



# Lower Squaw Creek Restoration Creek Technical Workshop Report

*for*  
*The Friends of Squaw Creek*  
*Truckee River Watershed Council*

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## Lower Squaw Creek Restoration Creek Technical Workshop Report

On October 29, 2008, the Friends of Squaw Creek convened small, focused group of 8 local river restoration experts with specific knowledge of the Squaw Creek. The workshop consisted of a 1-day working session where the technical team walked the site, reviewed existing technical work, and discussed the following:

- The state of existing knowledge
- Existing available data and data gaps
- Project status
- Potential impacts and risks
- Outlined methods to further our understanding of these impacts.

Much of the information for this discussion was based on existing studies and reports and the expert opinions of those in attendance. The primary approach synthesized the existing information across disciplines. This document summarizes the relevant information from this workshop.

The key objective of this workshop was to focus on:

- a) Peer review of existing technical work done to date, including perceptions of the experts as to the quality of interpretations
- b) Identifying any additional feasibility issues associated with the channel restoration alternatives, and
- c) Outlining a scope of work for additional technical studies needed to support design, permitting and environmental documentation that can be completed in Phase 2.

### **EXPERT PANEL PARTICIPANTS**

The invited group of experts was selected because of their expertise in creek restoration, hydrology, geomorphology, water supply, vegetation, erosion control and overall knowledge of the Squaw Valley landscape. The group in attendance included:

- Mike Liquori                      Sound Watershed Consulting
- Chris Bowles                      cbec

- |                      |   |
|----------------------|---|
| • Randy Westmoreland | US Forest Service                       |
| • Michael Hogan      | Integrated Environmental<br>Restoration |
| • Matt Kiese         | River Run                               |
| • Cyndie Walck       | CA State Parks                          |
| • Katrina Smolen     | HydroRestoration                        |
| • Mark Woysner       | Balance Hydrologics                     |
| • Mitch Swanson      | Swanson Hydrology &<br>Geomorphology    |
| • Jake Hudson        | ??                                      |

### ADDITIONAL PARTICIPANTS

The following participants attended the workshop as audience members, and contributed to various elements of the discussion during the day.

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|-------------------|---------------|
| • Ed Heneveld     | FOSC          |
| • Lisa Wallace    | TRWC          |
| • Beth Christman  | TRWC          |
| • John Hiscox     | CDFG          |
| • Edmund Sullivan | Placer County |
| • Carl Gustofson  | FOSC          |
| • Ed Hagedorn     | FOSC          |
| • John Moberly    | SVPSD         |

### SUMMARY OF DISCUSSION OF EXISTING STUDIES & DESIGN ALTERNATIVES

The following take-home messages reflect the summary of discussion:

- **Unanimous Consensus** – the existing technical work is solid and supports the conclusions regarding the dominant processes, diagnosis of existing problems, and conceptual recommended solutions.
- **Unanimous Consensus** – All experts agree that a more detailed version of Alternative 2 should be the preferred alternative. This alternative was dubbed *Alternative 2 PLUS*.
  - Alt 2 does not create discontinuities in grade break whereas the other alternatives could.

- Alt 2 addresses the full extent of problems throughout the study area, whereas the other alternatives ignore some issues
- Alt 2 is most likely to restore geomorphic processes and functions to provide a long-term solution to degrading site conditions
- **Unanimous Consensus** – While there are remaining technical gaps, there is strong support for moving forward with design work.
- **Unanimous Consensus** – The project boundary should begin upstream of the Trapezoidal Channel and extend through the meadow. This will avoid the problems of integration at a critical point in the project.
  - However, individual project elements may be pursued independently as available resources and/or other constraints permit
- **Broad Agreement** – Project should precede independent of the fate of the groundwater study (SVPSD study).
- **Broad Agreement** – There are significant long-term risks in leaving the lower (incised) channel in its existing alignment. The lower meadow controls hydraulic and storage conditions that affect the upper reaches. More inclined to fill existing channel, as the risks associated with a restored channel will be modest.
- **Broad Agreement** – There may be benefit to integrating a more watershed-scale perspective, particularly with regard to sediment management practices in the South Fork.

## RECOMMENDED PHASE 2 SCOPE OF WORK

The group collectively discussed a series of potential tasks and offered the following recommended priorities:

Landowner Buyin - the landowners to get buy-in toward the recommendations presented here. Most important is to ensure an landowner support for an integrated strategy that crosses multiple land ownerships.

**Develop Alternative 2 PLUS** – a more detailed conceptual design building on Alternative 2 that seeks to outline processes, functions and likely responses along the entire continuum of project area. Mostly qualitative but quantitative where possible. Focus on the following:

- **Bedload Free Zone (BFZ)** – focus on transition between Trapezoidal Channel and meadow so that bedload from extreme events does not continue to alter meadow channel conditions
  - Requires understanding sediment supply dynamics upstream of trapezoidal channel and fate of sediment below the trapezoidal channel. How much sediment is supplied on a decadal scale, and how coarse sediment is mobilized within the system once delivered.
  - Develop conceptual approaches to resolve this issue – consider trapping sediment upstream of Trapezoidal Channel
- **Hydrology and Hydraulics** work should focus on:
  - Rating curves to develop a preliminary estimate of sediment supply, with a focus on coarse sediment (i.e. that which influences downstream channel morphology).
  - Providing inputs for preliminary channel dimensions and hydraulic geometry (width, depth, slope, meander geometry) by comparing similar systems and evaluating existing hydraulic geometry data for the region.
  - It would help to understand how much water the Trapezoidal Channel is taking from aquifer in late spring and summer. Compare gages to estimate gain (or losses).
- **Detailed stream alignment and profile**
  - Integrate preliminary hydraulic calculations to frame sediment and floodplain connectivity. Hydraulic calcs should be limited to site-based calcs or simplified 1D modeling (HEC-RAS). Group agreed that 2D model would be the way to go eventually, but would require more funding than currently available.
- Review recently published literature: *Effect of geomorphic channel restoration on streamflow and groundwater in a snowmelt-dominated watershed* – Tague, Valentine, Kotchen (Water Resources Research, Vol 44, W10415). Study done on Trout Creek, Tahoe, CA.
- Outline the base project with an adaptive management process, pilot tests, and phased development
  - Should include targeted experimental designs with validation, monitoring to test specific working hypotheses

## **NEXT STEPS**

Sound Watershed Consulting will integrate these recommendations with those from the Floodplain and Public Workshops to provide an integrate set of recommendations for moving the project forward. This information will be presented to the landowners.

## **APPENDIX A) DISCUSSION NOTES**

*The following notes captured key thoughts of participants as the discussion proceeded*

**Michael Hogan** – Upslope infiltration opportunities. Level of compaction of meadow should be considered.

**Katrina Smolen** – infiltration, losing channel, better understanding of gaining or losing channel. Effect of sinuosity of this issue. Alluvial fan, coarse gravels. Groundwater – aquifer studies. Loss of recharge through the fault zones. How different reaches are affected by fault zone. Mountain block recharge. Nitrate analysis on floodplain with Desert Research Institute. Geomorphic processes.

**Matt Kiese** - focus on stream/floodplain issues. Long time experience. In line and in agreement with analysis. Immense evidence of stream impacts – highly non-functional stream channel. Positive things can be done on floodplain and stream channel. Issue with phrasing of alternatives. Does not like Pre-European as a title (misleading). Technical basis should be used – re-create geomorphic processes prior to human disturbance. Transition from alluvial fan to transport reach is important. Geomorphic form and process. Sinuous channel downstream can only be sustainable with low bedload transport. Diversity of riparian landscape, complexity of fish habitat – need to restore functions and processes. Best project will strive to restore these processes. Strong supporter of Alt 2 with re-phrasing. A lot of money can be spent on bedload transport. Rain on snow - 5%, snowmelt – more frequent. More studies or make design accommodate processes. Matt was leaning towards moving the next phase toward preliminary project design over getting more information.

**Mitch Swanson** – parrot Matt's statements. Can't really go back to how it was. Way to approach with a risk assessment of different options. A little different from alternatives presented. Enough information to "load the gun". Concerned about keeping channel in overflow position. Several constraints – golf course, homes. Valley hydraulic controls are predominant. Overflow more often downstream but upstream channel is overpowered by hydraulic controls. Focus on what project will look like and test – bedload is an issue, human landuse – long term maintenance issues, bedload freedom zone (BFZ). Put channel in will it stay? Channel has been persistent over time – lots of glue in bank. Impact assessment. Focus models on actual project – bedload and transport. This project has incredible opportunities. Ripest low fruit. Restoring geomorphic processes. Going to be uncertainty – impossible to predict everything – that's why risk

assessment is important. Field fitting is overwhelmingly important. Education on geomorphic processes with \$50k. Blackwood – uncorking gravel transport has been one of the best things. Do not create Disneyland (i.e. a manicured park-like environment). Geomorphic processes to enhance. Lateral channel movement is important – need to stop incision in lower reaches. Continuity for transport from upstream to downstream. How much bedload from upstream to downstream.

**Mike Liquori** – stated that FOSC and landowners want to get on with project rather than do more studies. But some additional studies are required to address risks, which are also important. Would like input to find the right balance.

**Jake Hudson** – huge opportunities to help a screwed up system. Sounds great to restore geomorphic function but will not get back to fully restored system. Not just sed transp, hydrology, compacted soils, other trapezoidal channels. Work out how to control impacts to maintain hydrologic and geomorphic function. May be an element of Disneyland – not a purely natural system therefore cannot get back to it.

**Randy Westmoreland** – Get flows back into remnant channels or designed channels. Could get functions back relatively easy. Upper watershed has a huge impact. Upstream topo has been modified so greatly to drain quickly. Something has to be done on upstream watershed. Alternative 2 is preferred alternative – but probably needs more... Deal with bedload, alluvial fan. Get it working again... Get it on floodplain through remnant channels – minimize risk. Higher risk to keep it in main channel. Lower energy on floodplain.

**Cindy Walck** – Good summary of historical conditions. Functions and processes again. ID disruption of processes. Needs to be brought out stronger. Upper watershed disturbances. Large fan depositional area in car park area. Trapezoidal channel is translocating fan. Not restoration. Restoration of a process given constraints. Deal with material generated in upper watershed. Does not like Bedload Free Zone (BFZ). Need a transitional zone from upland to lowland. Quantify sediments coming (or mapping depositional zones) from uplands. Adaptive management from depositional zone – needs to be planned for with periodic removal. Therefore channel downstream does not have to deal with that. Does not like keeping old channel. Design development, map sediments. Alt 2 – develop BFZ – further develop adaptive management. More sinuosity needed in downstream reaches. Focus on process restoration.

**Mark Woyshner** – Lots of good talk this morning. Agree with everything said. Originally had a different perspective. We know what



is going one. We do not have much money. Little money. In May consensus was Alt 2 on the whole. But why are we ignoring elephant in the room – trapezoidal channel. Could get a conceptual plan for Trapezoidal channel for \$50k!!! Get something on paper. Conceptual plan set. Start moving plan set. Get funding to implement. Less emphasis on studies.

**Cindy Walck** - Could be a phased approach – does not all have to go together. Elements could be done independently. Phased approach to design and implementation.

**Matt Kiese** - Preferred alt does not need to preclude other measures. Experts have agreed on an alternative and therefore going forward with planning and design is the way forward. Dynamic functions, wetlands, enormous potential benefits. Recognize constraints. Risk, risk, risk. Geomorphic process constraints with risk analysis. Conceptual designs that minimize constraints. Inclined not to focus as much on uplands – too much to deal with.

**Severall** – Mining gravel could be a solution??

**Mitch Swanson** – Mouth of trap channel is a very important zone – landowner permission there will be key. Consider a “Tarn” (small lake bound by moraine).

**Katrina Smolen** – Lots of work on slope restoration done in recent years by SkiCorp.

**Lisa Wallace** – pond behind Plumpjack – what could be added to Alt 2 PLUS.

**Earl Hagadorn** – many of the problems identified were predicted during golf course design. Recommendation for pond below Trapezoidal Channel was included with the design, but was not included for several reasons.

**Carl Gustofsen** – since 1963 has not degraded as much as people think. Middle reach problems are caused by golf course of middle reach by Resort at Squaw Creek. Does not like Carl’s Spring as a name for the upwelling area. Spring flows to middle reach from south have been significantly depleted. Overland flows intercepted by golf course. For \$50k get water from west pond through brook. Concerned about analysis paralysis. Work with Resort to fix problems. Public Service District are sitting on old channel. Re-routing golf course water.

**Michael Hogan** – agree with Matt but it is not an either or with upland processes. Glacial “flour” ultra fine soils. Re-worked by glacial activity grinding soils. Keep uplands in mind. SkiCorp and Resort could

do more stuff. Sediment supply for system. With such fine soils do not necessarily see rilling. Transported great distances. Cohesive until pore pressure is exceeded then all hell breaks loose! Disturbed soils upstream could be the sponge. Need soil restoration at depths. Resort will be doing some thinning – woodchips will be placed extensively – reducing supply of runoff. Tilling woodchips will be better but just spreading on surface also works.

**Matt Kiese** – Probably should include upper watershed in conjunction with stream channel. Creative part with parameters that you can't measure right now.

**Mitch Swanson** – need to get a handle on overland flows. Regional hydraulic geometry analysis could be money well spent.

**Matt Kiese** - Bring channel up and have more inundation into sediments – improving channel hydrology – easy to demonstrate benefits. Adaptive management needs specific decision points so it is not experimental. Do pilot projects through a carefully managed adaptive management framework.

**Michael Hogan** – Very carefully thought through adaptive management project. Frame project within the context. Channels change and we want them to. Experimental pilot project. Rather use test or validation plots.

**Cindy Walck** - Pilot projects shows something is happening to decision makers – not just experimenting but actually doing something

**Mike Liquori** – summarized adaptive management process with pilot projects. Project phasing may cause problems with permitting. How do you permit a phased approach.

**Lisa Wallace** – does not think it was a huge problem. Design the base project – what are the essential elements for the whole meadow – bed load, pool riffle zone, sinuous zone downstream. Not necessarily talking about phasing creek restoration but other elements. Phasing creek construction could be more problematic and costly than doing all at once. Number of field seasons to implement. Don't let phasing block the process. Bring along permitting agencies through process.

**Michael Hogan** – Adaptive management process will help.

**Cindy Walck** - Stream should be designed and permitted as a whole with other elements that could be phased

**Mike Liquori** – described two potential schedules – A and B. A is a continuous process that focuses on the entire project area at once, B is

a multi-threaded process that separates sub-projects into smaller, independent (but linked) projects. Pros and cons to both approaches were discussed. May want to think of a hybrid. A focused on major overarching plan. B other elements of the projects – add-ons. Base project is hydraulically driven, with series of sub-project that would not be as critical to the design of A and not hold up the schedule for A.

**Matt Kiese** - May be good to identify project A schedule now for base project. Other issues around the edge could hold the project back.

**Ed Heneveld** – summarized Resorts plans regarding runoff/seeps from south. Kleinfelder have been monitoring flows.