

2009 Temporary Best Management Practices Evaluation Program Report

USDA Forest Service
Lake Tahoe Basin Management Unit



Nicole Brill and James Harris, Hydrologists
LTBMU Department of Ecosystem Conservation
Revised May 2010

EXECUTIVE SUMMARY

This report was revised May 2010, in response to comments and discussion with Lahontan Regional Water Quality Control Staff regarding their observations of BMP performance during the October 2009 storm event. The majority of revisions are contained in the text presented in Appendix A, and identify several additional minor, and one major BMP implementation deficiencies. In addition, it is acknowledged that an overall procedural deficiency occurred related to the continued implementation of projects past the October 15th grading deadline, resulting in the LTBMU not complying with winterization requirements specified in Lahontan water quality permits for the projects described in this report.

The LTBMU's Temporary Best Management Practices (TBMPs) Evaluation Program is designed to monitor temporary BMPs applied to forest construction and restoration projects which have the potential for short term adverse impact to soil and water quality during implementation. Patterned after the Region 5 Best Management Practices Evaluation Program (BMPEP) process (USFS, 2002), protocols were developed to systematically assess and document implementation and effectiveness of TBMPs.

TBMPs are required during all construction in the Tahoe Basin where soil disturbance is involved. TBMPs differ from permanent BMPs as they are designed to remain effective only until construction is complete and permanent BMPs can be applied. Depending on the nature of the activity and site characteristics, a variety of different BMPs may be employed to prevent sediment from mobilizing.

The following 6 projects were evaluated in 2009:

- Tallac Creek Bridge
- Valhalla Pier
- Pope Beach Toilet
- Fallen Leaf Campground
- Blackwood Creek Stream Restoration Phase IIIa
- Angora Water Tank Road

Minor deficiencies were documented at 4 sites. After informing the project manager however, these deficiencies were quickly resolved. Major deficiencies were documented at 2 sites (Tallac Creek Bridge and Valhalla Pier) which allowed sediment to be transported to a SEZ (Stream Environment Zone). These deficiencies occurred during a large late season storm event (25 year recurrence interval). A rating is considered a minor deficiency, if eroded sediment did not reach or have the potential to reach, a SEZ. A rating is considered a major deficiency, if sediment did reach, or had the potential to reach a SEZ. This rating does not imply anything about the amount of sediment that may have been transported.

The full narrative description describing BMP effectiveness deficiencies during the October 13th, 2009 storm event is presented in a separate Appendix to this report entitled; *Summary of Post-storm BMP Monitoring Evaluations for October 13th, 2009 Storm Event.*

Communication between project managers and monitoring staff has improved since 2007 to: 1) ensure TBMP evaluators are fully cognizant of TBMP designs and specifications, and 2) ensure a timely response (within 48 hours) to correct TBMP deficiencies identified during evaluations.

TABLE OF CONTENTS

I.	Introduction.....	5
II.	Methodology.....	5
III.	Results.....	5
IV.	Conclusions.....	8
V.	References.....	8

Appendix A: Summary of Post-storm BMP Monitoring Evaluations for October 13th, 2009 Storm Event. (Page 9 to16)

I. Introduction

Temporary Best Management Practices (TBMPs) are required during all construction in the Lake Tahoe Basin Management Unit (LTBMU) that involves temporary soil disturbance. TBMPs differ from permanent BMPs as they are designed to remain effective only until construction projects are completed and permanent BMPs can be applied. Depending on the nature of the activity and site characteristics, a variety of different BMPs may be employed to prevent sediment from mobilizing.

The LTBMUs TBMP Monitoring program is designed to monitor temporary BMPs applied to Forest construction and restoration projects which have the potential for short term adverse impact to soil and water quality. Patterned after the Region 5 BMPEP process (USFS, 2002), protocols were developed to systematically assess and document the following:

Implementation

- Were TBMPs incorporated in NEPA documents and contracts?
 - Were they implemented on the ground?
 - Were they constructed according to design specifications and permit requirements?

Effectiveness

- Were TBMPs effective in controlling erosion and sediment delivery to surface water bodies?
- Were problems observed with TBMPs addressed in a timely manner?
- Did corrective actions remedy problems with TBMPs?

Protocols for this program are documented in the LTBMU, TBMPs Monitoring Plan, August 2006 (USFS LTBMU, 2006). For projects where required, this monitoring program fulfills the Lahontan Regional Water Quality Control Board Stormwater Pollution Prevention Plan (SWPPP) requirements to inspect, report, maintain, repair, and monitor TBMPs.

II. Methodology

The complete description of protocols can be found in the LTBMU Temporary BMP Monitoring Plan, August, 2006 (USFS LTBMU, 2006), and is available upon request. At the end of May, 2009, the Engineering and Ecosystem Departments provided the monitoring staff with a list of planned forest construction projects for 2008. Once the project list had been finalized, monitoring staff contacted the project manager for each project to collect all relevant planning and design specifications pertaining to temporary BMP implementation. The plans and specifications were evaluated to determine if appropriate TBMPs were identified and constructed according to design specifications.

Effectiveness monitoring was conducted periodically during construction, after precipitation events, after winterization (if applicable) and in spring (if applicable). Post-storm monitoring is conducted, if based on measurements from the nearest precipitation gauging station; a measurement of approximately 0.5 in/hr was documented. A significant event occurred on

October 13th/14th, during the 2009 construction season (2.75 to 8” inches of rain within 24 hours), and results were included in this monitoring report. Monitoring continues until TBMPs are removed.

The following projects were selected for TBMP monitoring in 2009.

Table 1: Projects selected for TBMP monitoring in 2009

Project Name	Project Type	Potential Threat	Construction Years
Tallac Creek Bridge	Bridge Construction	Water Quality of Tallac Creek & Lake Tahoe and SEZ soil	2009/2010
Valhalla Pier	Pier Access Improvement	Water Quality of Lake Tahoe	2009/2010
Pope Beach Toilet	Facility Construction	Water Quality of Lake Tahoe	2008-2010
Fallen Leaf Campground	BMP Retrofit	Water Quality of Taylor Creek & Lake Tahoe, and SEZ soil	2009/2010
Blackwood Creek Stream Restoration Phase IIIa	Stream Channel Construction	Water Quality of Blackwood Creek and Lake Tahoe	2008-2009
Angora Water Tank Road	Road Construction	Sediment and Erosion Control	2009

III. Results

A summary of the results of the 2009 TBMPs monitoring is outlined in Table 2. The results are presented in terms of minor deficiencies and major deficiencies in implementation and effectiveness. An implementation rating is considered a minor deficiency if less than ¼ of the BMPs were not implemented, and the lack of implementation posed very little threat to water quality. An implementation rating is considered a major deficiency if more than a ¼ of the prescribed BMPs were not implemented throughout various times and locations in the project, or if any given BMP implementation failure resulted in, or had the potential to result in, fine sediment transport to a water body. An effectiveness rating is considered a minor deficiency, if eroded sediment did not reach or have the potential to reach, a SEZ (Stream Environment Zone). An effectiveness rating is considered a major deficiency, if sediment did reach, or had the potential to reach a SEZ. Ratings do not imply anything about the amount of sediment that may have been transported, and are based on the professional judgment of the evaluator.

Table 2: SUMMARY OF 2009 TEMPORARY SITE BMP DEFICIENCIES

Project	Date Surveyed	INITIAL IMPLEMENTATION		EFFECTIVENESS (Post Implementation)	
		Where Prescribed	Implemented	Minor Deficiencies	Major Deficiencies
Tallac Creek Bridge	8/24,9/14,9/30,10/14,10/28	NEPA and Design Plan	Major Deficiency *	Sediment Control*, Management of Stockpiles*	Water Diversion Structures*, jetting of fines*
Valhalla Pier Accessibility Retrofit	8/31, 9/30,10/14,10/28	NEPA and Design Plan	Major Deficiency*	None	Erosion control*
Pope Beach Toilet	9/14, 9/30, 10/14,10/28	NEPA and Design Plan	Minor Deficiency*	Management of stockpiles, concrete waste disposal*	None
Fallen Leaf Campground BMP Retrofit	9/12,9/24,9/3010/14,10/28	NEPA and Design Plan	Minor Deficiency*	Dust control Designation of construction and equipment exclusion zone Sediment control*	None
Blackwood Creek Stream Restoration Phase IIIa	7/22,8/21,8/28,9/2,9/14,9/30 10/14	NEPA, Design Plan, SWPPP	Successfully Implemented	None	None
Angora Water Tank Road	8/18,9/1,9/14,10/14,10/28	Design Plan, Special Use Permit	Successfully Implemented	Hazardous material storage Management of Stockpiles Erosion Control* Sediment Control*	None

*Deficiency occurred during October 13th storm event.

The narrative of results is presented a little differently this year because of the post storm monitoring conducted after the October 2009 event. We wanted to present a complete description of that entire effort, which included both TBMPs as well as BMPEP monitoring protocols. The complete narrative describing the nature of BMP deficiencies utilizing both protocols is therefore provided in Appendix A: *Summary of Post-storm BMP Monitoring Evaluations for October 13th, 2009 Storm Event.* Please refer to this Appendix for the complete narrative regarding the nature of all documented TBMPs deficiencies during this event, including remediation actions and recommendations. In the table above the deficiencies that occurred during this storm event on noted by an asterisk. (For a full description of all BMPEP monitoring conducted in 2009 please refer to the separate report that documents that effort (USFS, 2010)).

The following narrative describes TBMP evaluations conducted **prior** to the October 13th storm event.

Tallac Creek Bridge

A departure from the erosion control plan was documented because of the use of an area within the SEZ as a staging area. The contractor stored equipment such as a roller, excavator, generator and small front loader in this staging area. Material stockpiles such as rocks and building materials were also stored in this area. Project engineers consulted with Lahontan staff, and it was determined this area within the SEZ could continue to be used by the contractor, with the installation of berms, filter fence, and coir logs to prevent any construction materials from leaving the staging area.

Vahalla Pier

No deficiencies observed.

Pope Beach Toilets

The stockpile area did not have adequate sediment control BMPs installed as prescribed in the design plans (coir logs or sediment fence). Also a prescribed sediment fence to enclose the area was 30 feet shorter in length, than indicated in the design plan. Once informed, the project manager addressed these BMP implementation deficiencies within 48 hours.

Fallen Leaf Campground

The material stock piles near the Moraine Trailhead Parking Lot were observed outside the delineated construction zone, and hikers were observed walking through this offsite work area. Fugitive dust were also observed leaving the site, because sediment control BMPS were not prescribed or implemented for these unauthorized stockpiles. This unauthorized stock pile area was subsequently closed to construction activities, once the project manager was informed of the problem.

Blackwood Creek Stream Restoration

No deficiencies observed.

Angora Water Tank Road

TBMP design departures identified during the August evaluations included a lack of spill prevention and hazardous material placards for a 100 gallon fuel tank, and stockpiles were observed uncovered while not actively being worked. Both of these departures were addressed within 48 hours after informing the project manager.

Copies of the actual BMP evaluation forms are available upon request at the LTBMU.

IV. Conclusions and Recommendations

Out of the six projects evaluated, TBMPs were rated as implemented as designed and effective at preventing adverse impacts to soil and water quality at two of the projects. Of the four remaining projects, two experienced major deficiencies in TBMP implementation and effectiveness, and two experienced minor deficiencies in implementation and effectiveness. For the two projects experiencing minor deficiencies,, project leaders quickly corrected the deficiencies documented, and no sediment (including fines) was transported to a water body, nor did the degree of erosion cause damage to soil function, as a result of the minor BMP deficiencies documented.

At the other two projects, all TBMPs were not implemented as designed resulting in major effectiveness failures during the October 13th storm event. The BMP effectiveness failure at the Tallac Creek bridge replacement project resulted from a failed diversion pipe. At the Valhalla Pier Project, plastic sheeting installed to protect disturbed soils resulted in a high volume of runoff that then overwhelmed downslope coir logs and sediment fencing. *In addition it is acknowledged that an overall procedural deficiency occurred to all four of the projects experiencing both minor and major deficiencies, related to the continued implementation of projects past the October 15th grading deadline without a grading exemption. This resulted in the LTBMU not complying with winterization requirements specified in Lahontan water quality permits for the projects described in this report. All of these projects were originally planned to be completed prior to October 15th as described in the NEPA decision and permit documents. Planning and notification for operating past October 15th was not adequate and contributed to the deficiencies that occurred during the October 13th storm event.*

A full description of implementation and effectiveness failures, and recommendations for improvements are described in the attached October 13th Post-storm monitoring report presented in Appendix A.

TBMP evaluations will be scheduled for the projects that will still be in construction during 2010, including evaluation of winterization TBMPs. This includes Tallac Creek Bridge, Valhalla Pier, Pope Beach Toilet, and Fallen Leaf Campground.

IV. References

USDA Forest Service. 2006. LTBMU Temporary BMP Monitoring Plan, LTBMU, South Lake Tahoe, CA.

USDA Forest Service. 2002. Investigating Water Quality in the Pacific Southwest Region: Best Management Practices Evaluation Program (BMPEP Users Guide); Pacific Southwest Region; Vallejo, CA.

USDA Forest Service. 2010. 2009 Best Management Practices Evaluation Program Report, LTBMU, South Lake Tahoe, CA.

Appendix A

Summary of Post-storm BMP Monitoring Evaluations for October 13th, 2009 Storm Event

BMP Monitoring Evaluations were conducted following a major storm event that occurred on October 13th and 14th of 2009. This approximately 25 year precipitation frequency event was of sufficient magnitude (2.75" to 8" inches/24 hours around the Basin) to warrant post-storm monitoring of not only those projects which were still active at the time of this storm, but also other projects which had been completed earlier in the summer.

LTBMU Temporary BMP (TBMP) monitoring protocols were utilized for active construction projects. TBMPs are defined as the temporary erosion and runoff control measures required for soil disturbing activities that occur during construction projects in the Tahoe Basin, such as for facilities retrofit and stream channel restoration projects. TBMPs differ from permanent BMPs as they are designed to prevent erosion primarily during construction activities, and to remain effective only until construction is complete and permanent BMPs can be applied. These TBMPs are described in general terms in NEPA document design features, and presented in detail on final project design plans, and in storm water prevention plans for projects permitted through the Lahontan Water Quality Control Board.

For TBMPs the results are presented in terms of minor deficiencies and major deficiencies in implementation and effectiveness. A rating is considered a minor deficiency, if eroded sediment did not reach or have the potential to reach, an SEZ (Stream Environment Zone). A rating is considered a major deficiency, if sediment did reach, or had the potential to reach a SEZ. This rating does not imply anything about the amount of sediment that may have been transported. A total of five TBMP evaluations were conducted for 5 active construction projects.

Regional BMPEP protocols were applied to completed construction projects, and all non-construction projects. A total of eleven BMPEP evaluations were conducted for 7 projects. BMPs for non-construction projects and completed construction projects are described in the USFS BMP handbook. These BMPs are also frequently described in further detail in the project specific design features presented in the NEPA analysis. If the work is conducted through a contractor, further specificity can be found in contract documents. These protocols were applied to vegetation management projects, road and trail BMP retrofit projects, and a completed stream channel restoration project. Please refer to the BMPEP User's guide or the Annual BMPEP Reports for a description of the rating system for these evaluations.

Temporary BMP Evaluations (for active construction Projects)

Facilities retrofits (all active)

- Fallen Leaf Campground
- Pope Beach Toilets
- Tallac Creek Bridge
- Vahalla Pier
- Angora Water Tank Road

BMPEP evaluations

Watershed Restoration

Blackwood Creek Phase IIIB (completed)

Trail BMP Retrofits

Barker Pass Road Slide Repair (completed)

Daggett Summit Trail (completed)

East Shore Trail (active)

Vegetation Management

Quail/Mckinney (active)

Round Hill (completed)

Angora Hazard Tree (active)

Facilities Retrofits

Fallen Leaf Campground (Minor Deficiency)

Fallen Leaf Campground was still undergoing permanent BMPs retrofits during the October 13th storm. Permanent BMP retrofits include paving the Moraine Trailhead Parking lot, construction of a sediment retention basin, redefining the lake access trail, upgrading a stream crossing, and redefining campsite spurs to reduce impervious coverage. Of these permanent BMPS, 80% were completed, and 20% were still in progress. TBMPS included sediment fence and coir logs, which were implemented as designed. There was one minor deficiency in BMP implementation in that the mulch material to be placed on restored soils (removed pavement), was not available to be put in place right after treatment. Wood chips should have been on site ready to install soon after pavement and soil restoration occurred, so these sites would have already been protected from rainfall splash erosion and compaction during the storm event.

Although post-storm monitoring conducted on October 14th identified numerous areas where sediment fence was eventually rendered ineffective by wind and storm water during the October 13th event, no significant erosion was observed and no sediment left the site.

Pope Beach Toilets (Minor Deficiency)

Upgrading of the two restrooms at Pope Beach, was still in progress during the October 13th storm event. One minor BMP implementation deficiency did occur related to management of concrete waste. Just prior to the storm event the contractor washed out a truck containing concrete waste onto a constructed ramp within the project, protected by two layers of silt fence. There was also concrete waste present on SEZ soils within the project area adjacent to the foundation. There was no transport of concrete or fill during the storm event, however concrete wastes may have leached contaminants into underlying or adjacent SEZ soils. Because of the

overall volume of concrete waste involved, and the fact that most of this did occur on fill material that will be removed, it is believed soil and water quality impacts will be minimal. All other TBMPs were implemented and effective during the post-storm site visit conducted on October 14th. Some silt fences did fail during the storm, and required constant maintenance throughout the project as this BMP is difficult to maintain in the beach sand substrate present at this site. This type of BMP may not be the best choice for this type of substrate, and other alternatives should be considered in future projects. There was no evidence of erosion or sediment transport at this site during or after the storm event.

Tallac Creek Bridge (Major Deficiency)

Post-storm monitoring of this project occurred on Oct. 14, 2009. Most TBMPs were implemented as initially designed, and as prescribed during site visits just preceding this storm event. However BMP implementation did occur related to water diversion during the storm event, which also contributed to a major BMP effectiveness failure.

A water diversion structure was installed to route flow in Tallac Creek around the bridge construction site and back into the stream channel below, via a sediment basin. The diversion was initially implemented as designed, consisting of a sandbag coffer dam which funneled water into a 12 inch flexible plastic pipe. During construction the pipe had to be moved and the contractors' relocation of the pipe, along with the methods used for construction of pipe joints, was not adequate to handle this storm event. The location of the pipe after it was moved resulted in the pipe having to transport flow "uphill" against a 5 foot elevation gain. The baling wire used to hold the pipe joints together was not able to handle the amount of pressure put on the pipe joints, against the 5 foot head during the flow volumes experienced during this event. The 12 inch pipe failed because the degree of leaking at the pipe joint created saturated conditions in the soils around the pipe, which eventually collapsed into the excavated area, and caused a total failure of the pipe.

Failure of the pipe resulted in diverted water discharging directly into the excavated area. During the first 8 hours after this occurred when the contractor was trying to repair the failed pipe, the contractor pumped turbid water directly out of the excavated area, and into the stream channel below. This was a deviation from the BMP prescription which was to pump water to an upslope location where flow would disperse and infiltrate away from the stream. This action was corrected when detected by USFS staff. The entire failure of the water diversion BMP is judged to constitute a major BMP effectiveness failure because stream channel turbidity increased from 4 NTUs above the project to 584 NTUs below the project during the storm event.

Recommendations to prevent this type of diversion pipe failure to occur in the future include:

- Perform more rigorous inspection of pipe joints, particularly segments of pipe and pipe joints that are either buried and/or flowing under pressure rather than just gravity.
- Perform more rigorous inspection of pipe alignments adjacent to excavations, to make sure the pipe is secured and cannot settle once full, creating stress on pipe joints.

- Provide more detail in contract document regarding installation and maintenance of flow diversions, including specifying the horizontal location of the pipe alignment and vertical grade of the pipe.

Although implemented as designed, some sediment control TBMPs were knocked down or overwhelmed during the storm event (stockpile covers, filter fence, and coir logs). In general the practice of utilizing plastic sheeting to protect stockpiles during rain events should be re-evaluated. This BMP can be effective at reducing air borne transport of fine sediment particles, but during rain events concentrates flows and does not allow for infiltration. There were also minor implementation deficiencies related to coir log placement throughout the project (gaps between and under coir logs). No additional sediment transport to Tallac Creek was observed as a result of these BMP failures, other than what occurred as a result of the failed diversion pipe. All TBMPs were repaired and fully functioning again by October 29th including the installation of new BMPs as determined through communications with Lahontan staff. New BMPs included additional silt fence, rerouting of groundwater diversion discharge, and wood chips on disturbed surfaces.

A BMP deficiency may also have occurred related to the jetting of fines on the reconstructed channel. Jetting of fines is seldom 100% successful with one application of the treatment, and experience on past projects indicates that some areas often require multiple treatments. The amount of loose soils still present after jetting was supposed to be complete at this project was sufficient for Lahontan inspectors to require fines to be re-jetted on a portion of the channel. Standards are not defined for determining when the level of jetting is sufficient, and this determination is typically made based on the professional judgment of project leaders. Future design specifications should establish criteria for determining when this BMP has been successfully implemented.

A BMP implementation deficiency also occurred related to the application of aggregate on a section of temporary access road leading to the stream crossing. This was prescribed by Lahontan staff for implementation soon after the storm event, but was not implemented by the contractor until a week before the end of the project. The project was closed with all BMPs in place for the winter by December 1st.

Valhalla Pier (Major Deficiency)

The project to reconstruct the Valhalla pier was also still ongoing during the October 13th storm. Post-storm monitoring performed on Oct. 14, 2009, identified rilling at the base of the site (2 inches to 3 inches wide, by 1 inch to 4 inches deep). Off-site effects were observed in the form of sediment deposits being transported to within 20 feet of Lake Tahoe.

Offsite erosion resulted because an appropriate soil cover BMP was never prescribed to prevent transport of disturbed/loose soils within the construction site, to be applied if needed while the project was still under construction. An appropriate BMP would have been materials that would allow infiltration while preventing sediment transport. However because these materials were not available on site, project and regulatory staff decided in the short time frame available to do something to install a large plastic sheet to cover recently placed fill within the construction area.

The plastic sheet had the effect of capturing all rain water and channeling it to the base of the construction site where it broke through and undermined the sediment fence and coir logs.

Erosion and sediment transport offsite would likely not have occurred if erosion control methods to provide soil cover had been properly prescribed during project planning and design, such as jute matting, straw or wood chips which will promote infiltration of rain water as opposed to collecting and channelizing it. Plastic sheeting should only be prescribed to prevent wind erosion of stock piled materials.

Angora Water Tank Road (Minor Deficiencies)

This road upgrade is located at Angora Ridge near Upland Way and was implemented under special use permit to the South Tahoe Public Utility District. The design plan for permanent BMPS included water bars, a rock-lined drainage ditch, an infiltration basin and prefab drywell to prevent erosion and sediment transport from 630 feet of road length. This project was still active during the storm. All TBMP's were properly implemented prior to the October 13th/14th storm, and were effective at preventing off site transport of sediment during the storm.

In addition to the three coir log waterbars specified in the design plans, three additional coir logs were installed across the road prior to the forecast storm, for a total of six coir logs spaced along the 630 feet of road. The two upper coir log waterbars functioned as designed, however the third failed due to filling with sediment and over topping, and the fourth and fifth coir log failed due to undermining. Fortunately the sixth coir log was effective and prevented any eroded sediment from being transported off site. As a result only minor rilling occurred (1 inch deep x 3 inches wide x 90 feet in length) within the road bed, and no sediment left the site or was transported into a SEZ.

Some sediment from material stockpiles was transported off site due to the filter fence being overwhelmed during the storm event. The bottom of the filter fence was pulled out of its keyed position, allowing runoff and sediment to flow beneath the fence. However sediment was transported less than 10 feet from the fence and did not reach the SEZ located 1000 feet away. The road work was completed on November 1st with permanent BMPs installed in accordance with design documents.

Watershed Restoration

Blackwood Canyon Phase III (I/E)

This project involved the reconstruction of 2,800 feet of channel and associated floodplain within Blackwood Creek, and was completed on October 9, 2009.

The post-storm BMPEP evaluation for in-channel construction practices (E13) conducted on October 14th, 2009, determined that stream restoration features functioned as designed and were effective at reducing the erosive nature of the pre-restoration stream channel. Some increases in turbidity did occur below the reconstructed channel reach during this event (20 NTUs above compared to 130 NTUs below) due to the recent completion of construction activities and

associated areas of unseated sediments, and the expected level of channel scour for this magnitude of event. As described in the NEPA document, the design approach assumes that the channel will remain dynamic during large scale events, while keeping channel erosion away from the high floodplain terraces, and maintaining the overall integrity of the channel morphology. The project was successful in keeping channel erosion away from the high floodplain terraces, and experiencing the large scale bank erosion and collapse that has occurred during previous high flow events within this reach prior to restoration (Blackwood Implementation Monitoring Report, 2009). In addition, overall channel morphology appears to have been maintained and areas of fine sediment deposition were observed within the newly constructed floodplain after this event.

Trail BMP Retrofits

Barker Pass Road Slide Repair (completed July 17th) I/E

This project, which repaired a 62 foot by 50 foot area of unstable fill-slope on the upper section of Barker Pass Road, was completed July 17, 2009. The project used approximately 100 cubic yards of boulders to construct a retaining buttress designed to stabilize the road fill slope and minimize erosion. No evidence of erosion or sediment transport was observed during the post-storm BMPEP evaluation (protocol E08).

Daggett Summit Trail (completed September 11th) I/E

Three miles of trails were decommissioned and/or rerouted. Decommissioned trail segments were tilled and covered with wood chips, branches and rocks. The project was completed on September 11, 2009, and post-storm monitoring BMPEP monitoring occurred on October 14th (protocol E08). Several rills (less than 0.5" deep and approximately 1" wide of varying lengths of 20' to 60') were observed in the trail surface and fill-slopes. No rills or eroded sediment, extended beyond the toe of the fill-slope or into an SEZ. Trail engineer were informed of these conditions and follow-up trail maintenance, which included recommended additional rolling dips, was completed by October 29th.

East Shore Trail (I/E)

This project includes 3.5 miles of decommissioned and rerouted trail which extends from Marlette parking lot to Chimney Beach. The new trail was built on a steep slope using reverse grade, rolling dips and rock steps, and all work on the new trail was completed by August 15th. The new and old trail was evaluated two weeks after the October 13/14th storm. No evidence of erosion or sediment transport were observed on the new trail sections, however there was a deep rill (2.5" x 4" x 30') on the trail section that had not yet been decommissioned. Trail engineers were informed of the above erosion feature and decommissioning was completed by November 13th. (E08)

Vegetation Management

Two of the fuels reduction projects below were still in progress during the October 13th storm event, and one was completed. The following BMPEP protocols were used for these storm event evaluations, as appropriate: T04-Landings, T02-Skid Trails, E14-Temporary Roads, and E09-Stream crossings.

Quail/Mckinney (I/E)

This active site was evaluated on October 15th after the October 13th storm event and again on October 20th following a minor rain event. Both evaluations on temporary roads and landings determined that all BMP's were implemented correctly in accordance with the NEPA decision and contract specifications, and were effective at preventing eroded sediment from leaving the site. Erosion was limited to minor rilling between waterbars and coir logs. There were no stream crossings in place within the project area during the storm event, and cut to length equipment was used for fuels treatments. (E14, T04)

Round Hill (I/E)

The evaluation was performed on a randomly selected unit within the Roundhill project (Unit 22). Project activities for the year were completed in 2009, prior to the storm event. There were no temporary roads or stream crossings located within the 2009 Roundhill treatment units. The landings and skid trail evaluations determined that all BMP's in Unit 22 were implemented correctly in accordance with the NEPA decision and contract specifications and were effective at preventing erosion and transport of sediments. (T02, T04)

Angora Hazard Tree (NI/NE)

This project was still active during the October 13th storm event. BMP implementation and effectiveness failures occurred at several locations within this project because BMPs were not implemented prior to the storm event, as identified in the NEPA decision and the timber sale contract. Failures resulted primarily as a result of not installing waterbars on the temporary roads and landings, which resulted in erosion of the road surface and the transport of flow and sediment to adjacent perennial and ephemeral water bodies. Transport problems were exacerbated by the failure of BMPS to be prescribed or implemented to hydrologically disconnect pre-existing user created trails which hydrologically connected project roads and landings to adjacent stream channels. Road drainage and road surface erosion were also compounded by the fact that one of the temporary roads became entrenched during construction. (T04, E09, E14).

The BMPEP evaluation conducted for skid trails was rated successfully implemented and effective (T02). It should also be noted that the stream crossing located on a tributary to Angora Creek did function during this event, and that no rilling or gullyng occurred outside of the roads and landings themselves. While not possible to quantify the volume of sediment transported, it can be concluded that loading to active channels was limited to fine and coarse sediment transported in sheet flows, primarily within the boundaries of user created trails connecting

landings and roads to adjacent stream channels. Adjacent to these trails it appears that sheet flows and associated sediments were infiltrated and deposited within the established SEZ buffers.

Remediation after this event was not required beyond re-blading the road and installation of the prescribed BMPs.

Conclusions

Out of the twelve projects evaluated, BMPs were rated as implemented as designed, and effective at preventing adverse impacts to soil and water quality at six of the projects. For another three projects minor deficiencies were experienced in either implementation and/or effectiveness. Some of these minor deficiencies in BMP effectiveness occurred because BMP were damaged during the storm event, and/or some minor erosion contained within the project area. However no sediment (including fines) was transported to a water body and the degree of erosion did not cause damage to soil function at these three projects.

In three projects, major BMP implementation and effectiveness failures occurred. BMP effectiveness failure at the Tallac Creek bridge replacement project resulted from a failed diversion pipe and at the Valhalla Pier Project from using plastic sheeting to prevent surface erosion of disturbed soils. Recommendations for improving the design/implementation of BMPs for these two projects were presented in the body of this report and should be included in future project specifications. In the Angora Hazard tree project, major deficiencies occurred in BMP implementation of control structures on project roads and landings, which resulted in deficiencies in BMP effectiveness.

In addition it is acknowledged that an overall procedural deficiency occurred related to the continued implementation of projects past the October 15th grading deadline without a grading exemption, resulting in the LTBMU not complying with winterization requirements specified in Lahontan water quality permits for the projects described in this report.

LTBMU staff are currently conducting an analysis of why these failures occurred in BMP implementation and effectiveness. Recommendations likely to come from this analysis include:

- A more structured extreme event storm forecasting and communication process within the LTBMU. This process will be designed to ensure timely notification to responsible staff, and ensure resources are obtained to respond as needed to prevent avoidable adverse impacts to water quality.
- Modifications to timing and location of soil and water design features for temporary roads, for ensuring adequate BMPs are installed prior to extreme storm events.
- Changes in contracting language and/or more timely implementation of contractor compliance measures in project contracting language related to BMP implementation, to improve contractor compliance,
- Consideration of how to plan for project implementation, as we approach the fall “wet season”, and more timely communication with regulatory partners as we approach this

season related to possible grading exemption requests. Plan projects to complete implementation of “in-channel” work prior to October 15th.

- Clarification of terminology internally and externally related to “winterization BMPs”, and clarification of design features/BMPs required to prepare for wet season operations, as opposed to design features/BMPS required to button up a project for the winter. Include wet season BMPs in planning documents (NEPA, erosion control plans, contract specifications), and grading exemption requests.
- Address hydrologic connectivity issues associated with both system and “user created” trails as part of the planning process for a project. Specific design features should be identified and implemented to disconnect these features from project areas (such as landings and roads), as part of project implementation.
- Reevaluate design specifications for stockpile management, and jetting of fines in channel substrates.