Qualitative Implementation and Effectiveness Monitoring of Fisheries Habitat: A Field Evaluation of Protocols

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INTRODUCTION

Ecological restoration is a strategic component of natural resource management in its effort to conserve and enhance habitat functions and maintain or recover species that are dependent upon those functions. Resources to implement this component have included State and Federal funding of grant programs. On-the-ground organizations have actively participated in these programs over two decades to improve stream habitat, reduce delivery of sediment and other water quality contaminants, and provide stewardship education to public and private land managers. This body of work presents an opportunity to learn about the intended and unintended outcomes of individual restoration projects as feedback to policy decisions regarding implementation of ecological restoration programs. Systematic and consistent collection of useful restoration project information and data depends upon the development and application of proven and repeatable monitoring protocols. For that purpose, Richard Harris, Forest Ecology Specialist at the University of California Berkeley, and team members presented qualitative protocols for implementation and effectiveness monitoring of restoration projects to the California Department of Fish and Game in 2004.

During the 2005 summer field season, the University of California Cooperative Extension conducted qualitative implementation and effectiveness monitoring on 54 individual restoration treatment sites using the Harris protocols. Because this group of projects was implemented through one overarching restoration endeavor, the Russian River Tributary Restoration and Landowner Outreach Program (which later became the Salmon Creek Watershed Restoration and Landowner Outreach Program), our monitoring effort provided the opportunity to evaluate the success of restoration projects implemented through that program. In addition, monitoring with the Harris protocol was conducted to field-test the protocol and provide recommended modifications and suggestions for their continued use. This report provides a summary of the results for both monitoring objectives. The comments and recommendations included in this report were drafted from the perspective of the user. The Harris et al. (hereafter referred to as Harris) qualitative monitoring protocol assumes users will be "agency staff or professional consultants with expertise in project design, implementation and contracting" and training in monitoring methods (p. 12). The evaluation team member who field-tested these methods UCCE has experience consistent with the users for which this protocol was intended.

Before proceeding, we would like to acknowledge the exceptional work done by Harris and team. We hope that our efforts will compliment their work and build upon the excellent foundation they have created.

RESTORATION PROJECT IMPLEMENTATION AND EFFECTIVENESS

The Russian River Tributary Restoration and Landowner Outreach Program (RRTRLOP) was initiated by UCCE and the California Sea Grant Program in 1998 and ended in 2005. Over those eight years, program staff conducted educational workshops on salmon habitat needs and local stream conditions for hundreds of landowners in all of the major sub-watersheds in the Russian River basin, as well as in the Salmon Creek watershed. In addition, 54 small-scale restoration projects were implemented through the program on fourteen Russian River tributary streams, two Salmon Creek tributary streams, and Scotty Creek. These projects included 23 streambank treatments (ST), sixteen instream treatments (IN), six stream crossing upgrades (CU), four erosion control treatments (EC), three revegetation treatments (RT), one land use control (LU), and one vegetation control treatment (VC) (Table 1). While all projects shared the objective of improving fish habitat conditions, they also served as demonstration sites for educational purposes. Therefore, while some projects were designed primarily to address specific limiting factors, others were somewhat opportunistic based on landowner needs, access potential, and the greatest educational impact.

The program's implementation of projects consistently rated good (41 of 54) to fair (9 of 54), with only four poor ratings. Similarly, the effectiveness of projects consistently rated from excellent (2) to good (23) to fair (10), with eighteen projects rating as poor or failed. Of the nine that had an effectiveness rating of failed, three of them were boulder wing deflectors installed at the same stream location.

We found that there was a direct correlation between implementation and effectiveness ratings. All of the treatments that received an implementation rating of poor (4) received an effectiveness rating of failed. Twenty-five of the 40 (62%) projects with implementation ratings of good also had effectiveness ratings of good (23) or excellent (2). Five of the ten (50%) projects with an implementation rating of fair received an effectiveness rating of fair and four of the ten (40%) received a rating of poor or failed.

Effectiveness ratings of poor or failed were assigned to at least one treatment in every project type evaluated except for stream crossing upgrades (SU) (6 sites). Effectiveness ratings of excellent or good were assigned to at least one treatment in every project type evaluated except for revegetation treatments (RT) (3 sites) and the one vegetation control treatment (VC). All three revegetation treatments received an effectiveness rating of failed. The primary factor in two of these cases was insufficient irrigation.

Sixteen bioengineered streambank stabilization treatments were evaluated. One received an effectiveness rating of excellent (6%), five of good (31%), four of fair (25%), four of poor (25%), and two of failed (12%). Of the bioengineered bank stabilization treatments with an effectiveness rating of poor or failed, 100% had either no irrigation or insufficient irrigation. Of the six that rated excellent or good for effectiveness, five (83%) had irrigation or a natural water source onsite. The exception to this was the one treatment that rated good without irrigation, but differed in its objectives in that it was intended

only to stabilize the bank long enough for the alder that was colonizing the streambanks surrounding the site to take hold. In this it succeeded, though the structure eventually died. Ultimately, all of the bioengineered bank stabilization structures that did not receive irrigation (or were not exposed to a natural water source) died. This underscores the role that irrigation plays in determining project success and the need for it to be provided and maintained if live plantings or structures can be expected to be effective.

Within this group of restoration treatments, bioengineered streambank stabilization treatments appeared to be more effective than the "hard" (or non-bioengineered) bank stabilization treatments evaluated, which included boulder deflectors and j-hooks. Of the six deflector and j-hook sites evaluated, two (33%) rated good, one (17%) fair and 3 failed (50%). The primary cause of failure in these structures was the use of undersized rock.

Table 1. UCCE Qualitative Effectiveness Monitoring Ratings

PROJECT TYPE	TREATMENT	PRIMARY OBJECTIVES	IMPL. RATING	EFFECT. RATING
CU	Culvert installation	Reduce erosion	FAIR	FAIR
CU	Culvert installation	Reduce erosion	GOOD	GOOD
CU	Culvert installation	Reduce erosion	GOOD	GOOD
CU	Culvert installation	Reduce erosion	GOOD	GOOD
CU	Culvert upgrade	Reduce erosion	GOOD	GOOD
CU	Culvert upgrade	Reduce erosion	GOOD	GOOD
EC	Gully headcut armor	Gully stabilization	GOOD	GOOD
EC	Gully post & brush checkdam	Gully stabilization	GOOD	POOR
EC	Gully rock checkdams (3)	Gully stabilization	FAIR	POOR
EC	Gully stabilization	Gully stabilization	GOOD	GOOD
IN	Boulder vortex weir	Create pool habitat & increase stable cover for fish	GOOD	FAIR
IN	Boulder weir	Pool development	FAIR	FAIR
IN	Boulder weir	Pool development & bank stabilization	GOOD	GOOD
IN	Boulder weir	Pool development & bank stabilization	GOOD	GOOD
IN	Boulder weir	Pool development & bank stabilization	FAIR	GOOD
IN	Boulder weir	Pool development & bank stabilization	GOOD	GOOD
IN	Boulder weir	Pool development & bank stabilization	GOOD	GOOD
IN	Boulder weir	Pool development & bank stabilization	GOOD	GOOD
IN	Boulder weir	Pool development & bank stabilization	GOOD	GOOD
IN	Boulder weir	Pool development & bank stabilization	GOOD	GOOD
IN	Boulder weir	Pool development & bank stabilization	GOOD	POOR
IN	Boulder weir w/ log cover	Scour pool	GOOD	FAIL
IN	Log cover/scour structure	Enhance pool habitat & increase stable cover for fish	GOOD	EXCL
IN	Log cover/scour structure	Create pool habitat & increase stable cover for fish	FAIR	FAIR
IN	Log cover/scour structure	Create pool habitat & increase stable cover for fish	GOOD	GOOD
LU	Riparian fencing	Exclude livestock from the stream channel	GOOD	N/A
RT	Revegetation	Change species composition & improve canopy	GOOD	FAIL
RT	Revegetation	Change species composition & improve canopy	GOOD	FAIL
RT	Riparian planting	Change species composition	GOOD	POOR
ST	Bank reshaping	Stabilize streambank	GOOD	FAIR
ST	Boulder & log deflector	Stabilize streambank & increase shelter	GOOD	GOOD
ST	Boulder & log deflector	Stabilize streambank	GOOD	GOOD
ST	Boulder J-hooks (5)	Bank stabilization & pool development	FAIR	FAIR
ST	Boulder wing deflector	Stabilize streambank	POOR	FAIL
ST	Boulder wing deflector	Stabilize streambank	POOR	FAIL
ST	Boulder wing deflector	Stabilize streambank	POOR	FAIL
ST	Willow baffles (3)	Stabilize streambank	FAIR	FAIL
ST	Willow baffles (4)	Stabilize streambank	FAIR	FAIR
ST	Willow deflectors (4)	Stabilize streambank	GOOD	FAIR
ST	Willow mattress	Stabilize streambank & enhance pool habitat	GOOD	EXCL
ST	Willow mattress	Stabilize streambank & improve canopy	GOOD	FAIR
ST	Willow mattress	Stabilize streambank	GOOD	GOOD
ST	Willow mattress	Stabilize streambank & improve canopy	GOOD	GOOD
ST	Willow mattress	Stabilize streambank & improve canopy	GOOD	GOOD
ST	Willow mattress	Stabilize streambank & improve canopy	GOOD	GOOD
ST	Willow mattress	Stabilize streambank	FAIR	POOR
ST	Willow wall	Stabilize streambank	POOR	FAIL
ST	Willow wall	Stabilize streambank & improve canopy	GOOD	FAIR
ST	Willow wall	Stabilize streambank & improve canopy	GOOD	GOOD
ST	Willow wall	Stabilize streambank	GOOD	POOR
ST	Willow wall	Stabilize streambank & improve canopy	GOOD	POOR
ST	Willow wall	Stabilize streambank	FAIR	POOR
VC	Exotic plant removal	Change species composition	GOOD	POOR

MONITORING PROTOCOL REVIEW AND RECOMMENDATIONS

The task of creating a straightforward and effective systematic monitoring protocol for use on a variety of project types, each with numerous indicators of performance, is tremendously challenging. The breadth of that challenge was made clear to our user as each problem was encountered and alternatives were considered. Perfecting a protocol that would accurately reflect the wide array of variables encountered at each different project feature may not even be possible. Conditions in the field are rarely "black and white", but are full of anomalies and obscurities and therefore tend to fall within the "grey" area. With that in mind, the comments included in this report are intended to encourage more efficient monitoring techniques and accurate data results. A condensed list of our recommendations and points of clarification are presented in Appendix A and discussed in depth in this section of the report. Appendix B provides suggested minor edits on a worksheet-by-worksheet basis.

Monitoring the effectiveness of restoration projects is undoubtedly an educational experience. All too often the contractor who implements a project does not return to evaluate the site, and thus does not benefit from the myriad lessons learned through witnessing how conditions are changed based on restoration techniques employed in each site-specific geomorphic and hydrologic context. Mandatory effectiveness monitoring would be a valuable experience for most restoration professionals. Furthermore, it would be an effective exercise in anticipating treatment effects, possibly leading to revisions in placement, orientation and other key elements of project design. If more contractors were required to conduct follow-up monitoring they would most likely reconsider, and ultimately refine, many aspects of their work. ***We recommend that project sponsors and/or contractors conduct effectiveness monitoring where possible.***[1] For DFG, the challenge in requiring contractors to conduct monitoring would probably lie in training them and compensating them for time expended.

There is another, more pragmatic reason for project sponsors and contractors to become involved in the monitoring effort. While conducting effectiveness monitoring, the primary difficulty we encountered in answering questions was a lack of pre-project data and insufficient information in the proposed project plans. Even where objectives were stated, they were frequently too general. While discussing this issue with other individuals conducting monitoring, we discovered that this was an all-too-common problem. Project sponsors and contractors cannot necessarily be blamed for this, as project documentation specifications have not been standardized in the past. In light of this, it is clear that this effort cannot be truly productive unless it is accompanied by an improvement in pre-project documentation methods.

The first page of the Harris protocol states that "Successful use of these methods depends on the availability of adequate information about projects" and that this can be satisfied in part by "requiring project sponsors to provide accurate project descriptions". The Harris

[1] Bold, italic type denotes specific recommendations. These are repeated in the list in Appendix A.

protocol also states that, "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" (p. 13).

Proposed plans and project descriptions could be greatly improved if the evaluation criteria from the monitoring checklists were considered by project sponsors during the project development stage. ***We recommend that contractors be required to conduct pre-treatment monitoring (a one time visit, using the current protocol) or, at the very least, review the pre-treatment checklists relevant to their project types and confirm that the answers to the questions can be found in their plans.*** This would lead not only to better clarification of project objectives but to also more pre-treatment data collection. These things, in turn, would lead to more definitive effectiveness monitoring results. For example, instead of describing the objective of a pool enhancement project with a general statement like, "enhance depth of the existing pool to improve over-summer habitat for salmonids", a contractor enhanced that statement to include, "increase residual pool depth from the current depth of 1.5 feet to 3 feet". When the time came to monitor the effectiveness of that project, it would be easy to judge whether the project had met its clearly-stated objectives, leading to a more accurate rating and making the monitoring process more efficient.

DFG also shares a responsibility with project sponsors to improve data storage and access to project records where it is needed.

KEY POINTS TO BE ADDRESSED

Effectiveness rating system

Perhaps the greatest deficit in the current effectiveness evaluation protocol is the lack of objectivity in the project effectiveness rating system. The current rating system allows not only for a difference of ratings between surveyors, but even by the same surveyor depending on the context of the visit (seasonal timing, time of day, features previously visited, and even the surveyor's mood).

A rating may be obvious when a project clearly meets or exceeds its objectives, as in a pool enhancement project that increases pool depth to the desired minimum depth. All too often, however, the desired minimum depth is not stated or pool depth has been increased but has not yet reached the desired depth. Unless a project has clearly met well-defined objectives it is often difficult to apply the current rating system in an objective manner.

The effectiveness ratings are the most critical component, or "bottom line", of qualitative monitoring. Yet, despite all of the data considered during evaluation, project feature rating remains a fairly subjective component. As stated in the Harris protocol (p. 8) "quantitative data collected using these methods…are only intended to allow for a qualitative effectiveness judgment to be made". ***We feel that more clear determinates of project feature performance are needed, and highly recommend establishing quantitative benchmarks for the rating scale to help reduce subjectivity in the rating***

system. Quantitative indicators of excellent, good, fair, poor and failed projects would provide guidelines to insure a more systematic approach to rating project features.

Consider a riparian planting project, for example. According to the current method, an evaluator would rate project effectiveness as "good" if "there are some deficiencies in the project feature's performance, but it is still performing in a satisfactory manner" (p. 22). This is open to interpretation by the evaluator. A better method might be to direct evaluators toward a rating of "good" if the plantings have a survival rate of 75-89 percent; a rating of "excellent" would be given for projects with survival rates of 90 percent and higher, a rating of "fair" for projects with survival rates of 60-74 percent, "poor" for 40-59 percent, and "failed" for below 39 percent.

Instream projects with objectives of increasing depth and shelter in an existing pool could take into account the increase in pool depth and percent shelter. Where pre-treatment data is limited or non-existent some ambiguity is inevitable, but in the future all projects surveyed for effectiveness should have pre-treatment data for comparison. Perhaps CDFG biologists could establish quantitative benchmarks for each project type based on their area of expertise. Where it is not possible to establish quantitative benchmarks for a certain project type, the current rating system could still be used.

Without a more definitive rating scale, it may be impossible to meet the qualitative monitoring objectives stated in the current protocols as "repeatability by and between observers" with a general goal of "variability of plus or minus 10 percent in measurements and assessments" (p.12).

Timing of monitoring visits

Another critical point that has certainly been considered by DFG but must be standardized is the timing of effectiveness monitoring visits. Due to the dynamic nature of stream restoration projects, there is simply too much variability in the outcome of monitoring surveys at different sampling intervals. In fact, the timing of effectiveness monitoring visits can sometimes be the primary factor in predicting a project's rating.

Consider how critical timing was to the effectiveness ratings assigned to the projects in the following examples:

1) A willow wall on Parsons Creek thrived for the first year after implementation. During the second year irrigation problems occurred but it survived with some growth. By the third year it was completely dead. Accordingly, ratings from the first to third years would have gone from excellent down to failed, depending on the time of survey.

2) The primary feature of a gully stabilization project on Forsythe Creek was a post-and-brush checkdam. It functioned flawlessly the first two years, capturing and containing over four feet of sediment. By the time the survey occurred four years after implementation, the checkdam was decomposing and

releasing sediment into the stream. If the site had been surveyed in the first or second year it would certainly have been rated excellent, in the third year it might have rated fair, but by the time the survey was conducted in the fourth year it received a rating of failed.

3) A boulder weir was installed on Pena Creek to enhance pool depth and capture spawning gravels. For the first three years it met all objectives quite effectively and would have been rated excellent if surveyed during this time. When it was surveyed five years after implementation it had blown out and received a rating of failed.

Obviously, preferred timing of monitoring visits will differ based on project type and depending on the amount of time required to reasonably ascertain whether objectives have been met. It may take more than ten years before the effectiveness of a riparian planting project intended to increase canopy is evident. While the effectiveness of most bank stabilization projects would be evident within the first two years. Survey timing for instream treatments and upslope watershed restoration could be based on stressing events but this would be impossible to standardize, as stressing events may not occur for a period of ten years or more.

The Harris et al. protocol states that "timing of effectiveness monitoring visits will depend on specific project objectives" and that "ideal utilization of these checklists…would involve repeated visits to…sites after the project has had adequate time to meet its objective" (p. 6). It is our understanding that the current practice by DFG is to visit sites as early as one year after implementation. We do not feel that the vast majority of projects have had adequate time to meet their objectives within that period. Furthermore, it takes no more time to visit a project site three years after implementation than it does to visit it one year after implementation. The Harris et al. protocol further states that it is not likely that the Fisheries Restoration Grant Program (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" (p. 7). This clearly being the case, we nevertheless ***recommend that DFG produce standardized guidelines to govern the timing of effectiveness monitoring visits, and that those guidelines be based on a balance of pragmatic considerations and the period of time required to meet project objectives and accurately reflect a project's efficacy.***

Even if the "ideal" monitoring visit time could be defined for each project type, it would certainly be challenging, and probably impossible, to establish a protocol which led to effectiveness monitoring visits precisely at that time. Nevertheless, if at least general guidelines are not established to address this component, monitoring results will be inconsistent and may not accurately reflect the effectiveness of projects.

One final note on timing: The Harris protocol recommends that implementation monitoring occur less than two years after project completion, but also states that "monitoring should occur immediately after implementation is complete but before the close-out of the contract, to allow time for any remedial actions to occur" (p. 6). Because

projects are often implemented in the final season of the contract period, ***we recommend that DFG adopt a policy that implementation monitoring be conducted within the first year, rather than the first two years, after project implementation.*** This practice would be preferable as it would allow contract managers to record implementation conditions accurately and to address any project deficiencies before the close of contract.

Miles of stream treated/affected

The project implementation checklist summary asks for total "miles of stream treated/affected" and it is *implied* that this is in reference to HB, FL HI and some HR project types. ***It needs to be clearly stated which project types (if not all) should be considered when determining this figure.*** In addition, and perhaps more importantly, it should be understood that accurately determining the length of stream affected by a project is a very convoluted task. Does a streambank stabilization project "affect" the 100 feet of bank upon which it is installed, the estimated 500 feet of downstream habitat which has a reduced amount of fine sediment in spawning gravels (a figure which requires additional sampling to determine), or the entire length of a tributary from the project site down to the confluence with its parent stream? Since this figure—total miles of stream treated/affected—is essentially the "bottom line" of project implementation evaluations, ***we recommend that DFG establish parameters to guide the determination of this figure for various project types.*** Until this happens it is unlikely that this entry will provide useful data results. If this proves too difficult an undertaking, we recommend that the word "affected" simply be removed, as determining the length of stream "treated" should be less ambiguous if adequately described in the instructions.

Collection of "optional" data

The instructions for filling out checklists on page 15 of the Harris protocol states that 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 that rule may be in order if repeat effectiveness monitoring using these checklists is anticipated."

We urge DFG to reconsider advocating this method. First, it does not provide any objective data, simply a statement by DFG staff that the project is "excellent" or "good". Will that be acceptable to the federal funding agencies or will it leave the monitoring program subject to further scrutiny? More importantly, it eliminates the opportunity to evaluate how specific conditions change over time at sites where a treatment is obviously effective. The combination of quantitative data and anecdotal information obtained during qualitative surveys brings to light important lessons in restoration techniques and offers opportunities for data comparisons in the future. Repeated monitoring and data collection might, for example, allow restoration professionals to illustrate how a

successful bioengineering bank stabilization project provides greater canopy and less vegetative bank cover as it ages. Or, for example, how an instream digger/cover log structure might increase pool depth only up to a certain point in time, or how it accumulates and sheds shelter in the form of small woody debris as time progresses, or even how conditions change as it begins to break down.

During the initial effectiveness monitoring visit to any particular site, it is quite likely that the evaluators would not know whether repeat monitoring of that site will be conducted and so they may choose not to collect the "optional" quantitative data. Eliminating data collection in cases where a project is a blatant success or failure robs us of the chance to learn invaluable lessons about how restoration techniques change stream conditions over time, not just at one point in time. ***We recommend that DFG mandate the completion of all applicable effectiveness checklist questions for every site visited.***

GENERAL CHECKLIST COMMENTS AND RECOMMENDATIONS

Survey direction

We recommend that the instructions include guidance on survey direction. Where possible and efficient, project features should be numbered and surveyed in a downstream to upstream direction. This will provide greater consistency and allow for more efficient follow-up surveys. If a different survey direction has already been established during previous surveys of an individual site, it would be best to follow the same order on repeat visits.

Bank angle

It seems it would be more appropriate and efficient to measure bank angle in degrees from horizontal as opposed to percent slope, since many bank erosion sites have pre-treatment angles of greater than 150 percent (56 degrees) and cannot be accurately recorded using percent slope. Bank angle is being recorded inconsistently at this time, with slopes less than 150 percent being recorded in percent and slopes greater than 150 percent being recorded in degrees. ***Unless there is a compelling motive for recording data in percent slope, we recommend that bank angle be recorded in degrees from horizontal.***

Photo location documentation

An entry is needed on the photo description form to document the location of digital photos. Digital photo numbers and descriptions are useless if the photos cannot be located. This will be of particular importance before the photo database is established, at which time evaluators can submit digital photo discs with their data forms.

Site address

In many cases, it would simplify project access if the site address were easily available. ***We recommend adding an entry for site address on the site access and location form.***

Project title

It would be helpful to include an entry for project title on all forms, to be used when the project title differs from the contract name. Some contracts include smaller projects at different sites with the same contract name. It would be more straightforward to identify those sites separately, as in "Parsons Creek Willow Wall", rather than "Russian River Tributary Restoration and Landowner Outreach Program", a contract name which included several other project sites and bears no clear reference to the bank stabilization treatment being monitored.

Project feature identification

We recommend that the instructions include guidelines on how to break sites down into separate project features. For example, four siltation baffles designed to work in conjunction with each other could be evaluated as one project feature or four project features, leading to inconsistency and to confusion on follow-up visits. Some of this is intuitive, but it would be helpful if it were standardized. This was one of the most inconsistent points during our monitoring visits. In one case, four willow deflectors were evaluated as one feature and three boulder deflectors at a different site were evaluated as three features. Projects that occur over a large area, like riparian plantings and livestock fencing, are more easily evaluated when they are broken down into multiple project features. These could be left bank and right bank sites or bank, floodplain and upslope sites. Some level of guidance on this would reduce the guess work by surveyors and lead to more efficient and consistent surveying methods.

We also recommend that surveyors be instructed to include a description of what constitutes each project feature in the comments section of the implementation form. For example, the column below project feature #1 might read, "40 foot long willow wall", the column below project feature #2 might read, "four willow siltation baffles", and the column below project feature #3 might read, "left bank riparian planting". This would save future surveyors the trouble of interpreting treatment codes and would identify how project features had been broken down when multiple features with the same codes exist.

Clarification of "approved"

Questions containing the word "approved" need clarification on several different implementation checklists. For example, question #5 on the ST Implementation form reads: "Were irrigation provisions installed as approved?" If irrigation was approved but not installed, the answer would clearly be "no", but if no irrigation was specified in the project contract would the answer be "no" or "not applicable?" Individual surveyors would probably respond differently. This question might be rephrased to read "If approved, were irrigation provisions installed?" Another example is question #12 on the

RT implementation form, which reads: "Were approved provisions for plant shading installed?" The following implementation form questions are somewhat obscure in this manner: **RD #3 & 12; ST #4, 5, 11, 13 & 14; CD #6, 10 & 17; CU #5, 8, & 18; IN #6; RT #9-12; RU #4-6, 10, 11 &13; and EC #6, 9 &11.**[2]

Implementation date

It would be helpful to instruct surveyors to refer to the implementation date on the implementation checklist summary form when rating the effectiveness of a project. Implementation date is generally an important factor to consider when rating effectiveness. For example, a pool enhancement structure that increased residual pool depth by .6 of a foot would likely receive a different rating depending on whether it was implemented one year ago (it scoured .6 of a foot per year) or five years ago (it scoured .12 of a foot per year).

Approved project goals

Several times during our surveys we had to make a concerted effort to rate a project based on the specific objectives stated in the proposed plans or statement of work, rather than based on our knowledge of the feature type and its functions***. Including summarized project goals (e.g., stabilize bank, increase canopy) at the top of the effectiveness checklists would be a beneficial measure in emphasizing the fact that projects are rated on their intended effects and would confirm that surveyors are indeed rating the project based on approved, stated objectives and not on presumed objectives.***

"Maintenance or repair" entry

We recommend numbering the question, "Does this feature need maintenance or repair?" on all effectiveness forms so it is easy to locate correlating comments by question number. In the field, we found it easiest to comment by question number and make general comments at the bottom of each form. When creating the monitoring database, it may be worthwhile to consider including a comments entry after each question.

Another point to be addressed here is that sometimes a feature may not need typical maintenance or repair, but it should be noted that problems still need to be addressed at that site. Consider, for example, a case in which a willow wall failed, leaving a bank vulnerable to further erosion. Since the treatment failed, it would not need maintenance and if the reason for its failure was unavoidable (e.g., no water available for irrigation, poor placement) it would not be worthwhile to repair it. However, it would be important to note that the problems that led to a project in the first place still exist at that site. ***We recommend including an entry at the end of the effectiveness checklists such as, "Do problems at the site warrant further treatment?".*** In this way such situations could be acknowledged somewhere aside from the general comments. It could also be noted in the

[2] Bold, plain type denotes references to specific checklists outside of the heading for that project type.

instructions that this is not intended to be an evaluation of whether further treatment at the site would be a priority in the watershed, but simply a documentation of current site conditions.

Comments

We recommend that the final instructions direct evaluators to document all beneficial or deleterious effects of treatments at each site in the comments section of the effectiveness checklists, whether they are anticipated outcomes or not. This may seem an intuitive exercise, but there is no guarantee that it will be done unless evaluators are instructed to do so. Though questions on the checklists such as, "Did the treatment lead to desired streambank conditions" and, "Did the treatment lead to undesirable streambank conditions?" are intended to collect this information, anecdotal information included in the comments section would insure that such conditions are elaborated on.

SPECIFIC CHECKLIST QUESTIONS AND COMMENTS

While using the pre-treatment, implementation and effectiveness monitoring checklists, we encountered numerous questions. Some points were resolved as we became more familiar with monitoring techniques. Others, such as the ones included below, remained somewhat unanswered. Ambiguous questions can be detrimental in that they reduce the consistency of answers among different surveyors, indicating that conditions have changed when the only change is due to surveyor subjectivity.

We recommend that the obscure points identified in this section be clarified, either by rephrasing the questions or providing clear instructions, in order to allow for the most accurate monitoring results as well as the greatest amount of consistency possible between different surveyors at each site. We believe this will lead to greater effectiveness at meeting the data quality objectives of "repeatability by and between observers" (Harris p. 12). Furthermore, we hope it will help streamline the evaluation process, making it more efficient for evaluators in the field. Clarifying checklist terminology is an effective step in reducing the amount of time spent in deliberation, and therefore the overall time required to conduct monitoring exercises.

The following comments address the checklists for those project types which we monitored. There are no comments on crossing decommission (CD), fish passage improvement (FP), or road segment decommission (RD) checklists because we did not evaluate those project types. All comments are in reference to the *current* qualitative effectiveness monitoring checklists used by DFG, which have been revised extensively from the forms originally created by Harris. Because there are not yet instructions accompanying the revised forms (other than those for the IN pre-treatment checklist), we will recommend that certain points be addressed when instructions are written at a future date.

Project implementation checklist summary

We recommend that the term "4th Field HUC" be defined in the instructions, along with information on how to obtain that data. Evaluators can be directed to use the CalWater layer of the GIS Biosviewer on DFG's website.

A clear explanation of what is expected should accompany the question, "Does the project address issues identified in a watershed plan or limiting factors analysis (LFA)?" and associated subquestions. What constitutes a watershed plan or LFA? If one has not been conducted but the project addresses limiting factors described in DFG's stream inventory reports, should that information be included? If a LFA has been conducted after the project and it turns out the project did address some of the limiting factors identified, can that be included or is this intended to document limiting factors knowingly addressed by the project at the time it was designed and implemented? ***We recommend that the goal of this question be evaluated by DFG, that the question be rephrased to reflect that goal and that the instructions pertaining to that question be drafted accordingly.***

On both the implementation and effectiveness checklist summaries, surveyors should be reminded that the "total # of project features" and "# of project features" should be recorded consistently on all forms. This seems straightforward but can become confusing when multiple features are lumped as one feature.

Project effectiveness checklist summary

On the effectiveness checklist summary, evaluators are required to assign cumulative performance rating for each project. Table 2 on page 10 of the Harris protocols describes an overall project effectiveness rating formula based on individual feature ratings. This formula is a very helpful step in standardizing ratings. However, we don't agree that projects in which 50 percent or less of the features received a rating of fair or lower should necessarily receive a rating of failed. If a project receives 50 percent fair ratings and 50 percent poor ratings, perhaps it should be rated poor rather than failed. ***We recommend that this component of the rating criteria be revised in order to not lead to unrealistically low overall project ratings.***

Evaluators are also required to identify the stressing event at each project site; the largest stream flow and/or rainfall event the treatment area has experienced since project implementation. This is fairly critical information since, according to the Harris protocol, it "allows judgment of whether the effectiveness rating assigned is definitive" (p. 28). Nevertheless, this data is somewhat difficult to obtain and the current instructions include no guidance as to where it can be found. After reviewing the Department of Water Resources and USGS gauge information, we found that there is no flow information specific to many project areas. It appears that, in the vast majority of cases, there is no data available for stream flows and precipitation events in the smaller tributaries where restoration takes place, since flow gauges tend to exist only in river mainstems and the larger tributaries (where, in the case of the Russian River, flows are affected by dam releases). In cases where no data exists at or near project areas, should the stressing event

at the nearest flow gauge upstream or downstream be reported with distance from the project area noted? ***We recommend that instructions direct evaluators to the source of information on stressing events and point them to alternatives when no site-specific information is available.***

Furthermore, it is not clear in what units this information is to be recorded. Is it best to record cubic feet per second, peak flow on a certain date, inches of rain on a certain date? The largest flow event recorded in the example on page 18 of the Harris instructions is the "10 year flow" and the largest rainfall event is the "5 year event". ***We recommend that the project effectiveness checklist summary form identifies the preferred units in which to record stressing event.***

Streambank treatment (ST) checklists

- Pre-treatment checklist

  All three streambank stabilization (ST) checklists include an entry for "length of bank treated" but there is some ambiguity as far as how treatment area should be assessed. In the case of many common streambank treatments (e.g., a willow wall), this measurement would be clear. However, in the case of a deflector it is unclear whether the length of bank treated should be recorded as the length of the structure installed (e.g., six feet) or the length of the stream *affected* (e.g., 30 feet). Interpretation could lead to quite different results. The original Harris ST checklists ask for "length of streambank stabilized". This seems like a more definitive measurement. ***We recommend that entries asking for "length of bank treated" be rephrased to ask for "length of streambank stabilized" and that instructions specify how to determine that length.***

  On ST pre-treatment and effectiveness checklists, question #6 and #11 ask surveyors to describe "current channel problems". Is this necessary to describe even if the treatment does not attempt to change channel conditions? If so, what length of stream should be considered when evaluating this? Defining channel problems *even when they were irrelevant to the project* was a challenge that we stumbled upon repeatedly in the field. In the Harris protocol, the ST checklists ask surveyors to describe channel problems and desired conditions only if "changing channel conditions is a goal of the treatment" (p. 54). It appears that this format would save surveyors time and frustration. Perhaps this question was altered to better reflect unanticipated channel effects. If so, the question might be rephrased to read, "apparent or visible channel problems at treatment site" to keep surveyors focused, rather than feeling as though they need to evaluate the stream channel on a reach level. ***We recommend restructuring questions about channel problems to ask surveyors to record channel problems only if they are relevant to the treatment being evaluated. As an alternative, the question could ask for "apparent or visible channel problems at treatment site".*** This also applies to **LU, IN, RT, VC, FP, CD & CU forms**.

Increase in canopy cover is a common goal of bioengineered bank stabilization treatments and, as such, can be an important indicator of project performance (even if increases in canopy do take a longer time to manifest). ***We recommend that DFG add pre- and post-treatment canopy cover assessments to the ST pre-treatment and ST effectiveness checklists.*** Questions about canopy cover could be copied directly from the RT pre-treatment and effectiveness forms.

- Implementation checklist

  Question #4a asks for "species planted" but there is no direction on how to record that information. Should evaluators write in the entire species name? The Harris et al. instructions say to "enter the DFG code for species planted" (p. 55), but there is no associated code list. ***We recommend that a standardized method of recording plant species be developed and that this method be indicated on the checklist.*** If a correlating code list is developed, then it should be referred to in the question on the form, as in "species planted (enter DFG species code)".

  Question #5b asks if there is an "agreement in place to assure irrigation will be completed?" ***First, the more appropriate term to use here is "insure" rather than "assure". More importantly, we recommend that this question be elaborated to include irrigation maintenance.*** Often times, irrigation has been completely installed for a project site but it needs to be maintained (i.e., lines reinstalled seasonally, water turned on, lines checked). Lack of irrigation *maintenance* has been a significant factor in reduced project performance in the sites we surveyed.

- Effectiveness checklist

  Questions #8 & #13 on the ST effectiveness form ask whether the treatment led to "undesirable" streambank or stream channel conditions. ***The instructions should direct surveyors to look for problems on opposite banks, downstream and upstream of the project site to insure that they acknowledge all of the effects of the treatment being evaluated. The question could also be rephrased to ask for undesirable effects "in the vicinity of the project site".***

  Question #22 asks whether the treatment led to an "increase in desired vegetation cover". An interesting elaboration of this would be to have surveyors document whether the increase in vegetation was through site planting or natural recruitment. ***A sub-question of #22 could ask "was this vegetation planted or recruited naturally?"*** Collecting this information would not significantly increase survey time, but would allow future comparisons of the rate of colonization of planted versus naturally-recruited species at stabilized sites.

Instream treatment (IN) checklists

- Pre-treatment & effectiveness checklists

For instream treatments there is similar ambiguity as far as how *both* treatment area and habitat unit are to be defined. On IN pre-treatment and implementation checklists, surveyors must record "length of instream channel to be treated" and "length of channel treated." Once again, it is unclear whether the length of stream treated should be recorded as the length of the structure installed or the length of stream *affected*. The length of instream channel treated by a weir, for example, could be recorded as the total length of the structure along the stream (e.g., eight feet) or it could be recorded as the length of stream affected (e.g., the distance over which gravel is captured upstream and a pool is created downstream, say 25 feet). The original Harris IN checklists asks for "length of habitat improved". Once again, this seems to be a more definitive measurement. ***We recommend that entries asking for "length of channel treated" be rephrased to ask for "length of habitat improved" and that instructions specify how to determine that length.***

The revised instructions for the IN pre-treatment form (those recently obtained from Brooke Budnick of DFG) direct evaluators to determine length of channel treated by measuring "the length of channel in the proposed treatment", and that the "treatment area is usually the habitat unit where the structure will be placed." Unfortunately, the mention of habitat unit in this context brings up another point of ambiguity. Unless habitat units are measured in a standardized manner (with the understanding that units change over time based on stream channel changes), results will vary. Consider the example of an instream digger log structure in a 100-foot-long run with the objective of scouring a pool and increasing shelter. Even if the treatment performed optimally, it would probably only alter the habitat in 20-25 percent of the run. If 75 percent of the habitat unit, or the "treatment area" (as defined in the revised instructions), was still a run, the conclusion would have to be that the digger log structure had not been effective in creating pool habitat, even if it had created significant scour. In this case, logic could prevail and a surveyor could over-ride the instructions to reflect a more accurate depiction of structure effectiveness. However, when evaluating associated factors such as instream shelter value, "current percent of habitat unit covered by shelter" and even dominant substrate, inconsistencies in the measurement of habitat units evaluated can lead to an entirely different data set.

The revised instructions say to evaluate shelter "using DFG habitat typing procedures". If the shelter in our example was measured in context of the 100 foot unit, the increase would be minimal, rather than if it was measured in context of the targeted treatment area, (regardless of whether that area had been changed to a pool and become its own habitat unit or not). Furthermore, if one surveyor measures the habitat unit as the run and a different surveyor measures it as the treatment area surrounding the structure in a subsequent survey, the results—even the final rating—are likely to be drastically different.

One suggestion on how to remedy this is to have surveyors assess conditions in the "targeted treatment area" rather than the DFG-recognized "habitat unit" in

which the project site exists. This would more accurately reflect the effects of treatments. ***IN checklists could include an entry for "length of treatment area" to insure that it is measured in a similar manner on future visits.*** The targeted treatment area could also be defined by contractors in the pre-treatment phase.

Question #4 on the IN pre-treatment form asks, "Is there an existing pool at the treatment site?" with a sub-question asking for residual pool depth, but there is no place to record pre-project habitat unit depth if there is not an existing pool. Likewise, question #6 on the IN effectiveness form asks for residual pool depth and question #7 asks whether the treatment increased the water depth "of the existing pool". Here again, there is no place to record whether the treatment increased depths of habitat units other than pools. In cases where a structure had clearly created more depth in a habitat unit that is not currently a pool, evaluators will likely still answer question #7 "not applicable" rather than record the depth increase.

Habitat unit depth before and after instream treatments is a critical indicator of project performance and this data should be collected regardless of the pre-existing habitat type. Consider, for example, that a log scour structure was installed but habitat modification was not done during installation. The site was evaluated a year later and, though a pool had not formed, the pre-existing riffle had increased in depth by .5 of a foot. This would be valuable information in indicating that the project was on its way to satisfying the objective of scouring a pool, even if it couldn't yet be considered to have met the goal of "change in habitat type". Using the current protocol, this increase in habitat unit depth would not be recorded, except perhaps in the general comments. However, consideration of the depth increase in the riffle at the project site could very well change the effectiveness rating the treatment was assigned.

Perhaps the issue surrounding this data gap is that it is difficult to measure residual depth in a unit other than a pool. Evaluators could be instructed to look as far downstream as necessary to find tail-outs in flatwater and riffle units which would allow them to collect an accurate residual depth measurement.

The dynamic nature of streams presents a challenge when measuring residual depth at many treatment sites. In some cases, the maximum depth in a unit after a treatment may not be associated with the structure at all. Say, for example, a log scour structure was installed in an 80-foot flatwater unit. When the treatment was monitored after two years, it had increased the depth in the targeted treatment area but not yet converted the unit to a pool (which would enable it to be evaluated at a smaller scale). The maximum depth around the base of the logs was .9 but the maximum depth in the entire flatwater unit was 1.1 and occurred 40 feet downstream at a bedrock shelf on the left bank. Clearly, the maximum residual depth of the unit bears no relevance to the treatment in this case. Similar cases are common. To insure that evaluators are collecting the data most relevant to project

effectiveness, they should be instructed to document maximum depth "associated with the structure" or in the targeted "treatment area".

Question #4 on the IN effectiveness form is also confusing. It asks, "Did the treatment create the desired instream habitat type?" If an instream structure was intended to enhance depth in an existing pool, rather than create a new habitat type, there is some ambiguity in how that question should be answered. It could be answered "no" or "not applicable" but those answers may not accurately convey treatment goals or site conditions. The recommended rephrasing of questions below may help simplify this point.

We also recommend including the formula "maximum depth – depth of pool tail crest" for all questions that ask for residual pool depth in order to minimize errors in measurement.

In order to clarify the above points and insure the collection of critical data, the questions in the "Habitat Type" section of the IN pre-treatment and effectiveness checklists could be restructured. The following is a recommendation for how this could be done:

- IN pre-treatment checklist:
    1. Length of instream channel to be treated
    2. Is change in habitat type a treatment goal?
        a. Current level II habitat type
        b. Desired level II habitat type
        c. Current residual habitat unit depth at treatment site (maximum depth – depth of tail crest)
    3. Is there an existing pool at the treatment site?
        a. Current residual pool depth at treatment site (maximum depth – depth of pool tail crest)
    4. Is increasing water depth in an existing pool a treatment goal?
        a. Desired minimum residual pool depth

- IN effectiveness checklist:
    3. Current level II habitat
    4. For sites without a pre-existing pool: Did the treatment create the desired instream habitat type?
    5. For sites without a pre-existing pool: Did the treatment increase the depth of the habitat unit at the treatment site?
        a. Current residual habitat unit depth associated with structure (maximum depth – depth of tail crest)
    6. Did the treatment increase the depth of the existing pool at the treatment site?
        a. Current residual pool depth associated with structure (maximum depth – depth of pool tail crest)
    7. Did the treatment create the desired minimum residual pool depth?

8. Did the treatment decrease the depth of the existing pool?

Another minor note: Question #5a on the current IN pre-treatment form asks for "desired minimum residual pool depth". If the surveyor answers "don't know" then what is the correct way to answer question #8 on the IN effectiveness form, which reads, "Did the treatment create the desired minimum residual pool depth"? It could be answered "don't know" or "not applicable". ***If these answers represent different data results then this should be clarified in the instructions.***

On IN pre-treatment and effectiveness forms, surveyors are asked to note the dominant substrate. Associated questions about habitat type and shelter are focused on the area at or immediately downstream of most structure types. Because one of the primary objectives of weirs is to trap and sort spawning gravels, we struggled repeatedly with the questions about dominant substrate—whether we should change our focus to the area upstream of the structure when evaluating substrate changes as a result of a weir treatment. Substrates are usually very different in riffles upstream of weirs versus pools downstream of them. ***How can this question be rephrased to accurately convey substrate changes brought about by weirs capturing gravel? We recommend examining this point.***

- Implementation checklist

IN implementation #9a asks for orientation of treatment. ***We recommend that the instructions include guidance on which of the possible answers are best applied to different IN project types.*** For example, is an upstream "V" weir oriented upstream or perpendicular?

Stream crossing upgrade (CU) checklists

- Pre-treatment checklist

Question #6a asks for an estimate of past erosion volume, but it is not clear whether this is an estimate of apparent sediment loss at the feature site or, in cases where the road is blown out and resurfaced periodically, if this is an estimate of total past erosion. ***We recommend that this be specified in the instructions.***

*Questions #6c-6e contain numerous geologic terms used to describe evidence of erosion, erosion mechanisms and area. ***We recommend that these terms be clearly defined in the instructions to avoid confusion and extra time associated with defining, for example, a "void" versus a "scar".***

- Effectiveness checklist

We recommend that question #6 be rephrased, "Has sediment eroded from crossings been delivered to streams **since treatment implementation*?" to***

remind evaluators that they are evaluating conditions after the treatment was implemented for this question and its five sub-questions.

*The comments on questions #6c-6e from the pre-treatment checklist also apply to the effectiveness checklist.

Road segment upgrade (RU) checklists

- Pre-treatment checklist

  It is not clear how question #5, which asks "Is correcting road drainage facility problems a treatment goal?" should be answered if the project entails installing drainage facilities, like culverts, where none currently exists. Also, is "facility" the best term to use here? We felt that it led to some confusion with the question.

  Question #9a asks for an estimate of past erosion volume, but it is not clear whether this is an estimate of apparent sediment loss at the feature site or, in cases where the road is blown out and resurfaced periodically, if this is an estimate of total past erosion. ***This should be specified in the instructions.***

  *Questions #9c-9e contain numerous geologic terms used to describe evidence of erosion, erosion mechanisms and area. ***We recommend that these terms be clearly defined in the instructions to avoid confusion and extra time associated with defining, for example, a "void" versus a "scar".***

  Question #10a asks for the "Stream crossing to which flow and sediment will deliver". Though this could be interpreted in different ways (how does one name a stream crossing?) the Harris et al. instructions direct evaluators to record the number of the project feature at the stream crossing. ***What if the stream crossing is not a numbered project feature? This point should be clarified in the instructions.***

- Effectiveness checklist

  The method for answering question #5 should be clarified to correlate with the answers given to question #5 on the pre-treatment checklist.

  *The comments on questions #9a and #9c-9e from the pre-treatment checklist also apply to the effectiveness checklist.

*All upslope watershed restoration (HU) checklists, including EC, CU, CD, RU and RD, and instructions for HU projects should include terms and definitions of terms from Chapter 10 of DFG's California Salmonid Stream Habitat Restoration Manual.

Erosion control (EC) checklists

- Pre-treatment checklist

  Question #2 asks for location of treatment and includes SDS (side slope or slope) and UPL (upland) as possible answers. ***Clear definitions of these terms should be included in the instructions so the surveyor can determine the most appropriate answer when a site falls into the grey zone (e.g., what is a hill slope in an upland area called?).***

  *Questions #4a-4b and #6c-6d contain geologic terms used to describe evidence of instability and apparent causes, as well as evidence of erosion and apparent mechanisms. ***We recommend that these terms be clearly defined in the instructions to avoid confusion and extra time associated with defining, for example, a "void" versus a "scar".*** It is even more confusing when these terms are used interchangeably. For example, the terms gully and landslide are used to classify "evidence" of instability in question #4a but as a "mechanism" of erosion in question #6d, rather than "evidence" of erosion in question #6c.

  Question #7a asks surveyors to rate erosion potential at the treatment site. ***It is essential to incorporate the associated instructions from Harris et al. to insure that surveyors understand that this is a "qualitative evaluation of the likelihood of erosion and/or failure, not a quantitative volume estimate" (p. 107).*** **This also applies to all other HU checklists.**

- Implementation checklist

  Question #9a asks for "post-construction" methods of surface erosion control used at the project site. This vocabulary is confusing. If silt fences or settling basins were installed before construction (which is generally proper protocol), do they somehow not qualify as "post-construction" or are we incorrect in translating the meaning here? If so, it is probably too misleading for use. ***It would be more direct to remove the term "post-construction" from the question and simply ask for "methods employed".***

- Effectiveness checklist

  Question #6 asks if sediment eroded from "crossings" has been delivered to streams. In cases where typical stream crossings are not present, surveyors could waste time (be less efficient) deliberating the meaning of "crossings". The original EC checklist in the Harris et al. protocol asked "Has eroded sediment from the treatment area been delivered to channels?" (p. 115). Why was this changed? ***We recommend that the question be stated in the original language used in Harris.***

Questions #6a-6d should all state "since implementation", as originally stated in the Harris et al. checklist (p. 115) to eliminate any ambiguity as to conditions being evaluated.

Once again, we recommend that the geologic terms used in questions #6c-6d be clearly defined in the instructions to avoid confusion and unnecessary time expenditures.

Land use control/easements (LU) checklists

- Implementation checklist

In regards to question #11a, we recommend that HTW, for high tensile wire, be added to the checklist and code sheet since high tensile wire is a commonly used fencing material and could otherwise only be documented in the comments with a data entry of "other". This current format would most likely eliminate the possibility of queries of high tensile wire fences from the future database.

It would be a good idea to include an entry to document whether an exclusion fencing or other land use control project is accompanied by a riparian planting project. LU pre-treatment and effectiveness checklists ask a series of questions about vegetation before and after the project, but there is no place to document whether the vegetation changes are a result of planting or simply of the land use control, such as riparian fencing (aside from a separate RT form). Such data could reveal trends if used in site comparisons.

Revegetation treatment (RT) checklists

- Pre-treatment checklist

All three RT checklists require documentation of plant species (pre-treatment question #5a, implementation #4a, and effectiveness #8) but do not define the format for recording species name. The Harris instructions say to "enter 4 letter species code" but plant codes are not included in DFG's code list and there is no reference to a separate code list. ***Species codes should be defined and instructions included next to the checklist questions (not just in the instructions) to insure that species are recorded consistently.*** In addition, riparian planting projects frequently include numerous species of trees and understory plants. Evaluators should be instructed to choose the dominant species in question or allowed multiple entries to record the three most dominant species.

- Implementation checklist

Question #5a asks for the "minimum adequate survival of planted vegetation". It is assumed that this information should be found in the contract's statement of work. ***The source if this information should be specified in the instructions.***

- Effectiveness checklist

  Question #19 asks if the treatment increased "large woody debris recruitment potential". How is this judged? Does having a greater number of woody plants on the streambanks qualify as increasing LWD potential or do mature coniferous species need to be falling over the channel? ***Details on how to judge LWD recruitment potential should be included in the instructions.***

Vegetation control (VC) checklists

- Pre-treatment, implementation & effectiveness checklists

  As with the RT checklists, all three VC checklists require documentation of plant species (pre-treatment question #5 &8 #6a, implementation #1a, and effectiveness #5 & #11a) but do not define the format for recording species name. The Harris instructions say to "enter 4 letter species code" but plant codes are not included in DFG's code list and there is no reference to a separate code list. ***Species codes should be defined and instructions included next to the checklist questions (not just in the instructions) to insure that species are recorded consistently.*** In addition, vegetation control projects frequently address numerous species of plants. Evaluators should be instructed to choose either the dominant species in question or allowed multiple entries to record the three most dominant species.

  Most vegetation control projects funded by DFG include a revegetation component. ***It would be more efficient to incorporate revegetation questions into the VC checklists to avoid having to complete two sets of checklists at each project site.***

Treatment Type Code List

Checkdams: Including checkdam treatments in the HS Bank Stabilization treatment type category led to some confusion. In our experience, checkdams are generally used in gully stabilization, rather than bank stabilization projects. Because of this we expected to find them under the category of HU Watershed Restoration (Upslope) treatment types. Finding them in HS caused us to question whether we had used the appropriate checklists during our evaluations of erosion control projects. ***Unless there is a compelling reason for including checkdam treatments in the HS Bank Stabilization treatment type category, we recommend including them in the HU Watershed Restoration (Upslope) treatment type category.***

Bank sloping/reshaping: In one case, we evaluated a bank stabilization project that entailed shaping the bank to a 2:1 slope and planting it densely with sedge. We completed both the revegetation treatment (RT) checklists for the planting component and the streambank stabilization (ST) checklists for the bank shaping component. However, we could not find a correlating treatment type code for bank reshaping. We

defaulted to code 210 for "streambank stabilization structures (other)", but did not feel that this was an accurate representation of the treatment. ***DFG could consider including a treatment type code for bank reshaping, for cases in which it is a significant ST project feature.***

APPENDIX A – SUMMARIZED LIST OF RECOMMENDATIONS AND POINTS OF CLARIFICATION

*Please see page numbers following each recommendation for additional information.

GENERAL COMMENTS ON THE MONITORING PROGRAM

1. In an effort to improve proposed plans and project descriptions, we recommend that:
    a. Project sponsors and/or contractors conduct effectiveness monitoring where possible (p. 1).
    b. Contractors be required to conduct pre-treatment monitoring or, at the very least, review the pre-treatment checklists relevant to their project types and confirm that the answers to the questions can be found in their plans (p. 2).
    c. DFG improve data storage and access to project records where it is needed (p. 2).

KEY POINTS TO BE ADDRESSED

Effectiveness rating system

2. We recommend establishing quantitative benchmarks for the rating scale to help reduce subjectivity in the rating system (p. 3).

Timing of monitoring visits

3. In regards to the timing of monitoring visits, we recommend that:
    a. DFG produce standardized guidelines to govern the timing of effectiveness monitoring visits (p. 4).
    b. DFG mandate that implementation monitoring be conducted within the first year after project implementation (p. 5).

Miles of stream treated/affected

4. In regards to the issue of miles of stream treated/affected, we recommend that:
    a. It be clearly stated which project types (if not all) should be considered when determining this figure (p. 5).
    b. DFG establish parameters to guide the determination of this figure for various project types (p. 6)

Collection of "optional" data

5. We recommend that DFG mandate the completion of all applicable effectiveness checklist questions for every site visited (p. 6).

GENERAL CHECKLIST COMMENTS AND RECOMMENDATIONS

Survey direction

6. We recommend that the instructions state that project features should be numbered and surveyed in a downstream to upstream direction (p. 6).

Bank angle

7. We recommend that bank angle be recorded in degrees from horizontal (p. 7).

Photo location documentation

8. We recommend adding an entry on the photo description form to document the location of digital photos (p. 7).

Site address

9. We recommend adding an entry for site address on the site access and location form (p. 7).

Project title

10. We recommend including an entry for project title on all forms, to be used when the project title differs from the contract name (p. 7).

Project feature identification

11. In regards to project feature identification, we recommend that:
    a. The instructions include guidelines on how to break sites down into separate project features (p. 8).
    b. Surveyors be instructed to include a description of what constitutes each project feature in the comments section of the implementation form (p. 8).

Clarification of "approved"

12. We recommend that questions containing the word "approved" be clarified on several different implementation checklists, including RD #3 & 12; ST #4, 5, 11, 13 & 14; CD #6, 10 & 17; CU #5, 8, & 18; IN #6; RT #9-12; RU #4-6, 10, 11 &13; and EC #6, 9 &11 (p. 8).

Implementation date

13. We recommend that surveyors be instructed to refer to the implementation date on the implementation checklist summary forms when rating the effectiveness of a project (p. 11).

Approved project goals

14. We recommend including summarized project goals at the top of the effectiveness checklists (p. 12).

"Maintenance or repair" entry

15. In regards to the "maintenance or repair" entry on all effectiveness checklists, we recommend:
    a. Numbering the question, "Does this feature need maintenance or repair?" so it is easy to locate correlating comments by question number (p. 12).
    b. Including an entry to document when problems at the site warrant further treatment even if the treatment itself does not require maintenance or repair (p. 13).

Comments

16. We recommend that the final instructions direct evaluators to document all beneficial or deleterious effects of treatments at each site in the comments section of the effectiveness checklists (p. 13).

SPECIFIC CHECKLIST QUESTIONS AND COMMENTS

Project implementation checklist summary

17. We recommend that the term "4th Field HUC" be defined in the instructions, along with information on how to obtain that data (p.14).
18. We recommend that the goal of the question "Does the project address issues identified in a watershed plan or limiting factors analysis (LFA)?" (and associated subquestions) be evaluated by DFG, that the question be rephrased to reflect that goal and that the instructions pertaining to that question be drafted accordingly (p. 14).
19. In the instructions for both the implementation and effectiveness checklist summaries, we recommend that surveyors be reminded that the "total # of project features" and "# of project features" should be recorded consistently on all forms (p.14).

Project effectiveness checklist summary

20. We recommend that the component of the overall project effectiveness rating formula that dictates that projects in which 50 percent or less of the features

received a rating of fair or lower should receive a rating of failed be revised (p. 14).

21. In regards to stressing events, we recommend that:
    a. Instructions direct evaluators to the source of information on stressing events and point them to alternatives when no site-specific information is available (p. 15).
    b. The project effectiveness checklist summary form identifies the preferred units in which to record stressing event (p. 15).

Streambank treatment (ST) checklists

- Pre-treatment checklist

22. We recommend that entries asking for "length of bank treated" be rephrased to ask for "length of streambank stabilized" and that instructions specify how to determine that length. This also applies to the ST implementation and effectiveness checklists (p. 16).
23. We recommend restructuring questions about channel problems to ask surveyors to record channel problems only if they are relevant to the treatment being evaluated. As an alternative, the question could ask for "apparent or visible channel problems at treatment site". This applies to ST, LU, IN, RT, VC, FP, CD & CU pre-treatment and effectiveness forms (p. 15).
24. We recommend that DFG add pre- and post-treatment canopy cover assessments to the ST pre-treatment and ST effectiveness checklists (p. 16).

- Implementation checklist

25. We recommend that a standardized method of recording plant species be developed and that this method be indicated on the checklist. This also applies to all RT and VC checklists (p. 16).
26. In regards to question #5b, which asks if there is an "agreement in place to assure irrigation will be completed?", we recommend:
    a. That the question be elaborated to include irrigation maintenance.
    b. Changing the word "assure" to "insure" (p. 16).

- Effectiveness checklist

27. We recommend that the instructions for questions #8 and #13 direct surveyors to look for problems on opposite banks, downstream and upstream of the project site. The question could also be rephrased to ask for undesirable effects "in the vicinity of the project site" (p. 16).
28. We recommend that a sub-question of #22 ask "was this vegetation planted or recruited naturally?" (p. 16).

Instream treatment (IN) checklists

- Pre-treatment & effectiveness checklists

29. We recommend that entries asking for "length of channel treated" be rephrased to ask for "length of habitat improved" and that instructions specify how to determine that length (p. 17).
30. In regards to defining treatment areas as habitat units, we recommend that:
    a. Surveyors be directed to assess conditions in the "targeted treatment area" rather than the DFG-recognized "habitat unit" in which the project site exists (p. 17).
    b. IN checklists include an entry for "length of treatment area" (p. 17).
31. We recommend including the formula "maximum depth – depth of pool tail crest" for all questions that ask for residual pool depth (p. 19).
32. We recommend that the questions in the "Habitat Type" section of the IN pre-treatment and effectiveness checklists be restructured as indicated on page 19.
33. We recommend including instructions on how to answer question #8 on the IN effectiveness form (which reads, "Did the treatment create the desired minimum residual pool depth?") if the answer to question #5a on the IN pre-treatment form (which asks for "desired minimum residual pool depth") is "don't know", but only if the answers "don't know" or "not applicable" represent different data results (p. 20).
34. We recommend examining how questions regarding dominant substrate can be rephrased to accurately convey substrate changes brought about by weirs capturing gravel. This also applies to the IN effectiveness checklist (p. 20).

- Implementation checklist

35. We recommend that the instructions include guidance on which of the possible answers for "orientation of treatment" (question #9a) are best applied to different IN project types (p. 19).

Stream crossing upgrade (CU) checklists

- Pre-treatment checklist

36. We recommend that instructions for question #6a specify whether "past erosion volume" is an estimate of apparent sediment loss at the feature site or, in cases where the road is blown out and resurfaced periodically, an estimate of total past erosion. This also applies to the RU pre-treatment checklist (p. 20).
37. We recommend that geologic terms used to describe evidence of erosion, erosion mechanisms and area be clearly defined in the instructions. This applies to all HU checklists (p. 20).
38. We recommend that all HU checklists, including EC, CU, CD, RU and RD**,** and instructions for HU projects include terms and definitions of terms from Chapter 10 of DFG's *California Salmonid Stream Habitat Restoration Manual* (p. 21).

- Effectiveness checklist

39. We recommend that question #6 be rephrased to read, "Has sediment eroded from crossings been delivered to streams *since treatment implementation*?" (p. 21).

Road segment upgrade (RU) checklists

- Pre-treatment checklist

40. In regards to question #5, which asks "Is correcting road drainage facility problems a treatment goal?", we recommend:
    a. Clarifying how this should be answered if the project entails installing drainage facilities, like culverts, where none currently exists (p. 21).
    b. Re-considering the use of the term "facility" here (p. 21).
41. We recommend that instructions for question #10a (which asks for the "Stream crossing to which flow and sediment will deliver") offer guidance on how to answer this question if the stream crossing is not a numbered project feature (p. 21).

- Effectiveness checklist

42. We recommend clarifying how question #5 should be answered to correlate with the answers given to question #5 on the pre-treatment checklist (p. 21).

Erosion control (EC) checklists

- Pre-treatment checklist

43. We recommend that clear definitions of the terms SDS (side slope or slope) and UPL (upland), used in question #2, be included in the instructions (p. 22).
44. In regards to question #7a, which asks surveyors to rate erosion potential at the treatment site, it is essential to incorporate the associated instructions from Harris et al. (p. 22). This also applies to all other HU checklists.

- Implementation checklist

45. We recommend removing the phrase "post-construction methods" from question #9a, which asks for methods of surface erosion control used at the project site, and replacing it with "methods employed" (p. 22).

- Effectiveness checklist

46. We recommend that question #6 be stated in the original language used in Harris P. 22).
47. We recommend that questions #6a-6d all end with "since implementation" (p. 23).

Land use control/easements (LU) checklists

- Implementation checklist

48. We recommend that HTW, for high tensile wire, be added to question #11a of the checklist and to the code sheet (p. 23).
49. We recommend including an entry to document whether an exclusion fencing or other land use control project is accompanied by a riparian planting project (p. 23).

Revegetation treatment (RT) checklists

- Implementation checklist

50. We recommend that instructions specify where surveyors can find the answer to question #5a, which asks for the "minimum adequate survival of planted vegetation" (p. 23).

- Effectiveness checklist

51. We recommend that details on how to judge LWD recruitment potential be included in the instructions (p. 24).

Vegetation control (VC) checklists

Pre-treatment, implementation & effectiveness checklists

52. We recommend incorporating revegetation questions into the VC checklists (p. 24).

Treatment Type Code List

53. We recommend including checkdam treatment types in the HU Watershed Restoration (Upslope) treatment type category, rather than the HS Bank Stabilization treatment type category (p. 24)
54. We recommend that DFG consider including a treatment type code for bank reshaping, for cases in which it is a significant ST project feature (p. 25).