was obviously deficient, enter N. Enter D for Don't Know.
5*a. Area of riparian plantings:* Specify the treatment area in which riparian planting occurred *(acres):*

6. Were plantings made during the designated planting season? – Enter Y if the planting season was as proposed or P if the planting season was different. If the planting season was obviously deficient, enter N. Enter D for Don't Know.

Planting Methods

7. Were plants planted using the specified methods? – Enter Y if planting was done as proposed or P if different measures were used. If required planting was omitted, enter N. Enter D for Don't Know.
7a. Method: Specify the planting method: *001* = Hand crew, *002* = Machine/Heavy equipment, *OTH* = other, specify in Comments section.

8. Were approved irrigation provisions installed? – Enter Y if irrigation was done as proposed or P if different measures were used. If required irrigation was omitted, enter N. Enter D for Don't Know. If no irrigation was proposed or needed, answer A.
8a. Method: Specify the irrigation method: *001* = Hand crew, *003* = Irrigation system, *OTH* = other, specify in Comments section.

9. Were approved weed control measures installed? **–** Enter Y if weed control was done as proposed or P if different measures were used and specify the deviations in the Comments section. If required weed control was omitted, enter N. Enter D for Don't Know. If no weed control was proposed or needed, answer A.

10. Were approved herbivore control methods installed? – Enter Y if herbivore control was done as proposed or P if different measures were used and specify the deviations in the Comments section. If

required herbivore control was omitted, enter N. Enter D for Don't Know. If no herbivore control was proposed or needed, answer A.

11. Were approved provisions for plant shading installed? – Enter Y if plant shading was done as proposed or P if different measures were used and specify the deviations in the Comments section. If required shading was omitted, enter N. Enter D for Don't Know. If no shading was proposed or needed, answer A.

Implementation

12. Did the as-completed treatment comply with design? - Enter Y, N, P, D, or A.
12a. If not, were modifications beneficial to performance? - Enter Y, N, P, D, or A.
12b. Was non-compliance significant enough to jeopardize performance? - Enter Y, N, P, D, or A.
12c. Are corrections needed? - Enter Y, N, P, D, or A.

Overall Implementation Rating: Rate the overall installation of the project feature. (see Completion of Monitoring checklists section).

RIPARIAN PLANTING - IMPLEMENTATION CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

	Project Feature	#:	#:	#:
OR	*Monitoring Segment -Beginning Feature Number:*	#:	#:	#:
	Monitoring Segment -Ending Feature Number:	#:	#:	#:
	Total # of Features in Segment/# of Features Evaluated in Segment:	/	/	/
	Type of treatment: (see code sheet)			

			Photo #		Photo #		Photo #
Treatment Characteristics	1. Were the approved riparian plant species planted?						
	a. Species of plants planted:						
	2. Were the approved number of plants planted?						
	a. Number of plants planted:						
	3. Was the spacing of planting as approved?						
	4. Were the plants planted in approved locations?						
	a. Length of stream treated/protected (miles):						
	5. Was the treated area the same as approved?						
	a. Area of riparian plantings (acres):						
	6. Were plantings made during the designated planting season?						
Planting Methods	7. Were plants planted using the specified methods?						
	a. Method: 001, 002, OTH						
	8. Were approved irrigation provisions installed?						
	a. Method: 001, 003, OTH						
	9. Were approved weed control measures installed?						
	10. Were approved herbivore control methods installed?						
	11. Were approved provisions for plant shading installed?						
Implementation	12. Did the as-completed treatment comply with design?						
	a. If not, were modifications beneficial to performance?						
	b. Was non-compliance significant enough to jeopardize performance?						
	c. Are corrections needed?						
	Overall Implementation Rating *(Excellent, Good, Fair, Poor, Failed)*						

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Riparian Planting Effectiveness Checklist

Riparian Cover Effects

1. Was survival of planted vegetation adequate? – Enter Y, N, P, A, or D. Use the survival goals stated in the contract's statement of work or the current standard of success: 80% survival after three years.

2. Is growth and vigor of planted vegetation acceptable? – Enter Y, N, P, A, or D. Use the goals stated in contract's statement of work for growth/vigor. If no standard has been set, use professional judgment based on species and planting site.

3. Did the treatment lead to an increase in vegetation cover of banks? – Enter Y, N, P, A, or D.
3a. Length of bank with increased cover: Estimate the total length of the bank with increased cover as a result of the treatment *(feet)*
3b. Total vegetation cover on banks: Estimate the total vegetation cover within the treatment area *(percent).*
3c. Dominant bank cover type: Specify the dominant type of vegetation that covers the bank in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

4. Did the treatment reduce the size of the gaps in bank vegetation? – Enter Y, N, or D.
4a. Length of largest gap in vegetation > 3 feet tall (ft): Estimate the length (along the stream) of the largest opening in riparian vegetation that is at least three feet tall within the treatment area *(feet).*

5. Did the treatment lead to an increase in floodplain vegetation cover? – Enter Y, N, P, A, or D.
5a. Area of floodplain with increased cover: Estimate the area of floodplain with increased cover as a result of the treatment *(ft^2).*
5b. Current vegetation cover on floodplain: Estimate the total vegetation cover within the floodplain treatment area above *(percent).*
5c. Dominant floodplain cover type: Specify the dominant type of vegetation that covers the floodplain in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

6. Did the treatment lead to an increase in over channel canopy cover? – Enter Y, N, P, A, or D.
6a. Length of channel with increased canopy cover (feet): Estimate the length of stream channel with increased cover as a result of the treatment *(ft).*
6b. Current over channel canopy cover: Estimate the total vegetation cover within the floodplain treatment area above *(percent).*

7. Did species composition change as a result of the treatment? – Enter Y, N, P, A, or D.
7a. Current dominant species: Enter the 4-letter species code (genus – species) of the dominant species.

8. Did the project increase large wood recruitment potential? – Enter Y, N, P, A, or D.
8a. Recruitment method: Identify the primary large wood recruitment method; EXC = excavation/exhumation of wood already in the channel, INT = interception of wood moving downstream in channel, PLC = placement of wood directly in the stream, RPR = recruitment of large wood from adjacent riparian areas, OTH = other, specify in Comments section.

Bank and Channel Effects

9. Did the treatment lead to desirable bank condition changes? – Enter Y, N, P, A or D.

9a. Improved: Specify the bank improvement(s) after the treatment: *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

10. Did the treatment lead to undesirable bank conditions? Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, P, A, or D.
10a. Impaired: Specify the bank problem(s) after the treatment; *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

11. Did the treatment lead to desirable channel changes? – Enter Y, N, P, A, or D.
11a. Improved: Specify the channel improvement(s) after the treatment: *AGG* = channel aggradation, *FPD* = floodplain deposition, *GRC* = grade control, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

12. Did the treatment cause undesirable channel change? Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, P, A, or D.
12a. Impaired: Specify the channel impairment(s) after the treatment; *AGG* = aggradation, *BRD* = channel braiding, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = channel sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

Overall Effectiveness Rating: – Specify the overall effectiveness of the riparian restoration feature. (see Completion of Monitoring checklists section). How well did the feature meet objectives stated in pre-treatment checklists?

RIPARIAN PLANTING - EFFECTIVENESS CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Riparian Cover Effects	1. Was survival of planted vegetation adequate?							
	2. Is growth and vigor of planted vegetation acceptable?							
	3. Did the treatment lead to an increase in vegetation cover on banks?							
	a. Length of bank with increased vegetation cover (ft):							
	b. Current total vegetation cover on banks (percent):							
	c. Dominant bank cover type: NON, HRB, SHR, TREE							
	4. Did the treatment reduce the size of the gaps in bank vegetation?							
	a. Length of largest gap in vegetation >3 ft tall (ft):							
	5. Did the treatment lead to an increase in floodplain vegetation cover?							
	a. Area of floodplain with increased cover (ft²)							
	b. Total vegetation cover on floodplain (percent):							
	c. Dominant floodplain cover: HRB, SHR, TREE, OTH							
	6. Did the treatment lead to an increase in over channel canopy cover?							
	a. Length of channel with increased canopy cover (feet):							
	b. Current over channel canopy cover (percent):							
Composition Effects	7. Did species composition change as a result of the treatment?							
	a. Current dominant species (enter 4 letter species code):							
	8. Did the project increase large wood recruitment potential?							
	a. LWD recruitment method: EXC, INT, PLC, RPR, OTH							
Channel and Bank Effects	9. Did the treatment lead to desirable bank condition changes?							
	a. Improved: ANG, BAR, CHS, ERO, MIG, SMP, STB, VEG, OTH							
	10. Did the treatment lead to undesirable bank conditions?							
	a. Impaired: ANG, BAR, CHS, ERO, MIG, SMP, STB, VEG, OTH							
	11. Did the project lead to desirable channel changes?							
	a. Type: AGG, FPD, GRC, HDC, INC, NAR, SDC, SIN, STB, OTH							
	12. Did the project cause undesirable channel conditions?							
	a. Type: AGG, BRD, HDC, INC, NAR, SDC, SIN, STB, WID, OTH							
Overall Effectiveness Rating *(Excellent, Good, Fair, Poor, Failed)*								

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Field Method 8: Erosion Control/Slope Stabilization Projects

Erosion control and slope stabilization projects attempt to reduce sediment inputs to streams to improve conditions for fish. Projects include:

- Soil engineering to increase slope stability
- Bioengineering such as mulching, planting, or seeding to reduce erosion and increase stability

Projects in this monitoring category may or may not be road related. For more information on the importance of controlling excessive sediment inputs to stream channels to maintain high quality fish habitat, see the companion *Monitoring the Effectiveness of Upland Restoration* (2005).

Effectiveness of these types of projects is judged based on reduced slope failure and decreased surface soil erosion and sediment delivery from the site. Short-term effectiveness monitoring should occur during the rainy season after the first large storm event.

Sampling is not generally recommended for erosion control or slope stabilization projects. However, some projects may include installation of a very large number of treatments and so require sampling. If sampling of treatments is done, the spatial definition of the sampling segment should be recorded on the On Site Navigation Form, as well as the checklist header. The method of sampling should be recorded in the checklist notes.

Field Method

Pre-treatment monitoring requires identification of the specific goals of the slope stabilization or erosion control project from the following choices:

- Increasing slope stability
- Decreasing erosion and sedimentation
- Dewatering a slope or gully
- Increasing vegetation cover

Pre-treatment monitoring also requires collection of basic information about stability, erosion and sedimentation conditions, as well as vegetation cover to allow comparison to post-treatment conditions. If the project is road related, it is likely that pre-treatment information will already have been collected using the DFG's upslope assessment methods described in Chapter 10 of the *Restoration Manual*. Use this assessment to help complete the pre-treatment checklist.

Implementation monitoring centers on the adherence of the contract implementers to contract provisions. Checklist questions ask for evaluation of:

- Length of road and stream affected
- Treatment size and excavation volume
- Stabilization structure type and erosion control treatments
- Spoils disposal and treatment

Effectiveness monitoring consists of evaluating whether the project reached the goals identified in the pre-treatment checklist. This is facilitated by collection of the same basic information about the site as collected during the pre-treatment phase including a quantification of sediment eroded since implementation. This allows evaluation of:

- Stabilization structure performance and condition
- Slope instability before and after implementation
- Sediment delivery from the site before and after implementation
- Extreme sediment events occurring after implementation
- Vegetation cover before and after implementation

Erosion Control / Slope Stabilization Pre-treatment Checklist

1. Is increasing slope stability a goal of the treatment? – If increasing the stability of a slope rather than just reducing erosion from a slope is the goal, enter Y, N, or A.
1a. Current slope problems: Specify the type of problem: *LDS* = landsliding, *SMP* = slumping, *OTH* = other, specify in Comments section.
1b. Visible evidence of slope instability: Specify the type of evidence for slope instability: *LDS* = landsliding, *SCR* = scarps, *SMP* = slumping, *TNC* = tension cracks, *OTH* = other, specify in Comments section.
1c. Causes of slope instability: Specify the presumed cause of slope instability: *CNR* = concentrated runoff, *PRM* = perched material, *OVS* = over-steepened fill, *UCT* = undercut toe, *OTH* = other, specify in Comments section.

2. Is dewatering a slope or gully a goal of the treatment? – If the treatment involves removing or decreasing the flow of water to a slope or gully, enter Y. If not, enter N. If not applicable, enter or A.

3. Is there evidence of active gully erosion occurring? – Enter Y, N, P, A, or D.
3a. Evidence: Examine the area around the gully to identify any evidence that the gully is actively eroding: *CNR* = concentrated runoff, *EMR* = emergent groundwater, *HDC* = headcutting, *SCR* = scarps, *SMP* = slumps, *TNC* = tension cracks, *OTH* = other, specify in comments section.

<u>Anticipated Erosion and Sedimentation effects</u>
4. Is decreasing erosion and sediment delivery a goal? – If decreasing sedimentation is the ultimate goal (even if goals 1 or 2 above have been chosen), enter Y. If not, enter N.
4a. Erosion mechanisms: Specify the type of chronic erosion issues in the treatment area: *GUL* = gullying, *RIL* = rilling, *SFE* = surface erosion, *SMP* = slumping, *OTH* = other, specify in Comments section.

5. Is the problem road related? – If the problem is road related, enter Y. In this case, completed sub-questions based on the upslope assessment completed using DFG Restoration Manual Chapter X. If not, enter N. In this case, complete sub-questions by gathering the data using the same upslope assessment method.
5a. Erosion potential: Enter *LOW, MEDIUM,* or *HIGH* for the potential for future erosion at the site. This is a qualitative evaluation of the likelihood of erosion and/or failure, not a quantitative volume estimate. Enter *High* if failure is very likely to occur.
5b. Estimate of future erosion: Estimate the volume of erosion from the site, using field measurements. This information should be found in the upslope assessment.
4c. Percent of future erosion delivered to channels: Enter the percentage of the soil that would enter a stream channel if the area/slope fails *(percent).* Assume 100% for erosion at stream crossings

6. Is decreasing the potential for extreme erosion and sediment delivery a goal of the treatment? – If there is a potential for erosion of more than just the immediate treatment area (through landsliding, torrenting of road fills in steep swales, and diversion of large streams onto steep, erodible or unstable hillslopes), enter Y. If not, enter N. Enter A if the question is not applicable to this situation. Answer the question using the upslope assessment completed using DFG Restoration Manual Chapter X, or field data using this method.
6a. Potential for extreme erosion: Estimate the expected volume of erosion or slope failure from an extreme erosion event from one of the following choices, <500,500-1000, 1-2k, 2-5k, 5k+ *(cubic yards).*

<u>Anticipated Vegetation Cover Effects</u>
7. Is increase in vegetation cover a goal of the treatment? – Enter Y, N, or A.

7a. Area of slope to be treated: Estimate the area of slope that may be expected to have increased vegetation cover as a result of the treatment *(ft^2).*
7b. Current vegetation cover on treatment area: Estimate the current vegetation cover within the area of slope to be treated specified above *(percent).*
7c. Current dominant slope cover type: Specify the dominant type of vegetation that currently covers the slope in the treatment area; *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *NON* = none, *OTH* = other, specify in Comments section.

EROSION CONTROL/SLOPE STABILIZATION - PRETREATMENT CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Anticipated Treatment Effects	1. Is increasing slope stability a goal of the treatment?							
	a. Current slope problems: LDS, SMP, OTH							
	b. Visible evidence: LSD, SCR, SMP, TNC, OTH							
	c. Current causes: CNR, EMG, OVS, PRM, UCT, OTH							
	2. Is dewatering a slope or gully a goal of the treatment?							
	3. Is there evidence of active gully erosion occuring?							
	a. *Evidence: CNR, EMR, HDC, SCR, SMP, TNC*							
	4. Is decreasing erosion and sediment delivery a treatment goal?							
	a. Erosion mechanisms: GUL, RIL, SFE, SMP, OTH							
Anticipated Sedimentation	5. Is the problem road related?							
	a. Erosion potential: LOW, MEDIUM, or HIGH							
	b. Estimate of future erosion (cy):							
	c. Percent of future erosion delivered to channels:							
	6. Is decreasing potential for extreme erosion and sediment delivery a goal?							
	a. Potential for extreme erosion: <500,500-1000,1-2k,2-5k,5k+ (cy)							
Vegetation Effects	7. Is increase in vegetation cover a goal of the treatment?							
	a. Area of slope to be treated (ft2):							
	b. Current vegetation cover on treatment area (percent):							
	c. Dominant vegetation cover type: HRB, SHR, TREE, NON, OTH							

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Erosion Control / Slope Stabilization Implementation Checklist

Treatment Characteristics

1. Was the approved slope or erosion/sediment control treatment installed? – Enter Y, N, P, A, or D.
1a. Length of stream affected (miles): Specify the length of stream affected by the slope stabilization or erosion control treatment.
1b. Length of road treated (miles): Specify the length of road treated if the slope stabilization or erosion control if the problem is road related.

2. Was the size of the treated area as approved? – Enter Y if the size of the treated area was as proposed, or P if a different size of treatment was implemented and specify deviations in the Comments section. If the size was clearly deficient, enter N. Enter D for Don't Know.
2a. Area treated or stabilized (acres): Specify the area of land treated or stabilized by the slope stabilization or erosion control treatment.

3. Was vegetation planted in association with the treatment? – If the treatment had biotechnical components, enter Y. If not, enter N.
3a. Species: If Y, enter the DFG code for the species that was planted.

4. Were approved irrigation provisions installed for plantings? – Enter Y if the proposed irrigation methods were used, or P if a different method was used. If an approved irrigation system was omitted, enter N. Enter D for Don't Know. If no vegetation is involved or irrigation is not needed, answer A.
4a. Method: Specify the irrigation method: *001* = Hand crew, *003* = Irrigation system, *OTH* = other, specify in Comments section.

5. Was the treatment installed in the approved location? - Enter Y if the treatment location was as proposed or P if a different location was used and specify deviations in the Comments section. If the location was obviously deficient, enter N. Enter D for Don't Know.

5. Were approved materials used for the treatment? – Enter Y if the materials used were as proposed or P if different materials were used. If materials were obviously deficient, enter N. Enter D for Don't Know.
5a. Materials: Enter the type of materials used: *BIO* = bioengineering, *NTR* = native rock, *OFR* = off-site rock, *RTW* = root wads, *VEG* = vegetation, *WOO* = wood, *OTH* = other, specify in Comments section.

7. Were the sizes of materials used the same as approved? – Enter Y if the materials' size was as proposed or P if a different size was used and specify deviations in the Comments section. If size was obviously deficient, enter N. Enter D for Don't Know.

8. Were approved gully dewatering treatments employed? – Enter Y if the dewatering treatments were as proposed or P if different treatments were used and specify deviations in the Comments section. If dewatering treatments were obviously deficient, enter N. Enter D for Don't Know. If no dewatering was proposed, answer A.

Erosion Control

9. Was the volume of excavation equal to the amount approved? –Enter Y if the excavation amount was as proposed or P if a different amount was excavated and specify deviations in the Comments section. If excavation was obviously deficient, enter N. Enter D for Don't Know. If no planting was proposed, answer A.

10. Have required surface erosion control measures been applied to bare soil areas? Enter Y if the measures were as proposed or P if different measures were used. If measures were obviously deficient, enter N. Enter D for Don't Know. If no measures were proposed or used, answer A.
10a. Type: Specify the type of erosion control methods used: *FAB* = fabric, *MUL* = mulching, *PLN* = planting, *ROC* = rock, *SEE* = seeding, *SLF* = silt fence, *STW* = straw mulching, *OTH* = other, specify in Comments section.

11. Were sediment delivery prevention measures installed as proposed? - Enter Y if the measures were as proposed or P if different measures were used. If measures were obviously deficient, enter N. Enter D for Don't Know. If no measures were proposed or used, answer A.
11a. Type: Specify the type of sediment delivery prevention measures used: *SET* = settling basins, *SLF* = silt fences, *250* = check dams, *OTH* = other, specify in Comments section.

12. Were spoils placed in approved locations? – Enter Y if spoils were placed as proposed or P if different locations were used and specify deviations in the Comments section. If placement was obviously deficient, enter N. Enter D for Don't Know. If no spoils were relocated, answer A.

13. Were spoils treated to reduce erosion as approved? – Enter Y if the spoils treatments were as proposed or P if different treatments were used and specify deviations in the Comments section. If spoils treatments were obviously deficient, enter N. Enter D for Don't Know. If no spoils were treated, answer A.

<u>Implementation</u>
14. Did the as-completed treatment comply with design? - Enter Y, N, P, D, or A.
14a. If not, were modifications beneficial to performance? - Enter Y, N, P, D, or A.
14b. Was non-compliance significant enough to jeopardize performance? - Enter Y, N, P, D, or A.
14c. Are corrections needed? - Enter Y, N, P, D, or A.

Overall Implementation Rating: Rate the overall installation of the project feature. (see Completion of Monitoring checklists section).

EROSION CONTROL/SLOPE STABILIZATION - IMPLEMENTATION CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Treatment Characteristics	1. Was the approved slope or erosion/sediment control treatment installed?							
	a. Length of stream affected (miles):							
	b. Length of road treated (miles):							
	2. Was the size of the treated area as approved?							
	a. Area treated or stabilized (acres):							
	3. Was vegetation planted in association with the treatment?							
	a. Species:							
	4. Were approved irrigation provisions installed?							
	a. Method: 001, 003, OTH							
	5. Was the treatment installed in the approved location?							
	6. Were approved materials used for the treatment?							
	a. Materials: BIO, NTR, OFR, RTW, VEG, WOO, OTH							
	7. Were the sizes of materials used the same as approved?							
	8. Were the approved gully dewatering treatments employed?							
Erosion Control	9. Was the volume of excavation equal to the amount approved?							
	10. Have required surface erosion control measures been applied to bare areas?							
	a. Type: FAB, MUL, PLN, ROC, SEE, STW, OTH							
	11. Were sediment delivery prevention measures installed as proposed?							
	a. Type: SET, SLF, 250, OTH							
	12. Were spoils placed in approved locations?							
	13. Were spoils treated to reduce erosion as approved?							
Implementation	14. Did the as-completed treatment comply with design?							
	a. If not, were modifications beneficial to performance?							
	b. Was non-compliance significant enough to jeopardize performance?							
	c. Are corrections needed?							
	Overall Implementation Rating *(Excellent, Good, Fair, Poor, Failed)*							

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Erosion Control / Slope Stabilization Effectiveness Checklist

Treatments

1. Is the treatment still in its original location? – Enter Y, N, P, A, or D.

2. Is the treatment performing as designed? – Enter Y, N, P, A, or D.
2a. Treatment condition: **–** Specify the current condition of the biotechnical treatment: *EXCELLENT* = The treatment is intact and structurally sound, *GOOD* = The treatment is intact and generally sound but some wear or undermining is evident. Components may have shifted slightly, erosion cloth is visible, wire fence material is visible, one or two anchor pins or cables are loose, but the structure is intact, *FAIR* = The treatment position or condition has been altered significantly, *POOR* = The treatment is visible but has suffered major movement or damage, *FAILED* = The treatment is not visible or remnants are not in any form of designed configuration.

3. Is treatment instability visible? – Enter Y, N, P, A, or D.

4. Was survival of planted vegetation adequate? – Enter Y, N, P, A, or D. Use the survival goals stated in the contract's statement of work or the current standard of success: 80% survival after three years.

5. Is growth and vigor of planted vegetation acceptable? – Enter Y, N, P, A, or D. Use the goals stated in contract's statement of work for growth/vigor. If no standard has been set, use professional judgment based on species and planting site.

Slope Stability Effects

6. Did the treatment increase slope stability? – Enter Y, N, P, A, or D.

7. Are there indications of slope instability? – Enter Y, N, P, A, or D.
7a. Type: Specify the type of problem: *LDS* = landsliding, *SCR* = scarps, *SMP* = slump, *TNC* = tension cracks, *OTH* = other, specify in Comments section.

8. Are any causes of slope instability remaining? – Enter Y, N, P, A, or D.
8a. Remaining causes: Specify the remaining cause(s) of slope instability: *CNR* = concentrated runoff, *EMG* = emergent groundwater, *OVS* = over-steepened fill, *PRM* = perched material, *UCT* = undercut toe, *OTH* = other, specify in Comments section.

Gullies

9. Did the treatment reduce runoff to a gully(ies)? – Enter Y, N, P, A, or D.

10. Is there evidence of active gully erosion since implementation occurred? – Enter Y, N, P, A, or D.
10a. Evidence: Examine the area around the gully to identify any evidence that the gully is actively eroding: *CNR* = concentrated runoff, *EMR* = emergent groundwater, *HDC* = headcutting, *SCR* = scarps, *SMP* = slumps, *TNC* = tension cracks, *OTH* = other, specify in comments section.

Erosion and Sedimentation effects

11. Has eroded sediment from the treatment area been delivered to channels?– Enter Y, N, P, A, or D.
11a. Erosion mechanisms: Specify the mechanisms by which erosion has occurred in the treatment area: *GUL* = gullying, *RIL* = rilling, *SFE* = surface erosion, *SMP* = slumping, *OTH* = other, specify in Comments section.
11b. Estimate of sediment eroded since implementation: Estimate the amount of sediment that eroded from the treatment site since implementation, using field measurements *(cy).* Use methods from the upslope assessment, described in Chapter X in the DFG manual.

11c. Percent of erosion delivered to channels: Enter the percentage of the soil that entered the stream channel when the erosion occurred *(percent).* Assume 100% for erosion at stream crossings

12. Has sediment from extreme erosion been delivered to channels? – If erosion of more than just the treatment area has occurred (from landsliding, torrenting of road fills in steep swales, and diversion of large streams onto steep, erodible or unstable hillslopes), enter Y. If not, enter N. Enter A if the question is not applicable to this situation.
12a. Extreme erosion mechanism: Specify the type of extreme erosion that has occurred: *DBB* = debris flow, *DIV* = stream diversion, *GUL* = gullying, *LDS* = landsliding, *SMP* = slumping, *WSH* = road washout, *OTH* = other, note in comments section.
12b. Estimate of extreme erosion: Estimate the volume of erosion that occurred from the extreme erosion event from one of the following choices, <500,500-1000, 1-2k, 2-5k, 5k+ *(cubic yards).* Use methods from the roads assessment, described in Chapter X in the DFG manual.
12c. *Percent of extreme erosion delivered to channels:* Enter the percentage of the soil that entered the stream channel when the event occurred *(percent).* Assume 100% for erosion at stream crossings

13. Has any of the above erosion occurred from spoils areas? – Enter Y, N, P, D or A.

<u>Vegetation Cover Effects</u>
14. Did vegetation cover increase in the treatment area? – Enter Y, N, P, A, or D.
14a. Area of slope with increased cover: Estimate the area of slope with increased vegetation cover as a result of the treatment *(ft^2).*
14b. Current vegetation cover in treatment area: Estimate the current percent cover of vegetation on the slope within the treatment area *(percent).*
14c. Dominant cover type: Specify the dominant type of vegetation that currently covers the slope in the treatment area; *NON* = none, *HRB* = herbaceous, *SHR* = shrub, *TRE* = tree, *OTH* = other, specify in Comments section.

Overall Effectiveness Rating: – Specify the overall effectiveness of the erosion control/slope stabilization project. (see Completion of Monitoring checklists section). How well did the feature meet objectives stated in pre-treatment checklists?

EROSION CONTROL/SLOPE STABILIZATION - EFFECTIVENESS CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Treatments	1. Is the treatment still in its original location?							
	2. Is the treatment performing as designed?							
	a. Treatment condition: Excellent, Good, Fair, Poor, Failed							
	3. Is treatment instability visible?							
	4 Was survival of planted vegetation adequate?							
	5. Is growth and vigor of planted vegetation acceptable?							
Slope Stability	6. Did the treatment increase slope stability?							
	7. Are there indications of slope instability?							
	a. Type: LDS, SCR, SMP, TNC, OTH							
	8. Are causes of slope instability remaining?							
	a. Remaining causes: CNR, EMG, OVS, PRM, UCT, OTH							
Gullies	9. Did the treatment reduce runoff to a gully(ies)?							
	10. Is there evidence of active gully erosion since implementation occured?							
	a. *Evidence: CNR, EMR, HDC, SCR, SMP, TNC*							
Erosion and Sedimentation	11. Has eroded sediment from the treatment area been delivered to channels?							
	a. Erosion mechanisms: GUL, RIL, SFE, SMP, OTH							
	b. Estimate of sediment eroded since implementation(cy):							
	c. Percent of erosion delivered to channels:							
	12. Has sediment from extreme erosion been delivered to channels?							
	a. Extreme erosion mechanism: DBB, DIV, GUL, LDS, SMP, WSH, OTH							
	b. Estimate of extreme erosion: <500,500-1000,1-2k,2-5k,5k+ (cy)							
	c. Percent of extreme erosion delivered to channels:							
	13. Has any of the above erosion occurred from spoils areas?							
Vegetation	14. Did vegetation cover increase in the treatment area?							
	a. Area of slope with increased cover (ft²):							
	b. Vegetation cover (percent):							
	c. Dominant type: NON, HRB, SHR, TREE, OTH							
Overall Effectiveness Rating *(Excellent, Good, Fair, Poor, Failed)*								

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Field Method 9: Stream Crossing Upgrading Projects

Crossing upgrading projects attempt to reduce chronic sediment inputs to streams and to reduce the likelihood of episodic sediment input due to stream crossing failures. Projects include:

- Upsizing or adding additional culverts
- Replacing culverts with arched culverts or bridges
- Modifying approaches to crossings to minimize the chance for stream diversion and culvert and road washout

Effectiveness of these types of projects is judged based on reduced culvert failure and decreased soil erosion and sediment delivery from the site. Implementation monitoring should occur prior to the occurrence of significant rainfall events. Effectiveness monitoring, which will include an evaluation of short-term adjustments (e.g., erosion and sediment delivery from the newly constructed crossing) should occur during the rainy season after the first large storm event.

For more information on the importance of well designed stream crossings to maintaining high quality fish habitat, see the companion *Monitoring the Effectiveness of Upland Restoration* (2005). For implementation and monitoring concepts, see the *Handbook for Forest and Ranch Roads* (Weaver and Hagans 1994), and the *DFG Restoration Manual* Chapter 10 (Flosi 1998).

Sampling should not be done for stream crossing upgrading projects. This is because these types of projects are typically high in value and strategic importance. Instead, a checklist column should be completed for each individual crossing structure (project feature).

Field Method

Pre-treatment monitoring requires identification of the specific goals of the crossing upgrading project from the following choices:

- Reducing the amount of road runoff reaching the stream
- Reducing the likelihood of flow diversion down the road
- Decreasing chronic or episodic erosion and sediment delivery
- Changing channel and bank conditions

Pre-treatment monitoring also requires collection of basic information about crossing and channel conditions to allow comparison to post-treatment conditions. In most cases, pre-treatment information should have already have been collected using the DFG's upslope assessment methods described in Chapter 10 of the Restoration Manual. Use this assessment to help complete the pre-treatment checklist.

Projects completed to remove a barrier to fish passage should also be monitored using Field Method 1 for Fish Passage. Implementation monitoring centers on the adherence of the contract implementers to contract provisions. Checklist questions ask for evaluation of:

- Length of road and stream affected
- Structure alignment, slope, position, condition and problems
- Channel erosion prevention, excavation, and sediment treatments
- Treatments to road surfaces and fill slopes
- Treatments to reduce diversion potential

Short-term effectiveness monitoring consists of evaluating whether the project reached the goals identified in the pre-treatment checklist. This is facilitated by collection of the same basic information about the site as collected during the pre-treatment phase. This allows comparison of:

- Crossing structure condition before and after implementation
- Problems and erosion issues associated with the crossing structure before and after implementation
- Delivery of chronic sediment to streams before and after implementation
- Delivery of episodic sediment to streams compared to the estimate and risk of occurrence before implementation
- Condition of channels and banks in the vicinity of the crossing before and after implementation

Stream Crossing Upgrading Pre-treatment Checklist

Anticipated Crossing Effects

1. Is the current crossing structure performing as designed? – If the current crossing structure is performing as designed, even if the design is outdated and faulty, enter Y. If it is only performing up to some original specifications, enter P. If it is not performing according to original design, enter N. If no crossing is currently in place, enter A. Enter D for don't know.

1a. Current crossing type: Specify the current type/types of crossing in place: *ARF*= armored fill, *BRD* = bridge, *CUL* = culvert, *FIL* = fill, *HUM* = Humboldt crossing, *NON* = none, *OTH* = other, specify in Comments section.

1b. Structure condition: Specify the current condition of the crossing structure: *EXCELLENT* = The structure is intact and structurally sound, *GOOD* = The structure is intact and generally sound but some wear or undermining is evident. *FAIR* = The structure position or condition has been altered significantly, *POOR* = The structure is visible but has suffered major movement or damage, *FAILED* = The structure is not visible or remnants are not in any form of designed configuration.

2. Are problems with the structure visible? – Enter Y, N, P, A, or D.

2a. Structure problems: Specify any problems with the crossing structure: *ALN* = alignment, *APP* = approach, *COR* = corrosion, *CRS* = crushing, *DIV* = diversion, *DVP* = diversion potential, *INL* = culvert inlet, *LNG* = culvert length, *OTL* = culvert outlet, *OVT* = crossing overtopping, *PIP* = piping, *PLG* = plugging, *SIZ* = culvert size, *WSH* = crossing washout, *OTH* = other, specify in Comments section

3. Is reducing the likelihood of flow diversion a goal of the treatment? - Enter Y, N, or A.

Anticipated Erosion and Sedimentation Effects

4. Is decreasing erosion and sediment delivery from crossings a treatment goal? - Enter Y, N, or A.

4a. Erosion potential: Enter *LOW, MEDIUM,* or *HIGH* for the potential for future erosion at the site. This is a qualitative evaluation of the likelihood of crossing erosion and/or failure, not a quantitative volume estimate. Enter *High* if failure is very likely to occur. This should be available from the roads assessment information.

4b. Estimate of future erosion: Estimate the volume of erosion from the site, using field measurements. This information should be found in the roads assessment. If not, use methods in Chapter X in the DFG manual.

4c. Percent of future erosion delivered to channels: Enter the percentage of the soil that would enter a stream channel if the crossing fails *(percent).* Assume 100% for erosion at stream crossings

5. Is decreasing the potential for extreme erosion and sediment delivery a goal of the treatment? – If there is a potential for erosion of more than just the obvious road or crossing fill (through landsliding, torrenting of road fills in steep swales, and diversion of large streams onto steep, erodible or unstable hillslopes), enter Y. If not, enter N. Enter A if the question is not applicable to this situation.

5a. Potential for extreme erosion: Estimate the expected volume of erosion or slope failure from an extreme erosion event from one of the following choices, <500,500-1000, 1-2k, 2-5k, 5k+ *(cubic yards).* This information should be found in the roads assessment.

Anticipated Channel Effects

6. Is changing channel conditions a goal of the treatment? – . This question refers to the channel above or below a culvert OR the channel above, below and under a bridge. Enter Y, N, or A.

6a. Problem: Specify the channel problem(s) of concern; *AGG* = aggradation, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = channel sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

6b. Desired: Specify the channel improvement(s) targeted by the treatment: *AGG* = channel aggradation, *FPD* = floodplain deposition, *GRC* = grade control, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

7. Is change in channel bank conditions a goal of the treatment? – This question refers to the streambanks above and below a culvert OR the channel above, below and under a bridge. Enter Y, N, or A.
7a. Current bank conditions: Specify the bank problem(s) of concern; *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.
7b. Desired problem reductions: Specify the bank improvement(s) targeted by the treatment: *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

8. Is removal of an obstacle to fish passage a goal of the treatment?* – Enter Y, N, or A.
* If fish passage improvement is a goal of the treatment, complete an FP - Fish Passage checklist as well.

STREAM CROSSING UPGRADING - PRETREATMENT CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:**

Date (mm/dd/yy): **Evaluation crew:**

	Project Feature	#:	#:	#:
OR	*Monitoring Segment -Beginning Feature Number:*	#:	#:	#:
	Monitoring Segment -Ending Feature Number:	#:	#:	#:
	Total # of Features in Segment/# of Features Evaluated in Segment:	/	/	/
	Type of treatment: (see code sheet)			

			Photo #		Photo #		Photo #
Anticipated Crossing Effects	1. Is the current crossing structure performing as designed?						
	a. Current crossing type: ARF, BRD, CUL, FIL, HUM, NON, OTH						
	b. Structure condition: Excellent, Good, Fair, Poor, Failed						
	2. Are problems with the crossing structure visible?						
	a. Problems: ALN, APP, COR, CRS, DIV, DVP, INL, LNG, OTL,OVT, PIP, PLG, SIZ, SLP, WSH, OTH						
	3. Is reducing the likelihood of flow diversion a goal of the treatment?						
Anticipated Erosion and Sedimentation	4. Is decreasing erosion and sediment delivery from crossings a treatment goal?						
	a. Erosion potential: LOW, MEDIUM, or HIGH						
	b. Estimate of future erosion (cy):						
	c. Percent of future erosion delivered to channels:						
	5. Is decreasing potential for extreme erosion and sediment delivery a goal?						
	a. Potential for extreme erosion: <500,500-1000,1-2k,2-5k,5k+ (cy)						
Channel and Bank Effects	6. Is changing channel conditions a goal of the treatment?						
	a. Problem: AGG, HDC, INC, IST, NAR, SDC, SIN, WID, OTH						
	b. Desired: AGG, FPD, GRC, HDC, INC, NAR, SDC, SIN, STB, OTH						
	7. Is change in channel bank conditions a goal of the treatment?						
	a. Current bank conditions: ANG, BAR, CHS, ERO, MIG, SMP, OTH						
	b. Desired problem reductions: ANG, BAR, CHS, ERO, MIG, SMP,OTH						
	8. Is removal of an obstacle to fish passage a goal of the treatment?*						

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

* If fish passage improvement is a goal of the treatment, complete an FP - Fish Passage checklist as well.

Stream Crossing Upgrading Implementation Checklist

Treatment

1. Was a new or upgraded crossing installed? - Enter Y, N, P, A, or D.
1a. Length of stream affected (miles): Specify the length of the stream that is affected by this upgrading treatment.
1b. Length of road treated (miles): Specify the length of the road that was treated for this upgrading treatment. Take care not to double count the length of road treated if road segment upgrading has also been done.

2. Is the upgraded crossing structure performing as designed? - Enter Y, N, P, A, or D.
2a. Structure condition: Specify the current condition of the crossing structure: *EXCELLENT* = The structure is intact and structurally sound, *GOOD* = The structure is intact and generally sound but some wear or undermining is evident, *FAIR* = The structure position or condition has been altered significantly, *POOR* = The structure is visible but has suffered major movement or damage, *FAILED* = The structure is not visible or remnants are not in any form of designed configuration.

3. Are problems with the structure visible? - Enter Y, N, P, A, or D.
3a. Structure problems: Specify any problems with the crossing structure: *ALN* = alignment, *APP* = approach, *COR* = corrosion, *CRS* = crushing, *DIV* = diversion, *DVP* = diversion potential, *INL* = culvert inlet, *LNG* = culvert length, *OTL* = culvert outlet, *OVT* = crossing overtopping, *PIP* = piping, *PLG* = plugging, *SIZ* = culvert size, *WSH* = crossing washout, *OTH* = other, specify in Comments section

Inlet/Outlet Treatments

4. Were approved methods applied to prevent plugging? – – Enter Y if plugging methods were installed as proposed or P if different methods were used. If prevention methods were obviously deficient, enter N. Enter D for Don't Know. If no methods were proposed or needed, answer A.
4a. Method: Specify the prevention method(s): *ARB* = armored banks, *DBB* = debris barrier, *FLA* = flared, *MIT* = mitered inlets, *WGW* = wing walls, *OTH* = other, specify in Comments section.

5. Were methods applied to prevent channel erosion above or below the outlet? – – Enter Y if erosion measures were applied as proposed or P if different measures were used. If measures were obviously deficient, enter N. Enter D for Don't Know. If no measures were proposed or needed, answer A.
5a. Method: Specify the prevention method(s): *ARM* = armoring, *DSP* = downspouts, *EXC* = excavation, *GRC* = grade control structure (if this is a large structure, fill out an instream structure checklist – Field method 2), *WGW* = wingwalls, *OTH* = other, specify in Comments section.

Fill Slopes

6. Were the fill slopes constructed at a stable angle (usually ≤2:1)? – Enter Y, N, P, A, or D.

7. Were fill slopes treated to prevent erosion as approved? – Enter Y if slopes were treated as proposed or P if different treatments were used. If treatments were obviously deficient, enter N. If no treatments were proposed or needed, answer A.
7a. Method: Specify the type of erosion control methods used: *FAB* = fabric, *MUL* = mulching, *PLN* = planting, *ROC* = rock, *SEE* = seeding, *SLF* = silt fence, *STW* = straw mulch, *OTH* = other, specify in Comments section.

8. Does the road surface drain onto the outside fill slope? – Enter Y, N, P, A, or D.

Road Surface

9. Is there potential for flow to be diverted down the road surface? – Enter Y, N, P, A, or D.

10. Was the road surfaced at the crossing as approved? – Enter Y if surfacing was as proposed or P if different methods were used. If surfacing was obviously deficient, enter N. If no surfacing was proposed, answer A.
10a. Type: Specify the type of surfacing: *PAV* = Paving, *ROC* = Rock, *OTH* = other, specify in Comments section.

Channel effects
11. Was the channel excavated to a stable shape? – If the treatment involved excavation of the channel to a stable shape, enter Y. (The area of concern is above and below the crossing for a culvert, or above, below and in the former fill area for a bridge). If the shape looks only partially stable, enter P and note deviation in comments section. If the excavation is obviously deficient, enter N. If no channel excavation was involved, enter A.

12. Was all fill and stored sediment in the channel removed or stabilized? – Enter Y, N, P, A, or D.

13. Were approved erosion prevention methods installed upstream of the crossing? – Enter Y if channel erosion prevention measures were installed as proposed or P if different measures were used and specify deviations in the Comments section. If measures were obviously deficient, enter N. If no measures were proposed, answer A.

14. Did the treatment improve passage for the targeted fish species?* - Enter Y, N, P, A, or D.
* If fish passage improvement is a goal of the treatment, complete an FP - Fish Passage checklist as well.

Implementation
15. Did the as-completed treatment comply with design? - Enter Y, N, P, D, or A.
15a. If not, were modifications beneficial to performance? - Enter Y, N, P, D, or A.
15b. Was non-compliance significant enough to jeopardize performance? - Enter Y, N, P, D, or A.
15c. Are corrections needed? - Enter Y, N, P, D, or A.

Overall Implementation Rating: Rate the overall installation of the project feature. (see Completion of Monitoring checklists section).

STREAM CROSSING UPGRADING - IMPLEMENTATION CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Treatment	1. Was a new or upgraded crossing installed?							
	a. Length of stream affected (miles):							
	b. Length of road treated (miles):							
	2. Is the upgraded crossing structure performing as designed?							
	a. Structure condition: Excellent, Good, Fair, Poor, Failed							
	3. Are problems with the crossing structure visible?							
	a. Problems: ALN, APP, COR, CRS, DIV, DVP, INL, LNG, OTL, OVT, PIP, PLG, SIZ, SLP, WSH, OTH							
Inlet/Outlet	4. Were approved methods applied to prevent plugging as approved?							
	a. Method: ARB, DBB, FLA, MIT, WGW, OTH							
	5. Were methods applied to prevent channel erosion below outlet as approved?							
	a. Method: ARM, DSP, EXC, GRC, WGW, OTH							
Fill Slopes	6. Were the fill slopes constructed at a stable angle (usually <2:1)?							
	7. Were fill slopes treated to prevent erosion as approved?							
	a. Method: FAB, MUL, PLN, ROC, SEE, SLF, STW, OTH							
	8. Does the road surface drain onto the outside fill slope?							
Road Surface	9. Is there potential for flow to be diverted down the road surface?							
	10. Was the road surfaced at the crossing as approved?							
	a. Type: PAV, ROC, OTH							
Channel Effects	11. Was the channel excavated to a stable shape?							
	12. Was all fill and stored sediment in the channel removed or stabilized?							
	13. Were approved erosion prevention methods installed upstream of crossing?							
	14. Did the treatment improve passage for the targeted fish species?*							
Implementation	15. Did the as-completed treatment comply with design?							
	a. If not, were modifications beneficial to performance?							
	b. Was non-compliance significant enough to jeopardize performance?							
	c. Are corrections needed?							
	Overall Implementation Rating *(Excellent, Good, Fair, Poor, Failed)*							

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

* If fish passage improvement is a goal of the treatment, complete an FP - Fish Passage checklist as well.

Stream Crossing Upgrading Effectiveness Checklist

Treatment

1. Is the upgraded crossing structure performing as designed? - Enter Y, N, P, A, or D.
1a. Structure condition: Specify the current condition of the crossing structure: *EXCELLENT* = The structure is intact and structurally sound, *GOOD* = The structure is intact and generally sound but some wear or undermining is evident, *FAIR* = The structure position or condition has been altered significantly, *POOR* = The structure is visible but has suffered major movement or damage, *FAILED* = The structure is not visible or remnants are not in any form of designed configuration.

2. Are problems with the structure visible? - Enter Y, N, P, A, or D.
2a. Structure problems: Specify any problems with the crossing structure: *ALN* = alignment, *APP* = approach, *COR* = corrosion, *CRS* = crushing, *DIV* = diversion, *DVP* = diversion potential, *INL* = culvert inlet, *LNG* = culvert length, *OTL* = culvert outlet, *OVT* = crossing overtopping, *PIP* = piping, *PLG* = plugging, *SIZ* = culvert size, *WSH* = crossing washout, *OTH* = other, specify in Comments section

3. Are treatments for flow diversion prevention performing as designed? - Enter Y, N, P, A, or D.

Erosion and Sedimentation Effects

4. Has eroded sediment from crossings been delivered to channels?– If the erosion is associated with the crossing, enter Y. (sediment coming from associated road segments should be recorded on the road upgrading/decommissioning checklists). If no erosion has come from the treatment area, enter N. Other options are A or D.
4a. Erosion area: Specify the location where erosion has occurred in the treatment area: *BED* = channel bed, *BNK* = from channel banks, *CUT* = from cut slopes, *DIT* = ditch, *FIL* = from crossing fill, *INL* = from culvert inlet, *ROD = from the road surface, OTL* = from culvert outlet, *SLP* = from fill slopes, *OTH* = other, specify in Comments section.
4b. Estimate of sediment eroded since implementation: Estimate the amount of sediment that eroded from the treatment site since implementation, using field measurements *(cy).* Use methods from the roads assessment, described in Chapter X in the DFG manual.
4c. Percent of erosion delivered to channels: Enter the percentage of the soil that entered the stream channel when the erosion occurred *(percent).* Assume 100% for erosion at stream crossings

5. Has sediment from extreme erosion been delivered to channels? – If erosion of more than just the road or crossing fill has occurred due to the crossing treatment (from landsliding, torrenting of road fills in steep swales, and diversion of large streams onto steep, erodible or unstable hillslopes), enter Y. If not, enter N. Extreme sediment not coming from or caused by the treatment area but from associated road segments should be recorded on the road upgrading/decommissioning checklists. Enter A if the question is not applicable to this situation.
5a. Extreme erosion mechanism: Specify the type of extreme erosion that has occurred: *DBB* = debris flow, *DIV* = stream diversion, *GUL* = gullying, *LDS* = landsliding, *SMP* = slumping, *WSH* = road washout, *OTH* = other, note in comments section.
5b. Estimate of extreme erosion: Estimate the volume of erosion that occurred from the extreme erosion event from one of the following choices, <500,500-1000, 1-2k, 2-5k, 5k+ *(cubic yards).* Use methods from the roads assessment, described in Chapter X in the DFG manual.
5c. *Percent of extreme erosion delivered to channels:* Enter the percentage of the soil that entered the stream channel when the event occurred *(percent).* Assume 100% for erosion at stream crossings

6. Has erosion occurred from spoils areas? – Enter Y, N, P, D or A.
6a. Spoils erosion volume since implementation: Estimate the amount of sediment that has eroded from the disturbed area since project implementation: *< 10, 10-50, 50-100, 100-500, 500+ (cubic yards).*

6b. Percent of total erosion delivered to channels: Estimate the percentage of erosion from spoils areas that actually entered a stream channel (*percent).*

Channel Effects (outside of the treatment area)

7. Did the treatment lead to desirable channel changes? – Examine the channel up and down stream of the crossing if a culvert, and in the crossing area for bridges. Enter Y if many desirable changes are found, P if a few desirable changes are found, or N if no desirable changes are found. Enter A if this was not a goal of the treatment.

7a. Improved: Specify the channel improvement(s) after the treatment: *AGG* = channel aggradation, *FPD* = floodplain deposition, *GRC* = grade control, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

8. Did the treatment lead to undesirable channel change? – Examine the channel up and down stream of the crossing if a culvert, and in the crossing area for bridges. Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, P, A, or D.

8a. Impaired: Specify the channel impairment(s) after the treatment; *AGG* = aggradation, *BRD* = channel braiding, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = channel sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

9. Did the treatment lead to desirable bank condition changes? – Examine channel banks up and down stream of the crossing if a culvert, and in the crossing area for bridges. Enter Y if many desirable changes are found, P if a few desirable changes are found, or N if no desirable changes are found. Enter A if this was not a goal of the treatment.

9a. Improved: Specify the bank improvement(s) after the treatment: *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

10. Did the treatment lead to undesirable bank conditions? – Examine channel banks up and down stream of the crossing if a culvert, and in the crossing area for bridges. Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, P, A, or D.

10a. Impaired: Specify the bank problem(s) after the treatment; *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

11. Did the treatment improve passage for the targeted fish species?* - Enter Y, N, P, A, or D.

* If fish passage improvement is a goal of the treatment, complete an FP - Fish Passage checklist as well.

Overall Effectiveness Rating: – Specify the overall effectiveness of the crossing upgrading project. (see Completion of Monitoring checklists section). How well did the feature meet objectives stated in pre-treatment checklists?

STREAM CROSSING UPGRADING - EFFECTIVENESS CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Treatment	1. Is the upgraded crossing structure performing as designed?							
	a. Structure condition: Excellent, Good, Fair, Poor, Failed							
	2. Are problems with the crossing structure visible?							
	a. Problems: ALN, APP, COR, CRS, DIV, DVP, INL, LNG, OTL,OVT, PIP, PLG, SIZ, SLP, WSH, OTH							
	3. Are treatments for flow diversion prevention performing as designed?							
Erosion and Sedimentation Effects	4. Has eroded sediment from crossings been delivered to channels?							
	a. Erosion area: BED, BNK, CUT, DIT, FIL, INL, OTL, ROD, SLP, OTH							
	b. Estimate of sediment eroded since implementation(cy):							
	c. Percent of erosion delivered to channels:							
	5. Has sediment from extreme erosion been delivered to channels?							
	a. Extreme erosion mechanism: DBB, DIV, GUL, LDS, SMP, WSH, OTH							
	b. Estimate of extreme erosion: <500,500-1000,1-2k,2-5k,5k+ (cy)							
	c. Percent of extreme erosion delivered to channels:							
	6. Has erosion occurred from spoils areas?							
	a. Spoils erosion since implementation (cy):							
	b. Percent of total erosion delivered to channels:							
Channel Effects	7. Did the treatment lead to desirable channel change?							
	a. Type: AGG, FPD, GRC, HDC, INC, NAR, SDC, SIN, STB, OTH							
	8. Did the treatment lead to undesirable channel change?							
	a. Type: AGG, BRD, HDC, INC, IST, NAR, SDC, SIN, STB, WID, OTH							
	9. Did the treatment lead to desirable bank condition changes?							
	a. Improved: ANG, BAR, CHS, ERO, MIG, SMP, STB, VEG, OTH							
	10. Did the treatment lead to undesirable bank conditions?							
	a. Impaired: ANG, BAR, CHS, ERO, MIG, SMP, STB, VEG, OTH							
	11. Did the treatment increase passage for the targeted fish species?*							
Overall Effectiveness Rating *(Excellent, Good, Fair, Poor, Failed)*								

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

* If fish passage improvement is a goal of the treatment, complete an FP - Fish Passage checklist as well.

Field Method 10: Stream Crossing Decommissioning Projects

The reason for removing stream crossings and restoring natural channels is to reduce chronic sediment inputs to streams and to reduce the likelihood of episodic sediment input. Projects include:

- Removing stream crossing structures and fill
- Excavating stored sediment and restoring natural channel geometry and stability

Effectiveness of these types of projects is judged based on decreased soil erosion and sediment delivery from the site. Implementation monitoring should occur prior to the occurrence of significant rainfall events. Effectiveness monitoring, which will include an evaluation of short-term adjustments (e.g., erosion and sediment delivery from the restored crossing site) should occur during the rainy season after the first large storm event.

For more information on the importance of stream crossing decommissioning to maintaining high quality fish habitat, see the companion *Monitoring the Effectiveness of Upland Restoration* (2005). For implementation and monitoring concepts, see the *Handbook for Forest and Ranch Roads* (Weaver and Hagans 1994), and the *DFG Restoration Manual* Chapter 10 (Flosi 1998).

Sampling should not be done for stream crossing upgrading projects. This is because these types of projects are typically high in value and strategic importance. Instead, a checklist column should be completed for each individual crossing structure (project feature).

Field Method

Pre-treatment monitoring requires identification of the specific goals of the crossing decommissioning project. These goals are the same as those listed in Field Method 9. Pre-treatment monitoring also requires collection of the same basic information about crossing and channel conditions as Field Method 9. In most cases, pre-treatment information should have already have been collected using the DFG's upslope assessment methods described in Chapter 10 of the Restoration Manual. Use this assessment to help complete the pre-treatment checklist.

Implementation monitoring centers on the adherence of the contract implementers to contract provisions. The primary difference between this implementation checklist and that for Field Method 9 is that checklist questions ask for evaluation of the excavation, size, alignment and treatment of the excavated channel rather than of a newly installed crossing. Effectiveness monitoring consists of collecting the same information as called for in Field Method 9.

Stream Crossing Decommissioning Pre-treatment Checklist

Anticipated Crossing Removal Effects

1. Is the current crossing structure performing as designed? – If the current crossing structure is performing as designed, even if the design is outdated and faulty, enter Y. If it is only performing up to some original specifications, enter P. If it is not performing according to original design, enter N. If no crossing is currently in place, enter A. Enter D for don't know.

1a. Current crossing type: Specify the current type/types of crossing in place: *ARF*= armored fill, *BRD* = bridge, *CUL* = culvert, *FIL* = fill, *HUM* = Humboldt crossing, *NON* = none, *OTH* = other, specify in Comments section.

1b. Structure condition: Specify the current condition of the crossing structure: *EXCELLENT* = The structure is intact and structurally sound, *GOOD* = The structure is intact and generally sound but some wear or undermining is evident. *FAIR* = The structure position or condition has been altered significantly, *POOR* = The structure is visible but has suffered major movement or damage, *FAILED* = The structure is not visible or remnants are not in any form of designed configuration.

2. Are problems with the structure visible? – Enter Y, N, P, A, or D.

2a. Structure problems: Specify any problems with the crossing structure: *ALN* = alignment, *APP* = approach, *COR* = corrosion, *CRS* = crushing, *DIV* = diversion, *DVP* = diversion potential, *INL* = culvert inlet, *LNG* = culvert length, *OTL* = culvert outlet, *OVT* = crossing overtopping, *PIP* = piping, *PLG* = plugging, *SIZ* = culvert size, *WSH* = crossing washout, *OTH* = other, specify in Comments section

3. Is reducing the likelihood of flow diversion a goal of the treatment? - Enter Y, N, or A.

Anticipated Erosion and Sedimentation Effects

4. Is decreasing erosion and sediment delivery from crossings a treatment goal? - Enter Y, N, or A.

4a. Erosion potential: Enter *LOW, MEDIUM,* or *HIGH* for the potential for future erosion at the site. This is a qualitative evaluation of the likelihood of crossing erosion and/or failure, not a quantitative volume estimate. Enter *High* if failure is very likely to occur. This should be available from the roads assessment information.

4b. Estimate of future erosion: Estimate the volume of erosion from the site, using field measurements. This information should be found in the roads assessment. If not, use methods in Chapter X in the DFG manual.

4c. Percent of future erosion delivered to channels: Enter the percentage of the soil that would enter a stream channel if the crossing fails *(percent).* Assume 100% for erosion at stream crossings

5. Is decreasing the potential for extreme erosion and sediment delivery a goal of the treatment? – If there is a potential for erosion of more than just the obvious road or crossing fill (through landsliding, torrenting of road fills in steep swales, and diversion of large streams onto steep, erodible or unstable hillslopes), enter Y. If not, enter N. Enter A if the question is not applicable to this situation.

5a. Potential for extreme erosion: Estimate the expected volume of erosion or slope failure from an extreme erosion event from one of the following choices, <500,500-1000, 1-2k, 2-5k, 5k+ *(cubic yards).* This information should be found in the roads assessment.

Anticipated Channel Effects

6. Is changing channel conditions a goal of the treatment? – Enter Y, N, or D.

6a. Problem: Specify the channel problem(s) of concern; *AGG* = aggradation, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = channel sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

6b. Desired: Specify the channel improvement(s) targeted by the treatment: *AGG* = channel aggradation, *FPD* = floodplain deposition, *GRC* = grade control, *HDC* = headcutting, *INC* = channel incision, *IST* =

channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

7. Is change in channel bank conditions a goal of the treatment? – Enter Y, N, or D.
7a. Current bank conditions: Specify the bank problem(s) of concern; *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.
7b. Desired problem reductions: Specify the bank improvement(s) targeted by the treatment: *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

8. Is removal of an obstacle to fish passage a goal of the treatment?* – Enter Y, N, or D.
* If fish passage improvement is a goal of the treatment, complete an FP - Fish Passage checklist as well.

STREAM CROSSING DECOMMISSIONING - PRE-TREATMENT CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:**

Date (mm/dd/yy): **Evaluation crew:**

	Project Feature	#:	#:	#:
OR	*Monitoring Segment -Beginning Feature Number:*	#:	#:	#:
	Monitoring Segment -Ending Feature Number:	#:	#:	#:
	Total # of Features in Segment/# of Features Evaluated in Segment:	/	/	/
	Type of treatment: (see code sheet)			

			Photo #		Photo #		Photo #
Anticipated Crossing Removal Effects	1. Is the current crossing structure performing as designed?						
	a. Current crossing type: ARF, BRD, CUL, FIL, HUM, NON, OTH						
	b. Structure condition: Excellent, Good, Fair, Poor, Failed						
	2. Are problems with the crossing structure visible?						
	a. Problems: ALN, APP, COR, CRS, DIV, DVP,INL,LNG,OTL,OVT,PIP, PLG, SIZ, SLP, WSH, OTH						
	3. Is reducing the likelihood of flow diversion a goal of the treatment?						
Anticipated Erosion and Sedimentation	4. Is decreasing erosion and sediment delivery from crossings a treatment goal?						
	a. Erosion potential: LOW, MEDIUM, or HIGH						
	b. Estimate of future erosion (cy):						
	c. Percent of future erosion delivered to channels:						
	5. Is decreasing potential for extreme erosion and sediment delivery a goal?						
	a. Potential for extreme erosion: <500,500-1000,1-2k,2-5k,5k+ (cy)						
AnticipatedChannel Effects	6. Is changing channel conditions a goal of the treatment?						
	a. Problem: AGG, HDC, INC, IST, NAR, SDC, SIN, WID, OTH						
	b. Desired: AGG, FPD, GRC, HDC, INC, NAR, SDC, SIN, STB, OTH						
	7. Is change in channel bank conditions a goal of the treatment?						
	a. Current bank conditions: ANG, BAR, CHS, ERO, MIG, SMP, OTH						
	b. Desired problem reductions: ANG, BAR, CHS, ERO, MIG, SMP,OTH						
	8. Is removal of an obstacle to fish passage a goal of the treatment?*						

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

* If fish passage improvement is a goal of the treatment, complete an FP - Fish Passage checklist as well.

Stream Crossing Decommissioning Implementation Checklist

Treatment Characteristics

1. Was a crossing removed? – Enter Y, N, P, A, or D.

1a. Length of stream affected: Specify the length of the stream affected by the decommissioning treatment *(miles).*

1b. Length of road treated: Specify the length of road treated for this decommissioning project *(miles).* Take care not to double count the length of road treated if road segment decommissioning has also been done.

2. Was the channel immediately upstream and/or downstream of the crossing excavated? – Enter Y, N, P, A, or D.

3. Was any fill left in the channel stabilized? – Enter Y, N, P, A, or D.

4. Does the new channel have the proper depth? – Does the channel, in the area of the former crossing, have the right depth? Enter Y, N, P, A, or D.

5. Does the channel appear to have adequate width to remain stable? – Does the channel, in the area of the former crossing, have the right width? Enter Y, N, P, A, or D.

6. Does the channel appear to have the proper gradient? – Does the channel, in the area of the former crossing, have the right slope? Enter Y, N, P, A, or D.

7. Are there indicators of potential instability on the channel bed? – Enter Y, N, P, A, or D.

7a. Type: Specify the instability indicators from the list below: *ERO* = channel erosion, *FLO* = flow obstructions, *GRB* = grade breaks, *HDC* = headcut, *INC* = channel incision, *IST* = channel instability, *NTG* = channel not to grade, *WID* = Inadequate channel width, *OTH* = other, specify in Comments section.

8. Were approved erosion prevention methods applied to the bed? – Enter Y, N, P, A, or D.

Sideslope Effects

9. Are channel sideslopes at a stable angle? – If channel sideslopes, in the area of the former crossing, were left at a stable angle, enter Y. If the angle looks only partially stable, enter P and note deviation in comments section. If the angles are obviously deficient, enter N. If no channel excavation was involved, enter A.

9a. Left/right bank angles: Enter the bank angle for the left bank and the right bank in the treatment area *(degrees).*

10. Do channel sideslopes in a stable configuration? – If channel sideslopes, in the area of the former crossing, were left at a stable configuration, enter Y. If the configuration looks only partially stable, enter P. If the configuration is obviously deficient, enter N. If no channel excavation was involved, enter A.

10a. Sideslope shape: Specify the configuration of the channel sideslope: *CCV*=concave, *CVX*=convex, *OTH*=who knows for left and right bank?

11. Were approved methods applied to sideslopes to prevent erosion or slope instability? – If the treatment involved erosion prevention methods on channel sideslopes (such as mulching, plantings or hardening) in the area of the former crossing as proposed, enter Y. If the measures are different than proposed, enter P and note deviation in comments section. If the methods are obviously deficient, enter N. If no erosion prevention was proposed or needed, enter A.

12. Are there indicators of potential instability on sideslopes? – Enter Y, N, P, A, or D.
12a. Type: Specify the instability indicators: EMG = emergent groundwater, IST = instability, OVF = oversteepened fill, TNC = tension crack, OTH = other, specify in Comments section.

Fish
13. Did the treatment improve passage for the targeted fish species?*– Enter Y, N, P, A, or D.
* If fish passage improvement is a goal of the treatment, complete an FP - Fish Passage checklist as well.

Implementation
14. Did the as-completed treatment comply with design? - Enter Y, N, P, D, or A.
14a. If not, were modifications beneficial to performance? - Enter Y, N, P, D, or A.
14b. Was non-compliance significant enough to jeopardize performance? - Enter Y, N, P, D, or A.
14c. Are corrections needed? - Enter Y, N, P, D, or A.

Overall Implementation Rating: Rate the overall installation of the project feature. (see Completion of Monitoring checklists section).

STREAM CROSSING DECOMMISSIONING - IMPLEMENTATION CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Treatment Characteristics	1. Was a crossing removed?							
	a. Length of stream affected (miles):							
	b. Length of road treated (miles):							
	2. Was the channel immediately up and/or downstream of crossing excavated?							
	3. Does the new channel have the proper depth?							
	4. Was any fill left in the channel stabilized?							
	5. Does the channel appear to have adequate width to remain stable?							
	6. Does the channel appear to have the proper gradient?							
	7. Are there indicators of erosion or instability on the channel bed?							
	a. Type: ERO, FLO, HDC, INC, IST, NTG, WID, OTH							
	8. Were approved erosion prevention methods applied to the bed?							
Sideslope Effects	9. Are channel sideslopes at a stable angle?							
	a. Left/right bank angles:							
	10. Are channel sideslopes in a stable configuration?							
	a. Sideslope shape: CCV, CVX, OTH							
	11. Were approved methods applied to sideslopes to prevent erosion or instability?							
	12. Are there indicators of potential instability on sideslopes?							
	a. Type: EMG, IST, OVF, TNC, OTH							
Fish	13. Did the treatment improve passage for the targeted fish species?*							
Implementation	14. Did the as-completed treatment comply with design?							
	a. If not, were modifications beneficial to performance?							
	b. Was non-compliance significant enough to jeopardize performance?							
	c. Are corrections needed?							
	Overall Implementation Rating *(Excellent, Good, Fair, Poor, Failed)*							

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

* If fish passage improvement is a goal of the treatment, complete an FP - Fish Passage checklist as well.

Stream Crossing Decommissioning Effectiveness Checklist

Treatment stability and function (within crossing removal/treatment area)

1. Is the restored channel performing as designed? - Examine the channel within the former crossing area. Enter Y, N, P, A, or D**.**

a. Channel condition: Specify the current condition of the reconstructed channel: *EXCELLENT* = The channel is functioning as designed, *GOOD* = The channel is intact and generally performing as designed but some erosion or instability is evident, *FAIR* = The channel position or condition has changed significantly since implementation, *POOR* = The channel has suffered major movement or damage to habitat, *FAILED* = The channel is not in any form of designed configuration and damage is occurring to habitat.

2. Are problems with the restored channel visible? - Enter Y, N, P, A, or D**.**

2a. Indicators: Specify any problems with the treatment area: *HDC* = headcutting, *INC* = channel incision, *LDS* = landsliding, *SMP* = slumping, *SDC* = sidecutting, *WID* = channel widening, *OTH* = other, specify in Comments section.

3. Was survival of planted vegetation adequate? – Enter Y, N, P, A, or D. Use the survival goals stated in the contract's statement of work or the current standard of success: 80% survival after three years.

4. Is growth and vigor of planted vegetation acceptable? – Enter Y, N, P, A, or D. Use the goals stated in contract's statement of work for growth/vigor. If no standard has been set, use professional judgment based on species and planting site.

Erosion and Sedimentation Effects

5. Has the treatment area eroded and delivered to channels? – If the erosion is associated with the crossing decommissioning, enter Y. (sediment coming from associated road segments should be recorded on the road upgrading/decommissioning checklists). If no erosion has come from the treatment area, enter N. Other options are A or D.

5a. Erosion area: Specify the location where erosion has occurred in the treatment area: *BED* = from the channel bed, *BNK* = from the channel banks, *CUT* = cut slopes, *DIT* = from the road ditch, *FIL* = from fill remaining in the channel, *ROD* = road surface, *SLP* = from fill slopes, *OTH* = other, specify in Comments section.

5b. Estimate of sediment eroded since implementation: Estimate the amount of sediment that eroded from the treatment site since implementation, using field measurements *(cy).* Use methods from the roads assessment, described in Chapter X in the DFG manual.

5c. Percent of erosion delivered to channels: Enter the percentage of the soil that entered the stream channel when the erosion occurred *(percent).* Assume 100% for erosion from the channel.

6. Has sediment from extreme erosion been delivered to channels? – If erosion of more than just the treatment area has occurred (from landsliding, torrenting of road fills in steep swales, and diversion of large streams onto steep, erodible or unstable hillslopes), enter Y. If not, enter N. Extreme sediment not coming from or caused by the treatment area but from associated road segments should be recorded on the road upgrading/decommissioning checklists. Enter A if the question is not applicable to this situation.

6a. Extreme erosion mechanism: Specify the type of extreme erosion that has occurred: *DBB* = debris flow, *DIV* = stream diversion, *GUL* = gullying, *LDS* = landsliding, *SMP* = slumping, *WSH* = road washout, *OTH* = other, note in comments section.

6b. Estimate of extreme erosion: Estimate the volume of erosion that occurred from the extreme erosion event from one of the following choices, <500,500-1000, 1-2k, 2-5k, 5k+ *(cubic yards).* Use methods from the roads assessment, described in Chapter X in the DFG manual.

6c. *Percent of extreme erosion delivered to channels:* Enter the percentage of the soil that entered the stream channel when the event occurred *(percent).* Assume 100% for erosion in the channel.

7. Has erosion occurred from spoils areas? – Enter Y, N, P, D or A.
7a. Spoils erosion volume since implementation: Estimate the amount of sediment that has eroded from the disturbed area since project implementation: *< 10, 10-50, 50-100, 100-500, 500+ (cubic yards).*
7b. Percent of total erosion delivered to channels: Estimate the percentage of erosion from spoils areas that actually entered a stream channel (*percent).*

Channel Effects (outside of the treatment area)
8. Did the treatment lead to desirable channel changes? – Examine the channel above and below the former crossing area, it is assumed that a decommissioning has improved the channel at the former crossing by restoring grade and plan form. Enter Y, N, P, A, or D.
8a. Improved: Specify the channel improvement(s) after the treatment: *AGG* = channel aggradation, *FPD* = floodplain deposition, *GRC* = grade control, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

9. Did the treatment lead to undesirable channel change? - Examine the channel above and below the former crossing only. Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, P, A, or D.
9a. Impaired: Specify the channel impairment(s) after the treatment; *AGG* = aggradation, *BRD* = channel braiding, *HDC* = headcutting, *INC* = channel incision, *IST* = channel instability, *NAR* = channel narrowing, *SDC* = channel sidecutting, *SIN* = channel sinuosity, *STB* = channel stability, *WID* = channel widening, *OTH* = other, specify in Comments section.

10. Did the treatment lead to desirable bank condition changes? – Enter Y, N, P, A, or D.
10a. Improved: Specify the bank improvement(s) after the treatment: *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

11. Did the treatment lead to undesirable bank conditions? – Examine the streambanks above and below the former crossing only. Answer regardless of the feature goals to document unintended negative consequences. Enter Y, N, P, A, or D.
11a. Impaired: Specify the bank problem(s) after the treatment; *ANG* = bank angle, *BAR* = bare banks, *CHS* = chiseled banks, *ERO* = bank erosion, *MIG* = bank migration, *SMP* = bank slumping, *OTH* = other, specify in Comments section.

12 Did the treatment improve passage for the targeted fish species?* - Enter Y, N, P, A, or D.
* If fish passage improvement is a goal of the treatment, complete an FP - Fish Passage checklist as well.

Overall Effectiveness Rating: – Specify the overall effectiveness of the crossing decommissioning project. (see Completion of Monitoring checklists section). How well did the feature meet objectives stated in pre-treatment checklists?

STREAM CROSSING DECOMMISSIONING - EFFECTIVENESS CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

	Project Feature	#:		#:		#:		
OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:		
	Monitoring Segment -Ending Feature Number:	#:		#:		#:		
	Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/		
	Type of treatment: (see code sheet)							
			Photo #		**Photo #**		**Photo #**	
Treatment Area	1. Is the restored channel performing as designed?							
	a. Channel condition: Excellent, Good, Fair, Poor, Failed							
	2. Are problems with the restored channel visible?							
	a . Indicators: HDC, INC, LDS, SMP, SDC, WID, OTH							
	3. Was survival of planted vegetation adequate?							
	4. Is the growth and vigor of planted vegetation acceptable?							
Erosion and Sedimentation Effects	5. Has eroded sediment from the treatment area been delivered to channels?							
	a. Erosion area: BED, BNK, CUT, DIT, FIL, ROD, SLP, OTH							
	b. Estimate of sediment eroded since implementation(cy):							
	c. Percent of erosion delivered to channels:							
	6. Has sediment from extreme erosion been delivered to channels?							
	a. Extreme erosion mechanism: DBB, DIV, GUL, LDS, SMP, WSH, OTH							
	b. Estimate of extreme erosion: <500,500-1000,1-2k,2-5k,5k+ (cy)							
	c. Percent of extreme erosion delivered to channels:							
	7. Has erosion occurred from spoils areas?							
	a. Spoils erosion since implementation (cy):							
	b. Percent of total erosion delivered to channels:							
Channel Effects	8. Did the treatment lead to desirable channel change?							
	a. Type: AGG, FPD, GRC, HDC, INC, NAR, SDC, SIN, STB, OTH							
	9. Did the treatment lead to undesirable channel change?							
	a. Type: AGG, BRD, HDC, INC, IST, NAR, SDC, SIN, STB, WID, OTH							
	10. Did the treatment lead to desirable bank condition changes?							
	a. Improved: ANG, BAR, CHS, ERO, MIG, SMP, STB, VEG, OTH							
	11. Did the treatment lead to undesirable bank conditions?							
	a. Impaired: ANG, BAR, CHS, ERO, MIG, SMP, STB, VEG, OTH							
	12. Did the treatment increase passage for the targeted fish species?*							
Overall Effectiveness Rating *(Excellent, Good, Fair, Poor, Failed)*								

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

* If fish passage improvement is a goal of the treatment, complete an FP - Fish Passage checklist as well.

Field Method 11: Road Segment Upgrading Projects

Road segment upgrading projects attempt to restore natural hill slope drainage and hydrologically disconnect roads from crossings. This should reduce chronic sediment inputs to streams and reduce the likelihood of episodic sediment inputs caused by road failures during stressing events. This field method should be used to evaluate projects completed on the portion of the road between stream crossings. Projects include:

- Road surfacing
- Improving road drainage through outsloping, installation of rolling dips, and ditch relief culverts
- Disconnection of road drainage from stream channels
- Stabilization of gullies caused by previous poor drainage
- Minor road re-alignment to reduce drainage or sediment problems

For more information on the importance of upgrading roads to maintaining high quality fish habitat, see the companion *Monitoring the Effectiveness of Upland Restoration* (2005). For implementation and assessment concepts, see the *Handbook for Forest and Ranch Roads* (Weaver and Hagans 1994), and the *DFG Restoration Manual* Chapter 10 (Flosi 1998).

Effectiveness of these types of projects is judged based on reduced erosion rates and sediment delivery to watercourses from the road surface, reduced road related slope failures, gully stabilization, and avoidance of offsite adverse effects from erosion or sedimentation. Implementation monitoring should occur prior to the occurrence of significant rainfall events. Short-term effectiveness monitoring includes an evaluation of short-term adjustments (e.g., erosion and sediment delivery from the treated road segment) and should occur during the rainy season after the first large storm event.

Defining a project or monitoring feature is especially challenging for road upgrading. This is because a segment of road may contain multiple features such as rolling dips, ditch relief culverts or outsloping. For these types of treatments, many component features work together to reduce the amount of sediment delivering into one particular stream crossing from the road segment. For this reason, a road upgrading segment and all its component features may be seen as one feature when trying to judge effectiveness. At the same time, each of its component treatments (such as a rolling dip) may be seen as individual features when trying to judge the quality of project implementation.

Because of these differences, implementation and effectiveness checklists are used differently for road upgrading. The implementation checklist requires inspection and appraisal of the quality of implementation of each individual component treatment on the road segment. One checklist

column should be completed for each individual treatment within the segment. For a segment with many identical treatments of similar quality, answers to checklist questions for multiple treatments may be lumped into one checklist column.

Pre-treatment and effectiveness checklists require identifying sources of sediment delivery along the whole segment, rather than at the exact location where structures or treatments will and have been installed. The project is effective when the amount of sediment entering the stream is smaller than the potential future sediment that existed before the upgrading.

No sampling should be done for implementation monitoring. Each individual upgrading treatment should be examined for quality of implementation. For effectiveness monitoring, sampling is possible, but should be done on a segment wide basis. The entire upgrading segment should be considered as a feature and either monitored (if part of the sample) or not. When sampling is done, the spatial definition of the road segments monitored should be recorded on the On Site Navigation Form, as well as the checklist header. The method of sampling should be recorded in the checklist notes.

Field Method

Pre-treatment monitoring requires identification of the specific goals of the road segment upgrading project for reducing sediment delivery to streams from the following choices:

- Reducing the amount of road runoff reaching the stream
- Reducing runoff to a gully(ies)
- Reducing sediment delivery to streams
- Reducing the potential for extreme erosion events

Pre-treatment monitoring requires a reconnaissance of the road segment to identify the erosion issues and quantify the potential future erosion that will occur without treatment to allow comparison to post-treatment conditions. In most cases, pre-treatment information should have already have been collected using the DFG's upslope assessment methods described in Chapter 10 of the *Restoration Manual*. Use this assessment to complete the quantitative sub-questions on the pre-treatment checklist.

Implementation monitoring centers on the adherence of the contract implementers to contract provisions. Checklist questions ask for evaluation of each individual treatment within the road segment including:

- The location and number of installed drainage features
- Treatments to road surfaces, cut and fill slopes, drainage feature outlets, and spoils
- Ditch connectivity to streams

Effectiveness monitoring consists of evaluating whether the project reached the goals identified in the pre-treatment checklist. This is accomplished by reconnaissance of the road segment to identify and quantify the actual amount of erosion that has occurred since implementation. This allows comparison of:

- Road drainage facility condition and performance before and after implementation
- Length of the road ditch connected to stream before and after upgrading
- Causes of gully erosion before and after implementation
- Erosion and delivery of sediment to streams from the road segment before and after implementation

Road Segment Upgrading Pre-treatment Checklist

Anticipated Drainage Effects

1. Are current road drainage facilities performing as designed? – If the current drainage facilities are performing as designed, even if the design is outdated and faulty, enter Y. If they are only performing up to some original specifications, enter P. If they are not performing according to original design, enter N. If no drainage facilities are currently in place, enter A. Enter D for don't know.

1a. Current road type: Specify the current road type in the treatment area: *CRN* = crowned, *INS* = insloped, *OUT* = outsloped, *OTH* = other, specify in Comments section.

1b. Road conditions: Specify the current condition of the road: *EXCELLENT* = The road is intact and sound, *GOOD* = The road is intact and generally sound but some deterioration is evident, *FAIR* = The road has deteriorated significantly, *POOR* = The road is visible but has suffered major deterioration, *FAILED* = The road is not visible or remnants are not in any form of designed configuration.

1c. Current drainage facility type: Specify the type of drainage facility draining the road in the treatment area: *CRD* = cross road drain, *DIT = inboard ditch, DRC* = ditch relief culvert, *RLD* = rolling dip, *NON* = none, *OTH* = other, specify in Comments section.

2. Is reducing the amount of road runoff reaching the stream a treatment goal? – Enter Y, N, or A.

2a. Total length of road ditch connected to stream: Estimate the total length of the road ditch or road surface (if no ditches drain the road surface) connected to the stream channel. Add the left and right bank approaches to get the total length (*feet*).

3. Is reducing runoff to a gully(ies) a goal of the treatment? – Enter Y, N, or A.

4. Is there evidence of active gully erosion occurring? – Enter Y, N, or A.

4a. Erosion evidence: Specify the type or cause of erosion at the gully: *CNR* = concentrated runoff, *EMG* = emergent groundwater, *HDC* = gully headcutting, *SCR* = scarps, *SMP* = slumping, *TNC* = tension cracks, *OTH* = other, specify in Comments section.

Anticipated Erosion and Sedimentation Effects

5. Is reducing sediment delivery from the road segment a goal of the treatment? – Enter Y, N, or A.

5a. Erosion mechanism: Specify the type of erosion occurring from the road segment: *DIV* = diversion of stream or ditch flow, *GUL* = gullying, *LDS* = landsliding, *RIL* = rilling, *SFE* = surface erosion, *WSH* = road washout, *OTH* = other, specify in Comments section.

5b. Erosion area: Specify the location where erosion will occur along the road segment: *CUT* = cut slopes, *DIT* = from the road ditch, *FIL* = from fill slopes, *INL* = ditch relief culvert inlet, *OTL* = ditch relief culvert outlet, *ROD* = road surface, *SLP* = slope, *OTH* = other, specify in Comments.

5c. Erosion potential: Enter *LOW, MEDIUM,* or *HIGH* for the potential for future erosion at the site. This is a qualitative evaluation of the likelihood of road erosion and/or failure, not a quantitative volume estimate. Enter *High* if failure is very likely to occur. This should be available from the upslope assessment information.

5d. Estimate of future erosion: Estimate the volume of erosion from the site, using field measurements. This information should be found in the upslope assessment. If not, use methods in Chapter X in the DFG manual.

5e. Percent of future erosion delivered to channels: Enter the percentage of the soil that would enter a stream channel if the road segment delivers *(percent).*

5f. Stream crossing to which flow and sediment will deliver: Enter the feature number for the stream crossing or site at which the eroded sediment will enter the stream channel.

6. Is decreasing the potential for extreme erosion and sediment delivery a goal of the treatment? – If there is a potential for erosion of more than just the obvious road or crossing fill (through landsliding,

torrenting of road fills in steep swales, and diversion of large streams onto steep, erodible or unstable hillslopes), enter Y. If not, enter N. Enter A if the question is not applicable to this situation.
6a. Potential for extreme erosion: Estimate the expected volume of erosion or slope failure from an extreme erosion event from one of the following choices, <500,500-1000, 1-2k, 2-5k, 5k+ *(cubic yards).* This information should be found in the roads assessment.

ROAD SEGMENT UPGRADING - PRE-TREATMENT CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:**

Date (mm/dd/yy): **Evaluation crew:**

	Project Feature	#:	#:	#:
OR	*Monitoring Segment -Beginning Feature Number:*	#:	#:	#:
	Monitoring Segment -Ending Feature Number:	#:	#:	#:
	Total # of Features in Segment/# of Features Evaluated in Segment:	/	/	/
	Type of treatment: (see code sheet)			

			Photo #		Photo #		Photo #
Anticipated Drainage Effects	1. Are current road drainage facilities performing as designed?						
	a. Current road type: CRN, INS, OUT, OTH						
	b. Road condition: Excellent, Good, Fair, Poor, Failed						
	c. Current drainage facility type: CRD, DIT, DRC, RLD, NON, OTH						
	2. Is reducing the amount of road runoff reaching the stream a treatment goal?						
	a. Total length of road ditch connected to stream (feet):						
	3. Is reducing runoff to a gully(ies) a goal of the treatment?						
	4. Is there evidence of active gully erosion occuring?						
	a. Erosion evidence: CNR, EMG, HDC, SCR, SMP, TNC, OTH						
Anticipated Sedimentation Effects	5. Is reducing sediment delivery from the road segment a goal of the treatment?						
	a. Erosion mechanisms: DIV, GUL, LDS, RIL, SFE, SMP, WSH, OTH						
	b. Erosion area: CUT, DIT, FIL, INL, OTL, ROD, SLP, OTH						
	c. Erosion potential: LOW, MEDIUM, or HIGH						
	d. Estimate of future erosion (cy):						
	e. Percent of future erosion delivered to channels:						
	f. Stream crossing to which flow and sediment will deliver:						
	6. Is decreasing potential for extreme erosion and sediment delivery a goal?						
	a. Potential for extreme erosion: <500,500-1000,1-2k,2-5k,5k+ (cy)						

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Road Segment Upgrading Implementation Checklist

Treatment

1. Have the approved number of drainage features been installed? – Enter Y if the approved number of drainage features were installed as proposed or P if some changes were made and specify the deviations in the Comments section. If installation was obviously deficient, enter N. Enter D for Don't Know.

2. Were drainage features installed in the approved locations? – Enter Y if locations were as proposed or P if different locations were used and specify deviations in the Comments section. If the locations were obviously deficient, enter N. Enter D for Don't Know

2a. Length of stream affected: Specify the length of the stream affected by the road upgrading treatment *(miles).*

2b. Length of road treated: Specify the length of the road included in this treatment *(miles).*

3. Was road drainage disconnected from streams? – Enter Y if road drainage was disconnected from stream as proposed or P if some changes were made and specify the deviations in the Comments section. If disconnection was obviously deficient, enter N. Enter D for Don't Know. If no disconnection was proposed or needed, answer A.

4. Was road drainage disconnected from a gully(ies)? – Enter Y if road drainage was disconnected from gullies as proposed or P if some changes were made and specify the deviations in the Comments section. If disconnection was obviously deficient, enter N. Enter D for Don't Know. If no disconnection was proposed or needed, answer A.

Erosion Control

5. Were spoils placed in approved locations? – Enter Y if spoils were placed as approved or P if some changes were made and specify the deviations in the Comments section. If locations were obviously deficient, enter N. Enter D for Don't Know. If no spoils storage was proposed or needed, answer A.

6. Were spoils treated to reduce erosion as approved? – Enter Y if spoils were treated as proposed or P if some changes were made and specify the deviations in the Comments section. If treatment was obviously deficient, enter N. Enter D for Don't Know. If no treatment was proposed or needed, answer A.

7. Was the road surfaced as approved? – Enter Y if the road was surfaced as approved or P if some changes were made. If treatment was obviously deficient, enter N. Enter D for Don't Know. If no treatment was proposed or needed, answer A.

7a. Surfacing: Specify the type of surfacing: *PAV* = paving, *ROC* = rock, *OTH* = other, specify in Comments section.

8. Have approved erosion control measures been applied to cut slopes? – Enter Y if erosion control measures were applied as proposed or P if some changes were made. If measures were obviously deficient, enter N. Enter D for Don't Know. If no measures were proposed or needed, answer A.

8a. Type: Specify the type of erosion control methods used: *FAB* = fabric, *MUL* = native mulching, *PLN* = planting, *ROC* = rock, *SEE* = seeding, *SLF* = silt fence, *STW* = straw mulching, *OTH* = other, specify in Comments section.

9. Have approved erosion control measures been applied to fill slopes? – Enter Y if erosion control measures were applied as proposed or P if some changes were made. If measures were obviously deficient, enter N. Enter D for Don't Know. If no measures were proposed or needed, answer A.

9a. Type: Specify the type of erosion control methods used: *FAB* = fabric, *MUL* = mulching, *PLN* = planting, *ROC* = rock, *SEE* = seeding, *SLF* = silt fence, *STW* = straw mulching, *OTH* = other, specify in Comments section.

10. Have approved erosion control measures been applied to ditches? – Enter Y if erosion control measures were applied as proposed or P if some changes were made. If measures were obviously deficient, enter N. Enter D for Don't Know. If no measures were proposed or needed, answer A.
10a. Type: Specify the type of erosion control methods used: *FAB* = fabric, *MUL* = mulching, *PLN* = planting, *ROC* = rock, *SEE* = seeding, *SLF* = silt fence, *STW* = straw mulching, *OTH* = other, specify in Comments section.

11. Have approved erosion control measures been applied to drainage outlets? – Enter Y if erosion control measures were applied as proposed or P if some changes were made. If measures were obviously deficient, enter N. Enter D for Don't Know. If no measures were proposed or needed, answer A.
11a. Type: Specify the type of erosion control methods used: *FAB* = fabric, *MUL* = mulching, *PLN* = planting, *ROC* = rock, *SEE* = seeding, *SLF* = silt fence, *STW* = straw mulching, *OTH* = other, specify in Comments section.

Implementation
12. Did the as-completed treatment comply with design? - Enter Y, N, P, D, or A.
12a. If not, were modifications beneficial to performance? - Enter Y, N, P, D, or A.
12b. Was non-compliance significant enough to jeopardize performance? - Enter Y, N, P, D, or A.
12c. Are corrections needed? - Enter Y, N, P, D, or A.

Overall Implementation Rating: Rate the overall installation of the project feature. (see Completion of Monitoring checklists section).

ROAD SEGMENT UPGRADING - IMPLEMENTATION CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Treatment	1. Have the approved number of drainage features been installed?							
	2. Were drainage features installed in the approved locations?							
	a. Length of stream affected (miles):							
	b. Length of road treated (miles):							
	3. Was road drainage disconnected from streams?							
	4. Was road drainage disconnected from a gully(ies)?							
Erosion Control	5. Were spoils placed in approved locations?							
	6. Were spoils treated to reduce erosion as approved?							
	7. Was the **road** surfaced as approved?							
	a. Surfacing: PAV, ROC, OTH							
	8. Have approved erosion control measures been applied to **cut slopes**?							
	a. Type: FAB, MUL, PLN, ROC, SEE, SLF,STW, OTH							
	9. Have approved erosion control measures been applied to **fill slopes**?							
	a. Type: FAB, MUL, PLN, ROC, SEE, SLF, STW, OTH							
	10. Have approved erosion control measures been applied to **ditches**?							
	a. Type: FAB, MUL, ROC, SLF, STW, OTH							
	11. Have approved erosion control measures been applied to **drainage outlets**?							
	a. Type: FAB, MUL, PLN, ROC, SEE, SLF, STW, OTH							
Implementation	12. Did the as-completed treatment comply with design?							
	a. If not, were modifications beneficial to performance?							
	b. Was non-compliance significant enough to jeopardize performance?							
	c. Are corrections needed?							
	Overall Implementation Rating *(Excellent, Good, Fair, Poor, Failed)*							

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Road Segment Upgrading Effectiveness Checklist

Road and drainage structure condition

1. Are road drainage treatments performing as designed? – Enter Y, N, P, A, or D.
1a. Treatment condition: Specify the current condition of the drainage facility: *EXCELLENT* = The treatment is intact and structurally sound, *GOOD* = The treatment is intact and generally sound but some deterioration is evident, *FAIR* = The treatment has deteriorated significantly, *POOR* = The treatment is visible but has suffered major deterioration, *FAILED* = The treatment is not visible or remnants are not in any form of designed configuration.
1b. Treatment problem: Specify the type of problem occurring with the treatment: *CRS* = crushing, *DIV* = diversion, *OVT* = overtopping, *PLG* = plugging, *SMP* = slumping, *UND* = undermining, *WSH* = washout, *NON* = none, *OTH* = other, specify in Comments section.

2. Did the treatment reduce the amount of road runoff reaching the stream? – Enter Y, N, P, A, or D.
2a. Total length of road ditch still connected to stream: Estimate the total length of the road ditch (both sides of crossing) still connected to the channel through road ditches (feet).

3. Did the treatment reduce runoff to a gully(ies)? – Enter Y, N, P, A, or D.

4. Is there evidence of active gully erosion since implementation occurred? – Enter Y, N, P, A, or D.
4a. Evidence: Specify the type or cause of erosion at the gully: *CNR* = concentrated runoff, *EMG* = emergent groundwater, *HDC* = gully headcutting, *SCR* = scarps, *SMP* = slumping, *TNC* = tension cracks, *OTH* = other, specify in Comments section.

Erosion and Sedimentation Effects

5. Has eroded sediment from the road segment been delivered to channels? – If sediment eroded from the road segment has been delivered to channels, enter Y. If no sediment has come from the treated road segment, enter N. Other options are A or D.
5a. Erosion mechanism: Specify the type of erosion occurring from the road segment: *DIV* = diversion of stream or ditch flow, *GUL* = gullying, *RIL* = rilling, *SFE* = surface erosion, *SMP* = slumping, *WSH* = road washout, *OTH* = other, specify in Comments section.
5b. Erosion area: Specify the location where erosion has occurred along the road segment: *CUT* = cut slopes, *DIT* = from the road ditch, *FIL* = from fill slopes, *INL* = ditch relief culvert inlet, *OTL* = ditch relief culvert outlet, *ROD* = road surface, *SLP* = slope, *OTH* = other, specify in Comments.
5c. Estimate of sediment eroded since implementation: Estimate the amount of sediment that eroded from the road segment since implementation, using field measurements *(cy).* Use methods from the upslope assessment, described in Chapter X in the DFG manual.
5d. Percent of erosion delivered to channels: Enter the percentage of the soil that entered the stream channel when the erosion occurred *(percent).*
5e. Stream crossing to which flow and sediment flowed: Enter the feature number for the stream crossing or site at which the eroded sediment entered the stream channel.

6. Has sediment from extreme erosion been delivered to channels? – If erosion of more than just the road segment itself has occurred (from landsliding, torrenting of road fills in steep swales, and diversion of large streams onto steep, erodible or unstable hillslopes), enter Y. If not, enter N. Enter A if the question is not applicable to this situation.
6a. Extreme erosion mechanism: Specify the type of extreme erosion that has occurred: *DBB* = debris flow, *DIV* = stream diversion, *GUL* = gullying, *LDS* = landsliding, *SMP* = slumping, *WSH* = road washout, *OTH* = other, note in comments section.

6b. Estimate of extreme erosion: Estimate the volume of erosion that occurred from the extreme erosion event from one of the following choices, <500,500-1000, 1-2k, 2-5k, 5k+ *(cubic yards).* Use methods from the roads assessment, described in Chapter X in the DFG manual.
6c. *Percent of extreme erosion delivered to channels:* Enter the percentage of the soil that entered the stream channel when the event occurred *(percent).* Assume 100% for erosion in the channel.

7. Has erosion occurred from spoils areas? – Enter Y, N, P, D or A.
7a. Spoils erosion volume since implementation: Estimate the amount of sediment that has eroded from the disturbed area since project implementation: *< 10, 10-50, 50-100, 100-500, 500+ (cubic yards).*
7b. Percent of total erosion delivered to channels: Estimate the percentage of erosion from spoils areas that actually entered a stream channel (*percent).*

Overall Effectiveness Rating: – Specify the overall effectiveness of the road segment upgrading project. (see Completion of Monitoring checklists section). How well did the feature meet objectives stated in pre-treatment checklists?

ROAD SEGMENT UPGRADING - EFFECTIVENESS CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Treatment Drainage Effects	1. Are road drainage treatments performing as designed?							
	a. Treatment condition: Excellent, Good, Fair, Poor, Failed							
	b. Treatment problem: DIV, OVT, PLG, SMP, UND, WSH, NON, OTH							
	2. Did the treatments reduce the amount of road runoff reaching the stream?							
	a. Total length of road ditch still connected to stream (feet):							
	3. Did the treatments reduce runoff to a gully(ies)?							
	4. Is there evidence of active gully erosion since implementation occured?							
	a. *Evidence: CNR, EMG, HDC, SCR, SMP, TNC*							
Erosion and Sedimentation Effects	5. Has eroded sediment from the road segment been delivered to channels?							
	a. Erosion mechanisms: DIV, GUL, RIL, SFE, SMP, WSH, OTH							
	b. Erosion area: CUT, DIT, FIL, INL, OTL, ROD, SLP, OTH							
	c. Estimate of sediment eroded since implementation(cy):							
	d. Percent of erosion delivered to channels:							
	e. Stream crossing to which flow and sediment will deliver:							
	6. Has sediment from extreme erosion been delivered to channels?							
	a. Extreme erosion mechanism: DBB, DIV, GUL, LDS, SMP, WSH, OTH							
	b. Estimate of extreme erosion: <500,500-1000,1-2k,2-5k,5k+ (cy)							
	c. Percent of extreme erosion delivered to channels:							
	7. Has erosion occurred from spoils areas?							
	a. Spoils erosion since implementation (cy):							
	b. Percent of total erosion delivered to channels:							
Overall Effectiveness Rating *(Excellent, Good, Fair, Poor, Failed)*								

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Field Method 12: Road Segment Decommissioning

Road segment decommissioning projects attempt to restore natural hill slope drainage and hydrologically disconnect roads from crossings. This should reduce chronic sediment inputs to streams and reduce the likelihood of episodic sediment inputs caused by road failures during stressing events. This field method should be used to evaluate projects completed on the portion of the road between watercourse crossings. Projects include:

- Recontouring and planting the former road surface to reduce surface erosion
- Disconnection of road drainage from stream channels
- Stabilization of gullies caused by previous poor drainage

Projects that also involve removal and stabilization of stream crossings should use Field Method 10 to assess effectiveness of crossing decommissioning.

For more information on the importance of decommissioning roads to maintaining high quality fish habitat, see the companion *Monitoring the Effectiveness of Upland Restoration* (2005). For implementation and monitoring concepts, see the *Handbook for Forest and Ranch Roads* (Weaver and Hagans 1994), and the *DFG Restoration Manual* Chapter 10 (Flosi 1998).

Ultimately, the effectiveness of these types of projects is based on the reduction of sediment delivered to watercourses. This results from reduced erosion rates from the former road surface, reduced road related slope failures, gully stabilization, and avoidance of offsite adverse effects from erosion or sedimentation. Implementation monitoring should occur prior to the occurrence of significant rainfall events. Short-term effectiveness monitoring includes an evaluation of short-term adjustments (e.g., erosion and sediment delivery from the treated road segment) during the rainy season after the first large storm event.

Definition of the road segment for monitoring should be done as in Field Method 11, with the entire decommissioning segment used for pre-treatment and effectiveness monitoring and each treatment for implementation monitoring. Sampling should be done for road decommissioning projects in the same way as described in Field Method 11.

Field Method

Pre-treatment monitoring requires identification of the specific goals of the road decommissioning project and assessment of the potential sediment yield to streams if left untreated as in Field Method 11. In most cases, pre-treatment information should have already have been collected using DFG's upslope assessment methods described in Chapter 10 of the

Restoration Manual. Implementation monitoring centers on the adherence of the contract implementers to contract provisions. Effectiveness monitoring consists of collecting the same sediment yield estimates as called for in Field Method 11.

Road Segment Decommissioning Pre-treatment Checklist

Anticipated Drainage Effects

1. Is blocking motor vehicles on the road a goal of the treatment? – Enter Y, N, or A.

2. Are current road drainage facilities performing as originally designed? – Enter Y, N, P, A, or D.
2a. Current road type: Specify the current road type in the treatment area: *CRN* = crowned, *INS* = insloped, *OUT* = outsloped, *OTH* = other, specify in Comments section.
2b. Road conditions: Specify the current condition of the road: *EXCELLENT* = The road is intact and structurally sound, *GOOD* = The road is intact and generally sound but some deterioration is evident, *FAIR* = The road has deteriorated significantly (50 percent intact), *POOR* = The road is visible but has suffered major deterioration (25 percent intact), *FAILED* = The road is not visible or remnants are not in any form of designed configuration.
2c. Current drainage facility type: Specify the type of drainage facility draining the road in the treatment area: *CRD* = cross road drain, *DIT = inboard ditch, DRC* = ditch relief culvert, *RLD* = rolling dip, *NON* = none, *OTH* = other, specify in Comments section.

3. Is reducing the amount of road runoff reaching the stream a treatment goal? – Enter Y, N, or A.
3a. Total length of road ditch connected to stream (feet): Estimate the total length of the road ditch or road surface (if no ditches drain the road surface) connected to the stream channel. Add the left and right bank approaches to get the total length (*feet*).

4. Is reducing runoff to a gully(ies) a goal of the treatment? – Enter Y, N, or A.

5. Is there evidence of active gully erosion occurring? – Enter Y, N, or A.
5a. Erosion evidence: Specify the type or cause of erosion at the gully: *CNR* = concentrated runoff, *EMG* = emergent groundwater, *HDC* = gully headcutting, *SCR* = scarps, *SMP* = slumping, *TNC* = tension cracks, *OTH* = other, specify in Comments section.

Anticipated Erosion and Sedimentation Effects

6. Is reducing sediment delivery from the road segment a goal of the treatment? – Enter Y, N, or A.
6a. Erosion mechanism: Specify the type of erosion occurring from the road segment: *DIV* = diversion of stream or ditch flow, *GUL* = gullying, *LDS* = landsliding, *RIL* = rilling, *SFE* = surface erosion, *WSH* = road washout, *OTH* = other, specify in Comments section.
6b. Erosion area: Specify the location where erosion will occur along the road segment: *CUT* = cut slopes, *DIT* = from the road ditch, *FIL* = from fill slopes, *INL* = ditch relief culvert inlet, *OTL* = ditch relief culvert outlet, *ROD* = road surface, *SLP* = slope, *OTH* = other, specify in Comments.
6c. Erosion potential: Enter *LOW, MEDIUM,* or *HIGH* for the potential for future erosion at the site. This is a qualitative evaluation of the likelihood of road erosion and/or failure, not a quantitative volume estimate. Enter *High* if failure is very likely to occur. This should be available from the upslope assessment information.
6d. Estimate of future erosion: Estimate the volume of erosion from the site, using field measurements. This information should be found in the upslope assessment. If not, use methods in Chapter X in the DFG manual.
6e. Percent of future erosion delivered to channels: Enter the percentage of the soil that would enter a stream channel if the road segment delivers *(percent).*
6f. Stream crossing to which flow and sediment will deliver: Enter the feature number for the stream crossing or site at which the eroded sediment will enter the stream channel.

7. Is decreasing the potential for extreme erosion and sediment delivery a goal of the treatment? – If there is a potential for erosion of more than just the obvious road or crossing fill (through landsliding,

torrenting of road fills in steep swales, and diversion of large streams onto steep, erodible or unstable hillslopes), enter Y. If not, enter N. Enter A if the question is not applicable to this situation.
7a. Potential for extreme erosion: Estimate the expected volume of erosion or slope failure from an extreme erosion event from one of the following choices, <500,500-1000, 1-2k, 2-5k, 5k+ *(cubic yards).* This information should be found in the upslope assessment.

ROAD DECOMMISSIONING - PRE-TREATMENT CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Anticipated Drainage Effects	1. Is blocking motor vehicles on the road a goal of the treatment?							
	2. Are current road drainage facilities performing as designed?							
	a. Current road type: CRN, INS, OUT, OTH							
	b. Road condition: Excellent, Good, Fair, Poor, Failed							
	c. Current drainage facility type: CRD, DIT, DRC, RLD, NON, OTH							
	3. Is reducing the amount of road runoff reaching the stream a treatment goal?							
	a. Total length of road ditch connected to stream (feet):							
	4. Is reducing runoff to a gully(ies) a goal of the treatment?							
	5. Is there evidence of active gully erosion occuring?							
	a. Erosion evidence: CNR, EMG, HDC, SCR, SMP, TNC, OTH							
Anticipated Erosion and Sedimentation Effects	6. Is reducing sediment delivery from the road segment a goal of the treatment?							
	a. Erosion mechanisms: DIV, GUL, LDS, RIL, SFE, SMP, WSH, OTH							
	b. Erosion area: CUT, DIT, FIL, INL, OTL, ROD, SLP, OTH							
	c. Erosion potential: LOW, MEDIUM, or HIGH							
	d. Estimate of future erosion (cy):							
	e. Percent of future erosion delivered to channels:							
	f. Stream crossing to which flow and sediment will deliver:							
	7. Is decreasing potential for extreme erosion and sediment delivery a goal?							
	a. Potential for extreme erosion: <500,500-1000,1-2k,2-5k,5k+ (cy)							

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Road Segment Decommissioning Implementation Checklist

Treatment

1. Have motor vehicles been blocked from using the road? – Enter Y, N, P, A, or D.

2. Have the approved number of drainage features been installed? –Enter Y if the approved number of drainage features were installed as proposed or P if some changes were made and specify the deviations in the Comments section. If installation was obviously deficient, enter N. Enter D for Don't Know.

3. Were drainage features installed in the approved locations? – Enter Y if locations were as proposed or P if different locations were used and specify deviations in the Comments section. If the locations were obviously deficient, enter N. Enter D for Don't Know
3a. Length of stream affected: Specify the length of the stream affected by the road decommissioning treatment *(miles).*
3b. Length of road treated: Specify the length of the road included in this treatment *(miles).*

4. Was road drainage disconnected from streams? – Enter Y if road drainage was disconnected from stream as proposed or P if some changes were made and specify the deviations in the Comments section. If disconnection was obviously deficient, enter N. Enter D for Don't Know. If no disconnection was proposed or needed, answer A.

5. Was road drainage disconnected from a gully(ies)? – Enter Y if road drainage was disconnected from gullies as proposed or P if some changes were made and specify the deviations in the Comments section. If disconnection was obviously deficient, enter N. Enter D for Don't Know. If no disconnection was proposed or needed, answer A.

Erosion Control

6. Were spoils placed in approved locations? – Enter Y if spoils were placed as proposed or P if some changes were made and note in Comments section. If placement was obviously deficient, enter N. Enter D for Don't Know. If no spoils were stored, answer A.

7. Were spoils treated to reduce erosion as approved? – Enter Y if spoils were treated as proposed or P if some changes were made and note in Comments section. If treatment was obviously deficient, enter N. Enter D for Don't Know. If no treatment was proposed or needed, answer A.

8. Have approved erosion control measures been applied to bare areas? – Enter Y if erosion control measures were applied as proposed or P if some changes were made. If measures were obviously deficient, enter N. Enter D for Don't Know. If no measures were proposed or needed, answer A.
8a. Type: Specify the type of erosion control methods used: *FAB* = fabric, *MUL* = mulching, *PLN* = planting, *ROC* = rock, *SEE* = seeding, *SLF* = silt fence, *STW* = straw mulching, *OTH* = other, specify in Comments section.

9. Have approved erosion control measures been applied to drainage outlets? – Enter Y if erosion control measures were applied as proposed or P if some changes were made. If measures were obviously deficient, enter N. Enter D for Don't Know. If no measures were proposed or needed, answer A.
9a. Type: Specify the type of erosion control methods used: *FAB* = fabric, *MUL* = mulching, *PLN* = planting, *ROC* = rock, *SEE* = seeding, *SLF* = silt fence, *STW* = straw mulching, *OTH* = other, specify in Comments section.

10. Was the area replanted the same as approved? – Enter Y if the area planted was as proposed or P if some changes were made. If replanting was obviously deficient, enter N. Enter D for Don't Know. If no planting was proposed or needed, answer A.
10a. Area planted: Specify the amount of area planted as part of the decommissioning treatment *(acres)*.

Implementation
11. Did the as-completed treatment comply with design? - Enter Y, N, P, D, or A.
11a. If not, were modifications beneficial to performance? - Enter Y, N, P, D, or A.
11b. Was non-compliance significant enough to jeopardize performance? - Enter Y, N, P, D, or A.
11c. Are corrections needed? - Enter Y, N, P, D, or A.

Overall Implementation Rating: Rate the overall installation of the project feature. (see Completion of Monitoring checklists section).

ROAD DECOMMISSIONING - IMPLEMENTATION CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Treatment	1. Are motor vehicles blocked from using the road?							
	2. Have the approved number of drainage features been installed?							
	3. Were drainage features installed in the approved locations?							
	a. Length of stream affected (miles):							
	b. Length of road treated (miles):							
	4. Was road drainage disconnected from streams?							
	5. Was road drainage disconnected from a gully(ies)?							
Erosion Control	6. Were spoils placed in approved locations?							
	7. Were spoils treated to reduce erosion as approved?							
	8. Have approved erosion control measures been applied to bare areas?							
	a. Type: FAB, MUL, PLN, ROC, SEE, SLF, STW, OTH							
	9. Have approved erosion control measures been applied to drainage outlets?							
	a. Type: FAB, MUL, PLN, ROC, SEE, SLF, STW, OTH							
	10. Was the area replanted the same as approved?							
	a. Area planted (acres):							
Implementation	11. Did the as-completed treatment comply with design?							
	a. If not, were modifications beneficial to performance?							
	b. Was non-compliance significant enough to jeopardize performance?							
	c. Are corrections needed?							
	Overall Implementation Rating *(Excellent, Good, Fair, Poor, Failed)*							

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

Road Segment Decommissioning Effectiveness Checklist

Road and drainage structure condition

1. Have motor vehicles been blocked from using the road? – Enter Y, N, P, A, or D.

2. Are road drainage treatments performing as designed? – Enter Y, N, P, A, or D.
2a. Treatment condition: Specify the current condition of the drainage treatment: *EXCELLENT* = The facility is intact and structurally sound, *GOOD* = The facility is intact and generally sound but some deterioration is evident, *FAIR* = The facility has deteriorated significantly, *POOR* = The facility is visible but has suffered major deterioration, *FAILED* = The facility is not visible or remnants are not in any form of designed configuration.
2b. Treatment problem: Specify the type of problem occurring with the treatment: *DIV* = diversion, *OVT* = overtopping, *PLG* = plugging, *SMP* = slumping, *UND* = undermining, *WSH* = washout, *NON* = none, *OTH* = other, specify in Comments section.

3. Did the treatment reduce the amount of road runoff reaching the stream? – Enter Y, N, P, A, or D.
3a. Total length of road ditch still connected to stream: Estimate the total length of the road ditch (both sides of crossing) still connected to the channel through road ditches (feet).

4. Did the treatment reduce runoff to a gully(ies)? – Enter Y, N, P, A, or D.

5. Is there evidence of active gully erosion since implementation occurred? – Enter Y, N, P, A, or D.
5a. Evidence: Specify the type or cause of erosion at the gully: *CNR* = concentrated runoff, *EMG* = emergent groundwater, *HDC* = gully headcutting, *SCR* = scarps, *SMP* = slumping, *TNC* = tension cracks, *OTH* = other, specify in Comments section.

6. Was survival of planted vegetation adequate? – Enter Y, N, P, A, or D. Use the survival goals stated in the contract's statement of work or the current standard of success: 80% survival after three years.

7. Is growth and vigor of planted vegetation acceptable? – Enter Y, N, P, A, or D. Use the goals stated in contract's statement of work for growth/vigor. If no standard has been set, use professional judgment based on species and planting site.

Erosion and Sedimentation Effects

8. Has eroded sediment from the former road segment been delivered to channels? – If sediment eroded from the road segment has been delivered to channels, enter Y. If no sediment has come from the treated road segment, enter N. Other options are A or D.
8a. Erosion mechanism: Specify the type of erosion occurring from the road segment: *DIV* = diversion of stream or ditch flow, *GUL* = gullying, *RIL* = rilling, *SFE* = surface erosion, *SMP* = slumping, *WSH* = road washout, *OTH* = other, specify in Comments section.
8b. Erosion area: Specify the location where erosion has occurred along the road segment: *CUT* = former cut slopes, *DIT* = from the former road ditch, *FIL* = from the former fill slopes, *INL* = ditch relief culvert inlet, *OTL* = ditch relief culvert outlet, *ROD* = from the former road surface, *SLP* = slope, *OTH* = other, specify.
8c. Estimate of sediment eroded since implementation: Estimate the amount of sediment that eroded from the restored road segment since implementation, using field measurements *(cy).* Use methods from the upslope assessment, described in Chapter X in the DFG manual.
8d. Percent of erosion delivered to channels: Enter the percentage of the soil that entered the stream channel when the erosion occurred *(percent).*
8e. Stream crossing to which flow and sediment flowed: Enter the feature number for the stream crossing or site at which the eroded sediment entered the stream channel.

8. Has sediment from extreme erosion been delivered to channels? – If erosion of more than just the road segment itself has occurred (from landsliding, torrenting of road fills in steep swales, and diversion of large streams onto steep, erodible or unstable hillslopes), enter Y. If not, enter N. Enter A if the question is not applicable to this situation.
9a. Extreme erosion mechanism: Specify the type of extreme erosion that has occurred: *DBB* = debris flow, *DIV* = stream diversion, *GUL* = gullying, *LDS* = landsliding, *SMP* = slumping, *WSH* = road washout, *OTH* = other, note in comments section.
9b. Estimate of extreme erosion: Estimate the volume of erosion that occurred from the extreme erosion event from one of the following choices, <500,500-1000, 1-2k, 2-5k, 5k+ *(cubic yards).* Use methods from the roads assessment, described in Chapter X in the DFG manual.
9c. *Percent of extreme erosion delivered to channels:* Enter the percentage of the soil that entered the stream channel when the event occurred *(percent).* Assume 100% for erosion in the channel.

10. Has erosion occurred from spoils areas? – Enter Y, N, P, D or A.
10a. Spoils erosion volume since implementation: Estimate the amount of sediment that has eroded from the disturbed area since project implementation: *< 10, 10-50, 50-100, 100-500, 500+ (cubic yards).*
10b. Percent of total erosion delivered to channels: Estimate the percentage of erosion from spoils areas that actually entered a stream channel (*percent).*

Overall Effectiveness Rating: – Specify the overall effectiveness of the road segment decommissioning project. (see Completion of Monitoring checklists section). How well did the feature meet objectives stated in pre-treatment checklists?

ROAD SEGMENT DECOMMISSIONING EFFECTIVENESS CHECKLIST Page ___ of ___

Contract name: **Contract #:**

Stream/Road: **Drainage:** **Maintenance? Yes** or **No**

Date (mm/dd/yy): **Evaluation crew:**

		Project Feature	#:		#:		#:	
	OR	*Monitoring Segment -Beginning Feature Number:*	#:		#:		#:	
		Monitoring Segment -Ending Feature Number:	#:		#:		#:	
		Total # of Features in Segment/# of Features Evaluated in Segment:	/		/		/	
		Type of treatment: (see code sheet)						
				Photo #		**Photo #**		**Photo #**
Treatment	1. Are motor vehicles blocked from using the road?							
	2. Are road drainage treatments performing as designed?							
	a. Treatment condition: Excellent, Good, Fair, Poor, Failed							
	b. Treatment problem: DIV, OVT, PLG, SMP, UND, WSH, NON, OTH							
	3. Did the treatment reduce the amount of road runoff reaching the stream?							
	a. Total length of road ditch still connected to stream (feet):							
	4. Did the treatment reduce runoff to a gully(ies)?							
	5. Is there evidence of active gully erosion since implementation occurred?							
	a. Evidence: CNR, EMR, HDC, SCR, SMP, TNC							
	6. Was survival of planted vegetation adequate?							
	7. Is the growth and vigor of planted vegetation acceptable?							
Erosion and Sedimentation Effects	8. Has eroded sediment from the former road segment been delivered to channels?							
	a. Erosion mechanisms: DIV, GUL, RIL, SFE, SMP, WSH, OTH							
	b. Erosion area: CUT, DIT, FIL, INL, OTL, ROD, SLP, OTH							
	c. Estimate of sediment eroded since implementation(cy):							
	d. Percent of erosion delivered to channels:							
	e. Stream crossing to which flow and sediment will deliver:							
	9. Has sediment from extreme erosion been delivered to channels?							
	a. Extreme erosion mechanism: DBB, DIV, GUL, LDS, SMP, WSH, OTH							
	b. Estimate of extreme erosion: <500,500-1000,1-2k,2-5k,5k+ (cy)							
	c. Percent of extreme erosion delivered to channels:							
	10. Has erosion occurred from spoils areas?							
	a. Spoils erosion since implementation (cy):							
	b. Percent of total erosion delivered to channels:							
Overall Effectiveness Rating *(Excellent, Good, Fair, Poor, Failed)*								

Comments and details for entry of OTH for other or P for partially:

Answer: **Y**es, **N**o, **P**artially, **D**on't know, Not **A**pplicable

LITERATURE CITED

Collins, B. 2005. *Annual Report to the National Marine Fisheries Service for Fisheries Restoration Grant Program Projects Conducted Under Department of the Army Regional General Permit NO. 12 (Corps File No.: 27922N) within the U.S. Army Corps of Engineers, San Francisco District during 2004*. California Department of Fish and Game, Northern California & North Coast Region, Coastal Restoration Monitoring & Evaluation. Fortuna, CA.

Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey and B. Collins. 1998. *California Salmonid Stream Habitat Restoration Manual, Third Edition.* State of California, The Resources Agency, California Department of Fish and Game, Inland Fisheries Division. Sacramento, CA.

Hall, Frederick C. March 2002. *Photo Point Monitoring Handbook*, U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, General Technical Report, PNW-GTR-526.

Weaver, W. E. and D.K. Hagans. 1994. *Handbook for Forest and Ranch Roads: A Guide for Planning, Designing, Constructing, Reconstructing, Maintaining and Closing Wildland Roads.* Prepared by Pacific Watershed Associates for the Mendocino County Resources Conservation District. Ukiah, CA. 197 pp.

APPENDIX

Treatment Types

100	Fish passage improvement
110	Fishways (general)
111	Step and pool ladder
112	Denil ladder
113	Alaskan steeppass
119	other
120	Culvert modification
121	Back flooding weirs
122	Culvert baffles – general
123	Washington baffles
124	Steel ramp CMP baffles
129	other
130	Natural barrier modification
131	Log jam removal or modification
132	Beaver dam removal/modification
133	Waterfalls/chutes/ modifications
134	Landslide removal or modification
139	Other
140	Fish screens
200..	Bank stabilization treatment general
210	Streambank stabilization structures
211	Boulder riprap or bank armor
212	Boulder wing deflectors
213	Log cribbing
214	Log bank armor
215	Log wing deflector
216	Boulder log deflector
217	Tree revetments
218	Gabions
219	Other
220	Mulching
230	Revegetation
240	Exclusion Fencing
250	Checkdams
251	Redwood board checkdams
252	Brush and rock checkdam
253	Post brush checkdam
254	Tree checkdam
255	Brush and rock mattress
260	Waterbars
270	Bioengineering (generally)
271	Live vegetative crib wall
272	Native material revetment
273	Willow wall revetment
274	Brush mattress
275	Willow siltation baffles
300	Stream Channel Improvement
310	Boulder weir
311	Boulder weir with sill log
312	Boulder cluster
313	Boulder wing-constrictor/single
314	Boulder wing-constrictor/opposing
315	Vortex boulder weir
320	Boulder/log Combo constrictor – single
325	Boulder/log Combo const – opposing
330	Log weir (plunge)
331	Log wing-constrictor – single
332	Log wing-constrictor – opposing
333	Digger/cover log (vertical)
334	Spider logs or cover log complex
336	Hewitt ramp
337	Upsurge log weir
340	Cover root wads
341	Cover logs (horizontal)
342	Cover boulders (edge cover)
343	Boulder cluster with woody cover
344	Unanchored large woody debris
350	Gabion weir
351	Gabion wing-constrictor/single
352	Gabion wing-constrictor/opposing
353	Boulder cluster field - >5 clusters
354	Log/gabion constrictor – single
355	Log/gabion constrictor - double
400	Land use control – easement
450	Water conservation/purchase
500	Vegetation control
550	Riparian planting
600	Erosion control / slope stabilization
650	Culvert upgrading
700	Culvert decommissioning
750	Road upgrading

800	Road decommissioning

Number Codes

001	Hand crew
002	Machine/Heavy equipment
003	Irrigation system
004	Chemical spray
005	Weed suppression fabric

Checklist Letter Codes

ABC	Above channel
ACT	In active channel
ADT	Adult
AGG	Aggradation
ALN	Alignment
ANC	Anchoring
ANG	Angle/angled to bank/floodplain
APP	Approach
ARB	Armored banks
ARF	Armored fill/Arizona crossing
ARM	Armoring
BAR	Bare (banks/soil)
BED	Bedrock/ channel bed
BIO	Bioengineering
BKC	Back-channel
MIG	Migration
BLD	Building
BNK	Bank
BRB	Berm breaks
BRD	Braiding
BRW	Barbed wire
BRD	Bridge
BOL	Boulder
BUB	Bubble curtain
BUR	Buried
CBL	Cabled
CCV	Concave,
CVX	Convex
CGA	Culvert gravel absent
CHL	Chain link
CHP	Channel slope
CHS	Chiseled (banks)
CNR	Concentrated runoff
COB	Cobble
COM	Complete
CON	Concrete
COR	Corrosion
CRD	Cross road drains
CRN	Crowning
CRS	Crushed
CUL	Culvert
CUT	Cut slope
DBB	Debris barrier/flow
DIT	Ditch
DIV	Diversion of stream flow
DNS	Downstream
DOX	Dissolved oxygen
DSP	Downspouts
DRC	Ditch relief culverts
DVP	Diversion potential
ELC	Electric
EMG	Emergent groundwater
ENC	Encroachment
ERC	Erosion control
ERO	Erosion
EXC	Excavated/excavation
FAB	Fabric
FIL	Fill/fill slope
FJH	Fish jump height
FLA	Flared
FLD	On floodplain
FLO	Flow obstructions
FLS	Floating segments
FLT	Flatwater
FPD	Floodplain deposition
FRM	Farming
GRC	Grade control
GRV	Gravel
GRZ	Grazing
GUL	Gullying
HRB	Herbaceous
HDC	Headcut

HUM	Humboldt Crossing
IMS	Impassable structures
INC	Incision
INL	Inlet
INS	Insloping
INT	Interception
IST	Instability
JUV	Juvenile
LDS	Landsliding
LNG	Length
MAT	Materials failure
MIG	Migration
MIT	Mitering
MDC	Mid-channel
MTL	Metal
MUL	Mulching
NAR	Narrowing
NNS	Non-native species
NON	None
NTG	Not to grade
NTR	Native rock
NTM	Nutrient movement
NUT	Nutrients
OFR	Off-site rock
OTL	Outlet
OVS	Oversteepened
OVT	Overtopped
OUT	Outsloping
PAR	Partial
PAV	Paving
PIP	Piping
PLC	Placement
PLG	Plugged
PLN	Planting
POO	Pool
POF	Pool filling
PRL	Parallel to bank/floodplain
PRM	Perched material
PRP	Perpendicular to bank/floodplain
REB	Rebar
RFS	Riffle sedimentation
RIF	Riffle
RIL	Rilling
RPR	Riparian recruitment
RIP	Ripping
RLD	Rolling dips
ROC	Rock
ROD	Road
RTW	Root wads
SBM	Substrate movement
SCR	Scarp
SDC	Side-channel/side cutting
SEE	Seeding
SET	Settling basins
SFE	Surface erosion
SHR	Shrub
SHF	Shifting
SIN	Sinuosity
SIZ	Size
SLC	Silt/clay
SLF	Silt fence
SLP	Slope
SMP	Slump
SND	Sand
SOP	Soil pedestals
SPN	Spanning
SPS	Suspended segments
STB	Stability
STK	Staked
STR	Stranding
STW	Straw mulching
TEM	Temporal
TIE	Tied
TMB	Timber
TMP	Temperature
TNC	Tension crack
TRE	Tree
TUR	Turbidity
UCB	Undercut banks
UCT	Undercut toe
UPS	Upstream
UND	Undercutting/Undermining

UNS	Undersized
VEG	Vegetation
WGW	Wingwalls
WID	Width/Widening
WOO	Wood, wooden
WSH	Washout
WTB	Water bars
WTD	Water depth
WTR	Water
WTV	Water velocity