

**Legacy Mines, Mercury and
Human Exposure**

Presentation by The Sierra Fund

The Sierra Fund

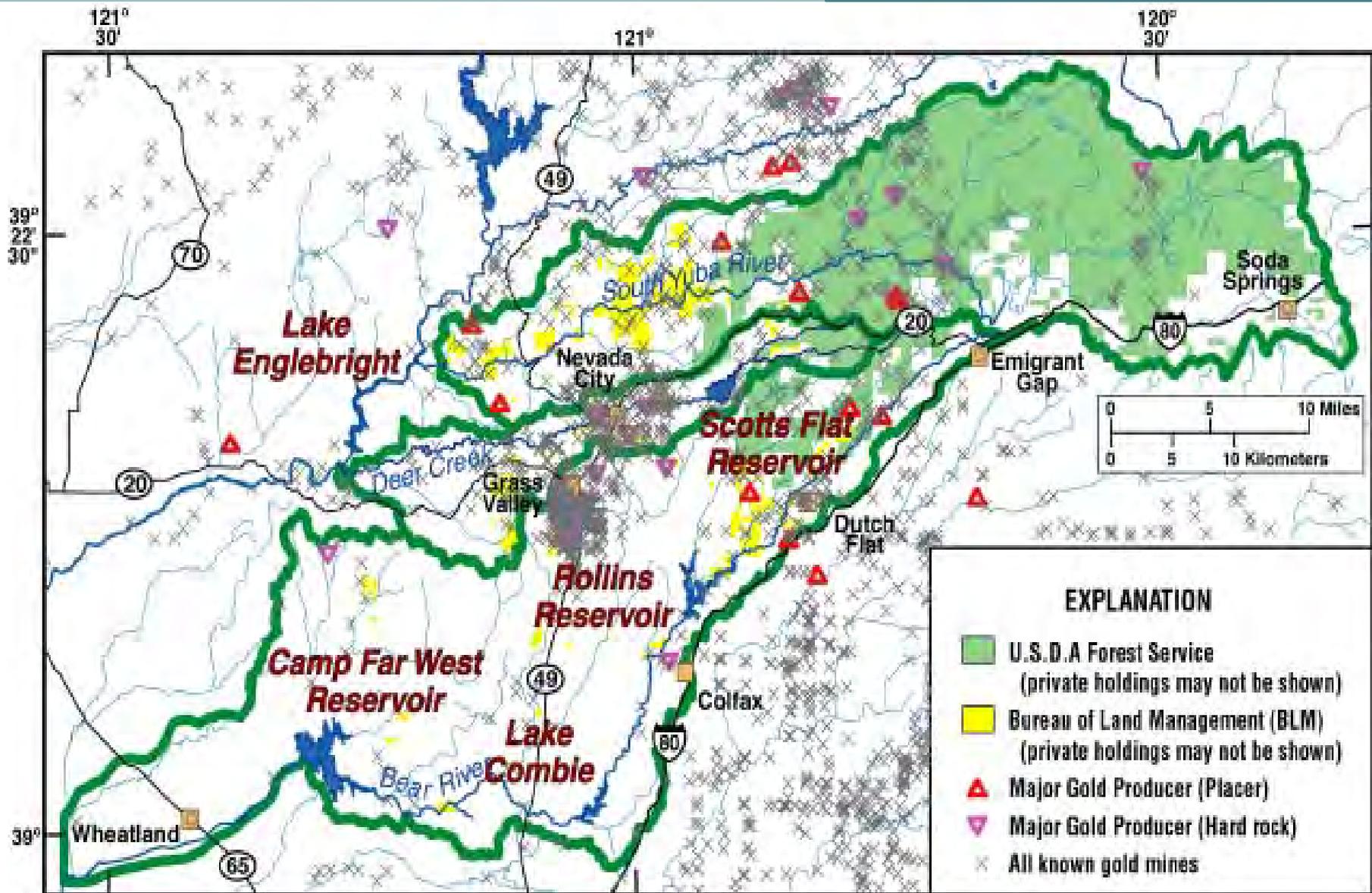
**Our Mission: Increase
public & private
investment
in the Sierra**

**Izzy Martin
CEO**

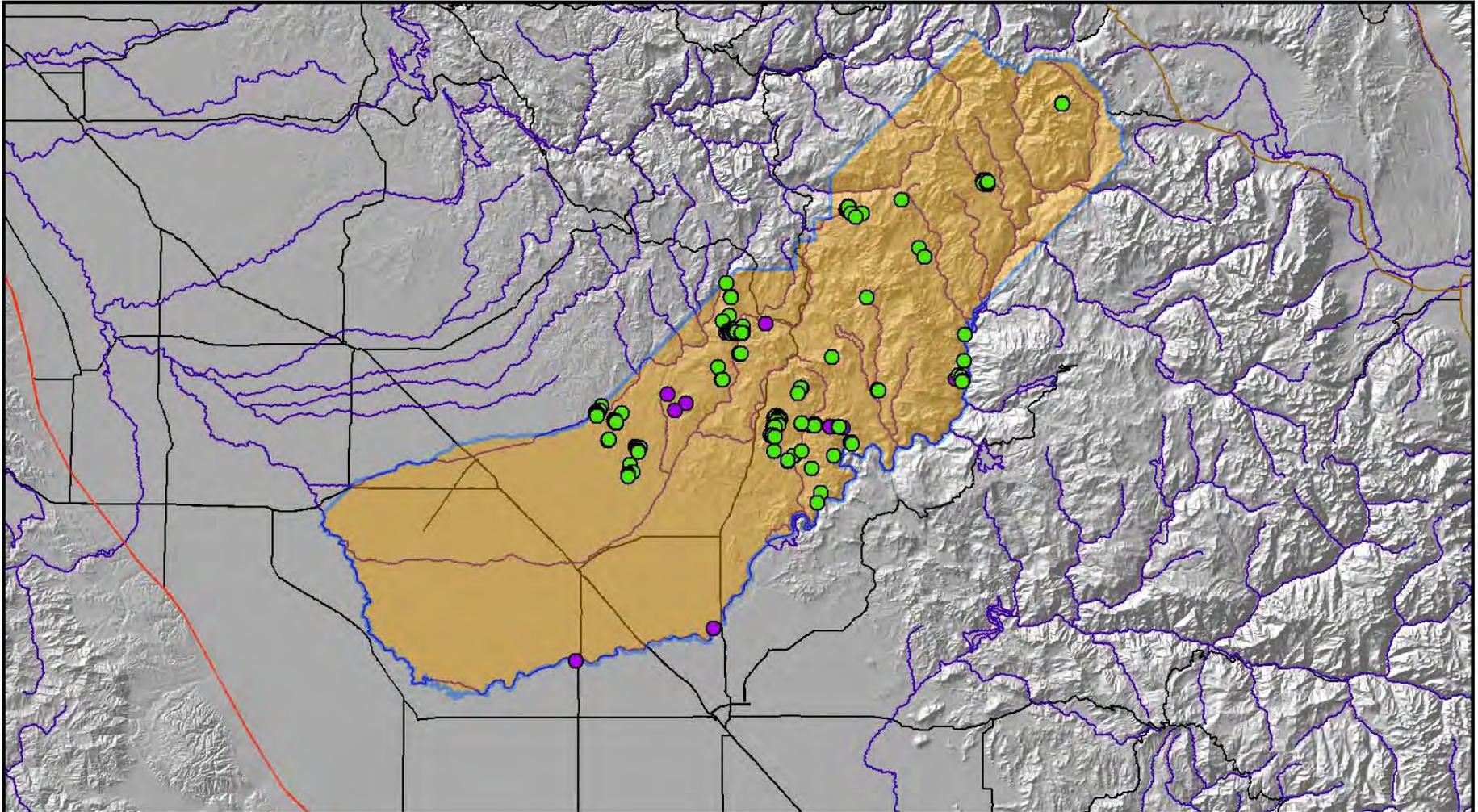


Mercury and the Gold Rush





DEPARTMENT OF TOXIC SUBSTANCES CONTROL MADERA COUNTY MINES AND MINING FEATURES



Legend

- Madera County: 183 Mining Features from Topographic Occurring Mine Symbols (TOMS)
- Madera County: 16 Mines from Principle Areas of Mine Pollution (PAMP)

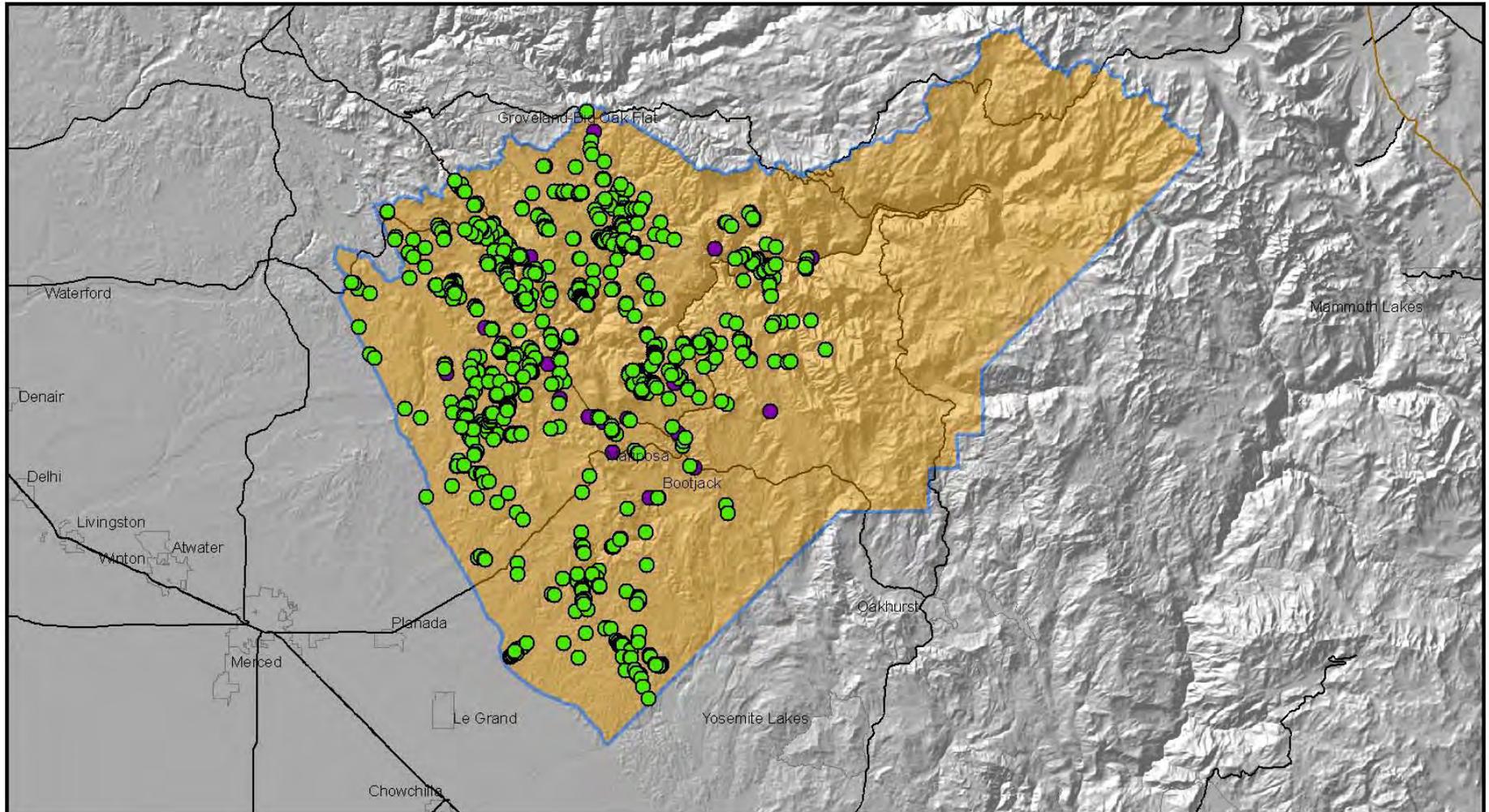
 **Madera County**

0 3 6 12 18 24

Miles W E



DEPARTMENT OF TOXIC SUBSTANCES CONTROL MARIPOSA COUNTY MINES AND MINING FEATURES



Legend

-  Mariposa County: 947 Mine Features from Topographic Occuring Mine Symbols (TOMS)
-  Mariposa County: 93 Mines from Principle Areas of Mine Pollution (PAMP)

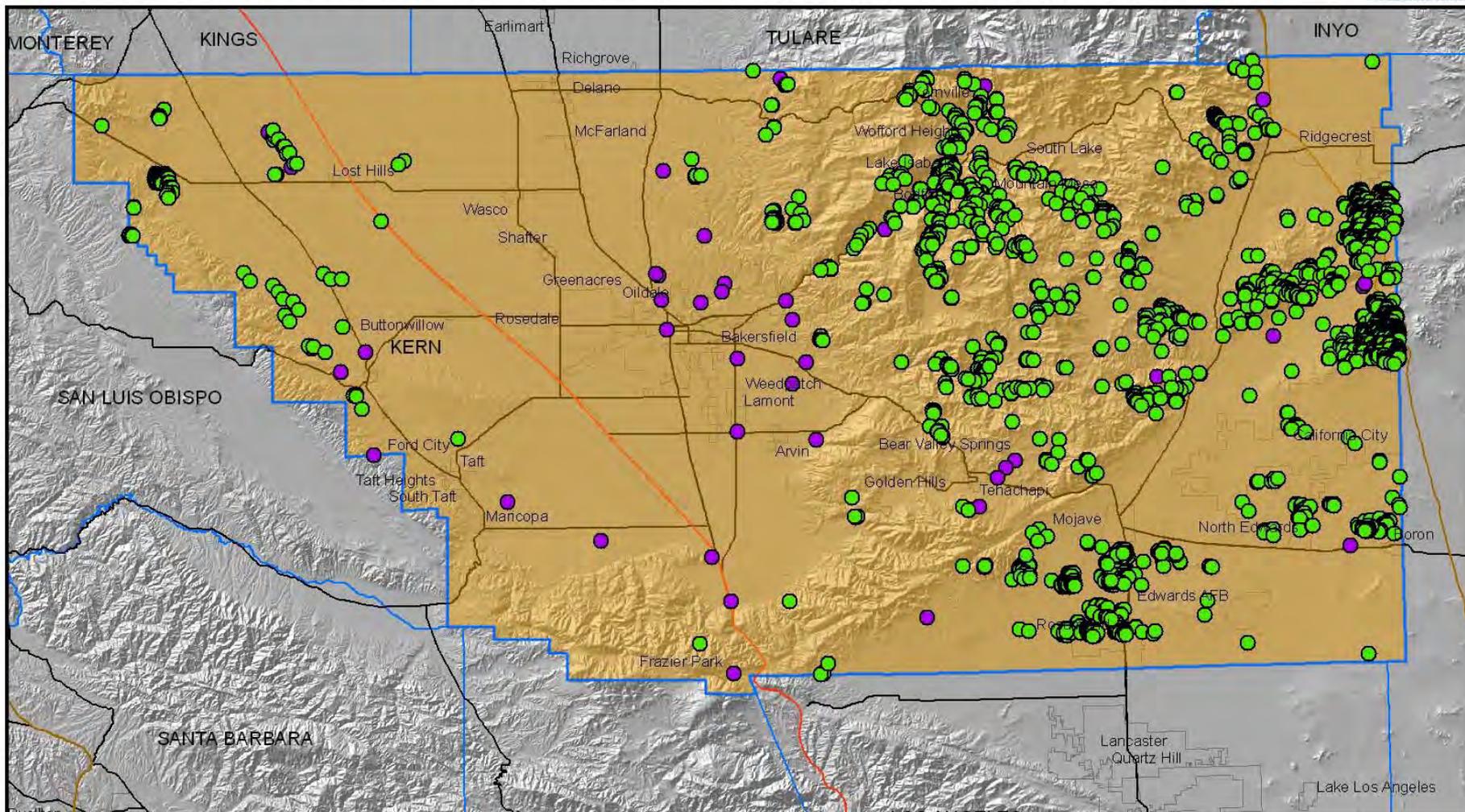
 **Mariposa County**

0 2 4 8 12 16

Miles



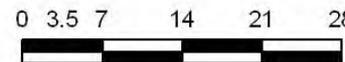
DEPARTMENT OF TOXIC SUBSTANCES CONTROL KERN COUNTY MINES AND MINING FEATURES



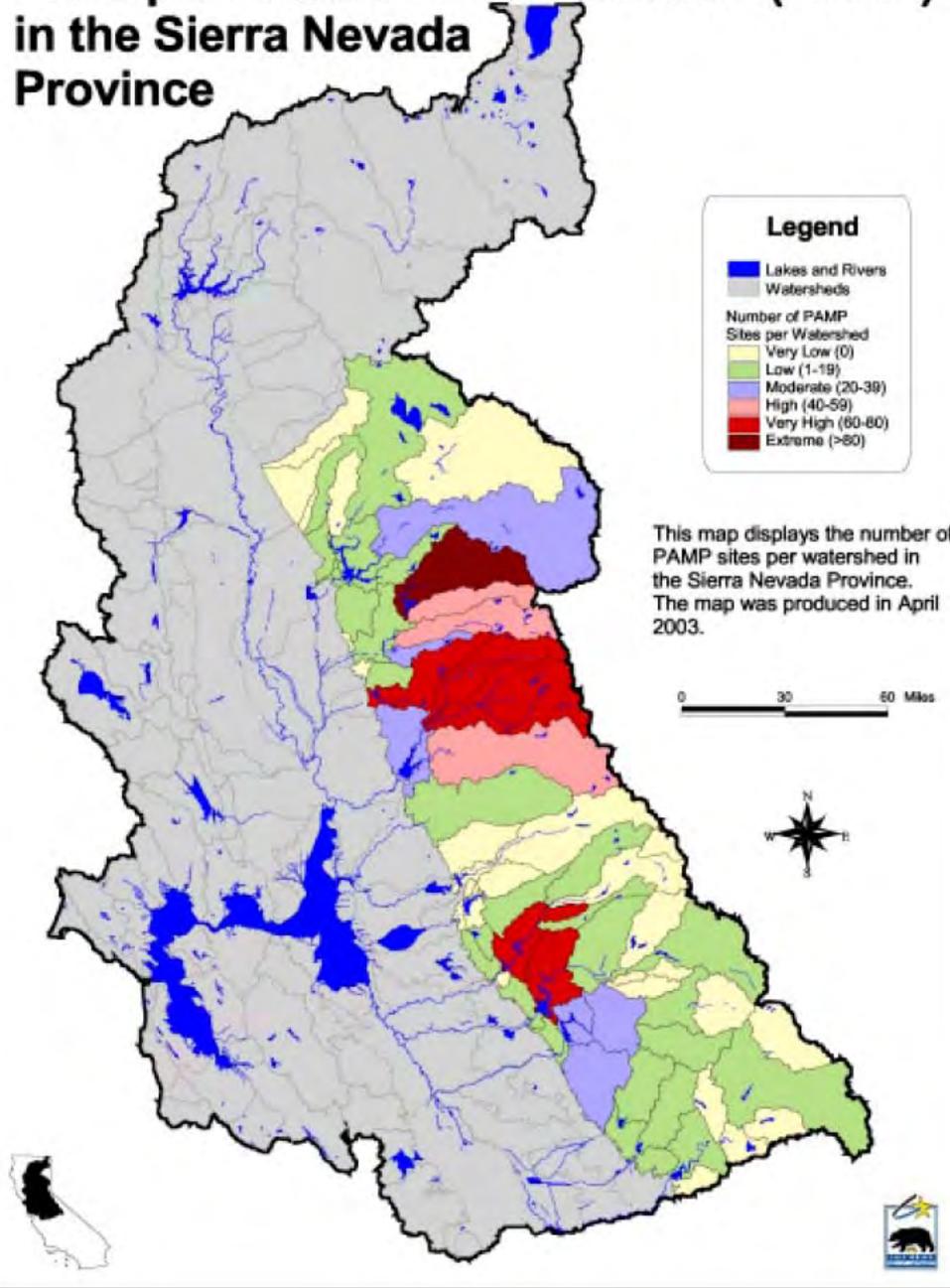
Legend

-  Kern County: 4146 Mine Features from Topographic Occuring Mine Symbols (TOMS)
-  Kern County: 128 Mines from Principle Areas of Mine Pollution (PAMP)

 **Kern County**



Principle Areas of Mine Pollution (PAMP) in the Sierra Nevada Province



Modern-day effects of historic mining in the Sierra Nevada

Sierra Nevada

Physical Hazards

- ▶ open mine shafts
- ▶ underground tunnels



Health Impacts

Mercury

Arsenic

Lead

Asbestos



O'Kelley Photo

26 Million pounds of mercury brought to Sierra for use in gold mining

Millions
30
25
20
15
10
5
0



■ 10 Million pounds lost in hydraulic mining

■ 3 Million pounds lost in hard rock mining

■ 50% of Mercury re-used





Gold Country Angler Survey

*A Pilot Study to Assess Mercury Exposure
from Sport Fish Consumption in the Sierra Nevada*

Carrie Monohan, Ph.D.



Mercury and the Gold Rush

Mercury was used during hardrock and hydraulic mining.
It is still entrained in the river gravels.

Deer Creek 1908



Greenhorn Creek 2011



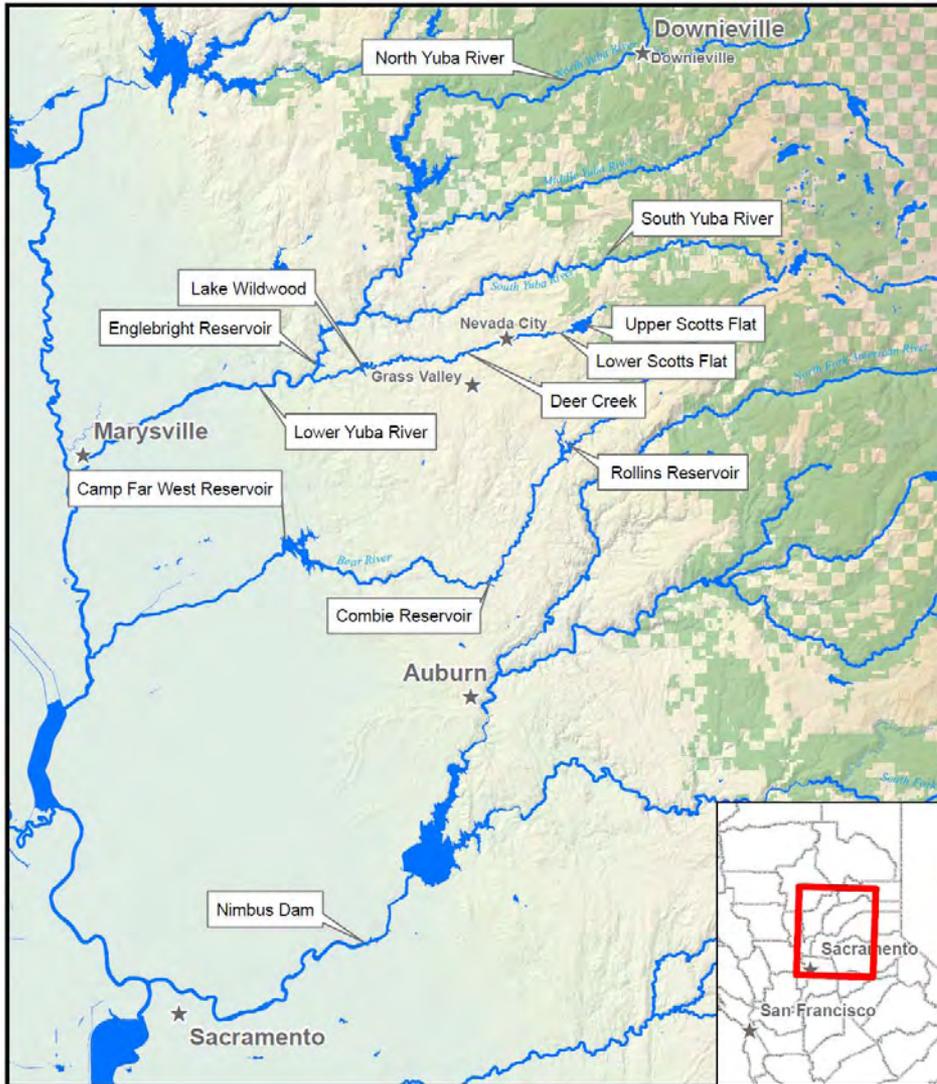
Sport Fish Consumption and Mercury

Toxic Effects of Mercury:

- Neurotoxin
- Developmental delays
- Nervous system, immune system, kidneys and heart
- Women and Children



Gold Country Angler Survey



Legend

- ★ Cities
- Rivers
- Reservoirs
- National Forest

Angler Survey Map



- Trained volunteers 2009, 2010
- 10 minute Oral survey
- 151 surveys so far

Selection Criteria

- 303d listed (and/or)
- History of mining

Survey Locations

- Deer Creek
- Upper Scotts Flat Lake
- Lower Scotts Flat Lake
- Lake Wildwood
- Bear River
- Rollins Lake
- Lake Combie
- Camp Far West Reservoir
- South Yuba River
- North Yuba River
- Lake Englebright
- Lower Yuba River (below Englebright)

Survey Methods

- Developed by DPH and UCD

Alyce Ujhara and Fraser Shilling

Training and visuals

- 2009

Watershed and Fly Fishing Groups

- 2010

Interns from Chico State

- 2011 & 2012-not yet analyzed

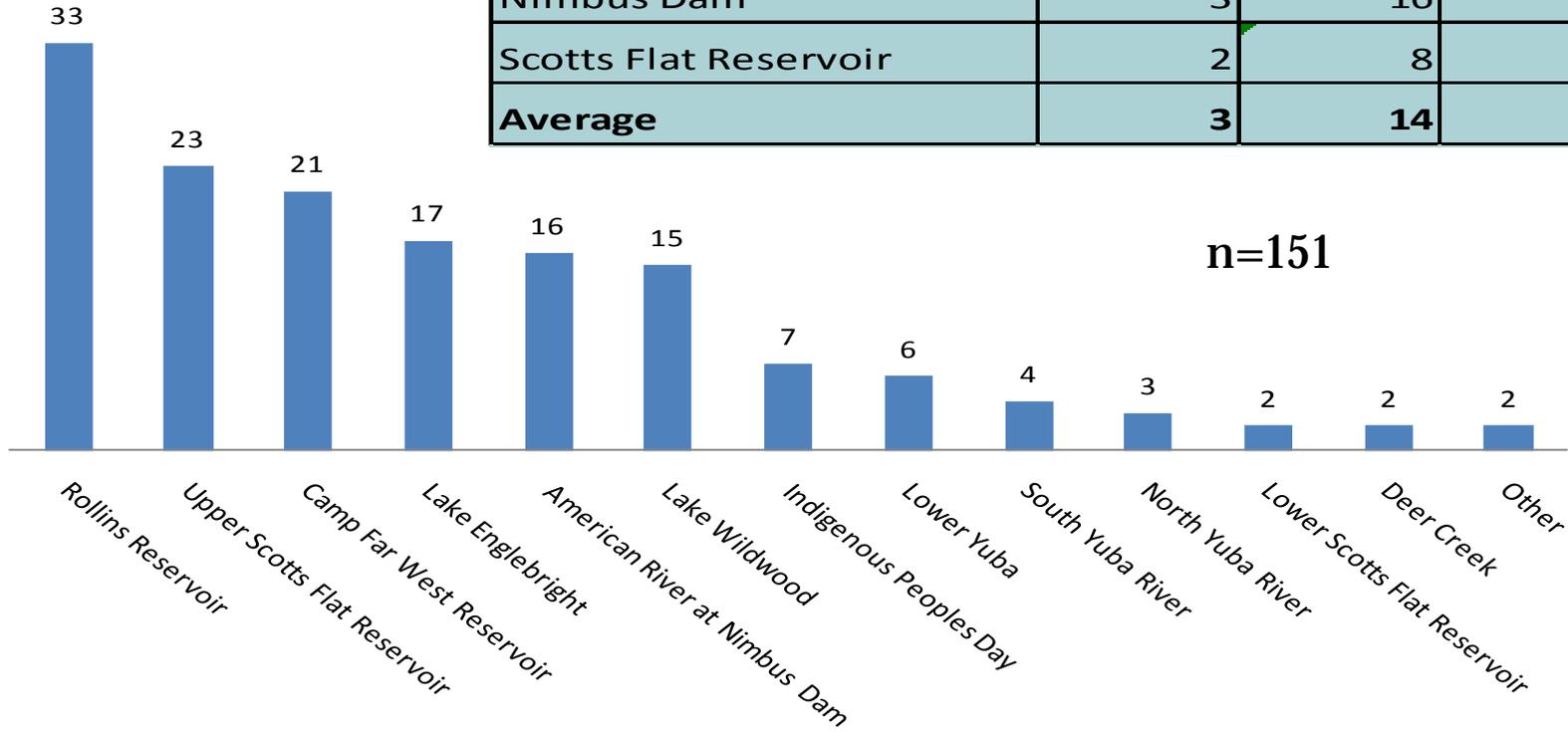
Upper American River Foundation

Bill Templin and Jen Hemmert

- 10 minute oral survey
- Anyone with a fishing pole was a candidate
- Approach
- Individual responses to a series of question about fish catch and consumption over previous 30 days and household demographics
- Education and thank you gifts at the end of the survey



Number of Surveys Completed

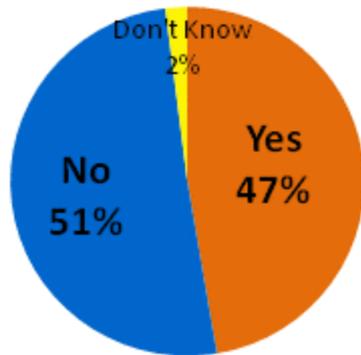


2010 Field Effort Results	Number of Site visits	Number of Surveys collect in 2010	Average survey/hour
Camp Far West Reservoir	3	20	2
Lake Wild Wood	3	7	2
Rollins Reservoir	6	24	2
Lake Engebright	3	6	2
Nimbus Dam	3	16	2
Scotts Flat Reservoir	2	8	1
Average	3	14	2

Survey Results

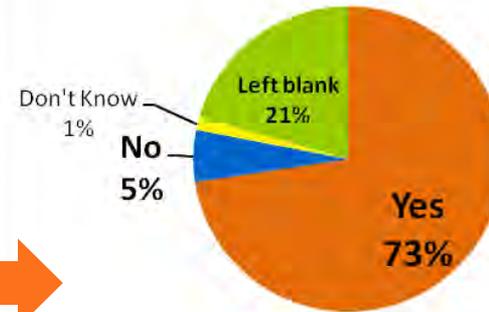
47% of anglers surveyed were trying to catch fish to eat

Are you going to eat the fish you catch today?

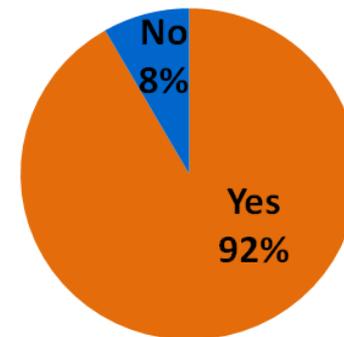


92% of anglers surveyed eat sport fish

If yes, are you going to feed it to your family?

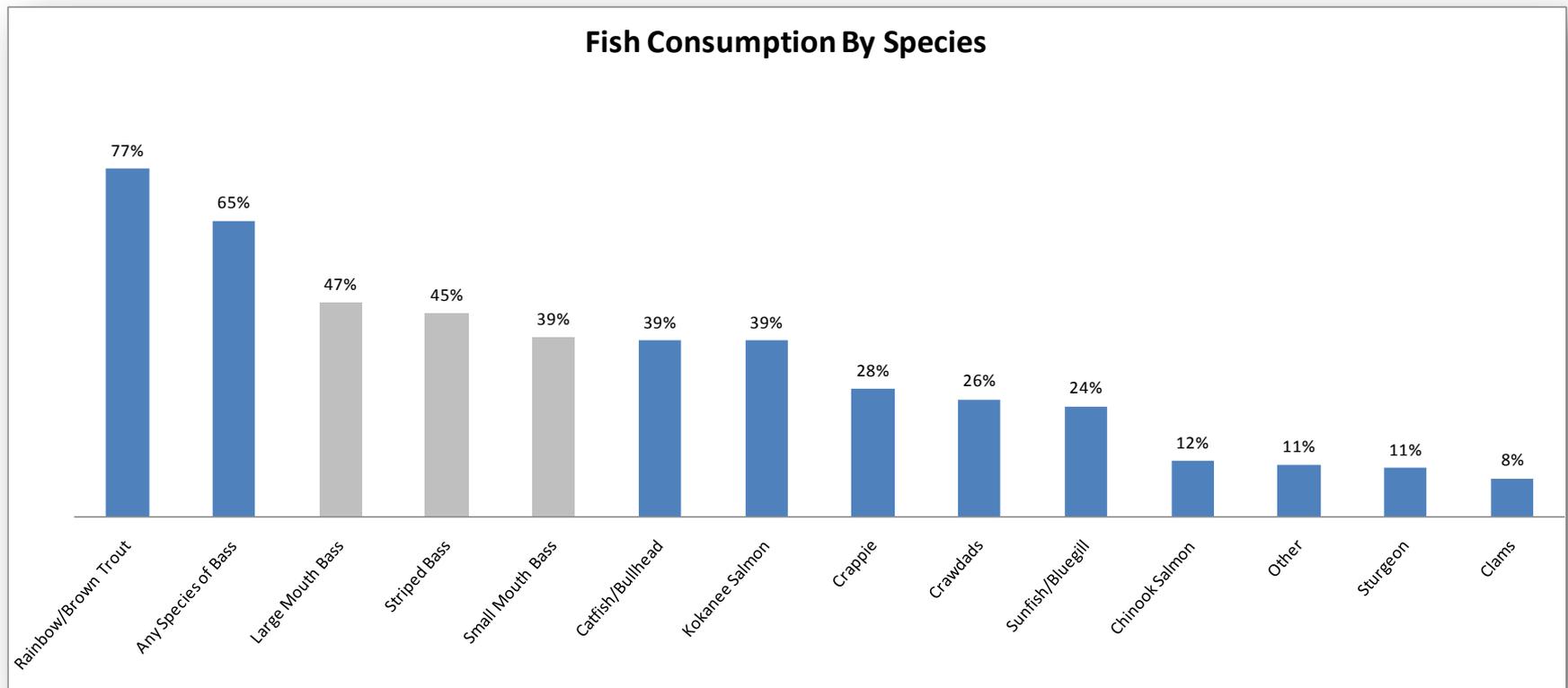


Do you EVER eat the fish that you or someone you know catches?



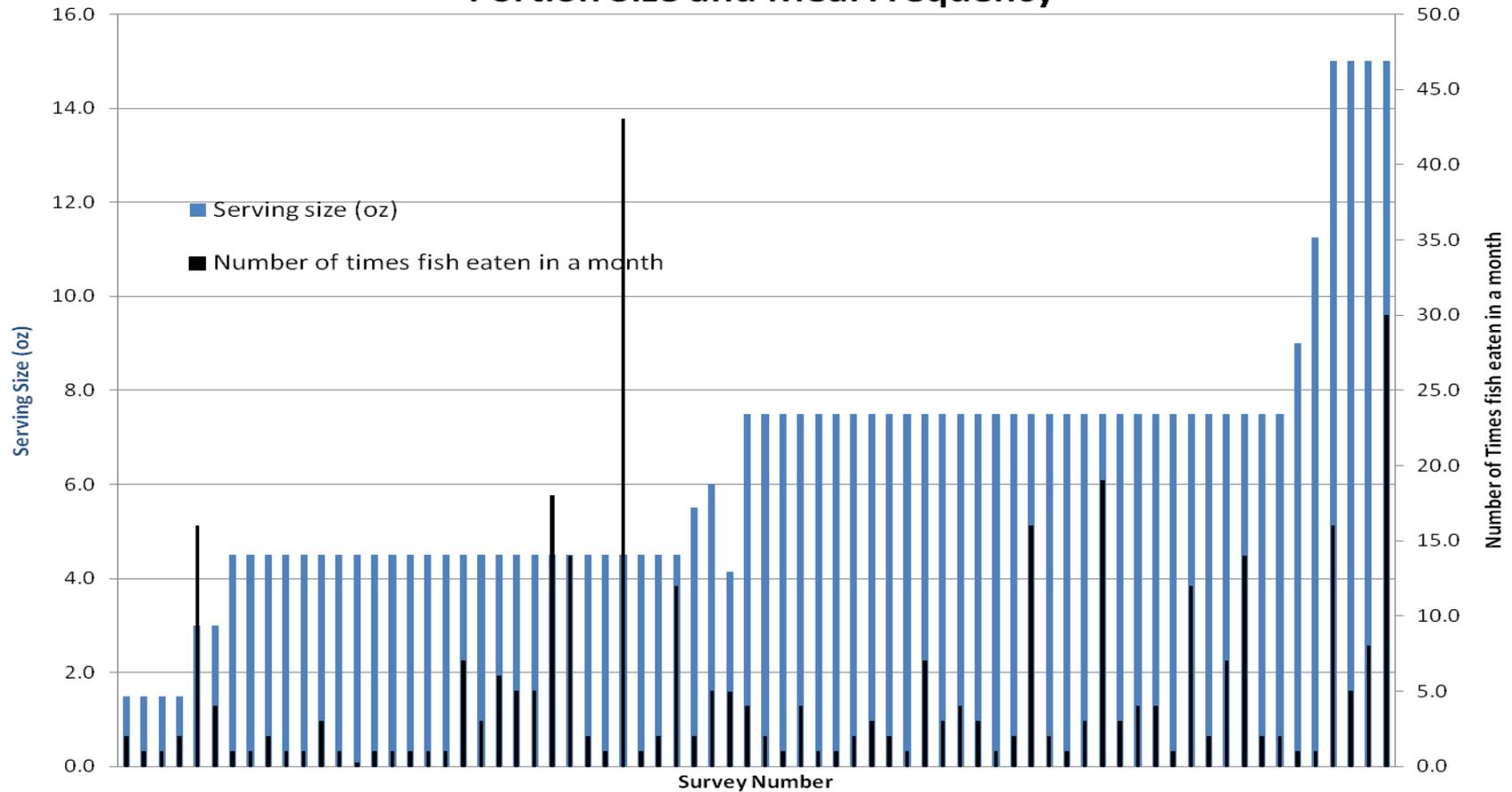
What fish did people eat?

Trout and Bass were the most popular



How much fish did people eat?

Portion Size and Meal Frequency



Calculate MeHg Exposure of Gold Country Angler Survey Participants

- How much sport fish he or she consumed in the last 30 days
 - Which species of sport fish were consumed
 - Where the fish had been caught, and
 - The typical serving sizes.
-
- How much of what kinds of commercially bought fish he or she consumed in the last 30 days, and
 - Participant's exact weight

Existing Fish Consumption Advisories

www.oehha.ca.gov/fish.htm

OEHHA

Office of Environmental Health Hazard Assessment

Safe Eating Guidelines for Fish from Rollins Reservoir

Women 18 – 45 and Children 1 – 17 Years

None	 catfish	None
2 or more Servings a week	1 Serving a week	Do not eat

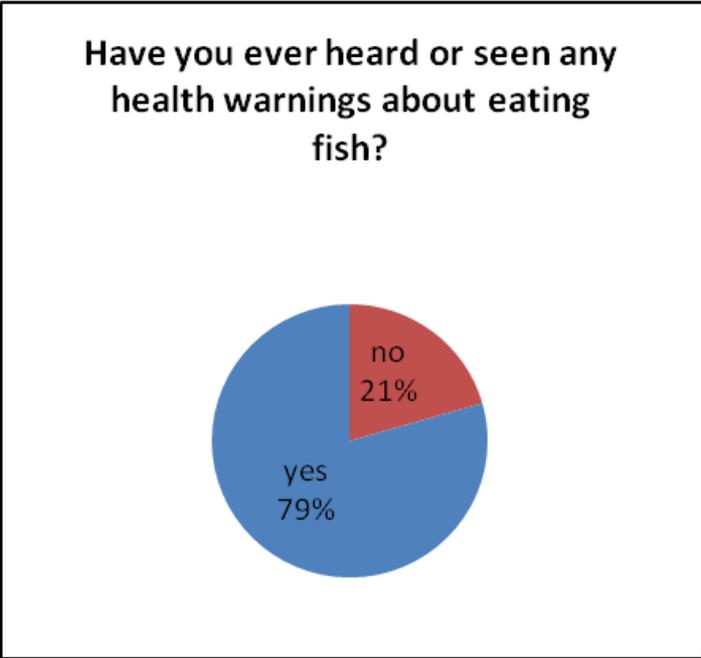
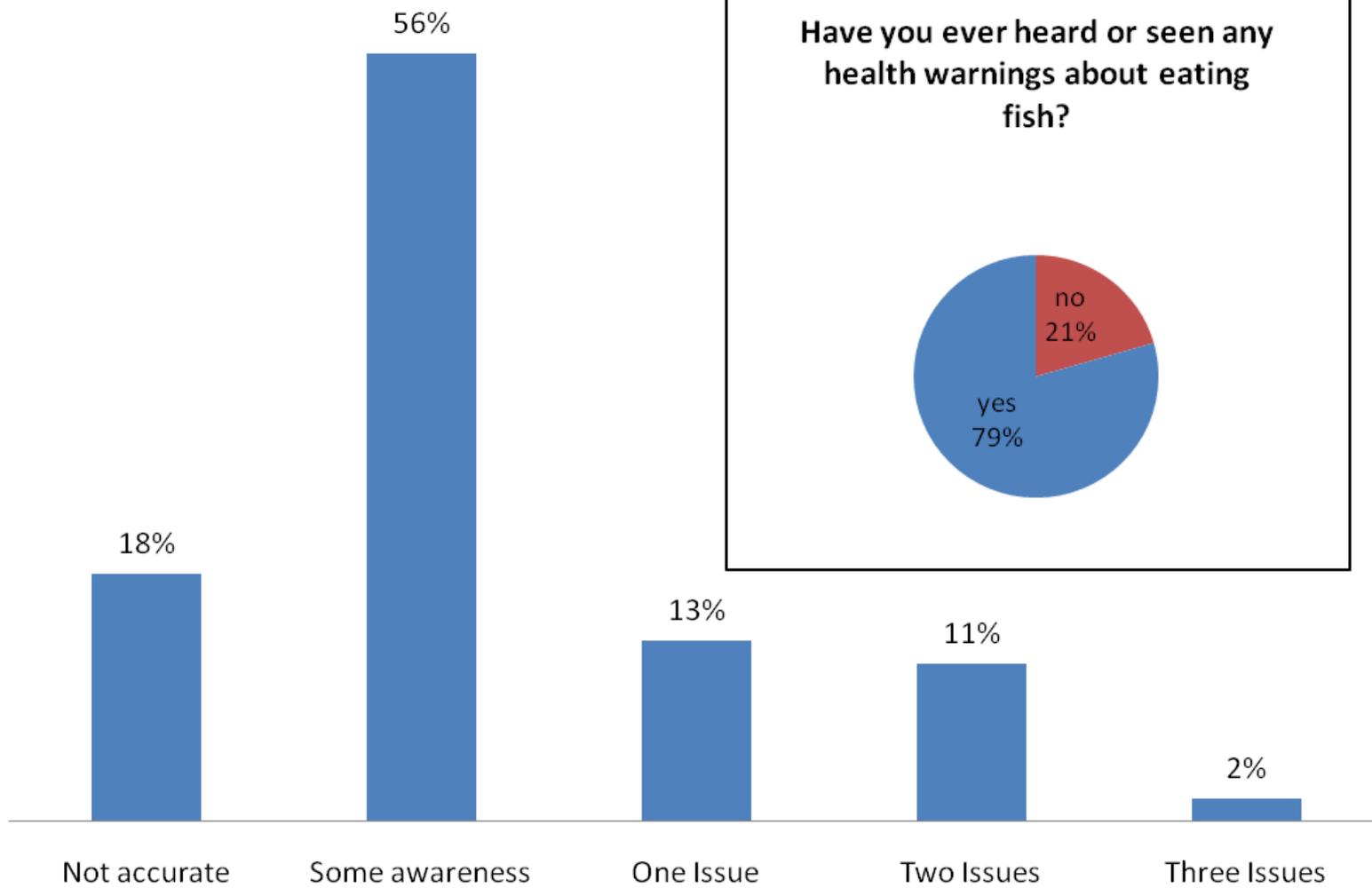
Men over 17 Years and Women over 45 years

None	 catfish	None
3 or more Servings a week	2 Serving a week	1 Serving a week

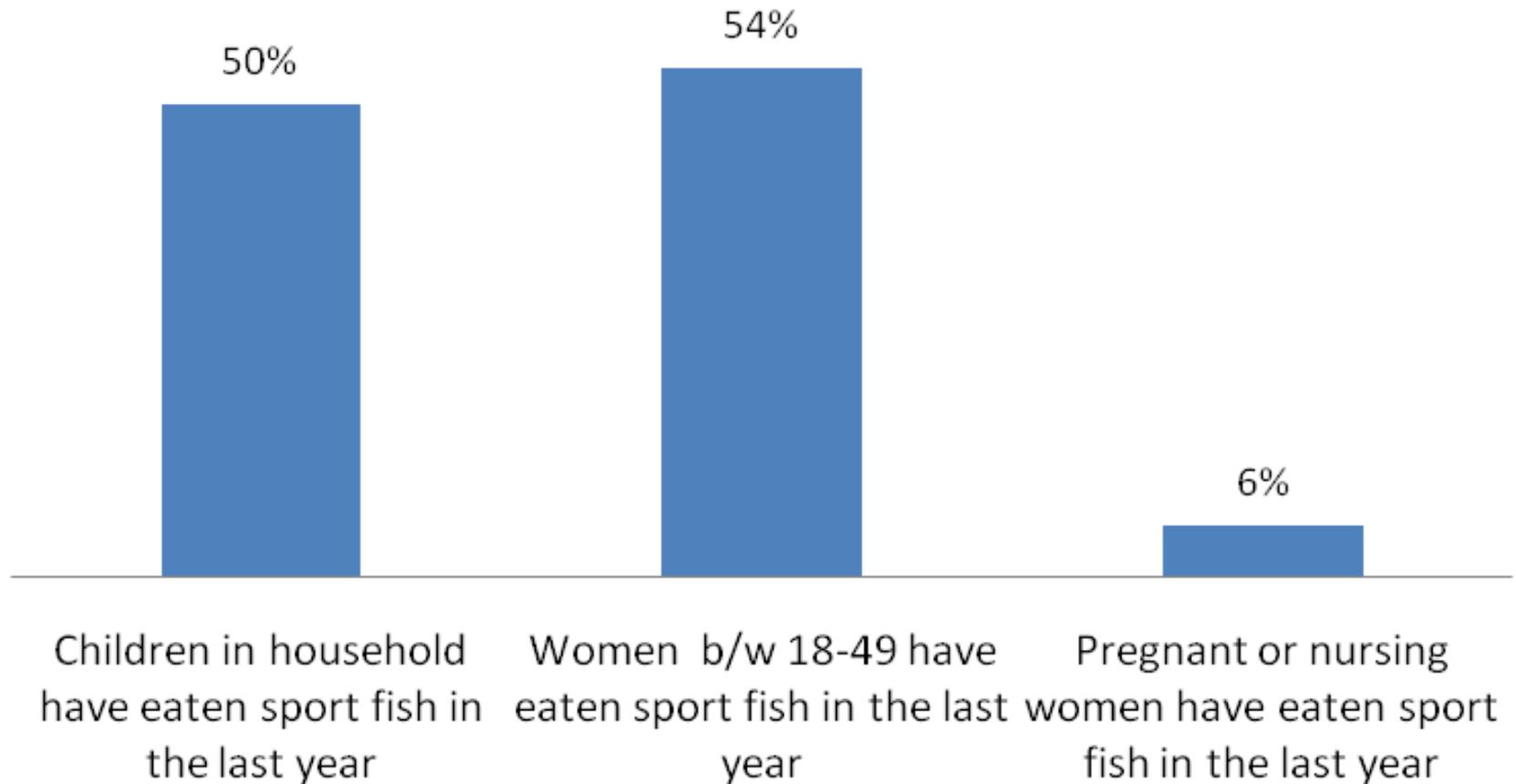


Health Hazard Awareness

If Yes, Accuracy of Health Hazard Awareness Response



Household Consumption Information



Summary

- Over 90% of anglers reported eating fish that was caught from mercury-contaminated areas
- Over 50% feed the fish they catch to children under the age of 18 and/or to women of child bearing age
- ~10% are consuming mercury at levels above the OEHHA safe eating guidelines
- Posted warnings were not present at most fishing locations
- **Exposure potential is high with limited awareness**

www.sierrafund.org/mining/Gold_Country_Angler_Survey.pdf

Recommendations and Next Steps

- **Complete the fish consumption advisory information**
 - Prioritize sites that are listed as impaired for Hg
 - Collect more fish data as needed by OEHHA
- **Get the information out to the public**
 - Posting at fishing locations
 - General information postings
- **Remove mercury from Reservoirs**
 - Combie Reservoir Sediment and Mercury Removal Project

Water Bodies with Fish Consumption Advisories

Office of Environmental Health Hazard Assessment

Advisories in Northern Sierra Nevada Foothill Counties (1)



Advisory Chemical

- (1) = mercury
- (2) = PCBs
- (3) = DDT
- (4) = selenium
- (5) = chlordane

Freshwater Advisories in San Francisco Bay Area Counties (1)



Existing Fish Consumption Advisories



Where do we need more fish data?

Mercury-Impacted Water Way	303(d) Listed as impaired by mercury (CVRWQCB 2010)	Fish Consumption Advisory 2003 (OEHHA 2003)	Fish Consumption Advisory 2009 Update (OEHHA 2009)
Deer Creek	X*	X	**
Upper Scotts Flat Lake	X	X	**
Lower Scotts Flat Lake			
Lake Wildwood	X		
Bear River	X	X	**
Rollins Lake	X	X	X
Lake Combie	X	X	X
Camp Far West Reservoir	X	X	X
South Yuba River	X	X	**
North Yuba River	X		
Lake Englebright	X	X	X
Lower Yuba River (below Englebright)	X		

* 303(d) listings have been issued for Little Deer Creek, a tributary to Deer Creek.

** Removed from the fish advisory during the 2009 update due to insufficient number of samples

Critical Information Gaps

- Listed as impaired but do not have a fish advisory
- Has a fish advisory for only some species
- No posting of information
- Sustenance fishing not quantified

What do we do with limited information?

Based on existing information and scientific knowledge, Sierra fish fall into the following categories:

LOW MERCURY

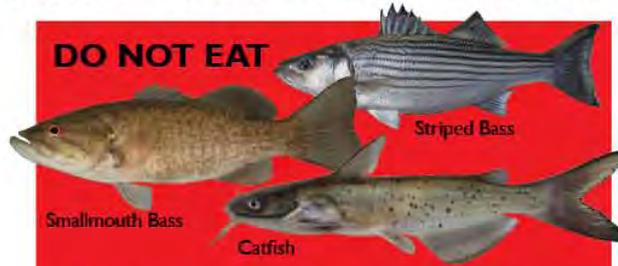


Rainbow Trout

Steelhead

Rainbow Trout and Steelhead have low mercury levels. According to the FDA, Women under 45 and children under 17 may eat up to six ounces per week of these fish, IF no store-bought fish or other fish are eaten. Give children smaller, age appropriate, servings.

DO NOT EAT



Smallmouth Bass

Striped Bass

Catfish

Bass (largemouth, smallmouth and striped) and Catfish are consistently high in mercury. To be safe, women under 45 and children under 17 should not eat them.

UNKNOWN/VARIABLE



Sunfish

Bluegill

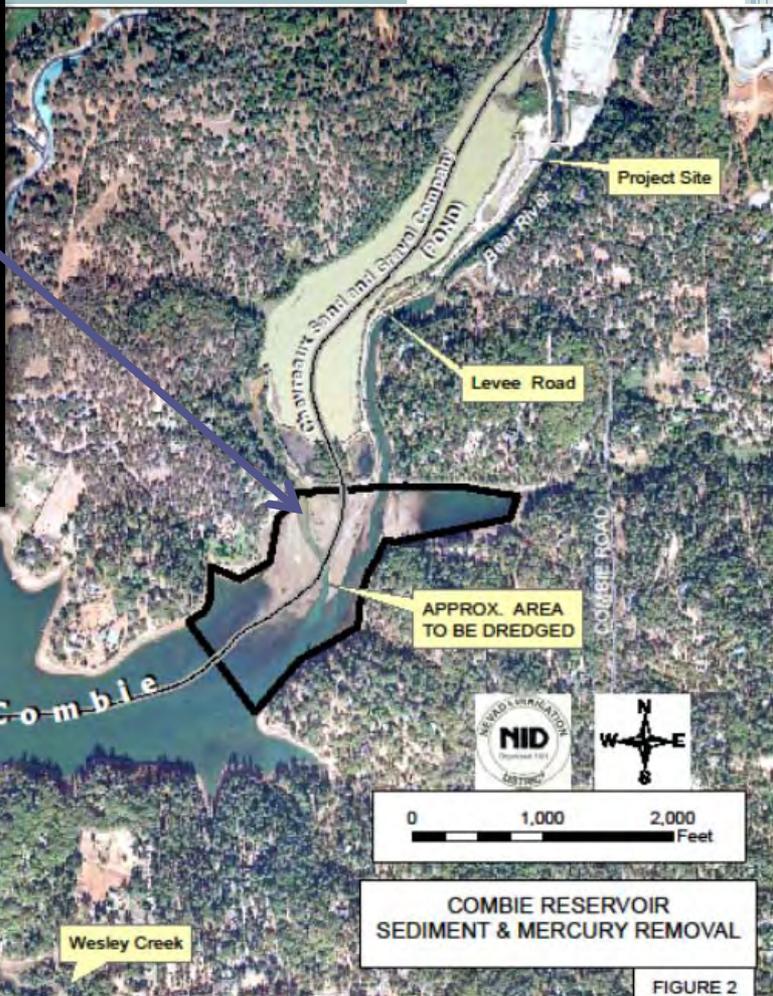
Crappie

Brown Trout

Salmon

Many kinds of Sierra fish have not been tested enough to know whether they are safe to eat in any quantity.

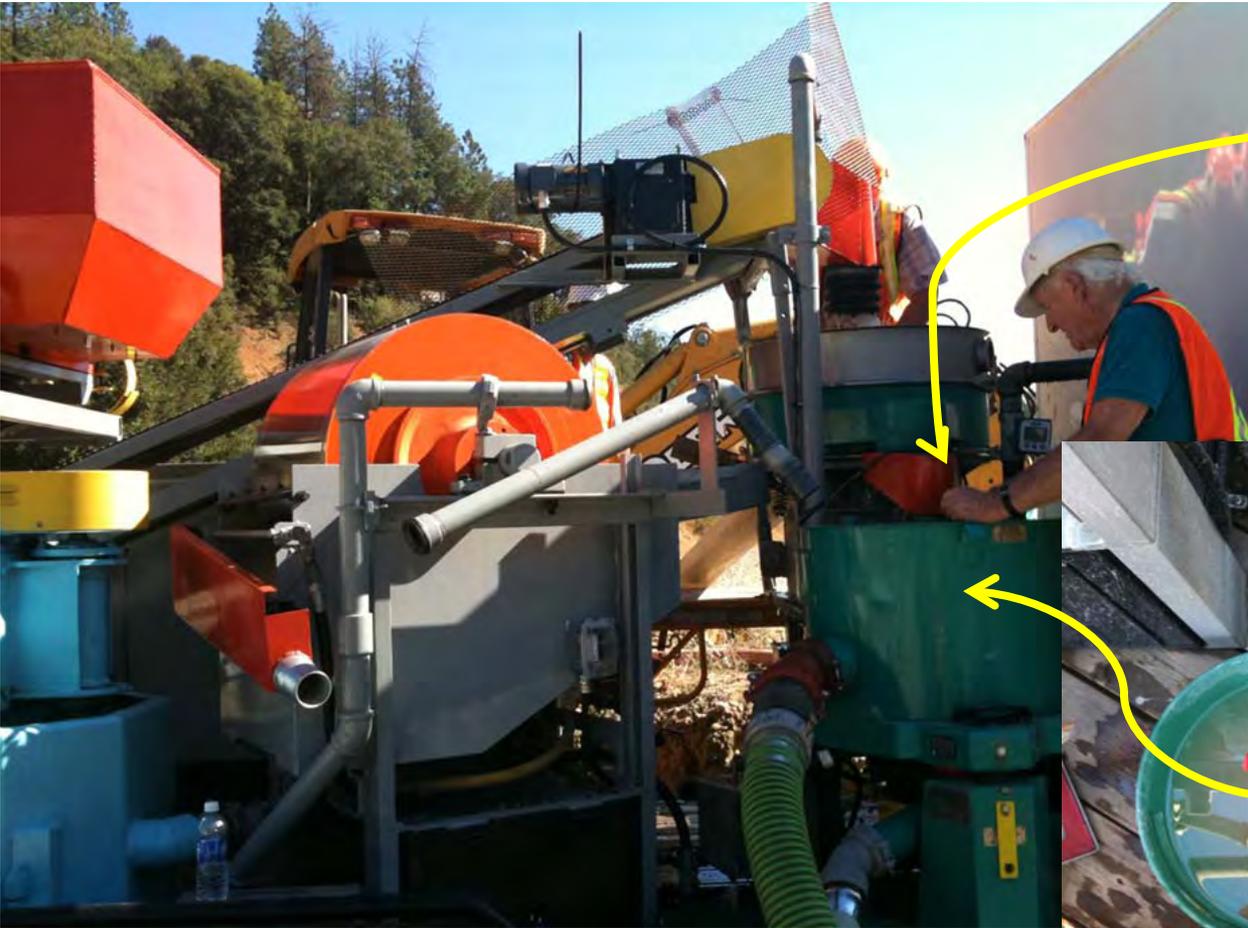
NO INFORMATION DOES NOT MEAN IT IS SAFE TO EAT



Combie Reservoir Sediment and Mercury Removal



Mercury Removal from Dredged Sediment



Sediment and Mercury Removal from Reservoirs in the Gold Country

- Equipment Testing and Evaluation (2009)
- Environmental Permitting for Combie
- Funding is expected in 2013
- USGS studies accompany this project (pre and post)
- Regional impact
 - Rollins Reservoir
 - Other Irrigation Districts
 - CABY IRWMP
- Green Gravel
- Green Gold (Eco-Gold)
- Mercury TMDL-
 - Mercury Control Program



Recommendations

1) Look up safe eating guidelines

www.oehha.ca.gov/fish.htm

2) Avoid large predatory fish

www.gotmercury.org

3) Make your voice heard

www.reclaimingthesierra.org

4) Develop projects to remove Hg

<http://www.youtube.com/watch?v=OT5EHct4hzE>



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www.sierrafund.org/mining/Gold_Country_Angler_Survey.pdf

