California Tahoe Conservancy
Agenda Item 8a
June 20, 2013

UPPER TRUCKEE RIVER RESTORATION WORKSHOP

The Conservancy hosted a workshop on the Upper Truckee River (UTR) Restoration Strategy on May 2-3, 2013. A field tour of six different reaches of the UTR was conducted on May 1, 2013 preceding the workshop. The goal of the workshop was to evaluate the current restoration strategy for the UTR and determine ways it can be improved and adapted. The workshop was coordinated in conjunction with US Forest Service, Lake Tahoe Basin Management Unit, California State Parks, the City of South Lake Tahoe, and the Tahoe Science Consortium (TSC).

Maureen McCarthy, Executive Director of TSC, moderated a panel that included five independent restoration experts. The panel included: Bill Christner, PhD, fluvial geomorphology; Josh Collins, PhD, landscape ecology; Jeanette Howard, PhD, riparian ecology; Doug Larson, PhD, resource economics; and Laurel Saito, PhD, hydrology. Panelists reviewed materials provided to them in advance of the workshop by the partner agencies as well as members of the public. They were also given six questions and asked to provide a joint written response (Attachment 1) that was presented on the afternoon of the second day. Each panel member also provided their own written response to the questions (Attachments 2-6).

The workshops were well attended by a wide range of people, including restoration consultants, interested members of the public, and numerous public agencies. All documents associated with the workshop, including the panel findings are posted on the Conservancy's website.

List of Attachments:

Attachment 1 – Panel's joint response
Attachments 2-6 – Panel's individual responses

Conservancy Staff Contact:

Penny Stewart Phone: (530) 543-6013
Stuart Roll Phone: (530) 543-6031

ATTACHMENT 1

UPPER TRUCKEE RIVER RESTORATION STRATEGY
BLUE RIBBON EXPERT PANEL KEY FINDINGS & RECOMMENDATIONS
PRESENTED AT THE UTR WORKSHOP 3 MAY 2013 (SOUTH LAKE TAHOE, CA)

I. Philosophy and guiding principles

Key findings:

- There are fewer obstacles to success in large-scale stream restoration in this basin than many other places we are aware of.

- We commend the science-based approach to designing projects and commitment to understanding physical processes is very important. However, these are not goals. They are tools for achieving certain goals.

- There is nothing inherently wrong with geomorphic process-based restoration BUT the UTR Restoration Strategy lacks a vision and associated goals. And without a vision, all projects are considered priorities and therefore nothing is a priority.

- The UTR Strategy appears to be geared toward making the watershed healthier, but an operational definition of health is missing.

- We don't see enough evidence of collaboration and cooperation among entities as required to achieve the stated goals of resiliency.

- The definition of restoration "restoring to pre disturbance or historic conditions" may not be achievable, especially due to anticipated hydrologic regime changes due to climate change.

- What is done here in UTR could/should become the hallmark for management in the entire basin, state and nation. This document/Strategy should not be viewed simply as means to achieve specific projects in lower 9 miles, but as a general model for watershed restoration throughout the basin.

- There is a need for more leadership to align funding opportunities, resolve scientific conflicts, and implement staff recommendations in a consistent way across agencies.

Recommendations:

- Develop an overarching, shared vision for a healthy Upper Truckee River watershed.

- Translate the vision into quantifiable goals (ecological/biological, ecosystem services, geomorphic processes etc.)

- Develop and implement a process to prioritize goals at the reach and watershed scales.

- Consider the full range of future conditions (climate, political, funding, economic etc.) of the watershed that could be used to set and meet goals, and full range of suitable restoration approaches.

- Identify executive leadership to develop planning, permitting, assessment, reporting, funding at the watershed scale.

II. Monitoring.

Key Findings

- With the exception of geomorphic form, the relationship between the goals and objectives and monitoring is unclear.

- Monitoring currently includes geomorphic form (cross sections, long profiles) not geomorphic processes (sediment transport, shear stress).

- The current monitoring framework does not reveal the effect of one project on another or combined effectiveness of the projects at the watershed scale.

- Monitoring is not designed to distinguish between project impacts and other activities or events that may have impacts (e.g. fire impacts, climate change etc.)

- A lot of data has been collected, but there does not appear to be an established process for multi-agency analyses, interpretation and results.

- No method for public or interagency access to data was presented.

- There was inadequate reference to or utilization of existing methods of data management and sharing tools.

- There is a perception that monitoring funding is limited to only permitted projects implementation (and not for long-term evaluation).

- It is commendable that adaptive management principles are considered; however, the adaptive management practices have not been hypothesis-driven.

- UTRWAG is a very positive step towards needed collaboration and coordination and it should be empowered to do more.

Recommendations

- Monitoring for projects should be connected to quantifiable objectives (e.g., the same monitoring approach does not have to be applied to all projects)

- Established monitoring baselines are needed for all projects

- Establish a program of ongoing measurement of such variables of flow, in situ measurements of dissolved oxygen and turbidity, and water temperature with adequate array of sensors to establish baseline conditions, shifts in baseline and the effects of projects on baseline. This ambient monitoring program at watershed scale can be used to track progress toward goals, detect change caused by external drivers (policy, climate change, funding, etc.) and that allow assessment of effects of projects on ambient conditions.

- Project monitoring should include a threshold and trigger mechanism to monitor beyond permit requirements.

- Develop decision processes to determine how monitoring can be distributed among projects such that not all monitoring has to happen at all projects all the time.

- Use UTRWAG to create conceptual models of watershed form and function to inform monitoring goals and methods and consider using predictive modeling approaches.

- Use modeling as component of hypothesis-driven adaptive management.

- Develop a research component for the monitoring program to develop and test monitoring methods to understand causal relationships between factors being measured – includes modeling effort to predict relationships, fill data gaps, and examine possible future conditions.

- For each of the goals (per above in Philosophy section) identify key processes that must be monitored to assess progress, and determine which processes must be measured directly and which can be inferred from changing conditions.

- Be efficient with monitoring funding, but do not let anticipated lack of funding deter monitoring. Consider using academic and research institutions, NGOs to assist with research and monitoring.

- Prioritize ongoing monitoring, data sharing, and data analysis. In addition to monitoring projects, have sites that are monitored for the foreseeable future so that changes due to projects are captured as well as impacts of hydrologic events and other activities in the watershed. This will require ongoing funding.

- Create a single repository for all data/reports produced from/for the UTR. This means one entity needs to step forward and be the lead. There should be a dedicated web page where the strategy, progress reports, monitoring reports, meeting minutes, etc. are posted. Having these stored on each agencies web site is not helpful to the public.

- Use an existing organization such as the Tahoe Science Consortium to coordinate monitoring at the watershed scale and to support independent, objective, interagency analysis and interpretation of monitoring results. Consider having an independent science entity develop a coordinated monitoring plan to measure progress toward specific goals over long-term. The San Francisco Estuary Institute (SFEI) could serve as a model.

III. Communication

Key Findings

- The UTR Strategy lacks a communication strategy.

- The agencies approaches toward the public may need to be adjusted to avoid inadvertently alienating the public.

- The methods of communication among agencies, the policy makers, and the affected public outside of regulatory processes could be improved.

- The UTR agencies are not taking full advantage of existing opportunities to outreach.

- There is a need to evaluate effectiveness of existing communications efforts.

- UTRWAG is positive model for interagency coordination and communication and should be built upon.

Recommendations

- Include the public in the UTR Restoration Visioning process.

- Develop an effective communication strategy that focuses on agreed upon set of messages about the UTR vision and actions to achieve that vision.

- Explore opportunities to collaborate creatively to leverage limited funding, such as pooling funds, incorporating citizen science, local volunteerism, interpretive signs, kiosks, connections with local schools, academic research institutions and NGOs.

- Evaluate the effectiveness of existing communications efforts (opinion polls, focus groups).

- Add signs and information kiosks to inform public about restoration projects before, during and after projects.

- Help develop and utilize capacity of local, state and national NGOs as communication partners.

- Evaluate tone and message of current signage. Consider translating into different languages as appropriate (e.g Spanish).

- Engage local businesses to participate in communicating UTR restoration.

- Enhance UTRWAG to improve interactions with public, stakeholders (e.g. websites, list-serves, social media, newsletter, press releases).

- Cultivate support from large donors.

- Foster the public's perception of openness on the part of agencies.

- Identify main audiences and for each one develop appropriate communications strategy.

- In 2 years produce project status report for public consumption and agency use that provides overview of status/health of Upper Truckee watershed.

IV. Ecosystem Services

Key findings

- Ecosystem services are mentioned but their role in the Strategy is underdeveloped. A variety of services are identified in UTR strategy but their relationship to the strategy is unclear.

- Ecosystem services are going to be increasingly important in stream restoration efforts because they relate restoration to people. This highlights their importance in inclusion in the communications strategy.

- The agencies are understaffed to properly incorporate ecosystem services into the strategies.

Recommendations:

- Develop in-house expertise to address ecosystem services from both ecological and economic perspectives.

- Encourage continued efforts to better develop the relationship between the strategy and ecosystems services. Make more explicit the relationship between ecosystem services and restoration goals.

ATTACHMENT 2

W.T. Christner, Ph.D.

UPPER TRUCKEE RIVER RESTORATION WORKSHOP

RESPONSE TO PANEL QUESTIONS

1. **The current UTR strategy and philosophy focuses the design of projects on the restoration of geomorphic and ecosystem functions. In what ways is this approach likely to be effective or ineffective, as a whole, in achieving the projected benefits?**
    a. Effective - The current UTR strategy and philosophy of focusing the design on restoration of the geomorphic and ecosystem functions has a high probability of being effect for several reasons. The ultimate goal of the UTR restoration is to "…bring it (UTR) back to its pre-degradation state or nudge it to a new state of equilibrium" (p.25). The state of equilibrium is determined by the current geologic, hydrologic, geomorphic, climatic and biologic components. Biological equilibrium requires the necessary hydrologic and geomorphic conditions operating in the current geologic time scale (not accelerated). The hydrologic and geomorphic processes form the basis of a solid restoration plan that will (if properly enacted and monitored) provide the foundation for the bio-geophysical processes necessary for ecosystem recovery.
    b. Effective - Focusing the restoration effort on the geomorphic and ecosystem functions forms the foundation for a solid restoration project. Restoration of biological resources (flora and fauna) first requires successful restoration of the geomorphic component in order to be successful. Current vegetative conditions on the UTR floodplain are less then optimal due to degradation of channel morphology (down-cutting/incision, over capacity, and loss of sinuosity). Down-cutting has lowered the streambed elevation. This has resulted in a loss of floodplain interaction, and a lowering of ground water levels across the floodplain. Raising the streambed elevation and providing floodplain access will provide the hydrologic conditions necessary for biological restoration (flora and fauna).
    c. Ineffective – The strategy lacks prioritization. Without priorities then every component of the restoration of each reach is a priority. If everything is a priority then nothing is a priority.
    d. Ineffective – The strategy has a stated philosophy: "…focused on re-establishing natural geomorphic processes and functions" (p.25). This philosophy is unattainable due the immovable structures on the landscape that prevent natural geomorphic processes and functions. Specifically, any road, runway, berm, fill, structure, etc, on the landscape will interfere with natural geomorphic processes and functions. The fill on the Highway 50 bridge across the UTR has taken away the floodplain and forced the river to flow through a dedicated

location. The LTA intrudes into the floodplain and restricts the channel to a narrow corridor with limited floodplain access. Both impede the "natural geomorphic process and function."

e. Ineffective - The approach may be ineffective due to the limited amount of floodplain area available for restoration, and lack of project funding. The LTCG and Lake Tahoe Airport (LTA) reaches have limited amounts of floodplain area available for restoration. This will limit the effectiveness of these reaches to trap and attenuate fine sediments, provide storage for flood waters, provide habitat for obligate species, and mitigate for climate change. Additionally, the lack of floodplain benefits in these reaches puts more stress on downstream reaches in terms of both erosion potential and fine sediment trapping.

f. Ineffective – the UTR Strategy acknowledges the impacts due to climate change, both current and potential. The Strategy describes the anticipated changes due to climate change, specifically mentioning an increase in the amount of rain, and more rain-on-snow events. The Strategy's approach to mitigation for these anticipated changes are to provide more floodplain interaction. However, Goal 1 of the Restoration Strategy states: "Restore properly functioning geomorphic channel configuration." Objective 1d of this Goal states: "Eliminate or reduce the need for maintenance by designing a geomorphically stable channel; note that stability in this sense is a dynamic equilibrium; the channel is not intended to be perfectly stable in one location over time, however, change should not be catastrophic, but rather characterized by slow movement of meanders over time, with erosion and depositional processes in balance" (p.26). I believe this objective is unrealistic and probably unattainable, for the following reasons.

    i. I don't think it is possible to mitigate for all the potential/anticipated impacts due to climate change specifically because the anticipated impacts are more rain-on-snow events and the Strategy specifically mentions that "Although infrequent, large floods occur as a result of rain-on-snow events. These floods can be much larger—often several times the volume of a typical snowmelt flood. **Large floods can have significant geomorphic effects**" (p.11).

    ii. If climate change is expected to produce more rain-on-snow events, and rain-on-snow events cause large floods, and large floods can produce significant geomorphic change; then designing a "geomorphically stable channel" where "change should not be catastrophic, but rather characterized by slow movement of meanders over time, with erosion and depositional processes in balance" are diametrically opposing views.

    iii. It would seem more appropriate to:

1. acknowledge the potential impacts from climate change,
2. state that more rain-on snow events are expected, and the restoration design will seek to obtain a dynamic equilibrium but,
3. catastrophic rain-on-snow runoff events, expected due to climate change, could alter the channel morphology of the UTR.

2. How could the overall restoration strategy be improved to provide the most robust, comprehensive, coordinated, and coherent framework for restoring ecosystem function and resiliency within the UTR stream channel and floodplain?

a. The management framework centers around meeting Threshold Standards for WQ, soil conservation, vegetation, etc. The Standards are set by TRPA and enforced by the Lahontan RWQCB. So one agency sets the limits and another agency enforces the limits. Communication and coordination between the two agencies will be important for the strategy framework.

b. There are fourteen (14) entities that have some form of involvement in the restoration of the UTR through ownership, jurisdiction, funding, etc. All parties must remain engaged in the process, even after completion of their task. Agencies will need to allot staff time to attend meetings and participate in the process well beyond the completion of their individual task(s). Continued, dedicated involvement from ALL entities will keep the process moving forward and allow for a robust, comprehensive, coordinated, and coherent framework. And that will allow for the process to attain resilient ecosystem functionality.

c. The Threshold Standards identified a targeted reduction in the amount of erosion from streambanks and channel bottoms in the UTR of 50 percent. Erosion from these sources currently accounts for 4 percent of all sediment eroding from the UTR, but comprises 60 percent of the fine sediment in Lake Tahoe from these sources.

   i. Is a 50 percent reduction in the erosion of streambanks and channel bottoms feasible? If attained, will this reduction allow for natural geomorphic process and functions (i.e.: channel migration, erosion/deposition processes)? If not, then this is an indefinite loop and you will be chasing your tails trying to achieve something that is infeasible.

d. Access to more floodplain area in the LTGC and LTA reaches. These two reaches represent a significant amount of floodplain area on the UTR. The inability to gain access to the floodplain in these reaches possess several problems.

   i. Both reaches experienced high fill volumes during construction of the airport and golf course. The fill was compacted during construction of

these facilities reducing the sites ability to infiltrate water into the soil and recharge groundwater.

ii. Flood flows will remain confined in the UTR compared to other restored reaches. This will result in higher in-stream velocities as flood stage increases. Reaches with floodplain access will experience a decrease in the in-stream velocities as flood stage increases.

iii. As in-stream velocity increases so too does the stream's erosive power (shear stress). The LTGC and LTA reaches have been identified as primary sources for fine sediments from the UTR. Increasing erosive power may result in more of these fine sediments being eroded.

iv. The increased erosive power will be transferred downstream to the Elk's Club Reach, Sunset Reach #6, and Johnson Meadow Middle Reaches. This has the potential to compromise restoration efforts in these reaches.

v. The lack of floodplain access in these reaches reduces the UTR's ability to store water which is a primary component of the climate change mitigation, and will also prevent these reaches from raising groundwater levels further hampering restoration of the flora and fauna.

e. Acquire more land necessary for floodplain connection (project goal). This is especially critical to the restoration of the Johnson Meadow reaches. Restoration of the Johnson Reaches is critical to achieving the restoration goals and objectives of the UTR in the lower section. The LTA reach, located immediately upstream, experienced a limited degree of channel and floodplain restoration. The design of the LTA reach resulted in a limited amount of channel and floodplain restoration. This will result in a limited amount of sediment filtering and retention in the LTA reach and, more sediment will be transported through the LTA reach into the Johnson Meadow reaches. Without a complete restoration of the Johnson reaches, sediment loads in the UTR will remain elevated. This will result in sediment inundation of the UTM and ultimately, Lake Tahoe proper.

f. Adjust the Strategy to truly reflect the potential impacts of climate change on channel morphology (see 1f).

3. What additional guidance can the inter-agency strategy incorporate to ensure the most efficient and beneficial river-wide effort is implemented?

a. Someone needs to step up and lead the inter-agency group. You need a bus driver. You have the bus (UTRWAG) and most of the passengers (CA Parks, USFS, etc). Now you need someone to lead it.

b. Keep all stakeholders involved/egaged. As projects are completed some stakeholders may sense their involvement has finished. All stakeholders need to

stay involved and engaged through completion of all projects and the long-term monitoring. The frequency of the meetings will decline as the restoration projects are completed and monitoring takes over. But everyone needs to stay engaged. It is crucial that all stakeholders stay engaged beyond completion of their project(s). Lessons learned in previous phases will help with the adaptive management strategy throughout the restoration project. Keeping all stakeholders involved will help ensure project success that will translate into shared pride.

c. Regulatory agencies must be willing to relax WQ standards during channel construction. The 15% above normal background is inadequate. Short-term sediment releases are expected during construction, therefore they should be tolerated. There needs to be recognition of the trade-off (benefits) between short-term sediment releases and the long-term benefits of restoration. Short-term sediment releases associated with construction should not significantly impact the clarity in Lake Tahoe. Holding the projects to the standard release (15% above background) is shortsighted, and may result in the abandonment of legitimate in-stream restoration approaches.

d. Get all the information into a single repository (see 5a).

4. Does the monitoring, analysis and reporting as described in the UTR strategy document, adequately provide guidance for measuring success in achieving the stated goals and objectives? In what ways can the monitoring, analysis and reporting be improved?

a. The UTR document provides *general* guidelines for developing monitoring plans for stream restoration in the UTR (p.64). It is not clear to me that there has been a basin-wide effort to establish baseline conditions for the physical (channel morphology and upland topography), biological (flora/fauna), and hydrological conditions of the UTR prior to restoration activities. These data will allow for a quantifiable comparison between pre- and post-project conditions. This includes acres of floodplain added, feet of stream channel restored, depth to ground water, type and amount of in-stream fish habitat, number and species of fish, type and amount of vegetation (riparian, meadow, upland).

b. The monitoring plan focuses on restoring natural geomorphic processes. The monitoring results we were provided indicated the monitoring plan was measuring geomorphic form and inferring geomorphic process. This is a start, but these are not the same. I did not see any mention in the monitoring reports provided to us of physical processes that impact geomorphic form, such as shear stress and particle mobility. These can (and should) be estimated for each cross-section.

c. Sediment transport should be estimated. There are multiple methods (equations) available to estimate sediment transport. Determine the most appropriate equation and apply it to all reaches to get estimates on sediment transport.
d. Develop a turbidity – suspended sediment (SS) relationship for the UTR and utilize the relationship to measure success towards achieving restoration goals.
    i. Turbidity is EASY to measure, much easier than actual SS sampling. If you can develop a strong relationship between turbidity and SS across a range of discharges, your monitoring just got cheaper, easier, and more effective.
e. Catalogue all geomorphic information in the same manner so that data from different entities can be readily compared. The three most common options available are:
    i. Excel spreadsheets – readily available and easy to use however, without standard forms things will be different. Also no easy method to display particle size data or get at sediment transport.
    ii. Mecklenburg files – Files developed by Dan Mecklenburg at the Ohio DNR. The modules utilize Excel spreadsheets with pre-developed forms for particle size distributions, longitudinal profiles, and channel cross-sections. Automatically constructs graphics. This is freeware and it's really nice.
    iii. RiverMorph Software – great software for storing and analyzing data. Can do sediment transport analysis based on a variety of sediment transport equations. Need to purchase individual licenses, $2,300 to $3,500 depending upon level of purchase.
f. Every in-stream measurement of channel form/morphology (cross-section, longitudinal profile) NEEDS to have the accompanying water surface elevation measured and plotted. This is crucial information. The time of the measurement should be recorded in the field notes and then correlated with the discharge reported at the appropriate stream gage. The stream gages are real-time reporting, so discharge is reported in specified intervals (such as every 15 minutes). This is crucial for calibrating discharge at-a-station cross-sections and the potential shear stress and accompanying sediment transport.
g. It is unclear to me if a bird survey has been performed along the UTR riparian zone. The UTR restoration desires to increase the habitat for song birds on the UTR floodplain. If a bird survey has not been conducted for each reach it will be difficult to determine the success of this component. The Borgmann work

covers the two Sunset reaches. Have the other reaches been surveyed to establish their baseline conditions?

h. It is stated that the current morphology of the UTR is generally planar and lacks well-defined riffle/pool morphology (field trip). The best approach to quantifying channel morphology is through channel surveys (cross-sections and longitudinal profiles). However, relating morphology to fish habitat is accomplished with a fish habitat assessment that quantifies individual fish habitat units. Having this information will allow for a quantifiable comparison of the before and after fish habitat. Fish habitat should be assessed by an aquatic/fish biologist, not a fluvial geomorphologist because the two (fluvial geomorph and fish bio) "see" the stream differently in very subtle ways. CADW, CA Trout or an independent fisheries biologist could perform this task.

i. Another tool to quantify fish habitat is two-dimensional modeling. Two-dimensional modeling provides information on the extent of inundation through various discharges along with water depths and velocities. Velocity vectors provide insight into erosive forces (shear stress). Water depth and velocity values provide insight into habitat suitability for targeted fish species. A 2D model of the UTR is unreasonable however; a 2D model of a selected reach pre- and post-construction can be utilized as a surrogate for the basin. It seems this might be appropriate for one of the Sunset or Johnson Meadow reaches.

j. Figure 1: Conceptual Monitoring Model. All cross-sections should be taken perpendicular to flow. I know this is a "conceptual model" but I just want to be sure channel cross-sections are perpendicular to flow. The cited protocol from Harrelson (Harrelson et al., 1994) is the desired guide.

k. Use meander geometry data to assess the lateral movement of the UTR. This should be done for all time periods if possible (pre/post-Comstock, pre/post-LTA, etc). it should also be done for the entire UTR and for individual reaches. Sinuosity is the current plan-form data collected. Meander geometry (meander belt width, meander width ratio) provide information on the lateral movement of the channel during different time periods. It will also provide information regarding channel change (migration) following restoration.

5. **Ecosystem resiliency is an overarching restoration goal. How do we more effectively communicate to the public and local government representatives the technical processes undertaken to select project approaches to achieve this goal, such as balancing risk of potential short-term construction related impacts to restoration projects with the long-term benefits to ecosystem function and resiliency?**

a. No matter what you attempting to communicate to the public, you need to be able to reach them (the public). So the following become key with regards to disseminating information.
    i. There needs to be a single repository for all the information relating to the UTR restoration project. Either its own website, or a dedicated page on one of the major landowner's website (CTC, CA State Parks, Forest Service, etc). You don't want the public to have to search around multiple sites to find information on the various restoration projects. If the information for each project is kept on a separate website it will be extremely ineffective. See the San Joaquin River Group Authority's web page for an example.
    ii. Publish a newsletter both on-line and through the USPS. Again, see the example by the SJRGA.
    iii. Use news releases.
    iv. Utilize a kiosk in the UTM right by the trail bridge across the UTR. This could be a rather large billboard with a map showing the various restoration reaches in the UTR. There could be a handout (newsletter) with the latest news and project updates about each reach.
    v. Stakeholder buy-in is key to the success of your project. Stakeholders in the UTR restoration project include everyone who lives, owns, recreates, and derives some pleasure from the UTR watershed. So this will include most everyone in SLT and a fair amount from outside SLT. Recognizing the common pedestrian as a stakeholder goes a long way in the public's perception of a successful restoration project, and this can translate into support for public funds. You can have a highly successful restoration project, but if it occurred without substantial/adequate input from the general public the perception may be less then successful.
    vi. It seems you will need to know your audience and find an appropriate anecdote. The restoration of an ecosystem is much like having major surgery. First you have the symptoms that cause you to seek advice from experts. The experts use their knowledge and experience to develop a hypothesis of the potential cause(s). Then information is gathered (X-rays, MRI, blood work, etc). The results are then analyzed and interpreted to develop the appropriate course of action. The action may be a combination of approaches such as surgery and diet and/or exercise changes. This is similar to how watershed wide restoration happens.

6. **How should new scientific information and technical advice, obtained as part of the program or project development, be incorporated to improve and expand the river-wide restoration strategy?**
    a. New information/advice should be presented to the UTRAMG asap to discuss the economic feasibility and practicality of incorporating the information/advice into the UTR strategy.
    b. The UTR restoration strategy is predicated on incorporating the best available scientific information. New information needs to be vetted through the Adaptive Management Framework. Is the information/advice a new restoration approach/technique? A new monitoring protocol? A new analysis? A new restoration approach/technique that improves the restoration project should be incorporated as soon as possible so that monitoring may begin. Only then can the effectiveness of the approach/technique be evaluated.
    c. A new monitoring protocol can be incorporated but it should be an additional monitoring protocol in order to maintain continuity of the monitoring methods throughout all phases of the restoration. It should not replace an existing monitoring protocol unless it can be demonstrated that results from the new method are comparable with the old method.
    d. Other issues to consider with new information/advice:
        i. Does it change the perception of how the UTR ecosystem functions? If it does then it must be incorporated into the restoration strategy.
        ii. Will it have a substantial impact on the restoration success of the UTR?
    e. Just do it.
7. **Additional Comments**
    a. Restoration in the UTR watershed cannot restore properly functioning geomorphic channel configurations. Therefore Goal #1 of the restoration approach is unattainable and should be reworded to reflect the limitations of the project and, the influence of anthropogenic features that make this goal unattainable.
    b. Missing key stakeholders such as CalTrans, and CA Trout. CalTrans could also provide funding.
    c. Missing key funding sources such as Trout Unlimited and Ducks Unlimited.
    d. The gages in the UTR basin NEED to be maintained. They are slated to be decommissioned. We need strong lobbying from local, state and federal representatives to keep these gages operational.
    e. Utilize a multi-stage channel design to allow for geomorphic adjustment to changes in hydrology. If the UTRWAG recognizes that the hydrologic regime will

be changing, then it would behoove them to take this into account in their channel design.

f. I had two individuals speak to me after the workshop concluded, one from CTC, the other from CADPR. Both spoke to me about "problems" with a specific recommendation the panel had made.
    i. The person from CADPR told me that they do engage the public, but they always get the same individuals.
        1. My Response: the Panel was suggesting alternative methods to engage/inform the public, not the same old public meeting with a notice and see who shows up. We specifically suggested reaching out via newsletters, outside posters and/or kiosks, etc. My initial reaction is this: if members of the UTRWAG are unwilling to try new approaches then the recommendations are falling on deaf ears.
    ii. The CTC individual had a concern that certain members of the UTRWAG did not care about (value) other members of the UTRWAG.
        1. Response: That's a lack of trust the UTRWAG will need to address if they are serious about being effective. If they cannot learn to trust each other than the UTRWAG is doomed to fail. This person felt that if a member from another organization was put in a leadership role then their voice would not be heard. So if the UTRWAG does appoint someone to head the UTRWAG, the appointed person will need to be skilled in effective collaboration.

ATTACHMENT 3

To: Maureen McCarthy
From: Josh Collins
RE: Final responses to UTR panel questions
Date: May 16, 2013

Hi Maureen

Here are my final responses to the questions you posed about the Draft Upper Truckee River Restoration Strategy (dated March 2013). I revised my draft comments provided on April 30 and May 3, based on the workshop concluding that day.

Please extend my thanks to everyone who helped produce the workshop. It was very well organized and conducted. As a panelist, I am grateful for every effort to meet my needs, from making sure I had coffee and a computer, to the kind remarks regarding my contributions, right or wrong as they might be.

I know what it takes to plan and hold an event like this, and its success reflects unusual care, understanding and capability. I am especially grateful for your experienced orchestration and leadership. I hope we get to work together again.

Finally, I want to acknowledge the high level of technical expertise, commitment and professionalism of the staff and other participants. This is a caring community of talented and dedicated people who have created a real opportunity to restore the well-being of the UTR watershed. I hope you succeed, and I hope these comments help.

UPPER TRUCKEE RIVER RESTORATION WORKSHOP

Responses to Panel Questions

Josh Collins, Ph.D.

May 7, 2013

General Comment

My responses to these questions led me to develop this overarching comment. It is in essence the outline of a revised Restoration Strategy. It is based on my experience helping to establish long range, regional ecological goals plus monitoring programs to track progress, understand shortcomings, and adjust the goals for new understanding. The outline is rudimentary. The community of restoration scientists and practitioners can discussion and decide the many necessary details. Funding will always be a concern. I have ignored this critically important aspect of a successful strategy. Suffice it to say that some level of routine costs for regional and watershed-based ecological health care should be shared among the responsible agencies through their coordination, collaboration, and true partnership. Perhaps the EIP has the potential to realize a cost-effective restoration program, based on the finalized Restoration Strategy, if the necessary leadership is available. My answers to the assigned questions appear after this outline and augment it to some degree.

1. Plan and conduct a visioning process with abundant public input at all stages to define the good health of the UTR watershed. The vision should be expressed as the range in distribution, abundance, diversity, and condition of major habitat types, including the river and its tributaries, wet meadows, and terrestrial plant communities that is likely to sustain target levels of selected ecosystem services. The vision must represent the consensus of scientific opinion and be consistent with the missions of all agencies responsible for the health of the watershed. It must be a very broadly shared vision. Disregard cost, property rights, etc. during the visioning process. Answer the question: what would we do if we could? How much of what kinds of habitats in what condition are needed where within the watershed? The answers are the targeted levels of the selected services. The targets should be numerical and place-based (mappable). They are the restoration goals. Define ecological restoration as everything and anything that must be done to achieve and sustain these goals, which in aggregate define the ecological good health of the UTR watershed.

2. Develop conceptual models, based on scientific consensus, that denote the cause-and-effect relationships among the natural and anthropogenic factors and processes that control health status (i.e., that control the distribution, abundance, diversity, and condition of major habitat types). Use these models to identify factors and processes that can be managed, and those that cannot be managed. Incorporate information from other regions of the Sierra or other comparable montane environments. Explicitly incorporate regional climate change forecasts in the models as a driving factor that cannot be managed. Cause-and-effect relationships that are included in the models but are not well understood can be prioritized for research (see Step 5). This research can be guided by hypotheses derived from the models. Revise the models for new understanding as it is acquired.

3. Using the conceptual models as guidance, translate the goals into landscape restoration templates. These templates should indicate the envisioned mosaics of key habitat types that should be distributed along the energy gradient of the river from its headwaters to the Lake. They can be narratives descriptions, but they must be illustrated with sketches and maps. They should depict the acceptable range in composition and condition of the habitat mosaics, based on their natural variability over time. It will be useful in each case for the templates to include the entire environmental moisture gradient lateral to the river, incorporating mountain slopes, alluvial fans, river terraces, wet meadows, active floodplains, the mainstem channel(s), tributaries, depressional wetlands, etc. The templates should collectively illustrate the overarching vision of good health for the watershed as a whole. They should guide restoration designs and plans. They should illustrate restoration success for the entire watershed. They should guide the designs of individual projects

regardless of their sponsors, size, location, or timing. They should be readily understandable by the concerned public.

4. Develop a set of guiding principles and practices for designing restoration projects. These might include such ideas as: minimizing project OM costs by maximizing the utilization of natural processes to form and maintain the river and associated habitat mosaics; maximizing the positive synergies between and among projects over time; distributing habitat types of an ideal landscape mosaic among smaller projects such that they collectively achieve the ideal; using projects as learning opportunities to test new restoration approaches and techniques; practicing persistence and patience to realize goals that can be trans-generational.

5. Develop a cost-effective but comprehensive monitoring program. Use the Wetland and Riparian Area Monitoring Plan (WRAMP) of the USEPA and CA State Water Board as a developmental framework. This will help assure that all monitoring data are directly related to one or more restoration goals. It will also serve to maximize the use of maps and rapid assessment as monitoring tools, while providing criteria to minimize the use of more expensive tools, such as quantitative measures of physical and ecological or biological processes or condition. Furthermore, WRAMP includes tools for tracking and visualizing projects, monitoring data, and overall watershed health that can be applied to the UTR (and elsewhere in the Tahoe Basin) with cost-sharing among other regions for tool development and OM. Using the WRAMP and it toolset will improve chances for funding through the USEPA, USACE, CDFW, and State Water Board. The monitoring program will need a home. A logical possibility is to expand the role of the Tahoe Science Consortium to provide independent, objective, scientific and technical support for restoration planning, permitting, and assessment. The TSC might focus on shortening the distance between environmental science and decision making by helping to identify and format data and information to best fit the decision processes, including regulatory actions. The TSC might consider becoming a Regional Data Center of the CA Surface Water Ambient Monitoring Program to more effectively contribute data to regional and statewide assessments of environmental condition. The Program should include ambient monitoring of watersheds and region-wide, as well as project monitoring. The project monitoring should provide evidence of project status relative to regulatory performance standards; the ambient monitoring should provide evidence of the relative effects of individual projects, multiple projects, and other factors, such as fire, flooding, policy shifts, and climate change, on the overall health of the watershed (as assessed by the difference between existing conditions and the restoration goals). The monitoring program should have a research component to develop and test models and other methodologies, fill data gaps, and better understand cause-and effect relationships (see Step 2 above). Use the results from monitoring and research to revise the monitoring program as needed to maximize its efficacy, and to revise the vision and goals as necessary to keep them realistic and attainable. Careful attention should be given to what should be monitored at the lower limits of the UTR watershed to assess the overall performance of upstream restoration efforts. In this case, given the objectives to improve fine sediment retention, reduce flood hazards, and improve in-stream conditions for cold-water fishes, meters to continuously track river stage, suspended sediment concentration, and temperature should be installed near the river mouth. The same devices might be installed between projects to assess their individual contributions to overall performance.

6. Develop an implementation plan. This should cover conceptual designs of projects, coordination of data collection and interpretation, funding, and communications. Once a vision exists, it can be very helpful to establish a standing group of technical experts and planners that serves to advise and review the conceptual designs of new projects. This is how to assure that new projects are consistent with the vision. Conceptual design should involve decisions about the project-specific objectives. Once a project is conceived and its objectives are established, the same or another group of experts should provide advice on monitoring and assessment, consistent with the monitoring program. The existing multi-agency UTR Monitoring Advisory Group (UTRWAG) might be the beginning of a

conceptual design advisory group. As monitoring data are collected, they should be interpreted. The primary purpose of the interpretation should be to decide whether the project is meeting its performance standards, and whether progress is being made toward the larger restoration goals for the watershed as a whole. It is very helpful to rely on an interpretive team that represents the various disciplines involved and the affected agencies. An essential aspect of any major ecological restoration strategy is a plan to effectively communicate with the affected public, governmental agencies, and private interests. This will involve developing clear massages and staying on message with all communication efforts, from reports and press releases to presentations and on-site signage. The intent should be to both inform and be informed. An emphasis on story telling rather than simple reporting can be helpful. Monitoring reports should be crisp and to the point. Developing public support for restoration of the UTR is complicated by the geographic remoteness of many restoration actions and their technical complexity. Try to answer this question: how do we personalize the UTR? A campaign is needed to raise awareness and engender support. One approach is to use public opinion polls and focus groups to help align restoration activities with public preferences and priorities. Another is to promise a public report on the health of the UTR watershed and then deliver on the promise by telling the story of the river, it's past, present, and possible future. The communication plan should maximize the use of all existing organizations and institutions, including NGOs that have the capacity and are willing to help implement the communication plan.

Answers to Assigned Questions

Q1. The current Upper Truckee River (UTR) strategy and philosophy focuses the design of projects on the restoration of geomorphic and ecosystem functions. In what ways is this approach likely to be effective or ineffective, as a whole, in achieving the projected benefits?

The Strategy is evidently intended to support the use of natural river processes to arrest channel incision and bank erosion within the valleys of the lower reaches of the mainstem of the UTR, while elevating the river bed, such that the valley floors along the river function as floodplains to trap suspended fine sediment and to increase the acreage of wet meadow habitat. This intention is not stated directly in the Strategy, but became evident during the UTR restoration workshop. It is the basis for most of my responses to this question.

A. The Strategy seems to indicate that the overarching goal of the restoration efforts is to restore natural river processes. These processes already exist, however. They are always ongoing in the presence of river flow. They are evident even in the stretches of the river that have been identified as most degraded. It is more appropriate and practical to establish restoration goals as quantifiable conditions or ranges in condition which, based on public input and expert consensus, are patently desirable. In other words, natural processes of the landscape are not restoration goals, but the means by which a set of desired endpoints of condition (i.e., the goals) are likely to be achieved. Understanding the effective processes and employing them through project design is essential to achieve the goals, but the goals should not be the processes themselves. The regional community of environmental scientists and restoration professionals seems to understand this, but it is not clearly stated in the Strategy. It should be.

B. Although the expressed intent of the Strategy is to restore natural river processes, it actually identifies a particular riverine landscape as a restoration template, as evidenced in the sketch of "healthy" and "unhealthy" wet meadows presented at the start of the workshop. This is an inconsistency in the Strategy that must be corrected. As stated above, natural processes are not restoration goals, but the means by which a set of desired endpoints of condition (i.e., the goals) are

likely to be achieved. Once the targeted conditions are defined, they can be represented in one or more restoration templates, such as the one presented in the workshop. The templates should illustrate the spatial relationships of the targeted conditions in a landscape context. They can be an important aspect of a restoration strategy. But, in this case, the single template is probably too restrictive. It only reflects conditions of the lower valleys during the mid-nineteenth century, as reconstructed from scant mid-twentieth century evidence. The template features single-thread channels with broad active floodplains in dynamic equilibrium with seasonal and inter-annual variations in flow and sediment supply that are typical for the current climatic regime. The Strategy should note, however, that the form and structure of the river through its meadows might have been naturally more variable than the single template suggests. It is likely that reconstructions of historical conditions based on sediment cores from the meadows, plus comparisons among meadows in neighboring regions of the Sierra would reveal a natural range in the form and structure of the river-meadow systems that could warrant multiple restoration templates. It is likely that the template would vary with elevation or position along the energy gradients of the mainstem of the river and its tributaries, from the headwaters of the UTR drainage network to the Lake. Multiple templates might be needed to represent the range in river steepness and planform, the influence of large woody debris jams and beaver dams, and the degree of river confinement by arid terraces. The synthesis of multiple templates to capture the full range of natural river form and structure would diversify the restoration palette, broaden the restoration approaches, and make the Strategy more relevant to the watershed as whole, especially in the context of climate change.

C. Climate change is a "game changer." It doesn't seem as though the Strategy fully addresses this fact. It calls for restoring natural process consistent with the present climatic regime. However, climate forecasts include a strong likelihood for lower levels of Lake Tahoe in the dry season (i.e., lowered base level for stream systems like the UTR that drain into the Lake), and more variable seasonal and inter-annual flow patterns with higher peak flows and longer droughts, all of which suggest that the historical conditions may not be entirely suitable as templates for future conditions. Again, it might be very helpful to examine the historical temporal variability in conditions, based on marsh and meadow cores, and the range of conditions along the climatic gradient presented by the north-south length of the Sierra, to identify the full range of suitable and likely restoration endpoints. I note that the allocation of fine sediment sources as presented in the TMDL will likely need to be updated due to climate change. The relative importance of local watersheds as sources of fine sediment is likely to increase, possibly due to channel incision (resulting from lower Lake levels and the increased "flashiness" of the storm hydrographs), plus increased frequency of major floods that scour the river channel and generate large sediment pulses.

Q2. How could the overall restoration strategy be improved to provide the most robust, comprehensive, coordinated, and coherent framework for restoring ecosystem function and resiliency within the UTR stream channel and floodplain?

A. There needs to be an overarching vision of a healthy UTR watershed. It is essential to develop a comprehensive vision for the kinds and levels of ecosystems services that are needed for the watershed as a whole, and how the vision might be achieved over time through coordinated restoration actions at the reach or even smaller scales, in the context of the most credible 100-yr forecasts of future climate change. The vision should answer the questions: how much of what kinds of habitats are needed where within the watershed to achieve and sustain what levels of which ecosystem services?

1. The ecosystem services concept as identified in the Strategy is appropriate and helpful to frame the visioning process because it can connect the restoration efforts to people, in operational

terms. However, the Strategy only presents a list of services, with no regard for their relative importance. The needed levels of service are not always identified.

2. The Strategy presents many restoration goals and objectives, some being numerical and others narrative. However, most of these goals and objectives are stated in terms of trends (e.g., "improve," "increase," or "decrease") without endpoints, so success is not actually defined. Furthermore, not all the goals or objectives are appropriate for all parts of the UTR watershed, and it is unlikely that all of the listed goals and objectives can be achieved. There needs to be agreed upon criteria and process for deciding what services matter most, what levels of those services need to be achieved, and what actions are most needed in what part of the watershed to achieve those levels of the targeted services.

    i. For example, assuming that one suitable service is the retention of fine sediment, and if the goal for that service is twice as much retention per average year (relative to current conditions), then coupling the control of erosion inside and outside of the river channel throughout its length with floodplain restoration in its lower reaches is probably appropriate. Since runoff from roadways in the watershed has been identified as a major cause of the fine sediment supply, BMPs to minimize such runoff might be more fully and explicitly incorporated into the Strategy.

    ii. If another desired service is the support of wet meadow plants and animals by doubling the acres of wet meadow habitats, and if this requires elevating the near-surface groundwater level, then all ways to recharge the groundwater (or to reduce its drawdown) should be considered. This might include, as emphasized at this time, stabilizing the river at a higher bed election to reduce channel erosion, increase recharge due to out-of-channel flooding, and decrease drawdown through the channel banks. However, it might also include alternative or additional approaches, such as using selected areas of some meadows as recharge basins for urban stormwater, recharging some meadows through shallow off-channel depressional wetlands that catch and hold precipitation, and recharging through alluvial fans on ephemeral tributaries at the margins of valleys and meadows. These latter approaches might become increasingly important in the future, given that the annual frequency and duration of flooding is likely to shorten, and that the watershed will tend to be drier longer during most years.

3. The effort to envision a healthy watershed (quantitative, place-based levels of selected ecosystem services stated in lay terms and represented by maps and landscape sketches) must involve the public and must be shared by all agencies responsible for the health and well-being of the UTR watershed.

    i. The vision should be mappable and readily represented in sketches and drawings. The sketch of "healthy and unhealthy" meadow systems that was shown during the introductory presentation of the workshop is an example of how to visualize good health for at least one major component of the watershed, that being wet meadows with active floodplains. Such sketches can help guide the restoration efforts by showing the desired distribution, abundance, and condition of major habitat types for selected areas of the watershed.

    ii. The vision will need to be cross-walked to the TRPA Thresholds Standards and translated into the performance standards and monitoring requirements of regulatory permits.

    iii. The scientific statements of the restoration goals will need to be translated into common language. For example, "floodplain retention of fine suspended sediment" might be referred to as "clear water" or "clean swimming holes." "Elevated near-surface groundwater levels" and "wet meadow restoration" might be termed "more

wildflowers and wildlife" or "better bird-watching." "Hydro-geomorphic dynamic equilibrium" might be called "stable river banks" or "the good kind of flooding."

B. Restoration is defined in the Strategy as a return to pre-disturbance or historical conditions. Enhancement is defined as improvements in process or condition subject to unnatural constraints. This definition of enhancement is reasonable. However, the definition of restoration is too restrictive and probably not realistic. It's more realistic to assume that we can't reach the past; ecosystems don't run backwards; the ecological past does not exactly predict the ecological future; etc. A more practical definition of restoration might be something like the following: ecological restoration is everything done to restore the ecological health of the UTR watershed, where good health is denoted by the science-based numerical goals for needed levels of the watershed's natural goods and services. This definition is consistent with the ecosystems services framework of the Strategy.

Q3. The UTR restoration effort involves a wide range of varying landscapes, impairments, constraints, and opportunities. Considering the significant variations in individual project reaches and the potentially different restoration concepts used in specific settings, what additional guidance can the inter-agency strategy incorporate to ensure that the most efficient and beneficial river-wide effort is implemented?

A. The current vision, as inferred from the Strategy, is river-centric. That may not always be entirely appropriate. The river should be envisioned as part of landscape-scale moisture gradients extending laterally to the river from the river channel or a tributary to its active floodplain, adjacent wet meadow habitats, arid terraces, alluvial fans, valley margins, and dry mountainsides. Such a landscape-scale perspective would be helpful to identify the most effective approaches to achieve restoration goals, which might not always be centered on the river (e.g., see Q2A1ii above). There is a need for conceptual models representing the known cause-and-effect relationships among natural and unnatural (anthropogenic) factors and processes that account for the length and steepness of these moisture gradients, and their component habitat types.

B. One major impediment to UTR restoration at the landscape-scale consists of the engineered crossings that function as bottlenecks for flood flows and bedload transport. The degree of the problem varies from one crossing to another. However, each crossing seems to present a problem, regardless of its location along the energy gradient of the river. Fixing this problem (e.g., widening bridges, replacing them with causeways, or replacing existing culverts with lar5ger ones of wide-enough crossings) might be essential and is certainly very expensive. At the landscaper scale, to what degree can the other problems be effectively fixed if this one isn't?

Q4. Does the monitoring, analysis and reporting as described in the UTR strategy document, adequately provide guidance for measuring success in achieving the stated goals and objectives? In what ways can the monitoring, analysis and reporting be improved?

A. As suggested above, the Strategy should define restoration success in terms of the distribution, abundance, diversity, and condition of major habitat types that are expected to provide the needed levels of selected ecosystem services for the UTR. Then it should state what metrics are needed to track progress, what data are essential to compute the metrics, who will interpret the data, and how they will be used to adjust the goals for changes in priorities, circumstance, and new understanding. To support the effort, there will need to be standing committees with open enrollment of independent experts who can help with conceptual designs for projects, recommend monitoring, and interpret the results. There will need to be a public information delivery system that makes visible the permitted on-the-ground actions and tracks their progress and cumulative effects.

B. Once the vision exists, and after it is translated into goals (i.e., targeted levels of selected ecosystem services), conceptual models should be developed to explain cause-and-effect relationships that account for the services and their levels. These models should be based on what is known as scientific fact, what can be inferred from the facts, and what is based on local expert guesswork. The latter is a very important form of understanding that should not be discounted. When the models account for this understanding, they can be used to identify and prioritize hypothesis-driven research. The models should consider the natural and anthropogenic processes and factors that affect the services of interest. They should also indicate how the targeted services relate to each other, how they might be allocated among the river reaches, and what their emergent, cumulative effects might be for the watershed as a whole. Based on the models, the goals might be adjusted. These models are not products so much as working tools to help the restoration experts understand each other and the systems they are trying to restore.

C. Monitoring is expensive and important in concept but seldom adequate in practice. It tends to be one of the first things to get cut from project budgets. This highlights the importance of knowing what monitoring data are absolutely essential, and acquiring them through coordination, collaboration, and partnership.

- Formation of the monitoring group referred to UTRWAG is an important step toward the coordination and collaboration that is needed. Its membership should be expanded to include all major sources of relevant data. Caltrans and USGS should be full members.
- As stated above, the goals and objectives representing the needed levels of essential ecosystem services must be established. This will guide the identification of data needed to track progress toward the goals and determine when the goals have been reached. There must be an exact, explicitly stated, direct relationship between any monitoring data and the restoration goals.

D. The monitoring framework is probably adequate but not entirely consistent with statewide and national efforts. There are benefits to being more consistent with frameworks implemented in other regions. For example, the interests in this region might look into the Wetland and Riparian Area Monitoring Plan (WRAMP) developed by the CA Wetland Monitoring Workgroup of the CA Water Quality Monitoring Council. The USACE and USEPA and the CA State Water Board seem poised to employ WRAMP to guide monitoring requirements under section 404 and 401 of the USCWA and under the CA Water Quality Improvement Act). The CDFW is exploring how to use WRAMP in the CA Lake and Streambed Alteration Program, and for planning and assessing NCCPs. WRAMP includes statewide data and information management systems for regional and local uses, including the California Aquatic Resources Inventory (CARI) that cab serve as a basemap, "Online 401" for adding project maps to CARI though 401 Certifications, "Project Tracker" for visualizing projects on any kind on CARI, the California Rapid Assessment Method (CRAM) for assessing the overall health of wetlands and streams, The Riparian Zone Estimation Tool ("RZET") for estimating the extent of riparian functions, and "EcoAtlas" as the web-based user interface and visualization tool. In essence, the statewide framework helps planners determine how maps and rapid assessment can be used to meet monitoring needs, and when more rigorous data are needed. I get the sense that much of what needs to be assessed in the UTR to track progress toward goals can be provided through standardized mapping and rapid assessment across projects and for the watershed as a whole, carefully augmented with quantitative measures of selected aspects of condition, such as presence-absence of indicator species, careful surveys of channel form and structure, plus ongoing measures of flow, suspended sediment, and water temperature. It's noteworthy that, as part of a USEPA demonstration of this framework, the CTC has helped to develop CARI for the UTR, more than 30 river scientists in the Tahoe Basin have been trained to use CRAM, and a probabilistic survey of stream health based on CRAM has been conducted throughout the UTR watershed by local interests,

including staff from TRPA, CTC, USFS, USBR, and the Tahoe Regional Water Board. The output from that pilot should inform this Strategy.

E. A web-based, public-access system for managing, visualizing, and delivering data and information is essential to coordinate data collection, interpretation, and reporting. This requires a go-to place to maintain the system, although the data can be provided from any number of sources. There is a need for agency members of the regional environmental protection and restoration community to decide where the system should reside, what it must do, and how it will be supported. Consistency and even partnership with other regions involved in statewide data and information management could be very beneficial. Again, review of outputs from the UTR pilot of state and federal methods and tools as mention above in item Q4D might be helpful.

Q5. Ecosystem resiliency is an overarching restoration goal. How do we more effectively communicate to the public and local government representatives the technical processes undertaken to select project approaches to achieve this goal, such as balancing risk of potential short term construction related impacts of restoration projects with the long term benefits to ecosystem function and resiliency?

Short-term and long term impacts are regulatory terms. This signals the need to align the restoration goals and objectives and monitoring plans with performance standards as indicated in regulatory permits. There is a real opportunity to begin coordinating a variety of permits under the US CWA (NPDES, 404-401, 405, etc.) and under the CA Water Quality Improvement Act (Beneficial Use protection) to improve their positive synergistic effects on conditions at the watershed scale. The state and federal agencies responsible for water quality in the Tahoe Basin are collaboratively developing a watershed approach to avoid, minimize and mitigate temporary/indirect and permanent impacts to state and federal waters. The approach is included in the current guidance from the South Pacific Division of the US ACE for mitigation planning, and in the current draft of phase 1 of the State Water Board's proposed Wetland and Riparian Area Protection Policy. I suggest that the leading agencies of the UTR restoration efforts confer with the US EPA, CA State Water Board, and its Lahontan Regional Water Board to begin exploring ways to use the watershed approach to establish guidance on how to address cumulative impacts and to coordinate permitting across multiple regulatory programs.

Q6. How should new scientific information and technical advice that is obtained as part of program or project development be incorporated to improve and expand the river-wide restoration strategy?

The next generation of watershed planning is upon us. I suggest the modeling of regional climate change, and the modeling of UTR-specific and Trout Creek-specific flow, sediment transport, and floodplain effectiveness that has recently been conducted (and that will probably continue off and on to some degree) should be combined with the existing detailed maps (CARI) into a "desktop watershed" that enables forums of interests to explore the effects of different climate change scenarios, river-lake management, and restoration alternatives on selected ecosystem services such as flood control, wildlife support, water supply, and pollution control. The science and technology to start to create such a system for "landscape scenario planning" exists at this time. "Desktop watersheds" are how choices can be weighed and consensus-based group decisions can be made about what to do, when, and where. Monitoring can be designed in part to calibrate and improve the models, as well as to track progress and adjust goals. This is how to "see through" the uncertainty of the future, define and manage options, and make informed decisions. This approach is inevitable, given its ability to help decision-makers and the public understand and visualize the various possible outcomes of alternative decisions, and because it is technically and scientifically possible, within quantifiable limits of accuracy.

The idea of establishing multi-agency and public forums to plan and guide visioning, goals setting, data development, data interpretation, and reporting should be formalized through institutional arrangements that free-up staff to participate, and that translate outputs from the forums into operational policy for the participating agencies. There is a great opportunity to restore UTR as a critically important component of the Basin ecosystem. But success will require more collaboration and coordination to achieve a consensus-based vision of success. The science is adequate and the public will seems to exist to support the poised political leadership. With some revision, the UTR Restoration Strategy can serve to nurture an effective relationship between science and policy as needed to restore the UTR watershed.

ATTACHMENT 4

Jeanette Howard

UPPER TRUCKEE RIVER RESTORATION WORKSHOP
PANEL QUESTIONS

I would like to preface my comments by saying there is a tremendous and unprecedented opportunity in the Upper Truckee River basin to achieve real success. The UTR restoration can become the hallmark for management in the basin. The expertise, knowledge, dedication and passion of staff are truly impressive. There is tremendous engagement and interest from the public. And the potential for the UTR to achieve the multiple goals laid out in the restoration strategy is ripe.

An incredible amount of work has gone into getting us where we are today – **a lot** of very good work. This is the time to step back, take a deep breath, and realize that success is at our fingertips– the pieces are in place. However, we are at a tipping point. How the next steps are taken is critical to whether this project truly becomes a shared watershed-scale restoration project or a continued series of individual projects operating in silos.

Leadership and guidance are absolutely key to creating a **watershed scale** restoration project, so that barriers are removed, entrenched ways of doing things are reconsidered/rethought, and that this does become the transparent collaboration staff have worked so hard to create.

From the voices I heard over the 3-day workshop I understood that many view the basin as having many constraints and many impacts. However, what I see is something you rarely see in river systems today – a tremendous opportunity to influence an entire basin that from my experience, has relatively few stresses, threats or constraints. Sure there is a golf course, sewage lines, an airport, roads and a development. But what we have here is something that you rarely see, future threats (with the exception of climate change) have been mitigated for, and there are few stresses currently on the system. Here we are in California and there are no issues of water supply or competition for water; there are no land use practices that need to be greatly altered (such as development threats or incompatible agricultural practices), no regulatory processes holding up the process. Sure there are funding constraints, but for the most part, the opportunities presented here are rare – the potential to restore a watershed in a highly valued part of the world viewed as a national treasure.

I am optimistic because from the lake to the upper watershed here's what I see:
Marsh: Although 1/3 of the marsh was developed in the 1960s, there is still 2/3 of the marsh there just waiting to be restored so it can resume functioning as a filtering sponge, mitigating water quality and flood impacts, providing even more wildlife opportunities than it does now, enhance a native fishery, and provide a link to the Upper Truckee watershed with the public. It is incredible that this land is under the Conservancy's ownership.
Johnson Meadows: an unconstrained and protected floodplain (cannot be developed) with an opportunity for public ownership perhaps through creative private fundraising. The restoration potential to reconnect this river reach with its floodplain is unprecedented in California waterways.
Airport Reach: Numerous miles of river and floodplain in public ownership – with a huge restoration potential.

Sunset Stables: More miles of river in nonprofit ownership.
Golf Course: California State Parks land.

I would encourage the group to rethink the strategy as a series of individual projects and think of the UTR instead as three ecological reaches: the lake influenced marsh at the mouth, the lower gradient reach below the golf course, and the higher gradient section that includes the golf course and above. Viewing the river as ecological reaches provides a framework for developing a vision for the watershed, instead of a series of projects owned by individual agencies.

1. The current Upper Truckee River (UTR) strategy and philosophy focuses the design of projects on the restoration of geomorphic and ecosystem functions. In what ways is this approach likely to be effective or ineffective, as a whole, in achieving the projected benefits?

The focus on "re-establishing natural geomorphic processes and functions" can be an effective one, however, restoring geomorphic and processes and functions for their own sake should not be the goal of restoration– there needs to be end goals/tangible results related to that philosophy. What are we restoring those functions for? Is our end goal more wet meadow habitat? Improved instream conditions for native fish assemblages? Improving water quality (suspended sediment, temperature, etc.)? The river already operates under "natural geomorphic processes and functions," just not the ones we think they should be operating within (incision, headcuts, disconnected from floodplain, etc.). In short, restoring geomorphic function is a means to getting at some goal, at restoring some target or set of targets. Those targets/goals need to be identified and clearly articulated.

The UTR strategy needs to be adjusted to be more specific, and the restoration strategy designed to clearly articulate quantifiable goals – whether they be geomorphic functions, ecological communities, ecosystems services etc. In general I translate the geomorphic functions and processes as described in the UTR restoration strategy as a strategy to reconnect the Upper Truckee River with its marsh/floodplain. From the golf course to the marsh, the focus of the individual restoration projects seems to be one designed to reconnect the river with its surrounding marsh/floodplain which then restores a variety of functions, processes, and ecosystem services (i.e. restoring geomorphic functions and processes).

Although unstated, the primary intention appears to be returning the surrounding area to wet meadow in areas above the marsh. The UTR approach to achieving reconnecting the river with its surrounding areas involves manipulating the stream channel to varying degrees – restoring channel to its historical channel such as in the golf course and Johnson Ranch, to creating new undersized channels in the airport reaches and Sunset stables – with the intention, to restore the system to a wet meadow system. However, in the face of climate change, maintaining wet meadows may not be viable in the future – these systems may look much different than they do now. Although project proponents said this isn't a one size fits all – the proposed methods for all projects (with the exception of the marsh) entail one method – create smaller, new channels and forcing the existing channel into the new channels, with the intent being more overbank flooding.

A study completed in 2012 by Ramstead et al. (Have wet meadow restoration projects in the Southwestern U.S. been effective in restoring geomorphology, hydrology, soils and plant

species composition?) conducted for the Centre for Evidence Base Conservation provides an overview of the effectiveness of wet meadow restoration projects in the southwestern U.S. In that review, 26 restoration projects were evaluated with varying degrees of success. That study can be found here and contains evidence on the effectiveness of wet meadow restoration: http://www.environmentalevidencejournal.org/content/1/1/11. One of the most important results from the study is how well does geomorphological restoration techniques work in the long-term. Most of the articles and project reports reviewed covered no more than five years of post-project results, yet there were multiple examples of failed efforts to restore stream channels most of which were believed to have failed during extreme flooding events. Given predictions of increased flooding events in the face of climate change are we prepared for the possibility that these projects will result in incision, failure?

In short, I see the restoration philosophy being more about reconnecting the river to its floodplain and marsh. When we view the work in that context -- there is an entire literature to rely on, examples from within and outside the basin to draw on, and a transparent and accessible approach and communication tool with direct and indirect quantifiable objectives. However, by limiting the philosophy to one that is restoring geomorphic and ecosystem functions for its own sake, there is little opportunity to hold the restoration accountable to quantifiable, measureable goals and objectives.

If we are able to rethink the UTR philosophy to be one of reconnecting the river with its floodplain – we begin to make the strategy and narrative tangible, accessible, and living within a vast community of restoration activities instead of one isolated in language and unrelated to quantifiable goals. We certainly cannot lose sight of the fact that this is a unique system – a truly remarkable system – a national treasure. However, drawing on known and tested terminology and methods will help make this project a true success.

In the face of climate change with, as we heard, there is a greater probability of rain on snow events and larger floods. Therefore, reconnecting the river with its surrounding areas makes sense also from a public safety point of view. Reconnecting the river with its floodplain at this coordinated and system-wide approach improves public safety, water quality by reducing fine sediments, and habitat for native fish and wildlife. A focus on geomorphic processes downplays the ecological/biological components of river – with an almost devil may care attitude of "if you build it they will come." Whether this is true or not is unknown as it does not seem that a systematic, baseline study of current conditions has been completed. At a minimum, such a baseline study should be conducted. [1]

I would encourage the groups to reconsider this one size fits all approach to restoring connectivity especially in the case of creating new channels, and look to existing literature

[1] I am happy to share examples of baseline studies we have done at some of The Nature Conservancy's project areas.

and studies to evaluate alternatives. Quite frankly, the method of abandoning existing, incised channels and putting the river into newly created channels, worries me. The long-term impacts of these types of projects in this type of system are unknown and in the short-term, these types of projects destroy existing habitat. I would encourage staff to explore other methods that that allow for the restoration of dynamic, self-forming channels, without such large-scale, invasive direct manipulation methods. We have conducted the direct manipulation in the adjacent Trout Creek watershed – yet from what I could tell, have little evidence to evaluate the success (or failure) of those restoration efforts.

By reframing the philosophy as one that reconnects the river with its floodplain/adjacent meadow, the impacts are tangible, the results quantifiable, and better communicated. Narratives can surround the restoration work.

2. How could the overall restoration strategy be improved to provide the most robust, comprehensive, coordinated, and coherent framework for restoring ecosystem function and resiliency within the UTR stream channel and floodplain?

The overall restoration strategy is lacking a vision. Without a vision, it is impossible to create a "**robust, comprehensive, coordinated, and coherent framework."** I would encourage the groups (including the public) to look holistically at the system, from the forested headwaters to the golf course to the mouth rather than by those smaller restoration reaches. What do we envision for the Upper Truckee River watershed in the next 20/50/100 years, and then begin to restore the system to that vision. We were told that the strategy developers moved away from describing desired future conditions to desired future processes, but I would urge that to be reconsidered. Restoring processes for what ends?

From the information I could gather re aquatic/riparian ecosystems, there appear to be 3 ecological zones in the watershed. From these ecological communities it would be appropriate to look at the lower river as three restorations distinct sections – the lake influenced marsh at the mouth, the lower gradient reach below the golf course, and the higher gradient section that includes the golf course and above. Although the upper watershed was not included in this strategy, it is appropriate to consider upstream activities as those upstream reaches have a large influence on the downstream reaches. How do we envision those three regions functioning in the future? What do we envision the fish communities to look like – are we okay with a non-natives dominating the system? How do we see the marsh functioning in the future? A vision would allow for sequencing projects more effectively.

As stated in question 1, I encourage the groups to view the watershed as a whole instead of a sum of individual projects. Looking at the watershed as a whole allows us to envision that some parts of the system do some things, other parts do other things, but as a whole the watershed achieves a vision of success. Currently, the restoration strategy is a series of individual projects, where projects are expected to do everything at that place! That is just not possible, not every place in the system is the same, and therefore should not be treated as doing everything everywhere.

How do we begin to view the system as a whole – what do the various parts of the system provide ecologically, geomorphologically, for water quality, for the public etc.?

3. The UTR restoration effort involves a wide range of varying landscapes, impairments, constraints, and opportunities. Considering the significant variations in individual project reaches and the potentially different restoration concepts used in specific settings, what additional guidance can the inter-agency strategy incorporate to ensure that the most efficient and beneficial river-wide effort is implemented?

Develop a Vision (and commit to a shared vision): Without an overall vision, the inter-agency strategy assumes that all projects within the UTR are priorities and therefore whoever gets money first should go ahead with their projects. If everything is a priority, nothing is a priority. Decisions are made to capitalize on opportunities. However, do those opportunities prohibit the basinwide vision from being successful? If a vision for the basin was developed, projects could be sequenced and designed to inform the next project.

Create a Science entity: Need a science consortium in charge of data, analyses, reporting, establishing baseline conditions. I encourage the groups to look outside their own agencies – bring in academic/research institutions to help with restoration/research/monitoring questions. This group doesn't have to do everything themselves. A little funding to an academic institution can bring lasting results and more outside funding. I've seen this happen on a number of TNC projects – where academic/research institutions set up shop at a project and were able to provide answers to questions we did not have capacity to explore.

Leadership: Who owns the strategy? What are the mechanisms for evaluating trade-offs? Who decides which projects will be implemented and in what order? How is funding being coordinated? Without leadership, the UTR strategy will continue to be approached as individual projects and not as **A** watershed scale restoration project.

Someone needs to make the hard decisions.

Staff is doing everything they can to make this watershed-scale restoration a reality. They – like the 7 individual restoration projects in the basin – should not be asked to do everything. Without leadership there can be a tendency to become entrenched in individual mindsets – such as "this is the way we do things". Regardless. To step outside those boxes and work in partnership requires leadership.

Engage Local Community in Process: It is striking that the people who will be most directly impacted by the restoration activities planned – private property owners near the golf course and around the marsh -- do not feel heard and we saw that first hand. Private landowners in the basin have a stake in the restoration and future of the watershed – this should be looked at as an asset – not as a negative. The public feels that the agencies have made decisions without their interests or input heard, and that deepens divisions.

I would encourage those involved to form a stakeholder group and involve the public in the process. This again requires leadership to coordinate and capitalize on existing resources.

Share information:
Set up recurring, regular meetings to ensure transparency.

Step outside the "Basin Box:
I see a real need for those involved to look outside the basin and individual group thought for examples of how this has been done in other places. There is a wide literature to draw from – many examples of watershed-scale restoration out there to learn from. I would encourage groups to reach out to academic or other research entities and listen and learn from other points of view, and evidence. Make this an evidence-based restoration project that can be amplified to other parts of the Basin and beyond. Make this a learning laboratory!

4. Does the monitoring, analysis and reporting as described in the UTR strategy document, adequately provide guidance for measuring success in achieving the stated goals and objectives? In what ways can the monitoring, analysis and reporting be improved?

The monitoring, analysis and reporting in the UTR strategy document is not linked to quantifiable goals, and therefore does not provide mechanism for measuring success.

Pages 25-27 lay out the goals of the project, however many of those goals are not quantifiable and therefore difficult to measure. For example, Goal 2 is to improve aquatic and wildlife habitat/populations with the objective being "to increase or enhance aquatic and terrestrial wildlife habitats." This is vague.

I would encourage the group to rethink the goals of the UTR strategy as a set of targets (this gets back to a vision) and develop quantifiable goals that can be measured. For example in the case of improving aquatic and wildlife habitat: reduce temperatures to XX degrees in such and such area to improve conditions for native fish assemblages. The group can look at the current goals and restructure those as targets, and then identify the key attributes of those goals. For example, what are the **key** attributes of goal 1 "restore properly functioning geomorphic channel configuration?" Here the key attributes are listed as floodplain inundation, pool and riffle dynamics etc. Are those key attributes and are they measureable?

A lot of the pieces are scattered in the strategy here and there – a bit more work is needed to better organize and get a handle on quantifiable goals which then leads to a monitoring plan[2]. This does not mean that you need to measure everything everywhere! Specific components need to be identified that will be monitored to determine the impact of restoration activities based on goals. And a comprehensive baseline assessment would provide a reliable representation of the ecological and hydrological conditions prior to restoration. Monitoring needs to be linked to specific goals and without goals, there can be no evaluation of whether or not you are meeting goals.

Right now I see the groups have been collecting a lot of data but have not been able to translate those data into information. What do the data tell us? Are we measuring the right things?

And one thing in particular, there is a glaring need for temperature monitoring!

[2] TNC's Conservation Action Planning framework could be helpful. Happy to provide information.

5. Ecosystem resiliency is an overarching restoration goal. How do we more effectively communicate to the public and local government representatives the technical processes undertaken to select project approaches to achieve this goal, such as balancing risk of potential short term construction related impacts of restoration projects with the long term benefits to ecosystem function and resiliency?

I think this goes back to my comments about creating a vision for the basin. Developing a narrative around the vision for the UTR will allow for more effective communication to the public and local government representatives. Currently the UTR strategy lacks a communications strategy.

In terms of process, there needs to be more transparency and a commitment to communication and transparency. And a need to the public in the visioning process.

Restoration is a social process too. Communicate how many jobs it creates in basin and importance of restoration to economy as well as the ecological/biological benefits.

Our key recommendations under COMMUNICATION provide some suggestions on how to better communicate what you are doing in the watershed to the public through better signage, collaboration with local schools and businesses. A key to this communication is developing an effective communications strategy that focuses on agreed upon set of messages about the UTR vision and actions to achieve that vision.

6. How should new scientific information and technical advice that is obtained as part of program or project development be incorporated to improve and expand the river-wide restoration strategy?

As stated above, I think we need to step back from the project scale approach to a real watershed scale approach and think of the whole as a sum of its parts. Work as a team. Foster leadership. Develop hypotheses. Collect data to test hypotheses. Consult the literature. Develop a baseline assessment. Define quantifiable and measureable goals. Develop a vision.

Because of the need for restoration action in the basin, and the uncertainties regarding the system, a real *adaptive management* approach is needed. Adaptive management will allow for restoration strategies to follow an iterative process: plan, act, monitor, evaluate, and then again to plan, act, monitor, evaluate. This will allow experimentation and results of monitoring to guide and determine the best management strategies for this complex system. This is an important restoration approach for the UTR watershed because it allows for flexibility and emphasizes the importance of monitoring the results of actions for the purpose of adjusting plans and trying new or revised approaches.

Responses to the Workshop Panel Questions

Preamble: This reviewer came away from the workshop with an extremely positive impression about the Upper Truckee River Restoration Strategy process. The draft Strategy itself is thoughtful and well-written, and the workshop participants in all roles were well-informed, professional, and passionate about a common goal. Special thanks to Patrick and the CTC staff for the wonderful job they did in hosting the event.

1. The current Upper Truckee River (UTR) strategy and philosophy focuses the design of projects on the restoration of geomorphic and ecosystem functions. In what ways is this approach likely to be effective or ineffective, as a whole, in achieving the projected benefits?

The framework, broadly, seems well thought out and comprehensive, with respect to planning, monitoring, and evaluation, especially given that this is an early draft that will be revisited and modified as a result of comments. This specific question is out of my area of expertise, but I would ask whether the full range of scientific expertise that is appropriate to this question was consulted in the drafting of the Strategy. The draft leans heavily toward a geomorphological approach and, while this may be fully appropriate, the question I have is whether this reflects the preponderance of expertise among the staffs writing the draft, or is a result of a wide, inclusive effort to attract scientific opinion about restoration strategies. Certainly the staffs of the agencies are fully committed and very capable, but does their collective expertise, and their scientific contacts, cover that full range? If not, there is a risk that the perspective about what is most important to emphasize in building in resiliency to climate change while seeking to achieve the types of benefits listed is skewed.

On the positive side, the emphasis on restoring functions, as opposed to designing projects around the benefits themselves, seems sensible and appropriate to this reviewer. From my limited perspective, it does sound right to build in capacity to respond to changing environmental conditions through creating as healthy and well-functioning systems as possible given today's conditions.

Overall effects of the program may be hard to evaluate in practice as there are many ongoing and potentially rapid changes occurring, especially those relating to climate change. These not only confound the isolation and identification of program effects, but also likely change the desired end targets of restoration in ways that are not necessarily readily predictable.

2. How could the overall restoration strategy be improved to provide the most robust, comprehensive, coordinated, and coherent framework for restoring ecosystem function and resiliency within the UTR stream channel and floodplain?

This again is a question that my expertise does not offer much insight on. There are a couple of practical areas which should be considered carefully in terms of the on-the-ground functioning of the framework. One of these is in monitoring, which the Panel has had fairly extensive comments on, and another is interagency cooperation. From what we saw, this seems to be working well at the technical staff level. (This is really the only level of interagency interaction

that we got a look at.) To the extent that it is not also working well at the higher levels of agencies, this is an essential issue to come to grips with.

3. The UTR restoration effort involves a wide range of varying landscapes, impairments, constraints, and opportunities. Considering the significant variations in individual project reaches and the potentially different restoration concepts used in specific settings, what additional guidance can the inter-agency strategy incorporate to ensure that the most efficient and beneficial river-wide effort is implemented?

This question gets to the fundamental issue of setting priorities. While it is evident that the staffs that created the Strategy have a pretty clear set of priorities guiding their thinking about restoration strategy, it is less evident that these have been written down and communicated to those outside the process in a sufficiently transparent and detailed way. Doing so requires stepping outside the immediate list of unfunded projects in the draft Strategy, which for a variety of specific reasons seem to have a reasonably well-agreed priority order to them. It also would seem to convey several important benefits to the process.

First, Lake Tahoe is a unique national treasure, and the UTR is the most important watershed draining into it. The management framework used here can and should be a model for stream restoration efforts in California and around the country. Second, it should demonstrate how the analysts are thinking about and incorporating ecosystem service values into their priority-setting process. There are at least three fundamental reasons why this is important. First, the ecosystem services yielded are the most tangible connections the broad public has with projects undertaken in the UTR. Second, ecosystem services are hugely important in today's world, because a failure to adequately consider the effects of our actions on them can have significant negative consequences. Optimization of these services to society over time *should* be the goal of restoration efforts. Third, outlining how the management actions undertaken result in anticipated improvements in ecosystem services will enhance the public's appreciation of the job that the responsible agencies are doing. This is extremely important, in that the projects are undertaken on behalf of the public, using the public's money, and the public's support is critical to continued success of the management effort.

The setting of priorities operates at several levels, in similar ways. At the project level, it results in the selection of a preferred alternative. At the stream reach within the UTR, it results in a priority order for projects to be undertaken. Within the Lake Tahoe basin, it is implicit in the ways that moneys are spent across different geographic areas and pollutant sources. It is this reviewer's opinion that (a) the goal of these optimization processes should be to maximize the environmental services the Lake provides to society, among which it seems there is general agreement that the overriding, but note sole, service is lake clarity; (b) that to do this, explicit tradeoffs between the environmental services that projects offer must be and are, as a matter of practice, made; and (c) these should be quantified and widely shared with those on whose behalf the decisions are being made.

This is potentially a formidable task, as the area of ecosystem services values is a deep and complex subject in general. This difficulty is reflected in the current draft Strategy, which does not explain how they are going to be incorporated into planning. While the discussions of ecosystem services in Section 2 is sensible (if brief), the management strategy (Goals,

Objectives, and Approach) in Section 4 says only that "UTR projects plan to address" them (p. 31).

However, there are accessible, intuitive, and rigorous ways to recognize the important ecosystem services concept in decisions that are currently being made by staffs of all the agencies that trade off the *relative* values of ecosystem services. As an example, one fairly simple and inexpensive-to-adopt way to make this more explicit might be a scorecard approach. This can readily communicate and quantify the ways in which the staffs' deep knowledge and experience are now being used to decide (1) what alternatives are chosen within a project, and (2) which projects within a basin should be chosen first when funding becomes available. It could operate at the level of (a) staff experts' choices only; or (b) a combination of the staffs' and the public's assessments. Taking (1)(a) as an example, with UTRWAG as the forum for argument's sake, each participating scientist could be given a scorecard with 100 points and be asked to assign the 100 points among projects based on the measurable project outputs (e.g., willow density, substrate, and fish counts, to name just 3 among many as a simple example) that ultimately lead to improvements in environmental services provided (water quality, vegetation, animal and fish population levels and quality, etc.).

The first step for each scientist in doing this scoring exercise is to decide what each type of project output is worth on the 100 point scale. Each scientist's allocation of the 100 points reflects their own relative valuation of the project outputs as they are understood to enhance ecosystem services.

Since project alternatives provide multiple outputs, an individual scientist's score for any individual alternative would be the sum of the quantitative changes in outputs provided by the alternative (which are agreed upon by all) times the weight s/he assigns, summed across all outputs for that alternative. Presuming that the relative values of each scientist participating in the process were weighted equally (which seems especially appropriate for processes such as UTRWAG), the group judgment about each project is the sum across scientists of their scores for each alternative, and the preferred one is the one with the highest score.

A couple of important points should be noted. First, a scoring method could be too simple in some situations, and it might be appropriate to explore such a methodology on an experimental, advisory basis. Second, a method such as this could readily be expanded to include the preferences of the public over alternatives being considered, which could have several side benefits, namely (a) increasing their sense of empowerment and involvement in decisions involving <u>their</u> resources; and (b) better informing the staffs of what the public really does want, which is an important part of their missions and can help shape the definition of alternatives. Were the public's opinion included, it would likely be appropriate to weight their average score lower than those of the scientists involved where the alternatives involve technical/scientific issues for which the staffs are better trained.

It appears that this is the area for which existing staff expertise is least well suited, notwithstanding the dedicated efforts currently being provided. To ensure the proper consideration of ecosystem services provided by projects undertaken under the Strategy, which is critical, it seems likely that additional staff with appropriate disciplinary expertise will need to be added.

4. Does the monitoring, analysis and reporting as described in the UTR strategy document, adequately provide guidance for measuring success in achieving the stated goals and objectives? In what ways can the monitoring, analysis and reporting be improved?

This is an example of an issue that arose in several places, where the words on paper are mostly well-written and seemingly well thought out (though often incomplete), but it is hard to tell how they translate to actual practice. Results on the ground may not have in the past met, nor in the future, meet the ideals set out in the Stategy. One obvious problem in evaluating this is that several criteria mentioned for measuring success on page 33, including cost-effectiveness, relative cost, and established protocols, are either not explained or not meaningful.

Cost-effectiveness measures the cost per unit of (valuable) output obtained, and to implement it one needs a measure of what the value obtained from the project is. This links to the general absence of guidance on how prioritization is implemented that was discussed in the response to question 3. It's not easy, but is vital to think about how one ranks and "values" the outputs from stream restoration (and other) projects: how important is a water quantity regulation function relative to water quality, habitat, terrestrial wildlife, aquatic life, human use and enjoyment, and other valued outputs from the projects? You need to state what the objective functions and process guiding the choices actually made is.

I'm not sure what the relative cost criterion referenced on page 33 is, beyond the obvious comparison of price tags, which, if meaning nothing more, is subsumed by the cost-effectiveness criterion. Its inclusion suggests it was either a throw-away bullet point or there was no time to develop a narrative about it. And I have no idea what the "established protocols" criterion in the same list means.

5. Ecosystem resiliency is an overarching restoration goal. How do we more effectively communicate to the public and local government representatives the technical processes undertaken to select project approaches to achieve this goal, such as balancing risk of potential short term construction related impacts of restoration projects with the long term benefits to ecosystem function and resiliency?

This seems very challenging given my impression of the long, and probably often negative, interactions that some, perhaps many, Basin landowners have had with regulatory authorities. This reviewer much appreciated the information provided by staff and the public about the fairly extensive existing outreach activities. It sounds like there have been a number of notable successes, as well as some areas in which participation has not been as extensive as desired.

I think the goal of existing outreach efforts is to enlist the public's support and goodwill on behalf of the restoration and other environmental improvement goals, and I think that emphasis is right and appropriate. But there are probably some opportunities, both in connecting the public more closely to the science involved in management and regulatory decisions, and in enlisting their goodwill.

The idea of enlisting members of the public as science assistants came up in the workshop. In principle, a public that is engaged with the science of protecting things valuable to them can act as important advocates for the scientific activities, and empower them with the sense they are really contributing to the material improvement of their own "back yard." This is, no doubt, a long-term process, but one that costs little compared to most of the hard science projects. Pilot science projects, perhaps beginning with schools from K-12 to university, that enlist their time in a fun experience that is part learning about the whys of what's being done and part collecting data can, depending on the ages and skills of those involved, deliver differing results on the spectrum from mostly educational to mostly enlisting cheap labor for science. It

appears that this is already being done, but there may be a substantial reservoir of science assistants in the older grade levels, say from high school through college, that could be engaged further.

Another way to open up the science to the public would be to open to everyone the technical meetings that are now closed. There was evidence in the comments that the public feels excluded and patronized within the process, and steps like this might show a willingness to be more inclusive. This would have to be done under conditions that don't hamper the productivity of meetings (e.g., no public comments, some parts of some meetings necessarily remaining closed). It would be straightforward in principle to live stream and post on the web the technical meetings as an alternative to actual public attendance. This also would have the advantage of opening the science process to a much wider swath of the public which uses and values Lake Tahoe, i..e, recreational visitors and non-visitors with an interest in the Lake's clarity.

In the area of outreach, there are things that may not have been tried and could have significant payoffs. There may not be immediately obvious funding, but it may be that they can be creatively bundled with scientific missions, and which seem likely to have high incremental payoffs. These include, in no particular order:

-beef up school engagement efforts, especially at the junior high and high school level, with an eye on both both educational and data collection missions. One can easily imagine a spectrum of interactions that classes from various grade levels can have with the UTR, ranging from mostly educational in the lower grade levels to some combination of education and science assistant at the upper grade levels. (Data collected by less trained observers can, of course, be incorporated into research efforts by taking care to identify the data collected by interviewer.)

-devote immediate attention to disseminating data even more broadly and deeply than is already done, so the public, when it looks, will feel empowered, not rejected, by Lake Tahoe scientific efforts.

- investigate the effectiveness of current outreach efforts. The panel heard comments that suggest that the agencies' perceptions of their openness to public involvement do not match the public's. This type of effort can involve public opinion surveys, web surveys, focus groups, or "on the street" random intercepts, depending on the objective, resources available, and type of use to which the resulting data are to be put. A number of these can be done in-house.

- in the interest of fostering the public's perception of openness on the part of agencies, look seriously at opening every meeting on project development to the public, with ground rules that allow them to gain a better look at the process without seriously compromising productivity.

-spend some effort cultivating support from wealthy Basin property owners, by hiring/training development officers/fundraisers to pursue their support, financially and otherwise.

- use social media to tap into the statewide, national, and international appeal of Lake Tahoe's special (and fragile) environmental appeal, monetarily as well as opinion-wise.

6. How should new scientific information and technical advice that is obtained as part of program or project development be incorporated to improve and expand the river-wide restoration strategy?

From my perspective, probably the most important dimensions here are the activities that occur after a project is completed: (a) ensuring that monitoring and evaluations continue *after* the capital phases of projects conclude; (b) ensuring sufficient effort is put into the modeling and data evaluation aspects of project evaluations; and (c) establishing a record of both qualitative and quantitative data that is consistent over time and passed on to subsequent research teams. This reviewer and the Panel as a whole recognize that in the current budgetary environment, it is difficult to find funding for of *ex post* monitoring. That does not diminish its essential importance. As for modeling and data evaluation, I cannot tell whether the existing staff capacity accommodates this adequately at present or not; if it doesn't, more staff must be hired, to put it simply. Item (c), establishing a qualitative and quantitative archive of observations, can be implemented with existing resources.

ATTACHMENT 6

The agency and public representatives are thanked for taking the time to participate and share information about the projects and Upper Truckee River Watershed activities! The time and input from staff and others were greatly appreciated.

1. *The current Upper Truckee River (UTR) strategy and philosophy focuses the design of projects on the restoration of geomorphic and ecosystem functions. In what ways is this approach likely to be effective or ineffective, as a whole, in achieving the projected benefits?*

The focus on restoration of geomorphic and ecosystem functions is commendable, but the achievement of benefits for the Strategy are not clear. For example, if there is a desire to improve fisheries and aquatic habitat in the watershed, or reduce sediment transport, will the focus on these two areas adequately result in such outcomes? The other concern about these foci is that the general public or non-scientists may not relate as well to this terminology and therefore may find it difficult to understand the projects or support them. Having a philosophy that is more easily understandable and quantifiable may be more effective. For example, the philosophy is to improve fish populations or reduce sediment loading may be more understandable even though the processes that may do this are geomorphic and ecological. Another concern about this focus on geomorphic and ecosystem functions is that these actions alone may not bring the watershed to the desired state. See my comments further down about having a vision for the watershed that might provide for actions and discussions around more holistic approaches to improving the watershed. I am not advocating to abandon the geomorphic and ecosystem function or other scientifically-based approaches, but to instead include them within an overall vision for the watershed that will make them more understandable.

2. *How could the overall restoration strategy be improved to provide the most robust, comprehensive, coordinated, and coherent framework for restoring ecosystem function and resiliency within the UTR stream channel and floodplain?*

The strategy of coordinating efforts between agencies is very positive. The existence and function of the UTRWAG is not a trivial accomplishment, and the engagement of the different agency partners is really nice to see. It is great that non-agency stakeholders (like the general public and other interested parties) are also part of the UTRWAG. From my experience in working with multiple agencies trying to agree on an actionable strategy on the Truckee River in Nevada regarding water quality monitoring, I sense that the use of somewhat vague language and lack of quantification may be due to the attempt to achieve consensus amongst different missions and priorities of different agencies. The list of goals and objectives is very comprehensive, but it seems like it could be difficult to prioritize projects with such a large list. It also may make it difficult to economize on monitoring or other project aspects.

Perhaps another way to proceed would be to try to agree on a vision of the desired watershed. Note that I am suggesting a watershed vision first, rather than reach visions. Although the restoration may likely occur on a reach basis, having an overall watershed vision will help to prioritize and adapt over time in a more effective manner. Having a vision will also help to determine the kinds of things that need to be monitored to examine if work is progressing towards that vision. By vision, I mean something like: the watershed will support populations of native fish species (perhaps be specific about the species or population threshold), the watershed will retain fine sediments (or specify a reduction of sediment in relation to the current sediment load or some past sediment load). The vision can consist of multiple desired outcomes (for example, both fish and sediment can be part of the vision). Further, a vision does not have to be restricted to what is doable now; it can imagine 'best case' situations or the removal of barriers that currently exist to create an optimistic outlook towards what is desired. Having a vision of

what is desired 10-, 20-, or however far in the future the group would like to look would then lead to goals and objectives that support that vision and help to prioritize funding, monitoring, and projects. It will also make the Strategy more comprehendable to wider audience.

3. *The UTR restoration effort involves a wide range of varying landscapes, impairments, constraints, and opportunities. Considering the significant variations in individual project reaches and the potentially different restoration concepts used in specific settings, what additional guidance can the inter-agency strategy incorporate to ensure that the most efficient and beneficial river-wide effort is implemented?*

As noted above, I think that having a watershed-level vision and strategy will help to guide prioritization and selection of reach-level activities. The Strategy document notes that all projects in the document are priorities, but having a way to connect the projects to the watershed vision may help with conveying the benefits and challenges of projects, and making difficult decisions if funding is inadequate or other constraints are present. Such a connection (or "prioritization") does not have to set the order of completing projects in stone; as was aptly pointed out, the constraints of funding, permitting, and acquisition of property will likely dictate that. These factors can also be included in a prioritization or 'selection' metric to make the reasoning for doing certain projects more 'transparent.'

4. *Does the monitoring, analysis and reporting as described in the UTR strategy document, adequately provide guidance for measuring success in achieving the stated goals and objectives? In what ways can the monitoring, analysis and reporting be improved?*

Monitoring should be a priority, otherwise it is difficult to tell if conditions are improving or realize that activities or events are having impacts. In addition, the collected data need to be analyzed, shared, and reported. Securing sustainable funding for ongoing monitoring, data analysis, and data sharing can go a long way towards demonstrating success of projects, learning about impacts of natural and anthropogenic-induced variability, providing background data to argue for projects and project funding, detect effects of climate change, communicate with stakeholders and the public, etc. While it may be easier to secure funds for "projects," demonstrated success of these projects (and support for future projects) will rely on what is invested in monitoring and data analysis. Ongoing monitoring will be important for teasing apart project impacts as well as capturing the effects of activities or events outside of project/agency control, such as climate change or wildfire. The issue of fuels reduction was brought up, and understanding of impacts of these types of activities may also be observed.

Monitoring for projects should be connected to quantifiable objectives. Most of the quantifiable goals discussed were related to geomorphic form, but if there are objectives of reducing sediment loads or improving fish habitat in particular, there should be quantifiable objectives and associated monitoring. As explained during the workshop, such monitoring can be expensive. Temperature should be a relatively inexpensive parameter that can be monitored to address fish habitat. Dissolved oxygen and turbidity could be measured with handheld instruments that would require $1500-$2500 to purchase but which could be used repeatedly to capture in situ measurements.

I noted the lack of specification for monitoring water temperature, which should be a monitored parameter if fish restoration is a goal and there are concerns about climate change impacts. I recommend ongoing monitoring of water temperature if it is not already being done, and monitoring of water temperature as part of project monitoring. If projects are expected to connect with shallow

groundwater and influence baseflow, such success should be detectable with appropriate temperature monitoring.

The diagram that the projects are using for existing conditions and project objectives is not very effective for communicating objectives and monitoring (for example, see Figures 2 and 3 of the Final Monitoring Plan for Reaches 3 and 4). Showing this figure on one page or one slide makes it very difficult to read the assessments or objectives and gives an impression that project personnel do not want others to know what the assessments or objectives are.

5. *Ecosystem resiliency is an overarching restoration goal. How do we more effectively communicate to the public and local government representatives the technical processes undertaken to select project approaches to achieve this goal, such as balancing risk of potential short term construction related impacts of restoration projects with the long term benefits to ecosystem function and resiliency?*

Communication about the efforts outlined in the Strategy could be improved. We were very impressed with the way interested parties in the Upper Truckee Restoration efforts took the time to attend and participate in this meeting and how public comments were handled and conveyed. We also heard about some of the challenges of involving and educating the public, stakeholders, and government representatives. Many of the concerns and challenges are found with most projects of this scope, and some are unique to this region. I understand that many times, agencies are constrained by their mandates and regulations from inside and outside of their organizations, and oftentimes, others outside the organization are not aware of these constraints.

Based on my experience in working within the public, private, and academic sectors, I recommend that agency staff consider more carefully how they convey their work to the public and carry out interactions with the public. In other words, interacting with stakeholders and the public is necessary for the success of these projects, but not just because it is a requirement of regulations and permits. I realize that we are seeing a snapshot of a long evolution of addressing these issues, and that this activity (the panel) is a small part of the continued evolution of affecting the ecosystems of the Upper Truckee River Watershed. I am sure that there is a long history of interactions with different stakeholders and interests in the watershed, but it is also important to continue to engage and recognize that such interests are also fluid and evolving. These interests can also provide histories and perspectives on projects that staff may not be aware of.

Because the UTRWAG can already have non-agency members, a listserve from the UTRWAG could be a means of communication about issues related to the watershed, ongoing activities, and opportunities to get involved, if it is not already doing that. The UTRWAG could coordinate a series of visioning workshops, which should involve the public. Connecting more actively with different NGOs that have large memberships in the Basin could also help with publicizing the projects more.

The Marsh project in particular offers excellent opportunities for project visibility and education. It reminds me a little of the McCarran Ranch project on the Truckee River downstream of Reno, where The Nature Conservancy (TNC) was able to implement a river restoration project that showed excellent results within one year of implementation. An overlook on Highway 80 was used to make it easy for travelers to pull over and see the project. TNC was able to use the success of this project to convince agencies to provide funding for more restoration projects on the Truckee.

While some may be opposed to providing boardwalks and encouraging access by the public to the Marsh, in my opinion it is a great opportunity for connecting with a lot of people and educating them about anthropogenic impacts on the watershed and why further restoration is needed. The implementation of a successful restoration project with quantified results and its proximity to South Lake Tahoe and Lake Tahoe itself could make it an iconic project for the Tahoe basin and for restoration projects across the country.

Educational placards about watershed visions and issues could be placed even before project funding is attained. Some placards already exist at the Marsh and Sunset Stables sites, and these could be enhanced to provide more information about the watershed and how restoration of these sites may benefit the watershed. Some funding would be needed for such placards but they should be minimal compared to the actual project costs.

Providing opportunities for the public to volunteer with projects will help with outreach. Connections with area schools, colleges, and universities may be useful for educating students, their instructors, and their parents about watershed issues. For example, I am the faculty advisor for The UNR Ecohydrology Club, and these students are eager to find hands on activities that will help with ecosystem issues. While residents of the Tahoe Basin may be saturated with opportunities to volunteer and participate, residents of nearby communities like Reno and Carson City may see opportunities to volunteer in the Tahoe basin as novel activities that will be fun and exciting.

An activity I was involved with in Colorado called Children's Water Festivals could be effective here as well. These Festivals were arranged by the Central Colorado Water Conservation District to educate 5th and 6th graders about water issues by having water professionals in the community volunteer to provide hands-on activities for the kids about water issues. These activities included things like demonstrations of groundwater flow, gold panning, a mock water court, and having kids stand in a shower stall that rained the amount spun on a 'water wheel' with return period probabilities. The activities were developed and put on by the water professionals (i.e., consultants, agency personnel, professors, graduate students, etc.). Approximately 1500 kids went through the activities in one day.

The development of a website where anyone can get information and data on watershed issues would also help with communication not only to the public, but amongst agency personnel also. Please also see my response to Issue 6.

Development of a watershed council for the basin may also help improve public education of watershed issues. The Truckee River Watershed Council on the other side of the Lake is a good example of such a grass-roots organization that does a good job of engaging and educating the public.

Please also note that in these suggestions, I consider communication with the public to involve reaching out to those who live inside and outside the Tahoe basin. The agencies and residents of the basin can see the visitors to the basin as potential contributors to restoration efforts as well – many come because they enjoy the recreational and aesthetic values the basin provides, and they may be interested in supporting these projects as well.

There may be ways to engage and get input from visitors from outside the basin. Local businesses could be engaged to distribute or display information or newsletters about projects. Surveys could be conducted at recreation spots not only by filling out paper or online surveys, but also by using creative mechanisms to cast votes. For example, visitors could indicate how important good fishing is to them by

dropping tokens in different canisters on site. Or they could vote for what aspects of the watershed are important to them in a similar way at different spots along the watershed.

6. *How should new scientific information and technical advice that is obtained as part of program or project development be incorporated to improve and expand the river-wide restoration strategy?*

A place for sharing data and project results would be useful (perhaps the LTIMPS site?). Having an entity like the Tahoe Science Consortium manage the database, coordinate the monitoring program, and analyze the data would be very beneficial for tracking project impacts as well as impacts of hydrologic events.