THE SIERRA FUND presents

Reclaiming the Sierra 2015: The New Gold Rush

April 20 & 21, 2015
California State University
Sacramento, California

A conference to set the agenda for an era of mine reclamation and community revitalization in California’s Gold Country

www.reclaimingthesierra.org
Reclaiming the Sierra Tonight Show

Monday, April 20, 6:30 - 8:30 pm

This link between cleaning up our legacy mines and educating consumers about the need for responsible mining practices will be featured on the opening night of Reclaiming the Sierra 2015. This talk show-styled panel includes leaders representing completely different perspectives, from international ethical jewelers working to identify “fair mined gold,” to protecting and restoring tribal culture devastated by the Gold Rush, to state regulators working to clean up California’s mine-impacted rivers and forests. Elizabeth “Izzy” Martin, CEO of The Sierra Fund will serve as the host and kick off the program with a quick outline of The Sierra Fund’s vision for the triple bottom line benefits that mine reclamation will bring to California. Keynote guests on the “show” include Greg Valerio, Paula Britton, Mark Nechodom, Ph.D., and Fran Spivy-Weber. Each of the guests will address the audience before sitting down with Izzy to discuss with each other their ideas.

Conference Synthesis Panel

Tuesday, April 21, 4:35 pm

As the closing item on the conference agenda, four panelists who have been observing and processing each of the four conference tracks will take the stage to discuss their impressions. The panel consists of Stephen McCord, Kendra Zamzow, Adrienne Alvord and John Regan. This panel will bring together the diverse facets of the conference, through a facilitated discussion of the conference themes.

Sierra Crest Awards

During conference reception - Tuesday, April 21, 6:00 pm

The Sierra Fund’s awards are annually presented to an organization, an agency, and an individual demonstrating exceptional leadership and initiative in their work to address the impacts of historic mining in California.
Dear Conference Participant,

Welcome to Reclaiming the Sierra 2015, the third conference to be held by The Sierra Fund devoted to assessing and addressing legacy mine reclamation issues in the California. We are excited to hold this conference for the first time at California State University at Sacramento, a beautiful space that allows our conferees easy access to the workshops and exhibits.

When we talk about the “New Gold Rush” we are not thinking about a new rush for precious metals, like the one that left an extensive ecological footprint which shaped our state from the Sierra to the sea with lasting environmental, cultural and health impacts. As a result of the historic Gold Rush, mining debris flowed down our rivers and filled one-third of the San Francisco Bay. The channels and levees dredged through this muck to allow river boat passage created the modern Delta. That debris was loaded with mercury that had been mined in the Coast Ranges and then used as part of hard rock and hydraulic mining for gold - millions of pounds of mercury were left behind in the Sierra Nevada, the headwaters of our state. Every tree in the range was cut down to timber the mines and build the towns of the Gold Country, leaving behind a badly damaged forest. The dams on living creeks and their impacts on the salmon run, the thousands of miles of ditches dug to convey water to mines using hydraulic force to blow apart mountains looking for gold – all are artifacts of the “old” Gold Rush.

Instead, this conference focuses on the triple bottom line benefits of restoring what was damaged by the Gold Rush. We want to learn more about how to prioritize legacy mine remediation to offer the most benefit for the buck; what the best available technologies are for reclaiming and restoring mine impacted lands including forests, meadows, and the enormous gravel/gold fields; how to incentivize reclamation of these legacy mines and mine-scarred lands (and pay for their cleanup) and ensure that modern mines are properly reclaimed; and lastly how to combine these activities to maximize public benefits.

As our state grapples with the most severe drought in decades, The Sierra Fund is working to be a center for collaborative science and well-informed policy that solves real problems from the past and restores resiliency to the state’s largest source of water. The “new gold” is improved forests and meadows that maximize clean water discharge to rivers, restored water capacity in our reservoirs to capture more precipitation, and improved water quality. And, there is even the potential for new “environmentally sound, economically viable and ethically mined” gold rings in which to set “conflict free” diamonds. A new California story with a golden ending.

Thanks for joining us!

Elizabeth “Izzy” Martin
Chief Executive Officer
The Sierra Fund

Program at a Glance

Monday, April 20

7:30 am  Registration Opens
8:15 am  Tour Groups Convene  (Ballroom 3, first floor)
8:30 am  **Buses Depart for Tours**  (See Gold Country Mines and Yuba Goldfields Tour Schedules, pages 10-11)

12:30 pm  Student Poster Session and Exhibit Hall Open  (Ballroom 3, first floor)
4:45 pm  Tours Return

5:30 pm  **Conference Opening Reception**  (Ballroom 3, first floor)
          Appetizers and No-host Bar, 5:30 - 8:30 pm

6:30 pm  **Reclaiming the Sierra Tonight Show: Legacy Mines, California and the World**  (See page 2)
          Featuring Conference Keynotes Greg Valerio, Paula Britton, Fran Spivy-Weber and Mark Nechodom, Ph.D.

Tuesday, April 21

8:00 am  Registration Opens
          Exhibit Hall and Student Poster Session Open (Ballroom 3, first floor)

9:00 am  **Conference Opening Plenary Session Begins**  (Ballroom 2, first floor)
          Introduction and Welcome:  Gary Parsons, The Sierra Fund Board Member

9:15 am  Enduring Legacy of a Toxic Fan via Episodic Redistribution of California Gold Mining Debris
          Michael Singer, Ph.D., University of St. Andrews

9:35 am  Estimating Reservoir Sedimentation Rates at Large Spatial and Temporal Scales: A Case Study of California
          J. Toby Minear, Ph.D., United States Geological Survey

10:25 am  Overview of Conference Tracks
          Carrie Monohan, Ph.D., Science Director, The Sierra Fund
          Elizabeth “Izzy” Martin, CEO, The Sierra Fund

10:45 am  Break
# Program at a Glance

**Tuesday, April 21, cont.**

## 11:00 am  
**Morning Breakout Sessions** *(See details on pages 6-9)*

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- **Multiple Benefits Track**
  - Multiple Benefits of Sediment Removal from Reservoirs

- **Best Available Techniques Track**
  - (1) Spectroscopic Methods for Arsenic Characterization;
  - (2) Polymer Use to Reduce Methylmercury in Wetlands

- **Site Prioritization Track**
  - (1) Yolo Bypass and Delta Mercury Modeling;
  - (2) Sierra Nevada Mercury Impairment Project

- **Improving Mine Reclamation Track**
  - Pre-SMARA Legacy Mine Remediation Challenges and Opportunities

## 12:15 pm  
**Lunch** *(Redwood Room, first floor)*

## 1:20 pm  
**Early Afternoon Breakout Sessions** *(See details on pages 6-9)*

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- **Improving Mine Reclamation Track**
  - SMARA Mine Permitting and Reclamation Issues

- **Site Prioritization Track**
  - (1) Tools for Prioritizing AML Sites across the State;
  - (2) Local Government Opportunities to Lead AML Prioritization Efforts

- **Best Available Techniques Track**
  - (1) Potential Management Practices for Reducing Fish Mercury Levels;
  - (2) Standards for Responsible Mine Reclamation

- **Multiple Benefits Track**
  - Definition of E3 Gold Standards

## 2:25 pm  
**Break**

## 2:40 pm  
**Late Afternoon Breakout Sessions** *(See details on pages 6-9)*

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- **Multiple Benefits Track**
  - E3 Gold Market Analysis and Early Development

- **Improving Mine Reclamation Track**
  - Water Bond Implementation Issues and Opportunities

- **Best Available Techniques & Site Prioritization Tracks**
  - Panel Discussion of Best Techniques and Remediation Priorities

## 4:20 pm  
**Break**

## 4:35 pm  
**Conference Synthesis Panel** *(see page 2) (Ballroom 2, first floor)*

## 5:30 pm  
**Closing Reception and Awards Presentation** - 5:30 - 7:00 pm *(Ballroom 3, first floor)*

*Appetizers and No-host Bar, Sierra Crest Awards and Student Poster Session Awards Presentation at 6:00 pm*
Prioritization of Remediation Efforts Track

Breakout Session Details, Tuesday, April 21

Track Facilitator: Stephen McCord, Ph.D., McCord Environmental
Track Sponsor: Sierra Nevada Conservancy

As part of this track, conference participants will hear technical presentations on prioritizing abandoned mine remediation efforts, encompassing a watershed-wide approach using innovative modeling techniques. The discussion will include tools for local government-led initiatives to access state and federal resources to address abandoned mine-related issues.

Morning Breakout Session, 11:00 am - 12:15 pm, Forest Suite, second floor

11:00 am  Track Introduction and Overview
Stephen McCord, Ph.D., McCord Environmental

11:10 am  Technical Presentation: Downstream Prioritization through Modeling: Yolo Bypass and Delta Mercury Modeling
Carol DiGiorgio, Department of Water Resources

11:40 am  Technical Presentation: Upstream Prioritization through Modeling: Sierra Nevada Mercury Impairment Project
Charles Alpers, Ph.D., United States Geological Survey

12:15 pm  Lunch  (Redwood Room, first floor)

Early Afternoon Breakout Session, 1:20 pm - 2:25 pm, Hinde Auditorium, first floor

1:20 pm  Bird's Eye View: Tools for Prioritizing AML Sites across the State
Glenda Marsh, Department of Conservation Abandoned Mine Lands Program

1:55 pm  Local Government Opportunities to Lead AML Prioritization Efforts
Alexandria Keeble-Toll, The Sierra Fund

2:25 pm  15-minute Break

Late Afternoon Breakout Session, 2:40 pm - 4:20 pm

Discussion Session combined with Best Available Techniques Track - see facing page.
**Best Available Techniques Track**

**Breakout Session Details, Tuesday, April 21**

**Track Facilitator:** Kendra Zamzow, Ph.D., Center for Science in Public Participation

As part of this track, conference participants will hear technical presentations on cutting edge scientific advancements related to abandoned mine land assessment, remediation and evaluation of remediation techniques.

**Morning Breakout Session, 11:00 am - 12:15 pm, Hinde Auditorium, first floor**

11:00 am  **Track Introduction and Overview**  
**Kendra Zamzow, Ph.D., Track Facilitator**

11:10 am  **Technical Presentation: Spectroscopic Methods for Arsenic Characterization**  
**Andrea Foster, Ph.D., United States Geological Survey**

11:40 am  **Technical Presentation: Polymer use to reduce Methylmercury in Wetlands**  
**Jacob Fleck, United States Geological Survey**

12:15 pm  **Lunch**  *(Redwood Room, first floor)*

**Early Afternoon Breakout Session, 1:20 pm - 2:25 pm, Forest Suite, second floor**

**Michelle Wood, Central Valley Regional Water Quality Control Board**

1:55 pm  **Technical Presentation: Standards for Responsible Mine Reclamation**  
**David Chambers, Ph.D., Center for Science in Public Participation**

2:25 pm  **15-minute Break**

**Late Afternoon Breakout Session, 2:40 pm - 4:20 pm, Forest Suite, second floor**

2:40 pm  **Prioritization and Best Available Techniques Tracks Joint Panel Discussion**  
**Stephen McCord, Ph.D., Facilitator**

- Andrea Foster, Ph.D., United States Geological Survey
- Jacob Fleck, United States Geological Survey
- Michelle Wood, Central Valley Regional Water Quality Control Board
- David Chambers, Ph.D., Center for Science in Public Participation
- Mark Nechodom, Ph.D., Director, Department of Conservation
- Carol DiGiorgio, Department of Water Resources
- Charles Alpers, Ph.D., United States Geological Survey
- Glenda Marsh, Department of Conservation Abandoned Mine Lands Program
- Alexandria Keeble-Toll, The Sierra Fund
Multiple Benefits of Mine Reclamation Track

Breakout Session Details, Tuesday, April 21

Track Facilitator: Liz Mansfield, Sierra Water Work Group

As part of this track, conference participants will evaluate the opportunities and challenges associated with creating a market for gold that is sourced from environmentally sound, economically viable and ethically managed (E3) legacy mine remediation activities. The track will consider standards for a new gold product that will allow jewelers, the electronics industry, and other consumers an option to purchase gold that resulted in a net reduction of mercury and other legacy pollution in the environment.

Morning Breakout Session: Multiple Benefits of Sediment Removal from Reservoirs
11:00 am - 12:15 pm, Ballroom 2, first floor

Workshop Sponsor: Forsgren Associates

- Remleh Scherzinger, General Manager, Nevada Irrigation District
- Ajay Goyal, Chief, Statewide Infrastructure Investigations Branch, Department of Water Resources
- Alberto Ramirez, Teichert Materials

12:15 pm Lunch (Redwood Room, first floor)

Early Afternoon Breakout Session: Definition of E3 Gold Standards
1:20 pm - 2:25 pm, Orchard Suite, second floor

- Sherri Norris, Executive Director, California Indian Environmental Alliance
- Greg Valerio, international fair trade and fair mined jewelry activist
- Jennifer Krill, Executive Director, Earthworks
- Amy Crook, Executive Director, Fair Mining Collaborative

2:25 pm 15-minute Break

Late Afternoon Breakout Session: E3 Gold Market Analysis and Early Development
2:40 pm - 4:20 pm, Ballroom 2, first floor

- Marc Choyt, Fair Jewelry Action
- Martin Taber, Ethical Metalsmiths
- Alberto Ramirez, Teichert Materials
Improving Mine Reclamation Track

Breakout Session Details, Tuesday, April 21

Track Facilitator: Caleb Dardick, South Yuba River Citizens League

As part of this track, conference participants will consider solutions to the challenges associated with regulating and funding abandoned mine reclamation in the current state and federal agency structure. Facilitated conference discussions will identify opportunities for collaboration, as well as funding from federal and state sources.

Morning Breakout Session: Pre-SMARA Legacy Mine Remediation Challenges and Opportunities

11:00 am - 12:15 pm, Orchard Suite, second floor

Workshop Sponsor: Holdrege & Kull

- Glenda Marsh, Department of Conservation Abandoned Mine Lands Program
- Julie Griffith-Flatter, Sierra Nevada Conservancy grant program
- Bob Schneider, Tuleyome

12:15 pm Lunch (Redwood Room, first floor)

Early Afternoon Breakout Session: SMARA Mine Permitting and Reclamation Issues

1:20 pm - 2:25 pm, Ballroom 2, first floor

Workshop Sponsor: Department of Conservation, Office of Mine Reclamation

- Pat Perez, Director, Department of Conservation, Office of Mine Reclamation
- William Craven, Senate Natural Resources Committee
- Gary Parsons, San Juan Ridge Taxpayers Association

2:25 pm 15-minute Break

Late Afternoon Breakout Session: Water Bond Implementation Issues and Opportunities

2:40 pm - 4:20 pm, Hinde Auditorium, first floor

- Jena Price, California League of Conservation Voters
- Keali'i Bright, Resources Agency
- Alf Brandt, Legislative Director, California Assemblymember Anthony Rendon's Office
Gold Country Mines Tour

Monday, April 20

Tour Sponsor: California Department of Conservation Office of Mine Reclamation
Tour Host: Elizabeth “Izzy” Martin, CEO, The Sierra Fund

This tour highlights two examples of potential cleanup technologies to abate mercury contamination of California’s headwaters. The tour will first visit Malakoff Diggins State Historic Park, where California Department of Parks and Recreation owns what was once one of the world’s largest hydraulic mines. Tour participants will walk into this nearly two mile long, one mile wide hydraulic mining pit and look at the historic Hiller Tunnel that is the outlet for surface water discharge from the pit. Tour participants will then travel to Combie Reservoir, on the Bear River, which is owned and operated by the Nevada Irrigation District (NID). Tour participants will view a demonstration of an innovative process and state of the art machinery that removes elemental mercury from dredged sediments and treats turbid water discharge, part of NID’s precedent-setting project to combine reservoir maintenance with mercury remediation.

Gold Country Mines Tour Agenda

8:15 am  Tour group convenes in Ballroom 3
          Welcome and orientation, The Sierra Fund CEO Elizabeth “Izzy” Martin

8:30 am  Bus departs from Conference Facility, CSU Sacramento

10:30 am Tour arrives at Malakoff Diggins State Historic Park
          Tour visits Malakoff Diggins Pond and Hiller Tunnel
          Presentations on the Humbug Creek Watershed Assessment and Management Recommendations
          Rick Humphreys, The Sierra Fund advisor and retired State Water Resources Control Board mining expert
          Charles Alpers, Ph.D., United States Geological Survey
          Cyndie Walck, California State Parks

12:20 pm Lunch served in the historic town of North Bloomfield

12:55 pm Bus leaves Malakoff Diggins State Historic Park

2:00 pm  Tour arrives at Combie Reservoir
          Demonstration of Nevada Irrigation District’s Mercury and Sediment Removal Project
          Timothy Crough, Nevada Irrigation District
          Carrie Monohan, Ph.D., The Sierra Fund

3:30 pm  Bus leaves Combie Reservoir

4:45 pm  Bus arrives at Conference Facility, CSU Sacramento
### Yuba Goldfields Boat Tour

**Monday, April 20**

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<tr>
<td>8:15 am</td>
<td>Tour group convenes in Ballroom 3</td>
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<td><em>Welcome and orientation, Alison Harvey, The Sierra Fund</em></td>
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<tr>
<td>8:30 am</td>
<td>Bus departs from Conference Facility, CSU Sacramento</td>
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<td>9:50 am</td>
<td><strong>Tour arrives at Parks Bar “Put In” on the Lower Yuba River</strong></td>
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<td>Orientation to Yuba River Watershed, <em>Chris Friedel, SYRCL</em></td>
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<td>Introduction to the Yuba Goldfields and Its Mining Legacy, <em>Rachel Hutchinson, SYRCL</em></td>
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<td>10:15 am</td>
<td>Launch boats</td>
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<td>12:00 pm</td>
<td><strong>Tour arrives for lunch at “Salmon Alley” Overlook</strong></td>
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<td>Presentation on Yuba River Salmon – <em>Chris Friedel, SYRCL</em></td>
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<td>Presentation: Fish, Mercury and Human Health – <em>Alex Keeble-Toll, The Sierra Fund</em></td>
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<tr>
<td>1:20 pm</td>
<td><strong>Short walk to Goldfields Overlook with Presentations:</strong></td>
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<td>Presentation: Experiencing the Goldfields – <em>Rachel Hutchinson, SYRCL</em></td>
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<td>Presentation: Present Day Mining and Reclamation – <em>Brandon Stauffer, Teichert Materials</em></td>
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<td>1:40 pm</td>
<td><strong>Presentation at SYRCL Restoration Site at Hammon Bar</strong></td>
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<td>Presentation: Riparian Vegetation and Habitat Restoration – <em>Rachel Hutchinson, SYRCL</em></td>
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<tr>
<td>3:00 pm</td>
<td>Boats take out at Sycamore Ranch Park</td>
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<td>3:30 pm</td>
<td>Bus departs for Sacramento</td>
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<tr>
<td>4:45 pm</td>
<td>Bus arrives at Conference Facility, CSU Sacramento</td>
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Ongoing Activities

Exhibit Hall

Businesses, nonprofit organizations and government agencies are displaying educational and technical information about their programs and products throughout the conference in Ballroom 3.

Student Poster Session

Students from area colleges and universities were invited to submit posters on legacy mining impacts and the policies, technologies and programs that address these impacts. The poster session is available for viewing in Ballroom 3 from Monday, April 20 at noon to Tuesday, April 21 until 7:00 pm. Students will present their posters at lunch on Tuesday, April 21.

Posters will be judged at the event and cash prizes for first, second and third place presented during the conference Closing Reception and Awards Presentation, April 21 from 5:30 – 7:00 pm.

Poster judges for the session include:

- Charles N. Alpers, Ph.D., Research Chemist, United States Geological Survey
- David Brown, Ph.D., Professor, California State University Chico
- Bill Christner, Ph.D., Senior Geomorphologist, Balance Hydrologics, Inc.
- Kevin Cornwell, Ph.D., Professor of Geology, CSU Sacramento

Legacy Mine Reclamation Services Directory

To continue building the diverse network established at our Reclaiming the Sierra conferences, The Sierra Fund has developed a comprehensive e-directory of the businesses, organizations and agencies providing environmental restoration, legal, outreach, financial and other services related to reclaiming legacy mines in the Sierra. Listing in the Directory is free – you can fill out an entry using the computer station located at conference registration, or go to: http://reclaimingthesierra.org/services-directory/.
Charles Alpers, Ph.D., has an undergraduate degree in geology from Harvard University and a Ph.D. in geology from the University of California, Berkeley. For the past two decades he has been a Research Chemist with the U.S. Geological Survey in Sacramento where his work has focused on environmental problems related to abandoned mine lands. In addition to his work on acid mine drainage from copper mines including Iron Mountain and Penn Mine, he has led several investigations of mercury contamination and bioaccumulation associated with past mining of gold and mercury in the Coast Ranges, the Trinity Mountains, and the Sierra Nevada.

Adrienne Alvord is the Union of Concerned Scientists’ California and Western States Director, based in Berkeley, California. Ms. Alvord is leading UCS’s effort to ensure robust implementation of the California Global Warming Solutions Act, California’s landmark climate law known as “AB 32.” Prior, Ms. Alvord was the environmental policy director for California State Senator Fran Pavley and served as lead staff on AB 32. She worked extensively in climate, energy, fuels, waste, and agricultural policy and has deep experience both in translating scientific and technical work into policy ideas and creating strategic partnerships to achieve those policies. Prior, Ms. Alvord served as a gubernatorial appointee directing state pesticide legislation and regulations, and previously was policy director for the Community Alliance with Family Farmers.

Alf Brandt, Legislative Director, California Assemblymember Anthony Rendon

Keali‘i Bright was appointed by Governor Brown in 2011 and currently serves as the Deputy Secretary for Legislative Affairs for Secretary John Laird at the Natural Resources Agency. In this capacity, he works with the agency on statewide and regional resource conservation and infrastructure legislation and program implementation. Prior, Keali‘i served as a principle consultant for the Assembly Budget Committee during which his primary policy assignments were natural resources, environmental protection and transportation. Keali‘i graduated from the University of California, Santa Cruz with a degree in Latin American and Latino Studies in 1998 and has since lived abroad and worked in the non-profit sector.
Paula Britton, Environmental Director, Habematolel Pomo

David Brown, Ph.D., California State University Chico

David Chambers, Ph.D., is the president of the Center for Science in Public Participation, a non-profit corporation formed to provide technical assistance on mining and water quality to public interest groups and tribal governments. He has 39 years of experience in mineral exploration and development. Dr. Chambers has Professional Engineering Degree in Physics from the Colorado School of Mines, a Master of Science Degree in Engineering from the University of California at Berkeley, a Ph.D. in Environmental Planning from Berkeley and is a registered professional geophysicist in California. His continuing research focus is on the intersection of science and technology with public policy and natural resource management.

Marc Choyt is President and co-founder of Reflective Images Jewelry, a company focused on ethically sourced, handmade designer jewelry since 1995, and co-founder of Fair Jewelry Action. The City of Santa Fe honored Reflective Images in 2014 for its triple bottom line business model. Marc sits on the board of Santa Fe’s Green Chamber of Commerce and recently led a campaign that helped block the opening of a new gold mine south of Santa Fe. He is currently working with Fairtrade to support the broad roll out of fair trade gold in North America and completing his book, The Circle Manifesto, which explores implementing regenerative business practices using the circle as a process model. He is a writing and literature graduate of Brown University and has his Masters in Humanities from St. John’s College.

Bill Christner, Ph.D. is a Senior Geomorphologist with Balance Hydrologics, Inc. As one of the few California geomorphologists coming from formal training in soil science, Dr. Christner applies his diverse background to a host of applications in channel morphology, soil characterization and assessment, wetland design and construction, erosion control, and shallow groundwater movement. He specializes in overall restoration of channel corridors to enhance salmonid spawning and rearing habitat, bringing a ‘valley-floor’ perspective to re-naturalizing stream systems. His 18 years of experience include work in California, Minnesota, Montana, Nevada, and Wyoming.

Kevin Cornwell, Ph.D., Professor of Geology, California State University Sacramento

William Craven is currently the chief consultant of the Senate Natural Resources and Water Committee. The committee is chaired by Senator Fran Pavley, D-Agoura Hills, co-author of AB 32, California’s leading climate change legislation. The Natural Resources and Water Committee has jurisdiction over legislation pertaining to water, forestry, wildlife, hunting and fishing, public lands, coastal protection, ocean policy, state parks, mining, harbors, and other key California resources. William also often

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participates in meetings of the Ocean Protection Council, the California State Parks and Recreation Commission, and the Wildlife Conservation Board on which Sen. Pavley is a legislative member.

Amy Crook is the Executive Director of the British Columbia based charitable non-profit Fair Mining Collaborative (FMC), an organization of independent scientists who provide technical and strategic support to Aboriginal leadership and communities affected by resource development. Ms. Crook has been conducting technical reviews of mining developments for 30 years, lending her extensive technical expertise to assist Indigenous communities with complex project management, community capacity building and knowledge transfer. Ms. Crook directed the development of FMC’s cutting edge work Fair Mining Practices: A New Mining Code for British Columbia and has been assisting First Nations with their response to the Mount Polley mine disaster.

Timothy Crough is the Assistant General Manager of the Nevada Irrigation District. He is a Registered Civil Engineer in California, with more than 35 years of public administration and engineering experience including 20 years in the water industry. Mr. Crough is the Project Manager for the Combie Reservoir Sediment and Mercury Removal Project by the Nevada Irrigation District, a one-of-a-kind project designed to remove legacy mercury from sediment in the Bear River, while restoring valuable water storage capacity for the District.

Caleb Dardick, Executive Director, South Yuba River Citizens League (SYRCL), has over 20 years of experience in community outreach, advocacy, governmental and media relations. Caleb leads SYRCL in fulfilling its mission to unite the community to protect and restore the Yuba River watershed. Upon joining SYRCL in September 2011, Caleb led the effort to save two State Parks slated to close due to budget cuts. Prior, Caleb served as Director of Local Government and Community Relations for UC Berkeley’s Office of the Chancellor. From 2000-2009, he provided public relations and public affairs consulting to a broad
range of clients in business, government, the nonprofit sector and politics. In the mid-1990s, Caleb served in the Berkeley Mayor’s Office. Caleb earned a B.A. in History with honors at the University of California, Santa Cruz.

Carol DiGiorgio is the Program Manager for the Mercury Monitoring and Evaluation Section in the Department of Water Resources. The section was formed in 2012 to coordinate the Department's compliance with the Delta Mercury Control Program. Carol has a Bachelor’s in Biology from UC Davis and a Master’s in Biology from Humboldt State University. She has worked on a number of water quality issues including selenium and pesticide toxicity, drinking water quality and pathogens and now mercury.

Jacob Fleck is a Research Hydrologist at the U.S. Geological Survey in Sacramento, California, where his research has focused on organic matter and mercury cycling in the environment. Jacob received a Bachelor’s in Biosystems Engineering and a Master’s in Soil Science, with emphases in biogeochemistry and water resources, from the University of Minnesota and began his career studying mercury cycling in the Great Lakes region. After a brief hiatus while studying drinking water contaminants in the Sacramento-San Joaquin Delta, he returned to studying mercury cycling in California. For the past 10 years, he has investigated mercury methylation in wetlands and mercury contamination related to historic gold and mercury mines. Jacob is currently involved in studies evaluating the relative importance of mercury sources and assessing techniques for managing the mercury threat to human and wildlife health.

Andrea Foster, Ph.D., obtained her B.S. with honors in Geology from Indiana University in 1992 and her Ph.D. from Stanford University in 1999. The same year, Foster accepted an appointment with the USGS Mineral Resources Program in Menlo Park. Her work investigating the environmental chemistry of arsenic at California mine sites began with Ph.D. research and continues to this day. She has been the principal investigator on ten successful proposals for synchrotron beamtime in the area of geochemistry/environmental mineralogy and has collaborated on several others. She continues to use synchrotron X-rays in her research, but is currently developing in-house methods using Raman microspectroscopy to identify the forms of environmentally- and economically-important elements in earth materials.

The Sierra Nevada Conservancy is a state agency that was created to initiate, support and enhance efforts to improve the environmental, economic and social well being of the Sierra Nevada Region. The SNC’s vision, goals, and program areas recognize the unique and special values of the Region.

www.sierranevada.ca.gov
The Office of Mine Reclamation (OMR) oversees implementation of the Surface Mining and Reclamation Act to assure reclamation of California’s mined lands to a beneficial end-use. OMR works with many partners to protect the public and environment from the residual contamination and safety hazards found at abandoned and legacy mines throughout the state.
Chris Friedel is the River Science Manager for the South Yuba River Citizens League (SYRCL) where he helps manage their environmental monitoring, education, and ecological restoration programs. Prior to SYRCL, he managed a native plant nursery and creek restoration program at Muir Woods National Monument, and worked as a vegetation ecologist for the National Park Service. More recently, Chris has led an effort to build a community-scale biomass-to-energy plant in Yuba County. Chris earned a Bachelor’s degree in Earth Systems Science from Stanford University in 2001.

Julie Griffith-Flatter is a Mt. Lassen Area Representative for the Sierra Nevada Conservancy (SNC) with a focus on the Conservancy’s Abandoned Mine Lands (AML) program and Tribal Policy. Her background includes 18 years of land use planning in Sierra County where mine permitting and environmental analysis were part of her responsibility for current mining operations. Through her work in Sierra County, her awareness of the continuing harmful impacts from abandoned mine sites grew. She has participated in the inter-agency abandoned mine lands forum, now known as the California Abandoned Mine Lands Agency Group, both as a County employee and a SNC employee. When the SNC initiated its AML program, she was pleased with the opportunity provided through the new program to enhance work towards remediating legacy impacts from AML sites in the Region.

Ajay Goyal is the Chief of the Statewide Infrastructure Investigations Branch in the Department of Water Resources. Mr. Goyal has over 20 years of experience in the planning, design, and construction of large water resources facilities. He is the program manager for the Surface Storage Investigations Program, and the System Reoperation Program. He is also assisting the California Water Commission in the development of regulations and guidelines for the quantification of public benefits associated with the $2.7 billion Water Storage Investment Program of the Water Bond.

Alison Harvey is the Director of Governmental Affairs for the United Auburn Indian Community, a federally recognized California tribe comprised of Maidu and Miwok Indians based in the Sierra Nevada foothills in Auburn. The UAIC owns Thunder Valley Casino and several other enterprises, which provide resources for the tribe’s school, housing, health, elder care and other vital programs. Alison directs the tribe’s federal, state and local government relations and legislative affairs. Prior to working for the UAIC, Alison was the Executive Director of the California Tribal Business Alliance, a coalition of seven California Indian tribes that operate gaming facilities under the terms of tribal-state compacts. Alison had 23 years of experience in the California Legislature, where she served as chief of staff to Senate President pro Temp John L. Burton, principal
consultant for the Senate Judiciary Committee, and 14 years as chief of staff to Assemblyman Phil Isenberg.

**Rick Humphreys**, until his recent retirement, was a Senior Specialist Engineering Geologist with the State Water Resources Control Board, where he worked since 1986. He began specializing in mining issues related to water quality in 1991. Rick holds both a BS and a MS in Geology.

**Rachel Hutchinson** is the River Science Director at the South Yuba River Citizens League (SYRCL). Ms. Hutchinson holds a BS in Environmental Resource Science and a MS in Water Resources. She has over 10 years of experience as a riparian ecologist working on a variety of Northern California's river and meadow ecosystems. Since joining SYRCL she has worked on legacy mining impacts in the Humbug, Scotchman, Spring, and Shady Creek watersheds, all tributaries to the South Yuba River and works on larger scale restoration projects restore the lower Yuba River.

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### Many Thanks

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<td>And, we couldn't do it without our fantastic team of volunteers – from students to weathered activists to local organizations!</td>
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<td>This conference would also not be possible without the visionary foundations that support our ongoing Initiative to address the impacts of legacy mining: Clarence E. Heller Charitable Foundation, True North Foundation, Nell Newman Foundation, and the Giles &amp; Elise G. Mead Foundation. We are honored that these organizations have chosen to invest in our work, showing their confidence in our abilities and the importance of this issue.</td>
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Alexandria Keeble-Toll has a B.A. in Sociology from UCLA and an M.A. in Sociology from CSU, Sacramento. Alex's M.A. work focused on environmental inequality and hazard formation; her thesis analyzed three hardrock gold mines across a 150-year timeframe. Alex recently became a UC Certified California Naturalist through UC Davis and began work toward an M.S. degree in Environmental Science at CSU, Chico. For her current thesis research, Alex is working with Dr. Carrie Monohan and The Sierra Fund to examine methylmercury bioaccumulation in fish tissue, focusing on water bodies in the Cosumnes, American, Bear, Yuba (CABY) watershed region.

Jennifer Krill is the Executive Director of Earthworks, where she worked since 2010 to protect communities and the environment from the negative impacts of mining and fossil fuel extraction. She co-founded and serves on the Board of Directors of Plug In America, which advocates for petroleum-free, pollution free electric vehicles. She also serves on the Board of the Labor Network for Sustainability and the Advisory Committees of the Business Ethics Network and the Western Mining
Action Network. Jennifer holds a B.A. and a B.L.A. from Ball State University, and previously directed successful campaigns at Rainforest Action Network, where she helped protect old growth forests and prevent banks from financing climate change-causing industries. In 2014, she was inducted into the Women’s Hall of Fame of Alameda County, California for her work on behalf of the environment.

Elizabeth Mansfield is currently the Director of the Sierra Water Workgroup, whose mission is to increase inter-regional cooperation and assist regional efforts in protecting and enhancing water quality, water supply, and watershed health. She has worked for the Center for Collaborative Policy as the senior facilitator for the Sierra Water Workgroup, and the El Dorado Irrigation District as the Water Resources Manager. She served as the Executive Director of the Integrated Regional Water Management Planning group for the Cosumnes, American, Bear and Yuba (CABY) Region. Prior, Mrs. Mansfield worked for the U.S. Bureau of Reclamation, was Deputy Assistant to the California Department of Water Resources, and Water Consultant to the California Legislature, Assembly Committee on Water, Parks and Wildlife.

Glenda Marsh is the Program Manager for the Abandoned Mine Lands Program at the California Department of Conservation. She brings a diverse 15-year career implementing environmental regulatory and natural resource programs at several state departments, including historical fishery, hydrological, genetics, and botanical research projects. She finds that reclaiming the state’s historic mined lands has many similar facets, requiring bridging between regulatory processes, human and environmental health and land management in order to protect people and the environment for future generations.

Elizabeth “Izzy” Martin is a community organizer and environmental advocate with over thirty years of experience working in rural communities to promote economic and environmental justice. Her background includes working with family farmers and farm labor advocates for two decades, serving two terms on the Nevada County Planning Commission and four years as a Nevada County Supervisor. In 2004 she led the successful advocacy effort to persuade the California State legislature to establish the Sierra Nevada Conservancy. Izzy has been the CEO of The Sierra Fund for over 10 years, during which time she helped to develop more than $125 million in new funds for conservation in the Sierra.

Stephen McCord, Ph.D., P.E., is President of McCord Environmental. He holds a B.S. degree in Civil Engineering from Clemson University, and an M.S. and Ph.D. degrees in Civil & Environmental Engineering from the University of California.
Biographies M

Davies. He has over 20 years of consulting, research and teaching experience in the environmental engineering field with projects throughout California, several other US states, and internationally. As a registered Professional Engineer in the State of California, Dr. McCord has managed stormwater monitoring projects and water quality field studies throughout California. A particular area of focus has been mercury – conceptual and mass balance models, TMDLs, trading programs, abandoned mine site cleanups, strategic planning, and stakeholder group facilitation.

J. Toby Minear, Ph.D., received a Bachelor’s degree from Colorado College and Master’s and Ph.D. from the University of California, Berkeley. Since 2010, Dr. Minear has worked at the United States Geological Survey California Water Science Center, in Sacramento, California, and is presently at the USGS Geomorphology and Sediment Transport Laboratory in Golden, Colorado. Dr. Minear works on a variety of river research and hydrodynamic modeling projects in California and the Western U.S., including the San Joaquin River, Trinity River, Klamath River, Merced River in Yosemite National Park, Upper Colorado River Basin, and Elwha River Dam Removal projects.

Carrie Monohan, Ph.D., Science Director for The Sierra Fund, earned her Doctorate in Forest Engineering and Hydrology in 2004 from the University of Washington, Seattle. Her dissertation work addressed the relationship between water quality in agricultural streams and diminishing salmon habitat. Throughout her graduate program, she was a research assistant to the Northwest Fisheries Science Center, National Oceanic and Atmospheric Administration (NOAA). Other notable recent positions include Senior River Scientist for the Natural Heritage Institute and project manager and lead scientist for the EPA Brownfields Community Wide Assessment in Nevada City. Carrie worked with The Sierra Fund as a consultant starting in 2007, and was hired as staff in 2010. Since 2011 she has served as adjunct professor at CSU, Chico.
Jason Muir, GE, QSD, is a Project Manager and Principal at Holdrege & Kull’s Nevada City corporate headquarters, is a registered Civil Engineer and Geotechnical Engineer, and holds a Master’s degree in Environmental Engineering from the University of California at Berkeley. He manages H&K’s Environmental Division, and has overseen the assessment of more than 3,000 acres of abandoned mine land. Mr. Muir has obtained Cal/EPA approval for over two dozen site investigations and engineering evaluations under the expedited CERCLA process, including hydrocarbon releases, pesticide residuals and unpermitted waste disposal sites.

Mark Nechodom, Ph.D., was appointed Director of California’s Department of Conservation (DOC) by Governor Brown in January 2012. He has dedicated his professional life to integrating sustainable production and practices while maintaining a sensible balance between economic opportunities, environmental health, and human well-being. Prior to his position at DOC, Dr. Nechodom was a Senior Policy Advisor at the US Department of Agriculture (USDA) and served as Director of the Office of Environmental Markets at USDA. He was a Senior Climate Science Policy Advisor to the Chief of the US Forest Service and worked on federal greenhouse gas legislation in Washington, DC. Dr. Nechodom earned his Ph.D. in Political Science and Environmental Policy from the University of California, Santa Cruz, where he taught for several years.

Sherri Norris has fourteen years of experience working as a tribal health and environmental advocate with California Tribes at the local level and at international European Union and United Nations forums. Sherri has given hundreds of presentations and trainings on the cycle and health effects of mercury on environmental health, risk-reduction strategies and the development of solutions that promote the continuation of eating traditional fish while avoiding toxins. As Executive Director of the California Indian Environmental Alliance (CIEA) Sherri’s work supports California Tribes by providing technical support and increasing opportunities for Tribes to guide cleanup, restoration and partner in the collaborative work required to reduce toxins in the environment. Sherri is a member of the Osage Nation and grew up in Northern California.

Gary Parsons is a San Juan Ridge-based general building contractor living and working on the Ridge since 1989. He received his B.S. in Environmental Design from the University of California, Davis in 1988. His community involvement on the Ridge is
shared between his role as a board member of the San Juan Ridge Taxpayers Association and as a board member of the Yuba Watershed Institute. Gary joined The Sierra Fund’s Board of Directors in 2015.

**Pat Perez** was appointed Assistant Director of the Office of Mine Reclamation at the California Department of Conservation on August 29, 2014 by Governor Brown. Perez served as acting supervisor of the Division of Oil, Gas, and Geothermal Resources in 2014. Prior, Perez held a number of managerial and supervisory positions during a 32-year career at the California Energy Commission. He led programs that dealt with such diverse topics as climate change, renewable energy, conventional fuels, liquefied natural gas, international energy market development, land use, and emergency planning and response. Before joining the Department of Conservation, Perez served as the Energy Commission’s Deputy Director for transportation energy and alternative fuel programs. A native of Santa Barbara, Perez graduated with a degree in geography from the University of California Santa Barbara in 1979.

**Jena Price,** Legislative Affairs Manager, California League of Conservation Voters

**Alberto Ramirez** is the Project Manager for Mining and Environmental Engineering at Teichert Materials in Sacramento, California, where he identifies and evaluates new and current water discharge requirements and is involved in river rehabilitation for sustainable and ethical aggregates mining. Ramirez has been with the company since 2003. Prior, he worked as Assistant Mine Manager for Cal Sierra Development in the operations of the Yuba Dredges on the Yuba Goldfields and has held management positions related to...
gold mining in Brazil and Peru. Ramirez graduated as a Mining Engineer from the Montana College of Minerals in 1983.

John Regan is a founding member of The Sierra Fund’s Board of Directors and President of Smart Campaigns, a national firm specializing in due diligence, strategic research, issues analysis and media relations. His clients have included more than thirty current and former members of Congress and more than a dozen U.S. senators, as well as state constitutional officeholders, political party organizations and interest groups in more than a dozen states. John has managed lobbying, public relations and legislative campaigns for community-based environmental organizations, including the South Yuba River Citizens League’s historic campaign that won California State Wild and Scenic River protection for the South Yuba River in 1999. He has coordinated environmental representation on several ambitious collaborative efforts to restore endangered salmon and steelhead populations in the upper Yuba River Watershed.

Remleh Scherzinger has served as the General Manager at the Nevada Irrigation District since January 2013. He brings extensive knowledge and experience in the water utility field. He is a former utilities engineering manager with the City of Petaluma, and has also worked with the Sonoma County Water Agency and Metropolitan Water District. He holds an MBA degree and is a licensed civil engineer.

Bob Schneider graduated from UC Davis with a B.S. degree in Geology in 1972. He is the co-founder of both the California Wilderness Coalition and Tuleyome, a conservation organization based in Woodland. Bob served as Tuleyome’s project director on the Corona Twin Peaks mercury mine restoration project and volunteers as their Senior Policy Director. Bob currently serves on the Central Valley Water Board where he developed an interest in mercury issues through participating in the development and approval of the Clear Lake, Cache Creek and Sulphur Creek mercury total maximum daily loads (TMDLs).

Michael Singer, Ph.D., earned an undergraduate degree in Environmental Science from the Evergreen State College in Washington and a Ph.D. from the Donald Bren School of Environmental Science and Management at the University of California, Santa Barbara. Singer is a lecturer in the Department of Earth & Environmental Sciences at the University of St. Andrews in the United Kingdom, and a researcher for the Earth Research Institute at UC Santa Barbara. His work has focused on hydrologic and geomorphic aspects of environmental problems ranging from the impact of climate change on hydrologic partitioning and earth surface processes to the legacy of 19th century hydraulic gold mining in California. In recent work, Singer has led a team of investigators on a study of mercury contamination and bioaccumulation within food webs of...
California’s Central Valley.

**Frances Spivy-Weber** was re-appointed as the Public Member of the State Water Resources Control Board on March 1, 2009. She serves as Vice Chair of the Board and is the Board liaison to the Los Angeles, San Diego, Central Coast, and Lahontan Regional Boards and the Ocean Protection Council Steering Committee. Prior to joining the Board, she was the Executive Director of the Mono Lake Committee; and International Programs Director of National Audubon Society. Fran has served on numerous state and regional water advisory groups and task forces, including the Bay-Delta Public Advisory committee; State Water Plan 2005 Advisory Committee California Landscape Task Force 2005; State Water Recycling Task Force 2003; Governor’s Advisory Drought Planning Panel 2000. She has served as convener and on the Board of the California Urban Water Conservation Council, co-convener of the Southern California Water Dialogue, and on the Boards of the Water Education Foundation, California Council of Land Trusts, and Clean Water Action/Clean Water Fund. Fran has a BA from the University of Texas in history and political science and an MA from Johns Hopkins University School of Advanced International Studies.

**Brandon Stauffer** is the North Region Division Manager at A. Teichert and Sons managing mining and reclamation at four operations, including two in the Yuba Goldfields. He has worked for Teichert for 14 years. Previously he worked for the California Dept. of Transportation for eight years while attending California State University Chico for a B.S. in Civil Engineering. He also worked for six years as Plant Manager at Knife River Corporation, a subsidiary of Montana Dakota Utilities, managing their sand and gravel operations in the Yuba Goldfields.

**Martin Taber** received his B.A. in Environmental Studies from the University of California, Santa Cruz in 1995. After a lifetime of involvement in the family business, in 1997 he took to the jewelry trade full-time to develop his interests in sculptural design and architectural form. The integrity of crafting directly in the metals and working so closely with his customers led Martin to renew his passion for the environment in his new signature collection of ecologically inspired, haute couture jewelry, Martin Taber Designs. Martin has made significant changes to the methods of production and acquisition of materials to reflect Taber Studios’ mission to become a leader in the move to help clean up the jewelry industry. He is currently the President of the Board of Directors of Ethical Metalsmiths, serving and guiding the jewelry industry to ever more ethically-minded practices.

**Greg Valerio** is a fair trade jeweler with a background in human rights and environmental advocacy. He has been foundational
to the international development and realization of fair trade jewelry and traceable supply chains from mine to retail. Greg is passionate about the jewelry industry’s potential to transform lives of small-scale miners through the power of mine-to-market traceability and transparency. Greg is the founder of CRED Jewelry and co-founder of Fair Jewelry Action. He is a regular columnist for The National Association of Goldsmiths Jeweler Magazine, and serves on the Ethics Working Group for the British Jewelers Association and National Association of Goldsmiths. He was the winner of The Observer Ethical Award for Global Campaigner in 2011.

Cyndie Walck is a geomorphologist and hydrologist for California State Parks, and the only hydrologist in the Parks system. She has over 20 years of experience in stream and watershed restoration, and has done numerous projects in the Tahoe Basin and around the state. She received her MS in Hydrology from the University of Nevada, Reno in 1993. Cyndie will be representing Parks at Malakoff Diggins State Historic Park on the Gold Country Mines bus tour.

Michelle Wood is an environmental scientist with the Central Valley Water Quality Control Board’s Mercury Total Maximum Daily Load (TMDL) Unit. Her academic and professional background includes water quality, flood hydrology, CEQA, climate change, and hazardous materials. For the past ten years, Michelle has worked on developing control programs for mercury and other metals, starting with the Delta and progressing upstream to reservoirs. Michelle is currently working with a team of scientists and engineers from multiple Water Boards to develop a statewide control program for mercury-impaired reservoirs. Michelle has a Master’s of Science in Geosciences from the University of Arizona and a Bachelor’s of Science in Physical Geography with a minor in Geology from Louisiana State University.

Kendra Zamzow, Ph.D., is an environmental geochemist and the Alaska representative for the Center for Science in Public Participation (CSP2). She has a Ph.D. in Environmental Chemistry from the University of Nevada, Reno. In 2012 she accepted a Science and Technology Policy Fellowship through the American Association for the Advancement of Sciences and spent 16 months in the Washington, DC offices of the EPA’s Office of Research and Development/Office of Science Policy. She currently works with CSP2 from Chickaloon, Alaska, providing technical analysis of mining projects on behalf of communities and tribes on topics that include copper heap leach closure, arsenic chemistry in tailings, mercury release from thermal processing of gold, and potential for acid drainage.
The Sierra Fund developed Issue Papers to frame each of the four tracks of the Reclaiming the Sierra 2015 conference, providing conference participants with a common understanding of the topics being discussed.* Summaries of each Issue Paper are included below, and full copies of the Papers are available at The Sierra Fund’s exhibit table in Ballroom 3. The Sierra Fund will produce four corresponding outcomes papers on these topics based on the conference proceedings, which will be published later in 2015.

SUMMARY: The New Gold Rush: Multiple Benefits of Restoration Activities in the Gold Country

Recovering from the Gold Rush requires a new approach to forest and reservoir management, meadow and wetland restoration, and economic development in the Sierra Nevada region. There are “triple bottom line” benefits to be derived by improving the watershed health of the region’s forests that serve as the “lungs” of the State and rivers that serve as its source of water. The Sierra Fund has identified two related recommendations for action around reclamation:

1. **Multiple Benefits:** Restore reservoir water storage capacity, improve water quality, enhance wildlife habitat, provide environmental benefits, and get gold, too. This activity has so many benefits – improved water quality, improved storage for rainwater, improved wildlife habitat and other major environmental benefits.

2. **E3 Gold:** Explore the potential for the development of a marketable gold product from legacy mine reclamation that tells the story of restoration of rivers, forests and meadows and revitalization of tribal cultures. This gold could be marketed to consumers interested in ethically sourced jewelry and/or to electronics companies looking for more environmentally sound sources of gold.

SUMMARY: Improving Mine Reclamation in California

The Sierra Fund is interested in remediating legacy mines from the 19th and 20th centuries and improving the enforcement of mining law on current mines.

**Incentivize Legacy Mine Reclamation:** Prior to the adoption of the California Surface Mining and Reclamation Act (SMARA) California did not regulate mining and there were no requirements that mines be reclaimed. As a result, there are 47,000 abandoned mines in the state, 2/3 of them on federal land. All of them present potential physical hazards, and about 10% present chemical hazards. The Sierra Fund has identified three strategic objectives to incentivize legacy mine reclamation:

1. Improve coordination both among governmental regulatory agencies with jurisdiction over private and public land management and reclamation, and also with the academic, business, community, and conservation institutions with interest in legacy mine reclamation.

2. Develop funding sources for reclamation activities on both public and private lands.

3. Create new incentives for mine reclamation using best available technologies and practices for responsible and pro-active mine reclamation activities.

**Improve Enforcement of Modern Mine Operations:** For operating mines, it is in the State of California’s interest to ensure that a mine is operated in compliance with its permit, to ensure that this permit protects the State’s water and air from contamination, and to make sure that when the mine ceases operation it is remediated to allow a beneficial end use instead becoming another abandoned, unreclaimed mine. SMARA is inconsistently enforced around the State, creating an unfair market and threatening the air, water, and safety of surrounding communities. The Sierra Fund has two recommendations for action to improve modern mine methods and reclamation:

1. Strengthen SMARA and improve enforcement of SMARA by lead agencies and

2. Clarify the regulatory requirements for suction dredge mining permitting
SUMMARY: Prioritization of Remediation Efforts

Hydraulic and hardrock mining activities throughout California in the late 1800s and early 1900s left behind 10-13 million pounds of mercury, numerous mine-scarred landscapes and countless physical hazards. State and federal agencies responsible for addressing environmental risks associated with contaminated lands continue to identify, catalogue, and clean up mercury and other contaminants from such areas in the Sierra Nevada and elsewhere. Mercury and other contaminants from abandoned mine land discharge and in-stream legacy sources present special challenges because there are no clearly responsible parties that can be ordered to perform cleanup actions. There are both technical and regulatory challenges to addressing the results of streams of unregulated waste over a century or more.

A proactive strategic approach that is comprehensive across California is needed in order to abate the contamination and physical hazards posed by abandoned mine lands. Strategic prioritization of remediation efforts can be informed by models developed for a particular constituent, such as mercury. Modeling strategies for addressing public health and environmental concerns will need to consider a broad range of factors, time scales, and space scales. In other areas of environmental management, payments for watershed services have been a valuable tool to incentivize downstream communities to contribute to the cleanup of upstream contamination.

Prioritization efforts that should be considered include:

1. Work with local land use authorities to improve and implement mine assessment and prioritization protocols, and draft ordinance language that can be adopted by counties to inform smart growth.
2. Work with downstream water managers seeking lower-cost solutions to mercury impairments upstream.

SUMMARY: Best Available Techniques for Mine Impacted Lands

Best Available Techniques (BATs) is used here to refer to the most appropriate, cost-effective methods to abate environmental contamination. BATs are commonly applied to abate air and water emissions from industrial operations. BATs for Mine Impacted Lands (BATMiLs) are techniques that abate pollution associated with previous mining activities. BATMiLs may be required to address multiple contaminants in multiple environmental compartments (land, air, and water), and consider both the long-term benefits and the potential for re-mobilization of contaminants during reclamation activities. BATMiLs are integral at all steps of the abandoned mine remediation process and can be evaluated and applied in the remediation process as part of the 1.) Initial site assessment, II.) Remediation activities, and III.) Evaluation of effective cleanup.

1. **BATMiLs in Abandoned Mine Site Assessment:** Identification and inventory of the contaminant(s) of concern (COCs) with best available assessment methods is required to determine if a technique or technology is effective at removing the COCs. Good baseline data, including current contaminant status and historical information, should be compiled at the beginning of reclamation planning.

2. **BATMiLs for Risk Assessment:** Historical and contemporary baseline data, such as discussed above, are important to determine contaminant sources and delineate contaminant pathways. Once contaminants, their mobility, and pathways are known, potential “receptors” (fish, land mammals, birds, humans) potentially at risk can be determined. In this way, cleanup priorities are identified and the appropriate BATMiLs brought forward for discussion.

3. **BATMiLs for Remediation Activities at Abandoned Mines:** Choosing the most appropriate BATs to apply in remediation should consider not only the cost, availability, and ability to implement the BAT, but also take into account indirect benefits or harm associated with the remediation technique. An emphasis is placed on water quality and quantity, as remediation of water resources is generally the most problematic issue on a site.

*The issue papers represent the views and position of The Sierra Fund only. The U.S. Geological Survey or its employees did not contribute to the writing of the issue papers. The issue papers do not represent the views or position of the U.S. Geological Survey or the U.S. Government. Participation of Department of Water Resources’ staff was for the purpose of providing technical information on current Department projects. Department staff did not contribute to the writing of the issue papers. The issue papers do not represent the views or position of the Department of Water Resources.*
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