



Lower Squaw Creek Restoration Public Workshop

for

*The Friends of Squaw Creek
Truckee River Watershed Council
Sierra Nevada Conservancy*

Prepared by:

Mike Liquori

May 15, 2008

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Sound Watershed Consulting

Creating Functional Water Environments



Next Steps

May 15, 2008



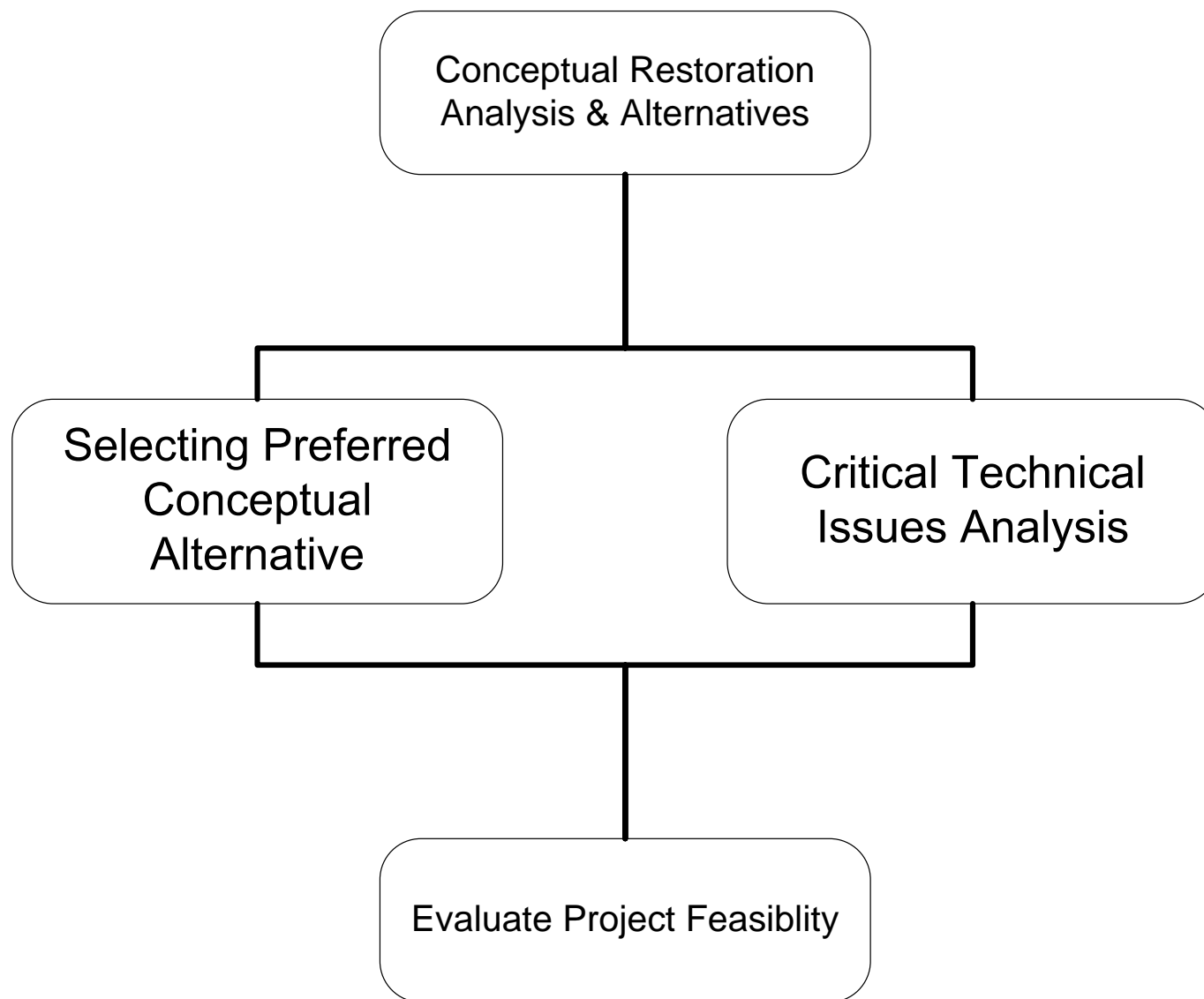
Completed Phases

Background Studies

Conceptual Restoration
Analysis & Alternatives

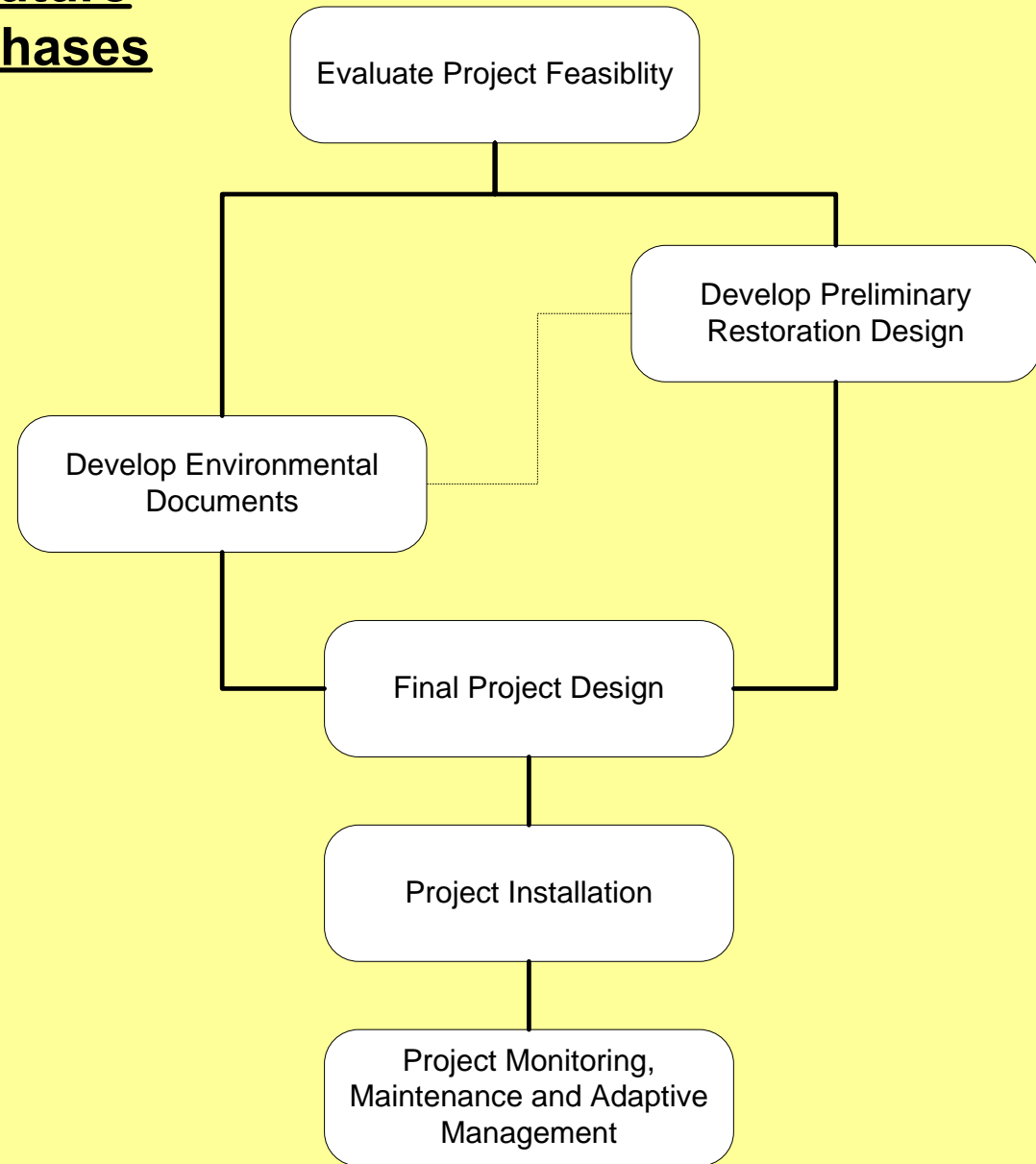


Current Status





Future Phases





Additional Studies

- Evaluation of channel changes
- 2D Hydraulic Modeling
- Bedload supply & transport assessment
- Hyporheic conditions
- Feasibility Studies
- Biological studies
- Permitting studies
- others



Restoration Feasibility Issues

Typical Project Requirement	Current Technical Status	Recommended Phasing	Feasibility Priority	Limitations of Existing Information	Approaches for Refining Technical Basis	Example Techniques & Tools
Project Planning						
Project Objectives	Clearly defined Project Goals	Concept	1	Assumes trapezoidal channel will remain	Refine objectives to incorporate site constraints and opportunities. Obtain client and stakeholder agreement through iterative review	<ul style="list-style-type: none"> Table or List Conceptual Diagram
Watershed Characterization	General characterization available from existing reports	Concept		May need refinement during environmental review	None Required	<ul style="list-style-type: none"> Maps of Key Characteristics Historical Photos & Maps General Historical Review Land-Use Distribution
ID Site Constraints	General constraints identified	Concept / Design		More focus on specific constraints should be developed during design phase	Assemble a comprehensive list or table of site constraints, specific to each reach of project site. For example, describe the constraints for acceptable levels of stream aggradation, incision, bank erosion, migration rates, etc.	<ul style="list-style-type: none"> Table or List
Strategic Approach	General strategic approach identified	Concept		Additional work required to demonstrate feasibility. If feasibility cannot be established, the strategic approach may need to be refined.	Any refinements to approach would be captured when formalizing design criteria and conducting stability analysis. May benefit by considering alternative hypotheses that also explain observed patterns	<ul style="list-style-type: none"> Concept Diagrams Flow Charts Plots of Supporting Data
Technical Objectives / Design Criteria	Partially developed technical objective identified for broad classes	Feasibility	2	Need specifics for select alternatives.	Assemble design criteria to link geomorphic process with desired design conditions	<ul style="list-style-type: none"> Design Tables Flowcharts
Hydrology						
Hydrologic Characterization	Preliminary rainfall runoff evaluation available	Feasibility	3	no calibration or validation. Q50 and Q100 values may be too large. Does not consider changing climatic conditions. Does not sufficiently consider snowmelt or rain-on-snow	Validate against other data sources, including agency data, FEMA studies, on-site monitoring data. Could also benefit by evaluation of climate change scenarios	<ul style="list-style-type: none"> Flood Frequency Analysis Flow Duration Analysis Hydrograph Analysis Hydrologic Modeling
River Floodplain Interactions	Limited	Feasibility	1	Several scientific and extensive public uncertainties about the interactions between surface and subsurface conditions. Has implications for design and environmental review.	Convene a workshop of groundwater experts and restoration team to identify methods for integrating knowledge and reducing uncertainty through monitoring or additional studies	<ul style="list-style-type: none"> Describe Floodplain Stratigraphy Water Table Elevations Estimated Hydraulic Conductivity
Design Hydrology Assumptions (e.g. stormwater, climate change, etc.)	None	Feasibility	2	Need to model effects on hillslope runoff to meadow - field evidence suggests this is an important component of snowmelt runoff in this watershed	Develop methods for road and hillslope runoff to use in hydraulic and hydrologic modeling	<ul style="list-style-type: none"> HEC-HMS Sensitivity Analysis in Hydraulic Modeling Integrated Stormwater Evaluation
Hydraulics						
Analysis of Hydraulic parameters (e.g. width, depth, slope, roughness, shear stress, velocity, sinuosity, stream power, etc.)	Preliminary 1D Hydraulic Model Available	Feasibility	1	Existing model does not sufficiently represent actual conditions	Develop a 2D model to integrate floodplain conditions, provide more precise design specifications, and integrate hillslope runoff component	<ul style="list-style-type: none"> Hydraulic Models (HEC-RAS, MIKE-11, etc.) Analysis of XSs (existing and design) Regime Equations Empirical Relationships
Existing Channel Forming Discharge Analysis	None	Feasibility		uncertainty pending revised hydrologic regime	Apply existing data to select design Q using standard geomorphic analysis methods	<ul style="list-style-type: none"> Dominant Discharge Sediment Entrainment Thresholds Sediment Transport Equations Sediment Transport Modeling
Design Discharge Analysis	None	Design		uncertainty pending revised hydrologic regime	Final designs will benefit from revising hydrologic analysis that integrates results with hydraulic and geomorphic-stability analysis, then compared to desired ecological conditions	<ul style="list-style-type: none"> Flood Frequency Analysis Duration Analysis Expected Hydrologic Regime Analysis Field Calibration
Sediment Transport Analysis	None	Feasibility	2	Insufficient information available about sediment supply. Need in channel stability analysis to evaluate design channel stability	Review sediment transport by examining shear stress in and mobile boundary conditions within hydraulic model. Determine if conceptual designs meet design criteria and project	<ul style="list-style-type: none"> Basic Transport Equations Entrainment Thresholds Analysis Hydraulic Modeling Sediment Transport Modeling

Geomorphology	Available	Refinements in Feasibility Phase will aid Design	4	no repeat cross-sections available, making diagnosis of local changes difficult	Map bank conditions and re-survey select cross sections to capture channel changes since 2005 survey. Use survey information to diagnose localized channel trends and identify specific design solutions	<ul style="list-style-type: none"> Bank Condition Mapping Montgomery & Buffington Classification Geomorphic Forms and Sedimentation Characteristics mapping
Channel Characterization & Reach Delineations	Available	Refinements in Feasibility Phase will aid Design	4	no repeat cross-sections available, making diagnosis of local changes difficult	Map bank conditions and re-survey select cross sections to capture channel changes since 2005 survey. Use survey information to diagnose localized channel trends and identify specific design solutions	<ul style="list-style-type: none"> Bank Condition Mapping Montgomery & Buffington Classification Geomorphic Forms and Sedimentation Characteristics mapping
Historical Evaluation	Available through other reports & studies	Concept		fairly extensive, but limited detail on channel conditions	N/A	<ul style="list-style-type: none"> Maps of Key Characteristics Historical Photos & Maps General Historical Review Land-Use Distribution
Sediment Characterization	Very limited data available	Feasibility	1	Only generalized data available. Need systematic measures along entire length of channel.	Perform surface and subsurface soil counts combined with fine sediment sampling to obtain sediment distributions, long profiles, and perform characterization (to compare with hydraulic results)	<ul style="list-style-type: none"> Existing Sediment Characterization Estimates of Supply Spatial Distribution Variation Erosion & Deposition Patterns Compare to Hydrodynamic Forces
Diagnose Existing Instabilities	Preliminary diagnoses established at the site scale	Feasibility	2	Need to refine with more localized diagnoses at the reach and sub-reach scale	Identify specific treatment options at each identified stability site.	<ul style="list-style-type: none"> Systematic Geomorphic Interpretation Historical Queries of Existing Data Tests of Multiple Working Hypotheses
Planform Alignment Analysis	Conceptual ideas presented in Concept Plan report	Feasibility	1	Ideas need to be tested to verify feasibility, with particular concern over the effects of a) increasing role of Rain-On-Snow associated with climate change and b) alteration imposed by trapezoidal channel	Identify a geomorphic basis for design based on hydro-geomorphic processes and functions, utilizing existing meanders as needed to achieve specific hydraulic or geomorphic objectives. Note that planform alignment solutions must be coupled to sediment tra	<ul style="list-style-type: none"> Hydraulic Model Tools Excess Shear Stress Plots Analysis of Cross Sectional Stresses Specific depositional & erosion mapping Historic channel migration trends Longitudinal Shear Stress Longitudinal Channel Dimension Changes Evidence from E
Channel and Planform Stability Analysis	None	Feasibility & Design	2	Historic channels may reflect hydrologic and geomorphic conditions that cannot be sustained with existing land-use and climate conditions.	Couple hydraulic analysis with basic sediment transport analyses to establish a domain of possible solutions that meet site constraints	<ul style="list-style-type: none"> Hydraulic Model Geomorphic Interpretation Entrainment Estimates Shear Stress & Stream Power Profiles Bank Stability Assessment
Ecology						
Vegetative Habitat Structure	Limited to other studies & reports	Environmental Review & Design		Only general site characterization information available. More detail regarding potential future habitat conditions will benefit design	Consider hydrograph recession trends validated by groundwater elevation monitoring to identify potential future habitat conditions	<ul style="list-style-type: none"> Vegetation Succession Mapping Ecotone Interpretation Mapping Soil Type Mapping Wetland Delineation
Aquatic Habitat Structure	General characterization available	Environmental Review & Design		Lacks specific habitat detail that may apply to design channel planform alignment will support stability channel	Add additional detail for habitat characteristics (e.g. pools, oxbow, spawning, etc.)	<ul style="list-style-type: none"> IFM Methods Interpretation of Geomorphic Maps Habitat Typing Map Bed Facies Map
Wildlife Habitat Structure	Limited	Environmental Review & Design		Only general site characterization information available. More detail regarding specific species assemblages will benefit design	Evaluate existing habitat and identify improvements that are consistent with site design	<ul style="list-style-type: none"> Succession Profiles Integrated Landscape Habitat Models Habitat Typing Map Extended Habitat Qualities Matrix



Project Approach

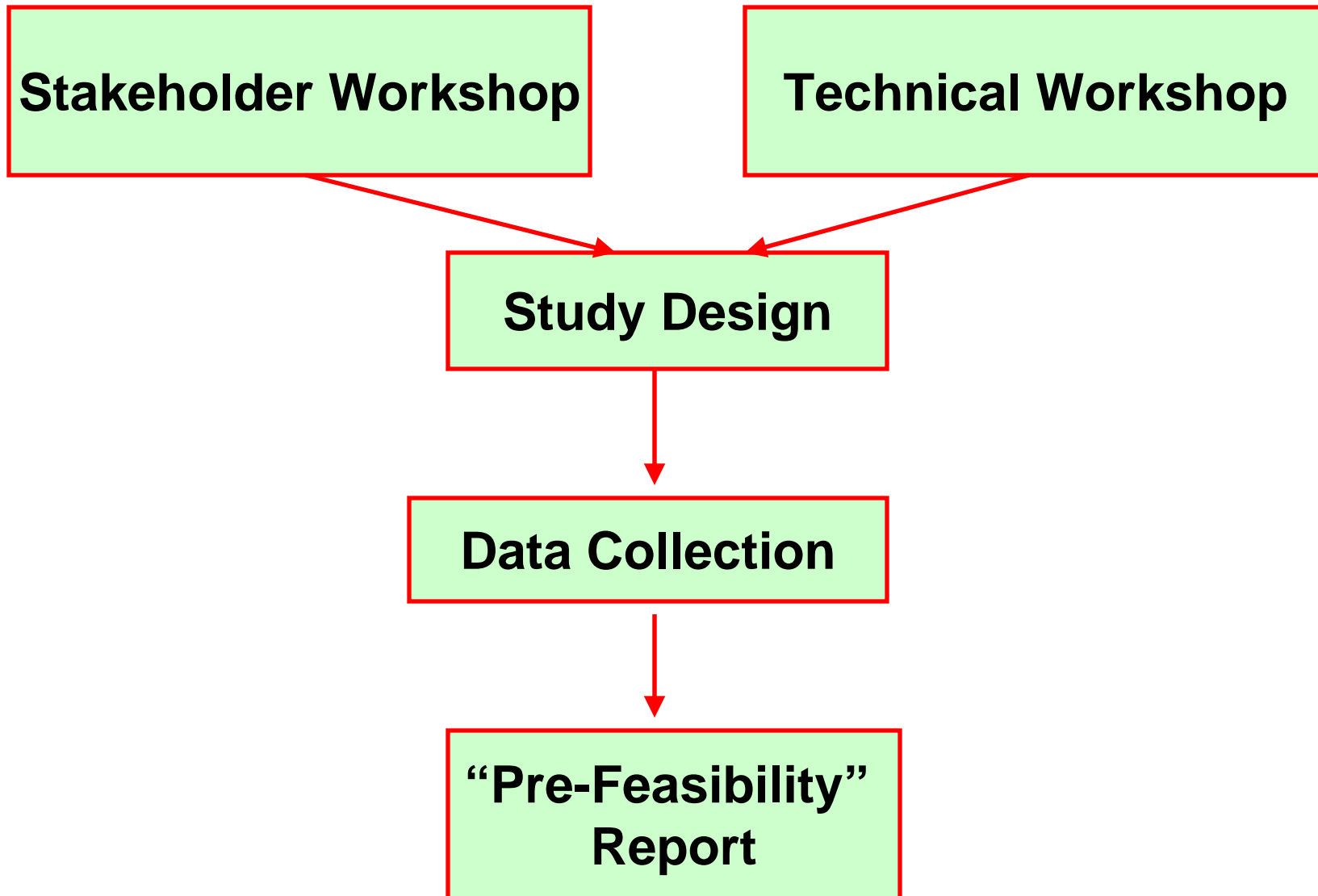
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River-Floodplain Interactions	Limited	Feasibility	1	Several scientific and extensive public uncertainties about the interactions between surface and subsurface conditions. Has implications for design and environmental review.	Convene a workshop of groundwater experts and restoration team to identify methods for integrating knowledge and reducing uncertainty through monitoring or additional studies.	<ul style="list-style-type: none"> • Describe Floodplain Stratigraphy • Water Table Elevations • Estimated Hydraulic Conductivity



- *Understand the “Sponge-Effect”*
 - *Not looking at groundwater supply issues*
 - *Focus on strategies to reconnect the creek & floodplain*
 - *Leverage data & knowledge from existing groundwater studies*
- *Technical Feasibility Studies.*
 - *Remaining funds will be used to address other feasibility issues*



Project Scope





Thank You

- Friends of Squaw Creek
- Truckee River Watershed Council
- Philip Williams & Associates
- Sierra Nevada Conservancy
- Ed Heneveld
- Lisa Wallace
- Edmund Sullivan
- Chris Bowles
- Adam Parris
- Eric Ginney
- Russell Poulson
- Cam Kicklighter
- Carl Gustofson
- Tom Gavigan