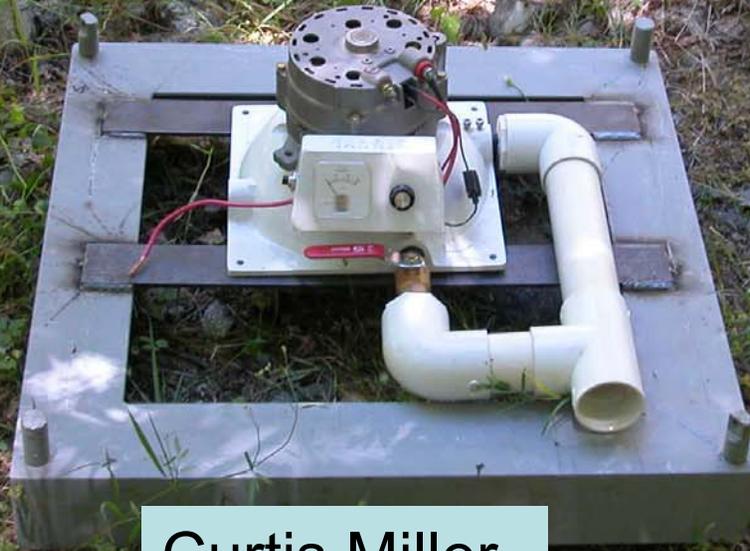


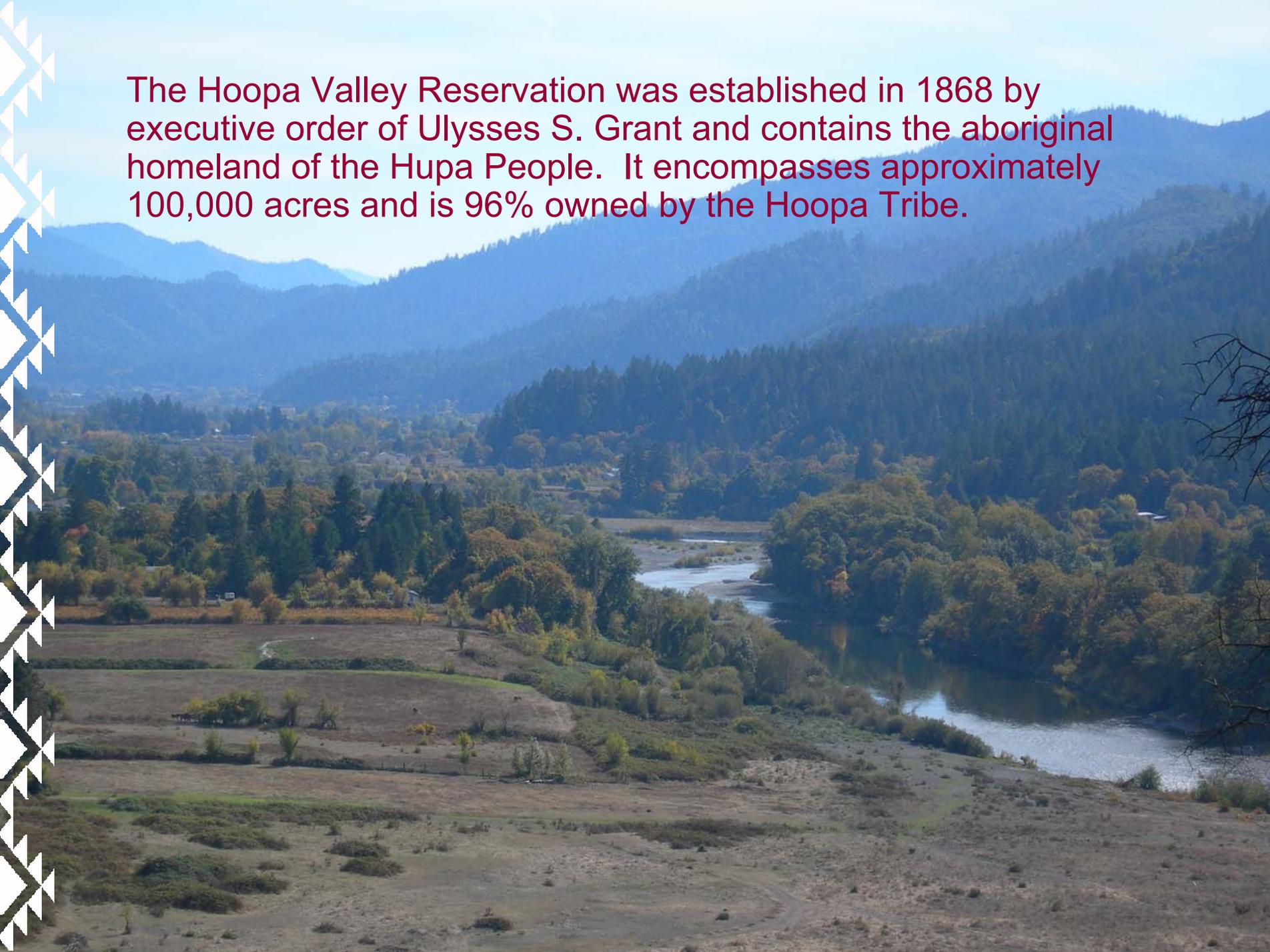
Micro-Hydro Feasibility Study



Curtis Miller

Hoop Valley Tribe

The Hoopa Valley Reservation was established in 1868 by executive order of Ulysses S. Grant and contains the aboriginal homeland of the Hupa People. It encompasses approximately 100,000 acres and is 96% owned by the Hoopa Tribe.



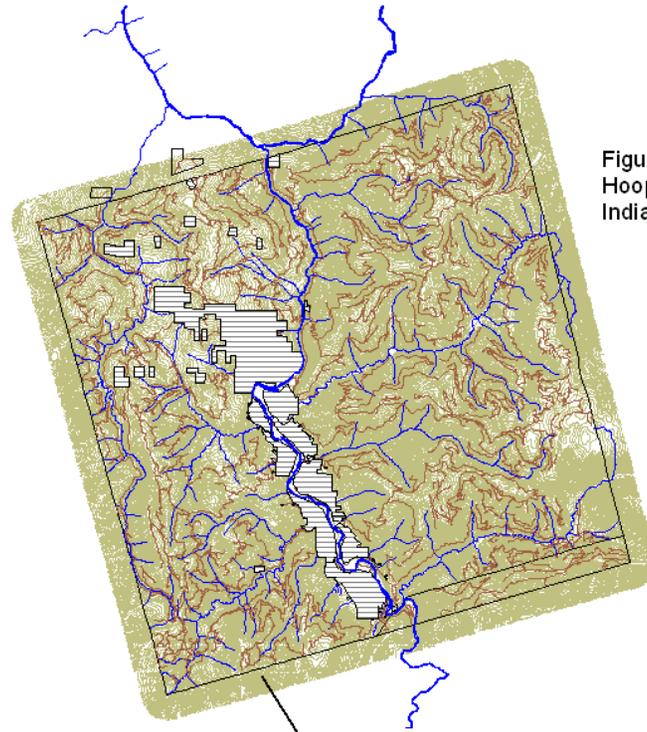


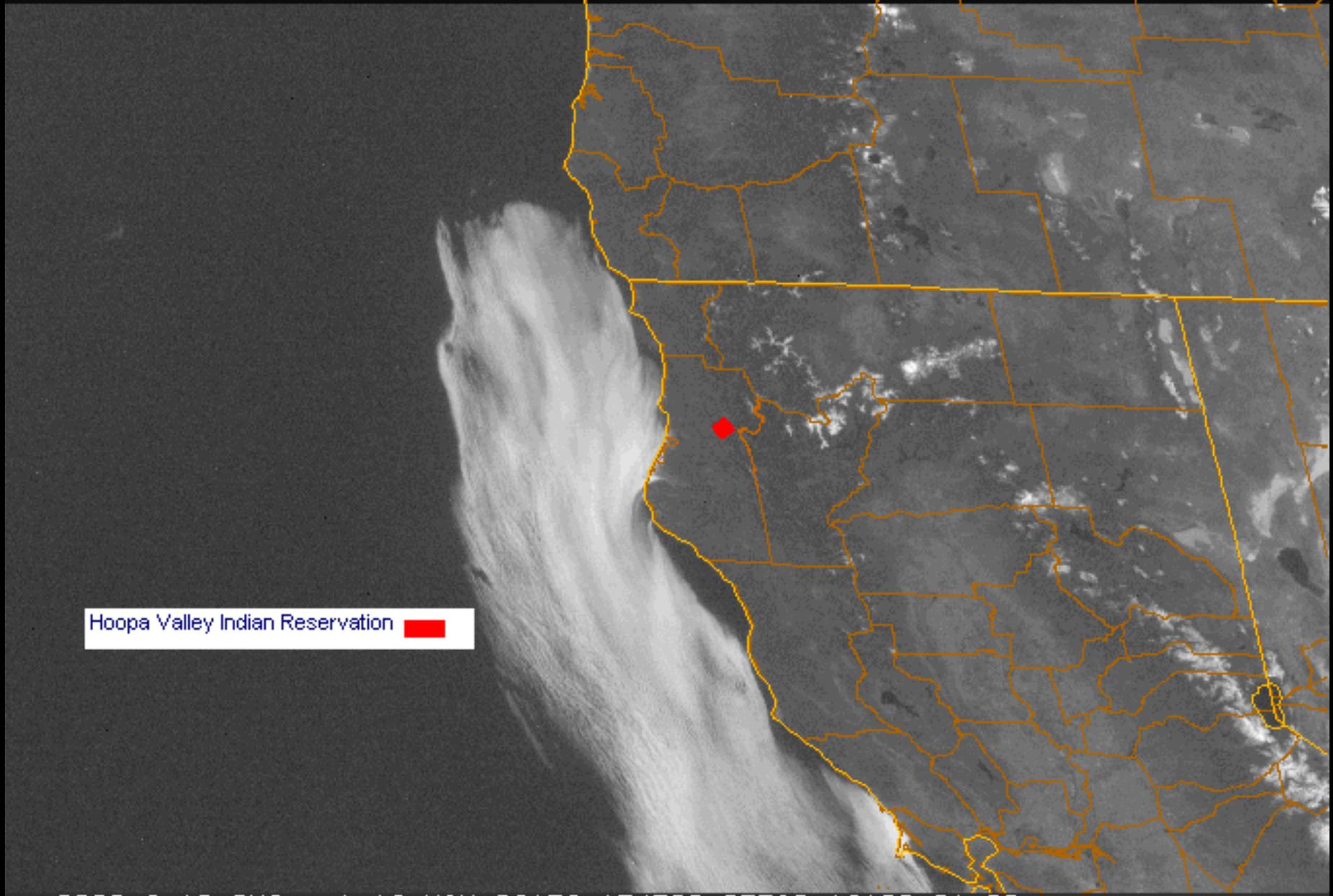
Figure 1. Location of the Hoopa Valley Indian Reservation

Hoopa Valley
Indian Reservation

California

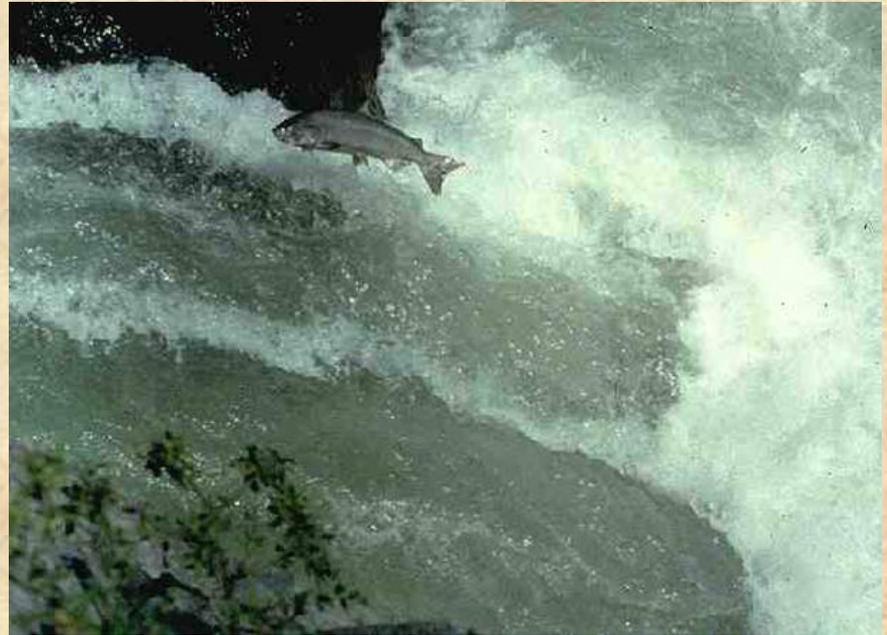
San Francisco

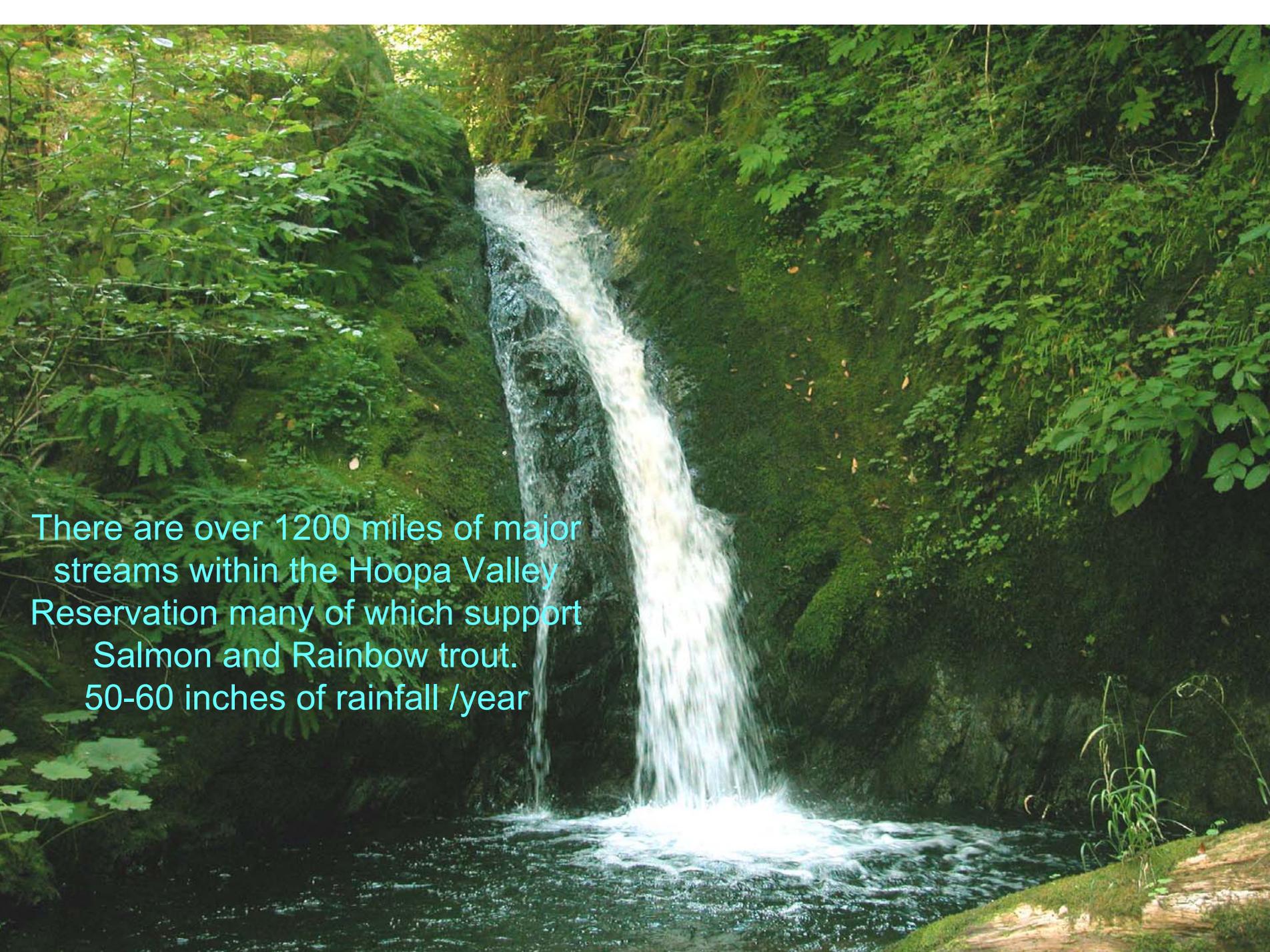




Hoopa Valley Indian Reservation ■

Salmon are the life blood of the Hupa and Yurok and Karuk people



A photograph of a waterfall in a dense forest. The water is white and frothy as it falls from a dark, moss-covered rock face. The surrounding area is filled with vibrant green foliage, including ferns and various leafy plants. The scene is captured from a low angle, looking up at the waterfall. The text is overlaid on the left side of the image in a light blue, sans-serif font.

There are over 1200 miles of major streams within the Hoopa Valley Reservation many of which support Salmon and Rainbow trout. 50-60 inches of rainfall /year

Why Hydro?

- Most common renewable energy
- Well developed technology
- Most efficient means of producing electricity
- Multiple uses of water resource
- Ideal for distributed generation
- Least expensive power in US



Hydro Efficiency

- Generates between 205-267 times the amount of energy to build and maintain the facility
- Windpower is 37x
- Nuclear is 16x
- Coal is 11x



In FY06 the Hoopa Valley Tribe received a grant from the DOE to conduct a hydro-power feasibility study on 7 major streams of the Reservation



Concept of Approach

- Road access to streams
 - Intake sites, pipeline construction and turbine sites
- Distance to Valley
 - produce enough power to get down to the valley and still have plenty for the community to use
- Proximity to power lines – connectivity
- Location for turbine
 - relatively flat, close to power lines
- Adequate head and majority of stream flows at intake site



Issue(s)

The Hoopa Valley Tribe has been involved in legal battles with upstream dams for over 10 years

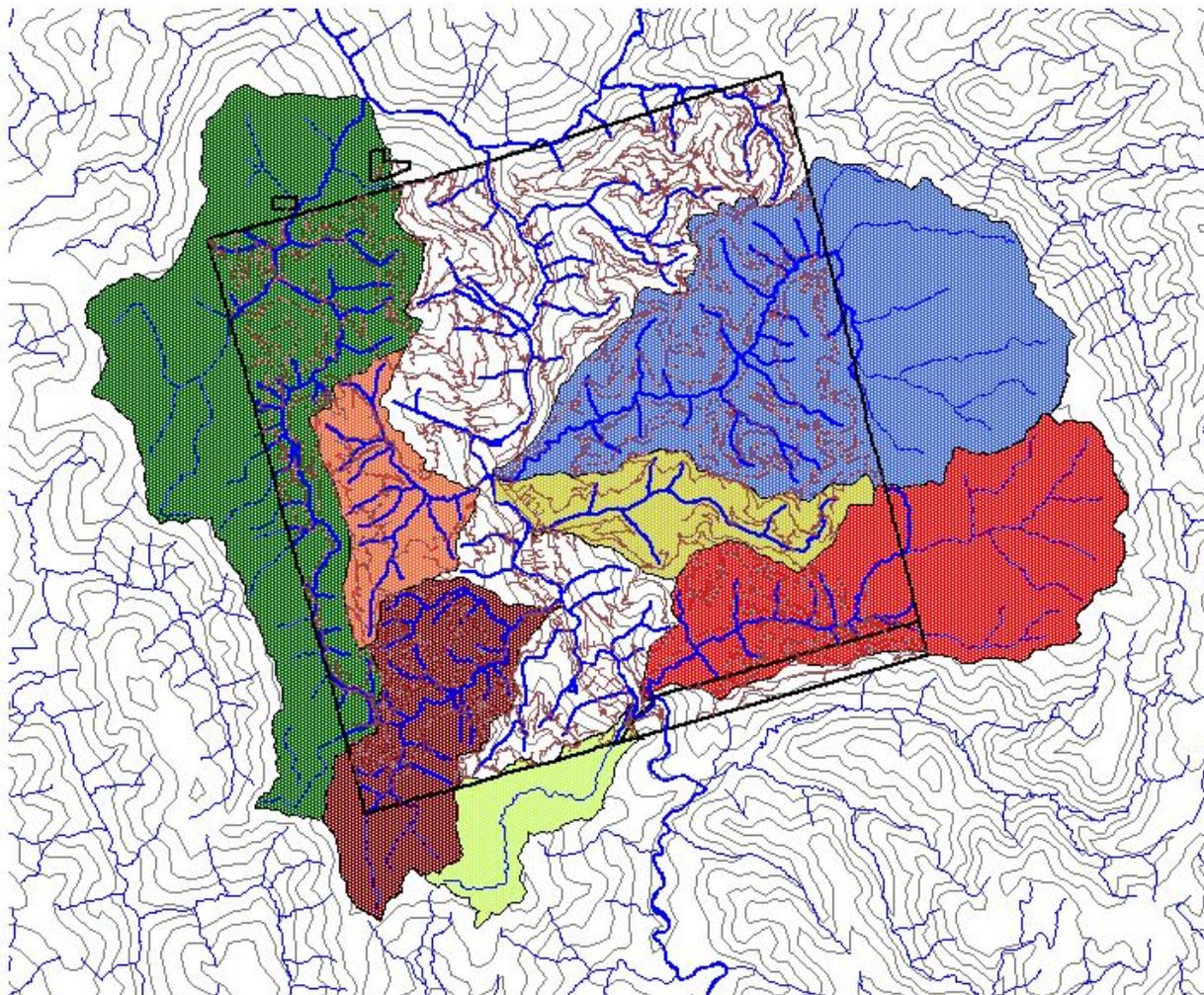
In 2003 the Tribe won it's case for 30% more water from the Lewiston dam to support Salmon fisheries in the Trinity and Klamath Rivers



Lewiston Dam – Trinity River



Hoopla Valley Hydrosheds

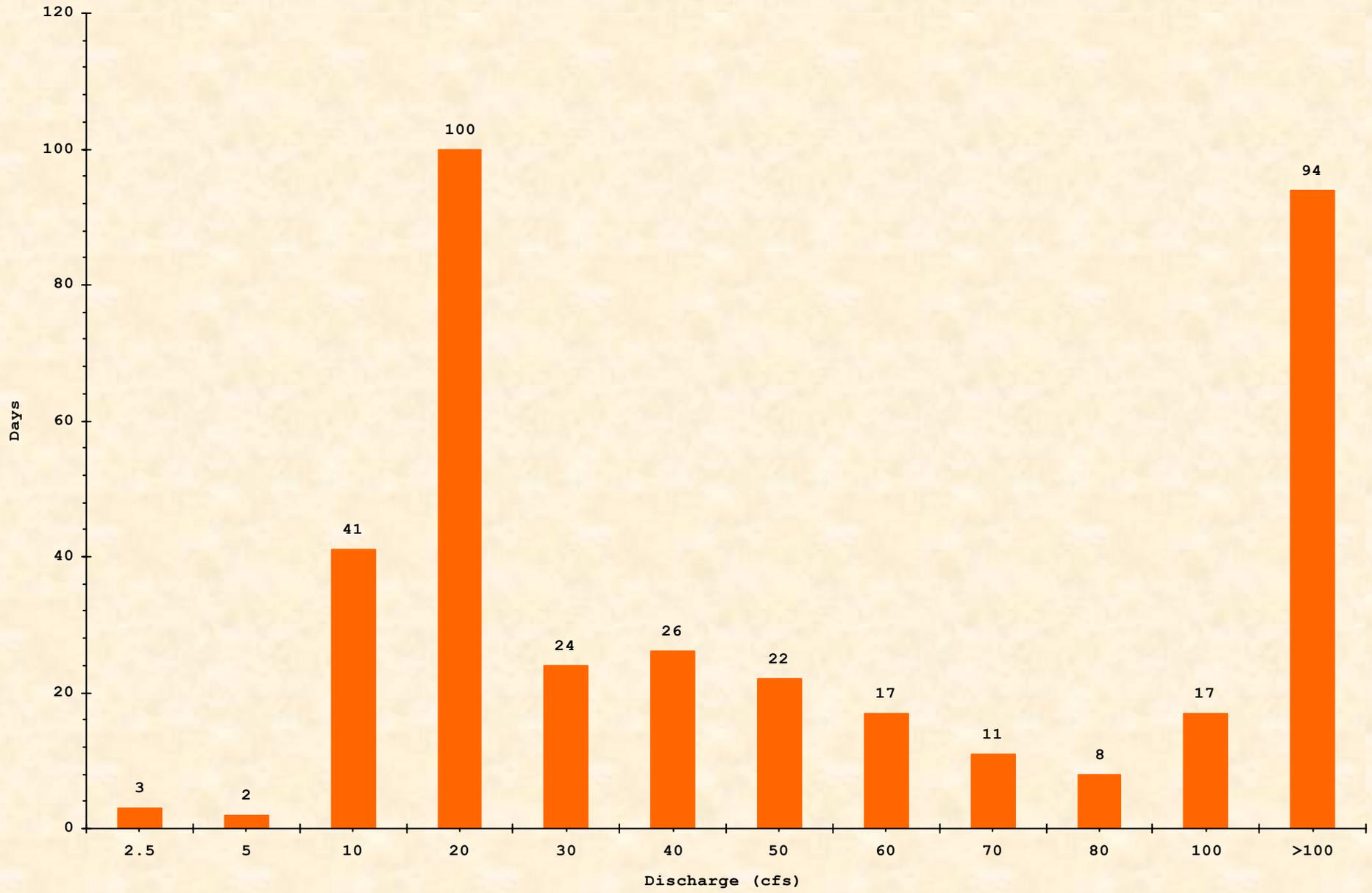


-  Roads
-  Trinity River
-  Reservation boundary
-  Major streams
-  Reservation Streams
-  Campbell_shed.shp
-  Tish Tang Watershed
-  Tish Tang Hydro Area
-  Hostler Watershed
-  Supply Creek Watershed
-  Pine Creek Watershed
-  Socktish Watershed
-  Mill Creek Watershed
-  Contour at 500ft

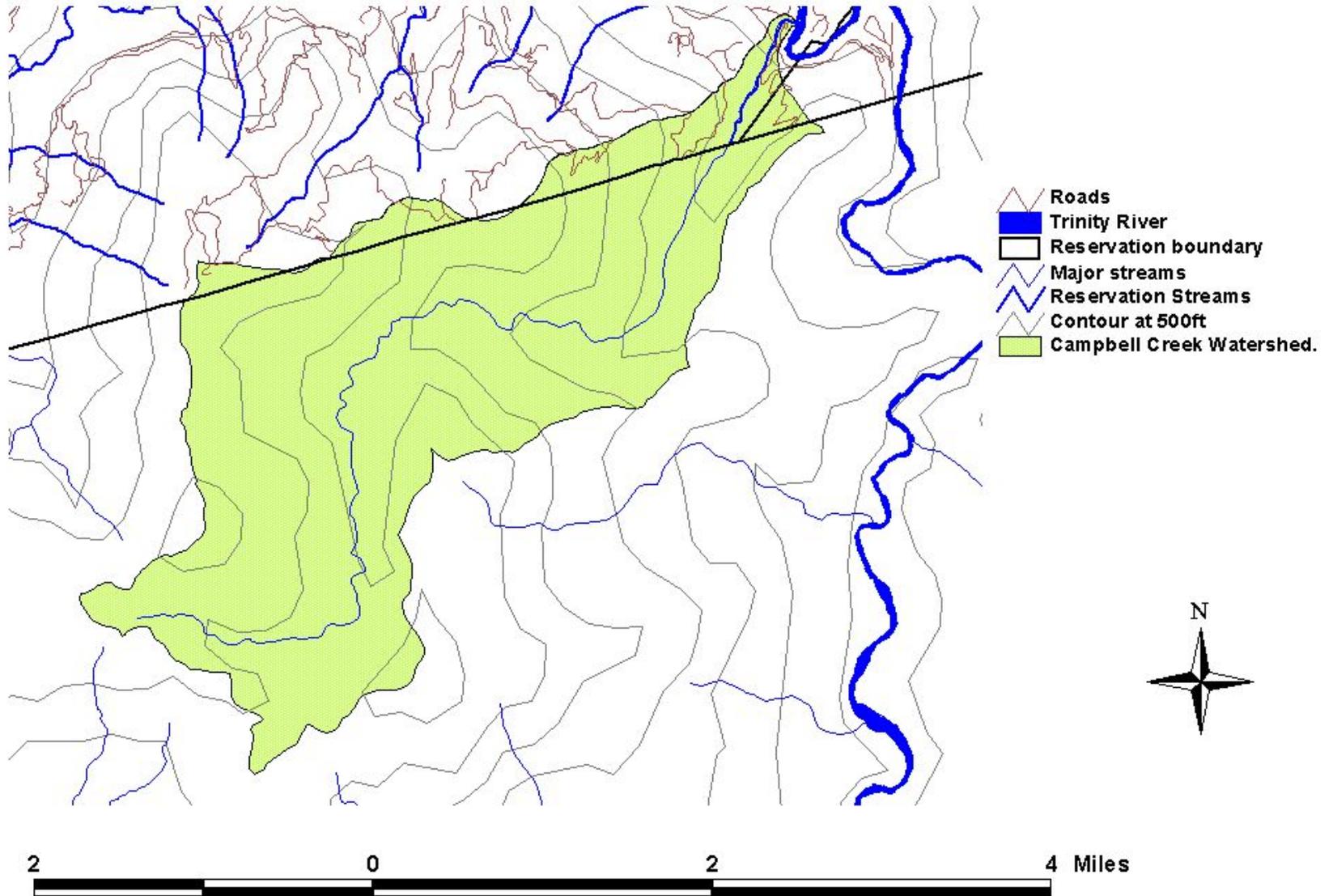


7 0 7 14 Miles

Lower Supply Creek Discharge Frequency
365 days, Water Year 2005



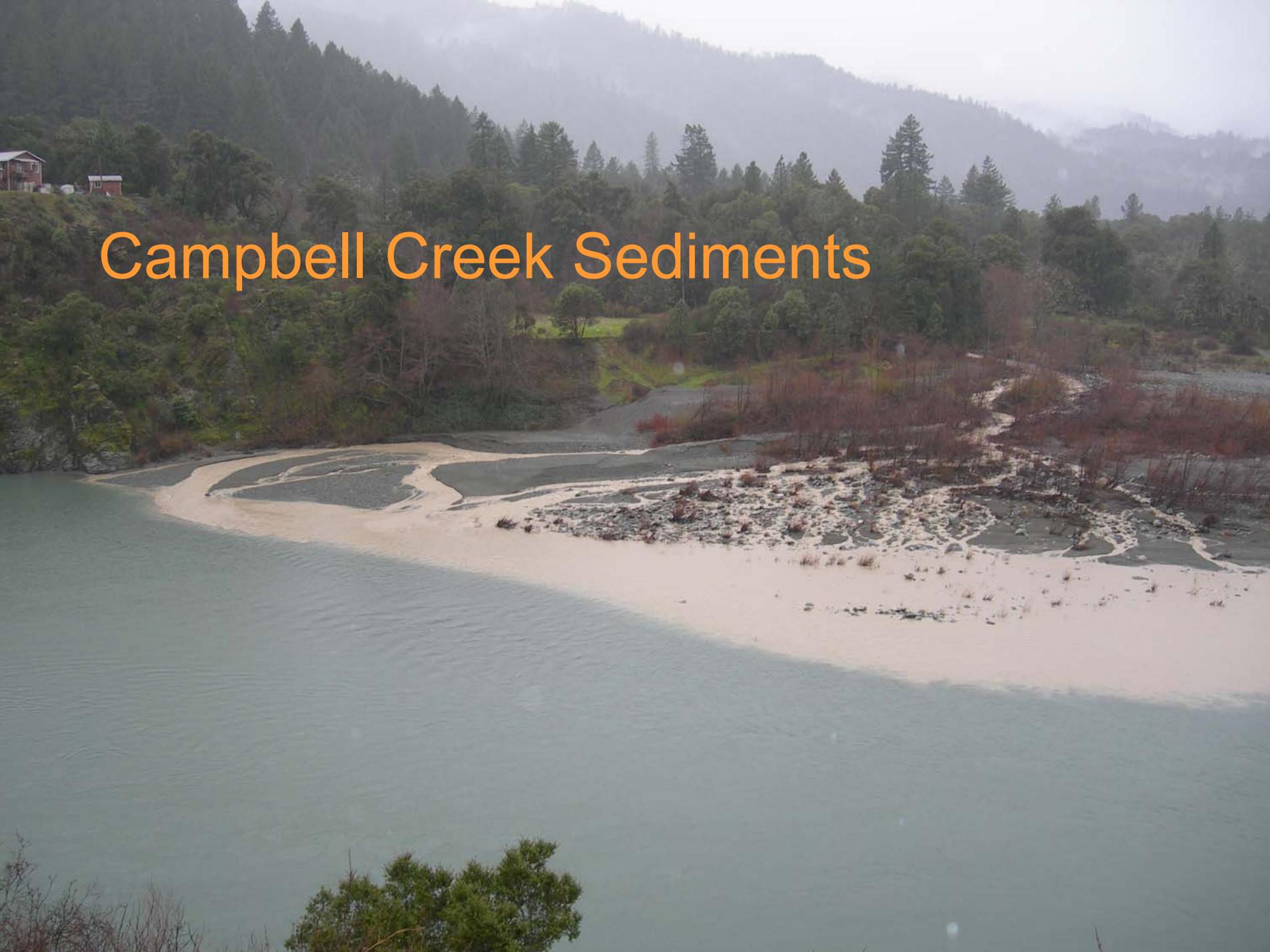
Campbell Creek Watershed



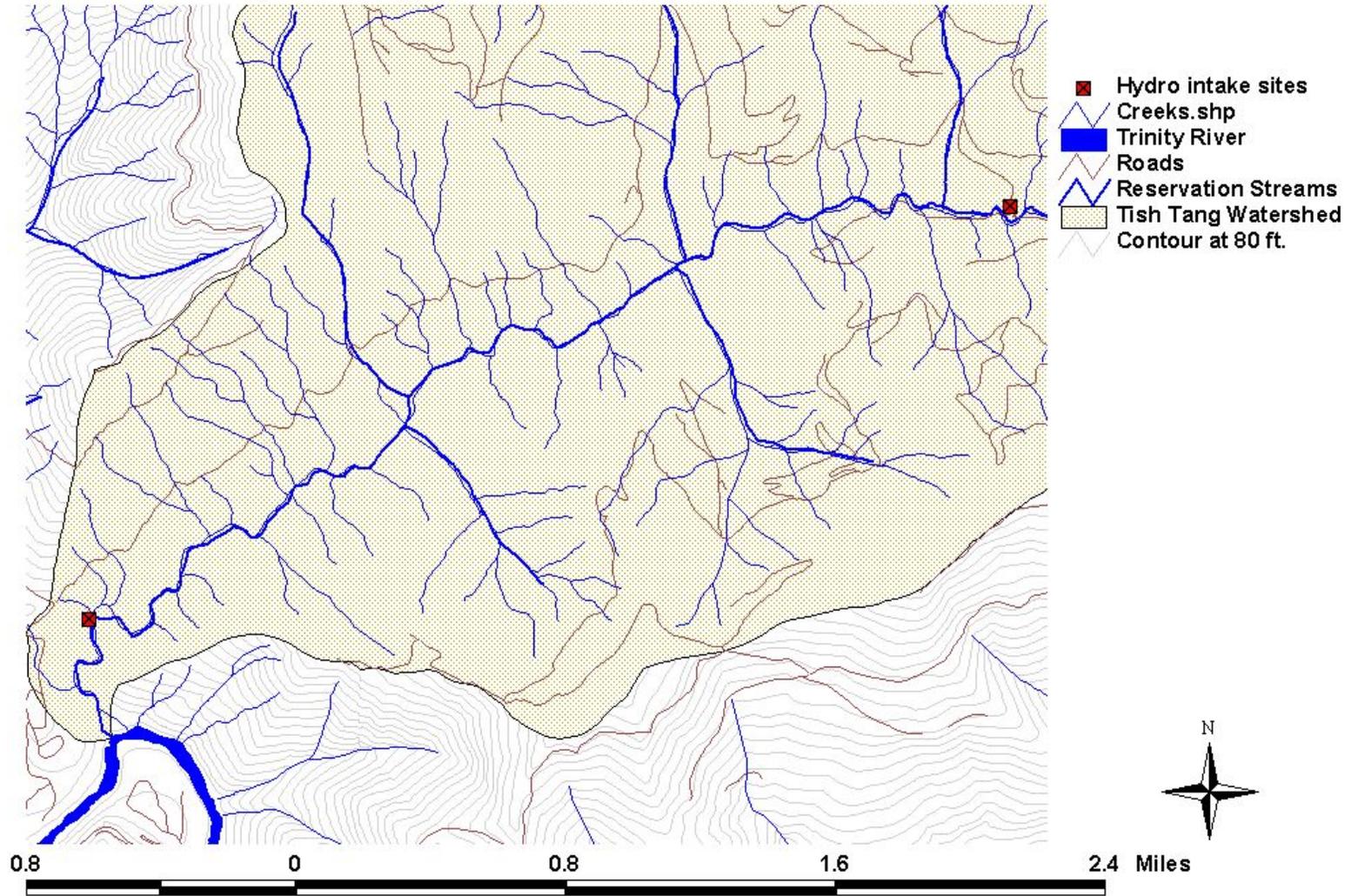
Upper Campbell Creek Landslide Off Reservation Impacts



Campbell Creek Sediments



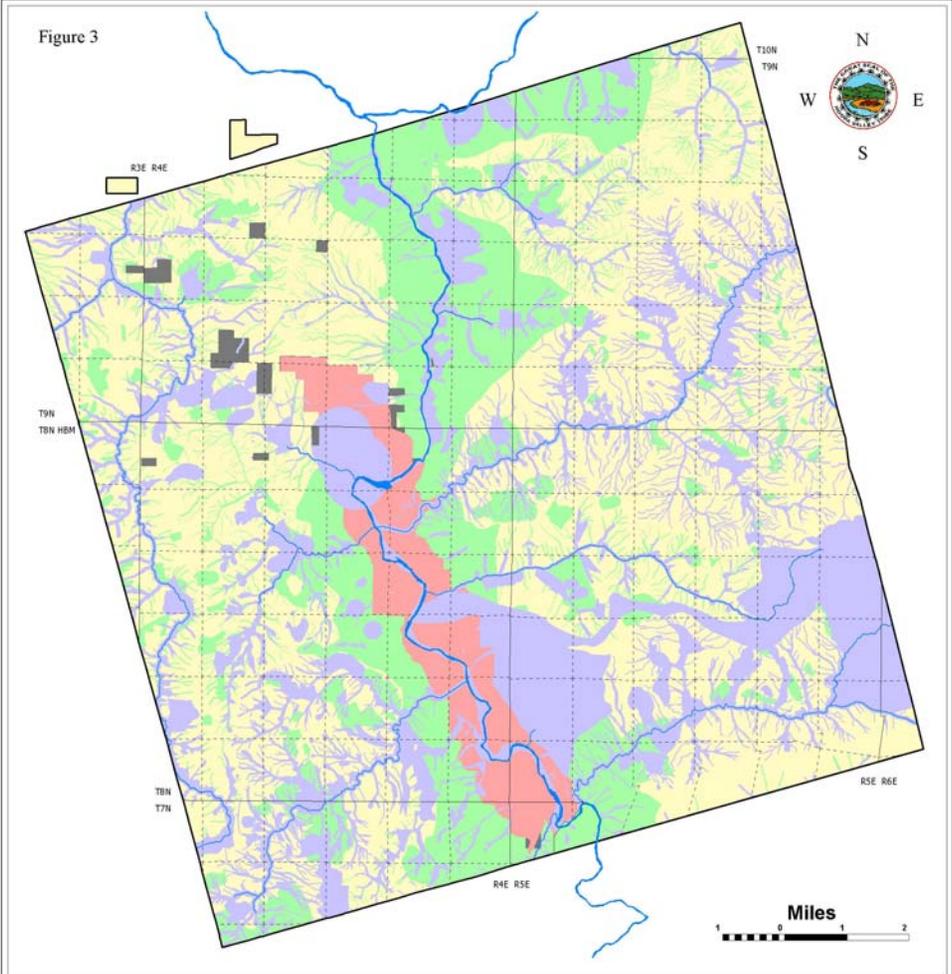
Lower Tish Tang Creek Hoopa Valley



Problems with Tish Tang

- Very gradual gradient 5-10%
- Unstable slopes
- Timber set asides
- Cultural sites
- Lack of low elevation site for turbine





**HOOPA VALLEY INDIAN RESERVATION
Harvest Restrictions**



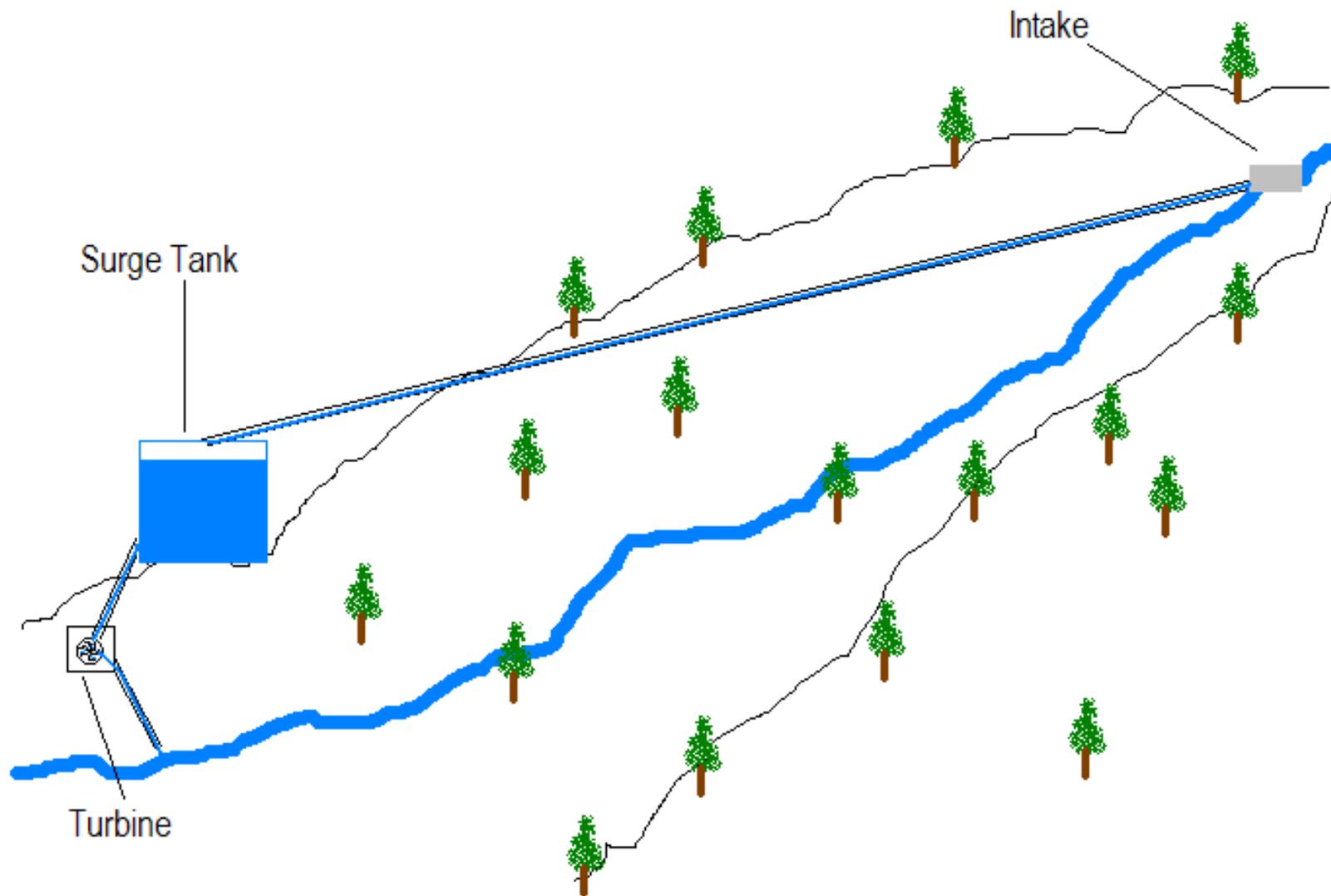
Instability



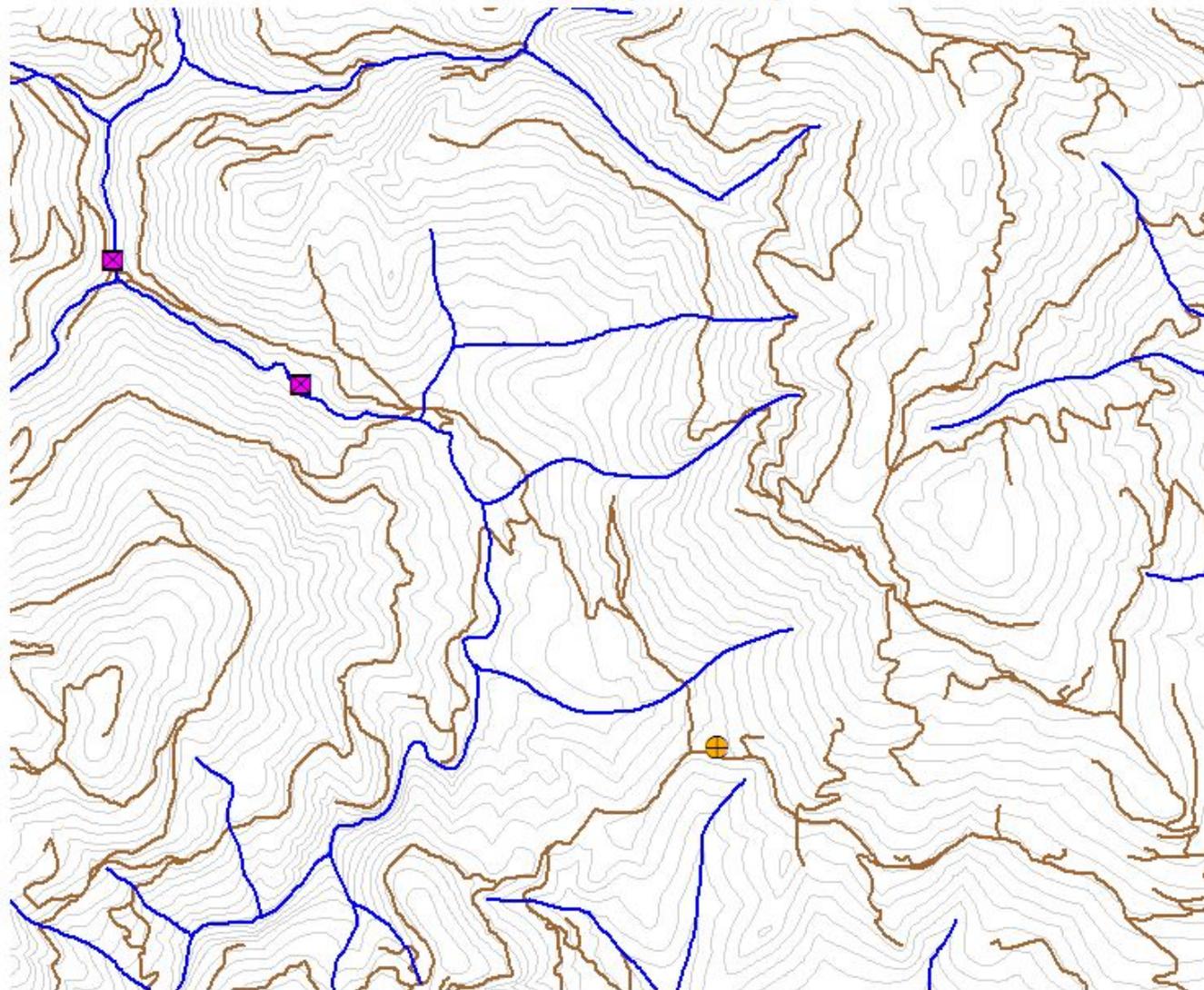




Alternative Concept



Pine Creek Hydro Sites Hoopa Valley



- Pine creek hydro sites
- PG&E_connect
- △ Streams
- River
- Roads
- ~ Contour

1 0 1 2 3 Miles

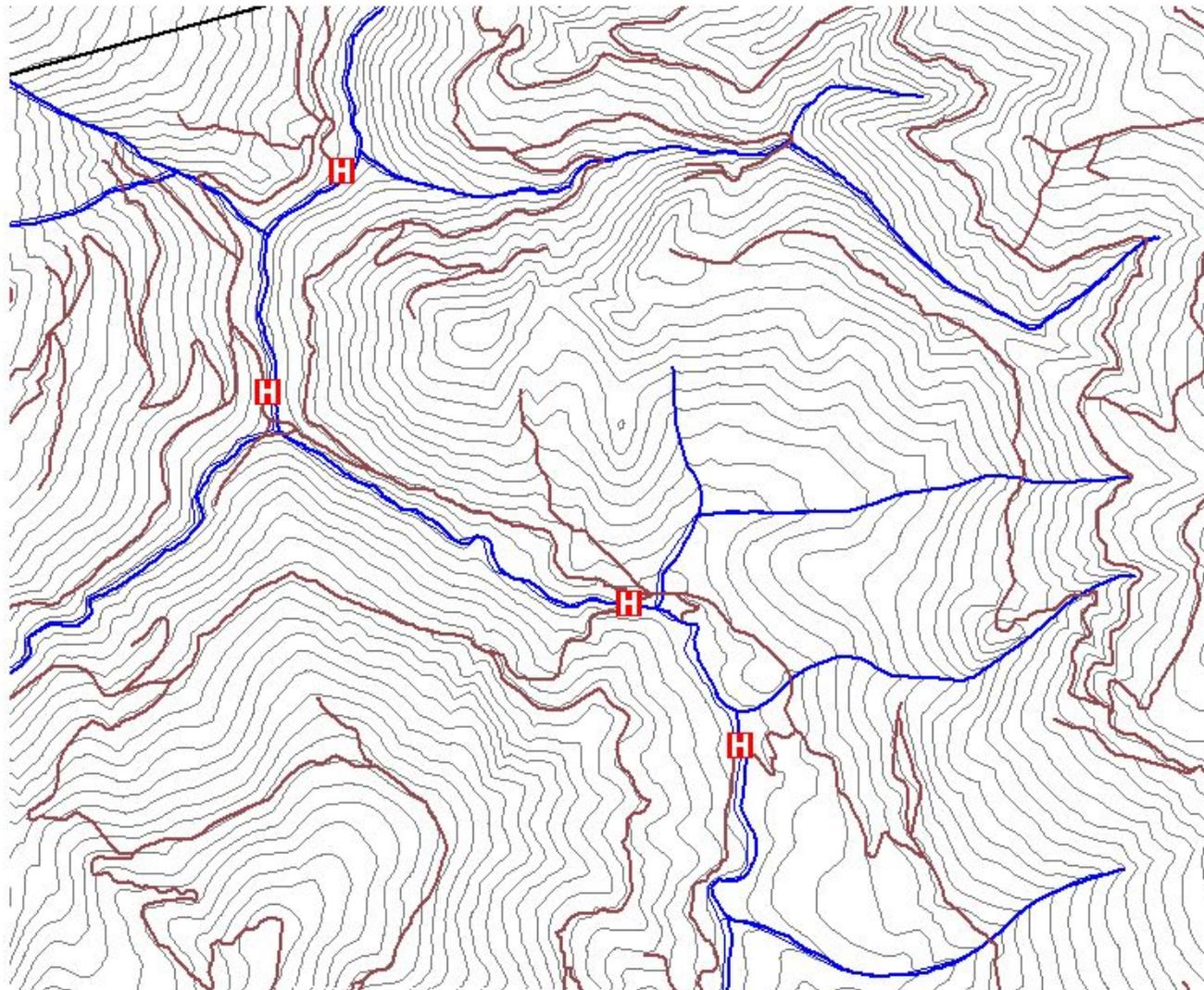




Pine Creek

- Gross head, 66 feet
- Length of pipe, 4500 feet
- Flow range, 50 cfs
- Duration 50cfs for 141 days
- Recommended pipe diameter, 48"
- Calculated net head, 62 feet
- Expected power, 220KW

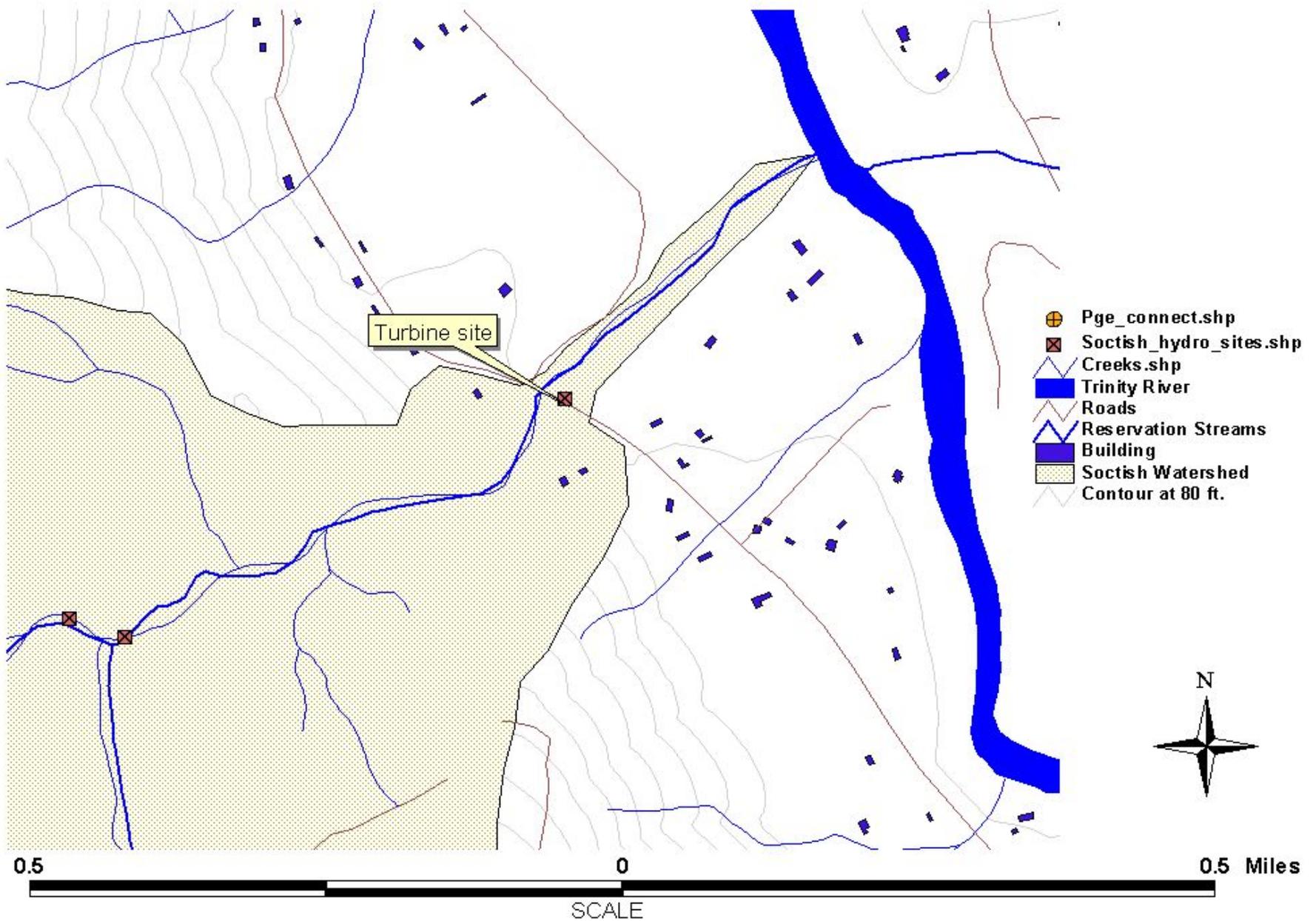
Pine Creek Hydro Sites



-  Hydro sites
-  Reservation boundary
-  Roads
-  Reservation Streams
-  Major streams
-  Trinity River
-  Contour at 80 ft.



Soctish Creek Hydro Sites

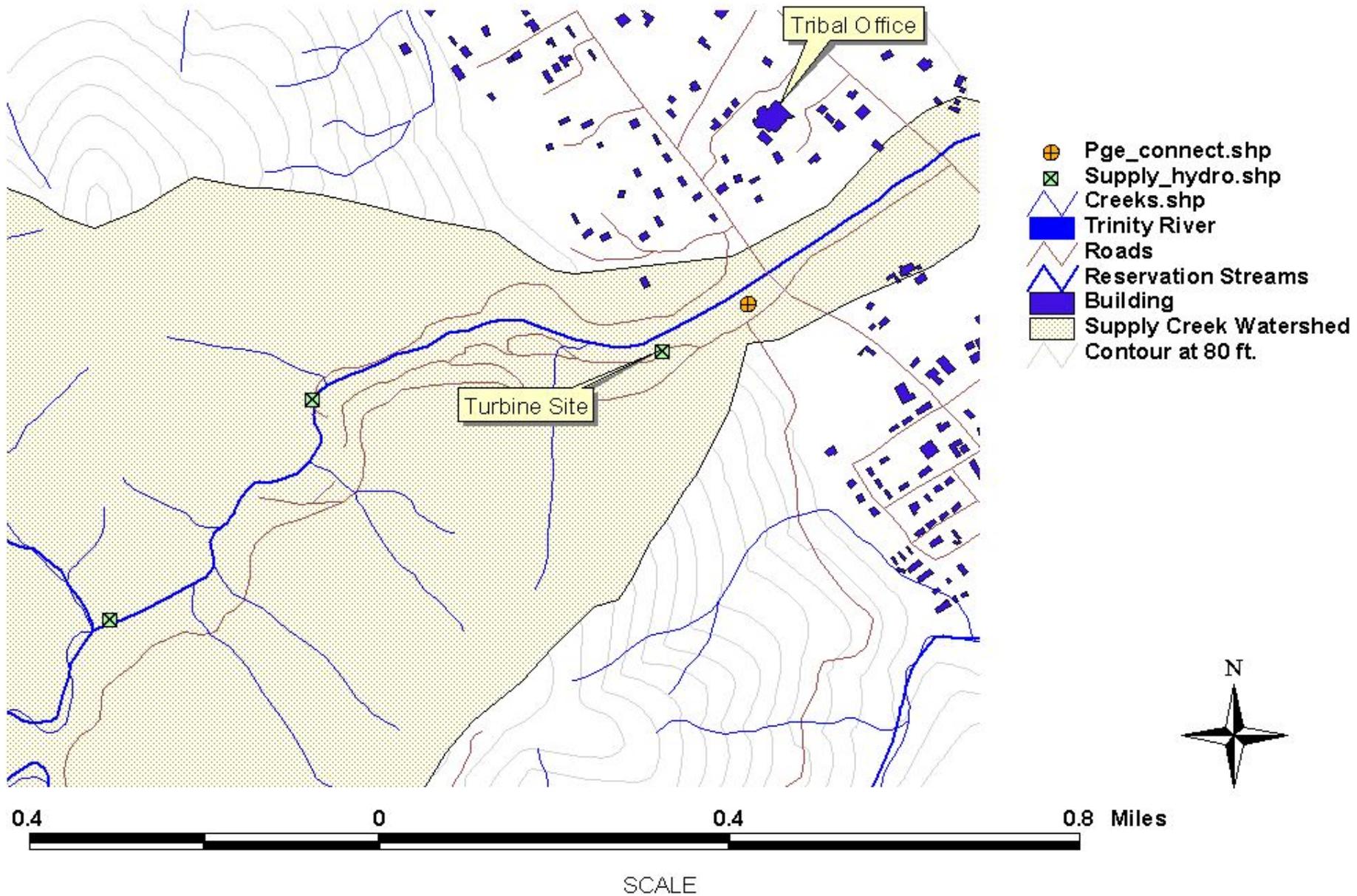




Soctish Creek

- Gross head, 118 feet
- Length of pipe, 2716 feet
- Flow range, 100 cfs
- Flow duration 217 days
- Recommended pipe diameter, 48"
- Calculated net head, 109 feet
- Expected power, 790KW

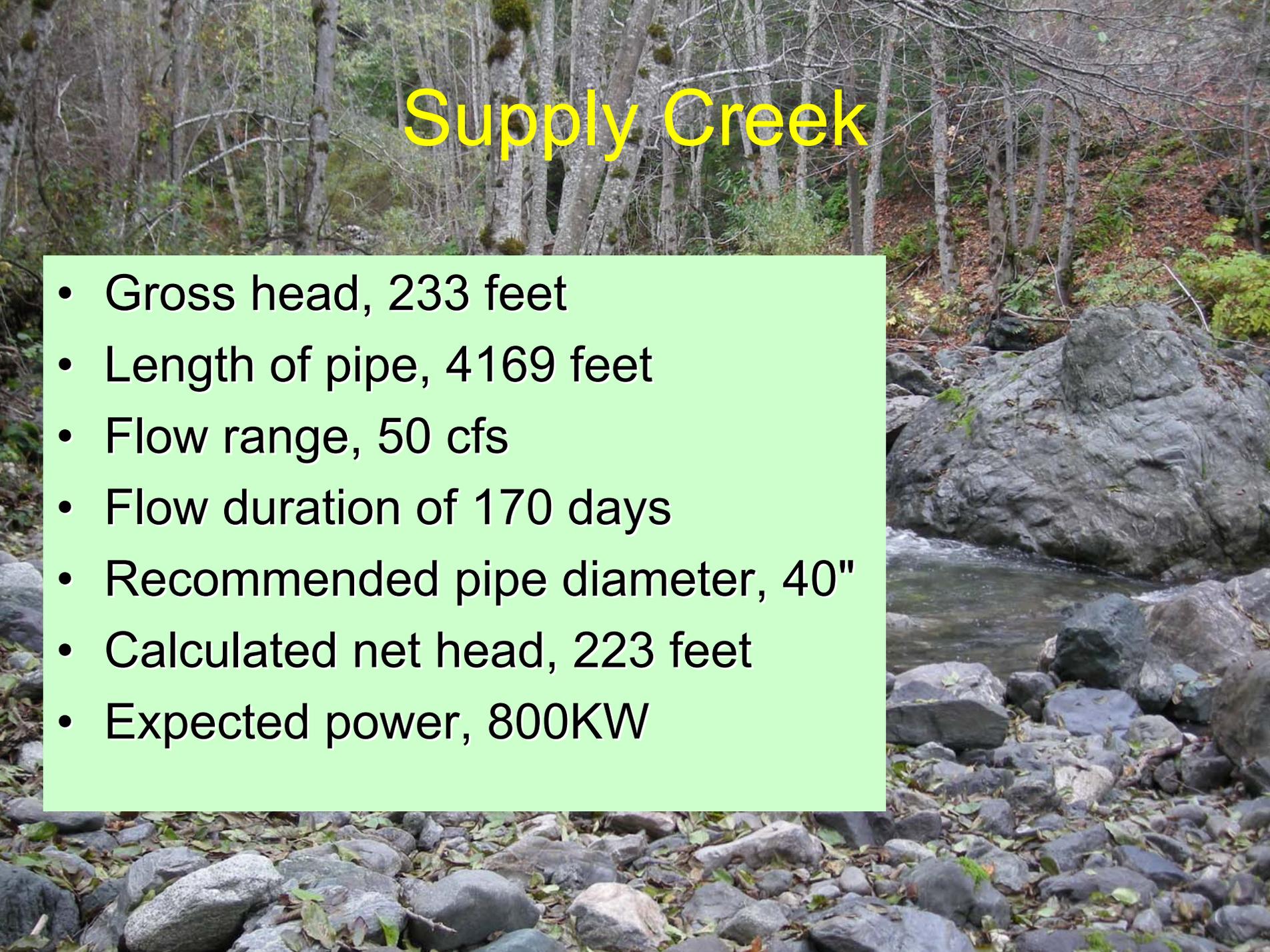
Supply creek hydro sites



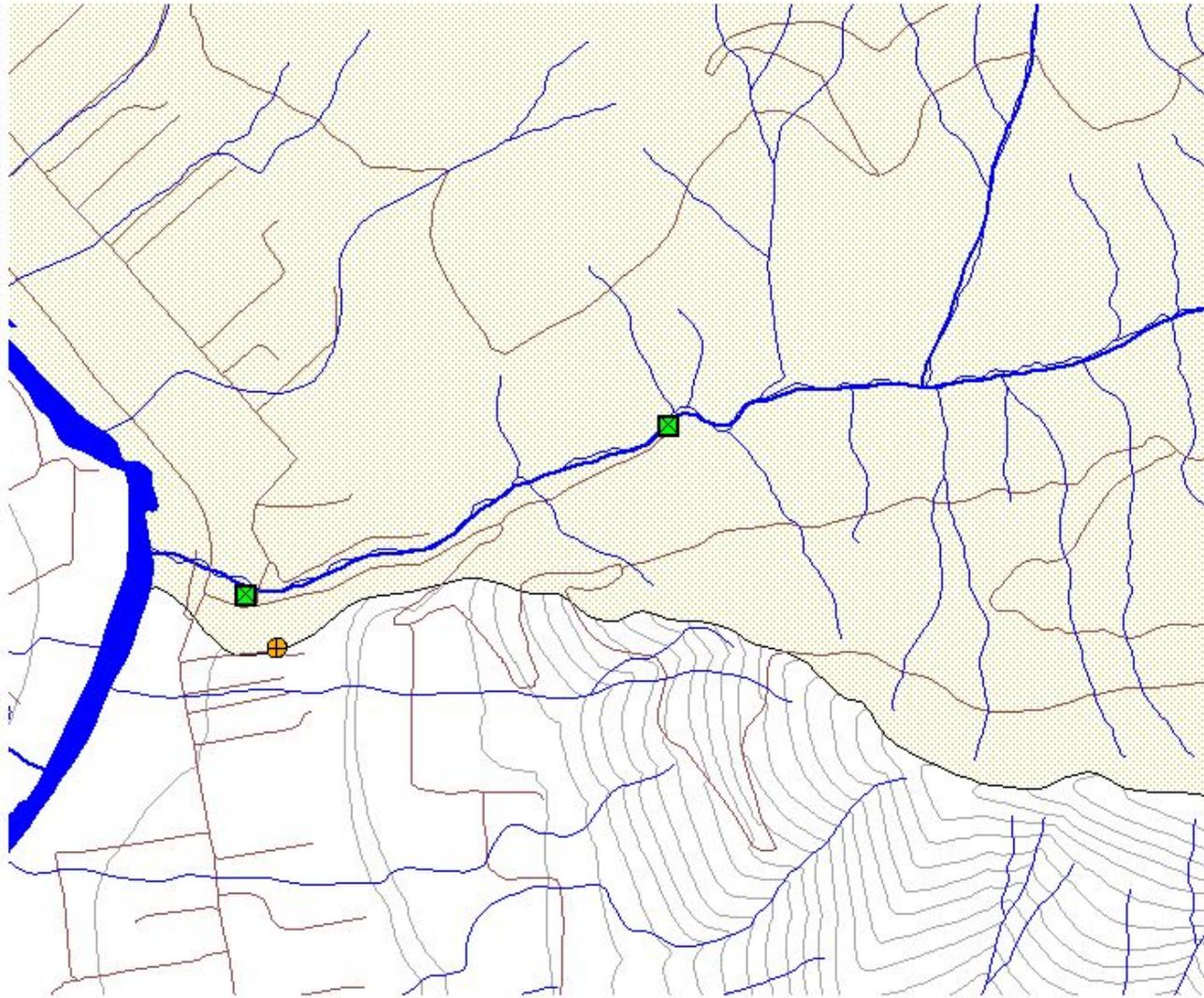


Supply Creek

- Gross head, 233 feet
- Length of pipe, 4169 feet
- Flow range, 50 cfs
- Flow duration of 170 days
- Recommended pipe diameter, 40"
- Calculated net head, 223 feet
- Expected power, 800KW



Hostler Creek Hydro Sites



- Pge_connect.shp
- Hostler Creek Hydro Sites
- △ Creeks.shp
- Trinity River
- △ Roads
- △ Reservation Streams
- Hostler Watershed
- Mill Creek Watershed
- △ Contour at 80 ft.



1 0 1 Miles

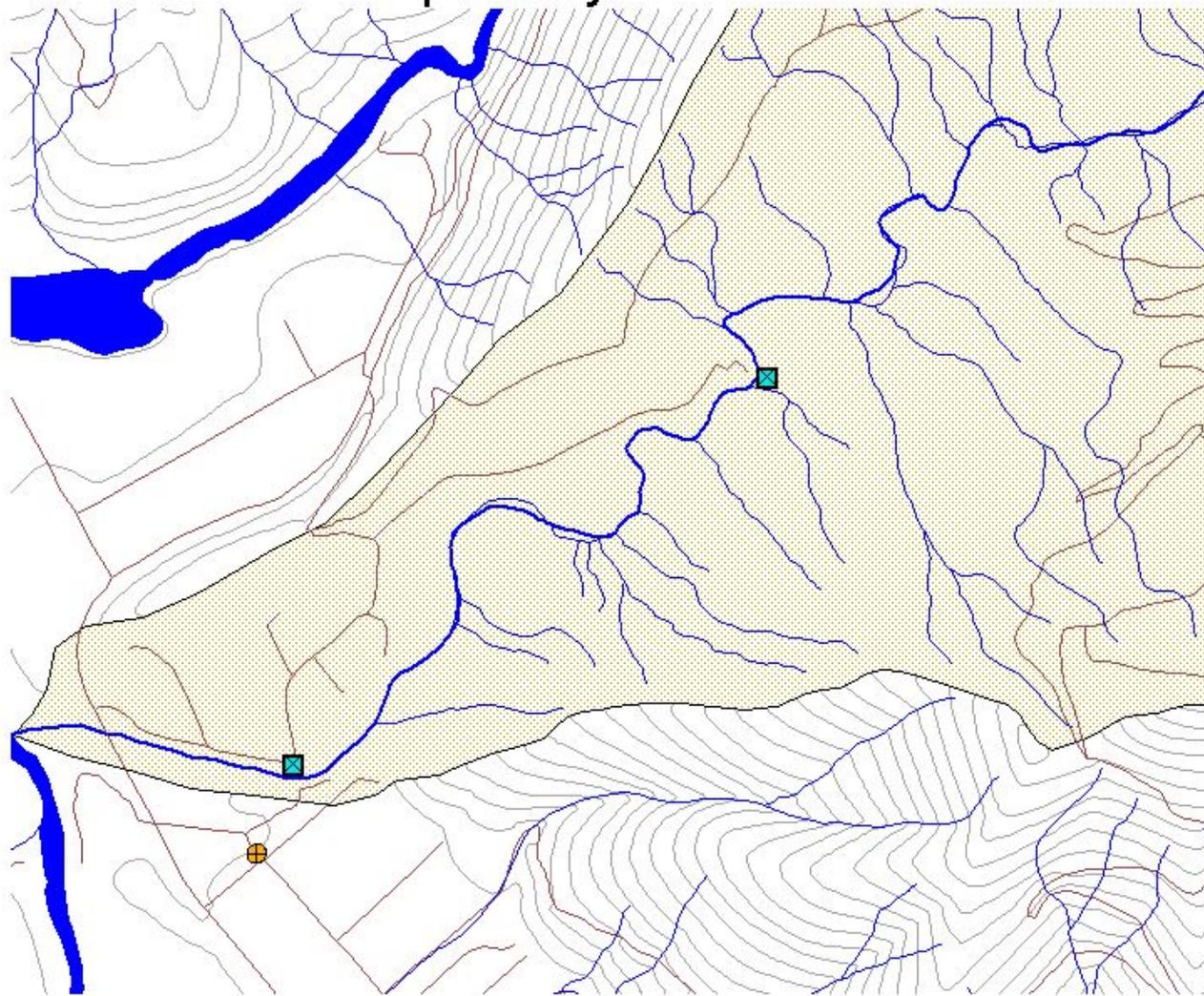


Hostler Creek

- Gross head, 39 feet
- Length of pipe, 375 feet
- Flow range, 10 cfs
- Flow duration 317 days
- Recommended pipe diameter, 16"
- Calculated net head, 35 feet
- Expected power, 19KW



Mill Creek Hydro Power Sites Hoopa Valley



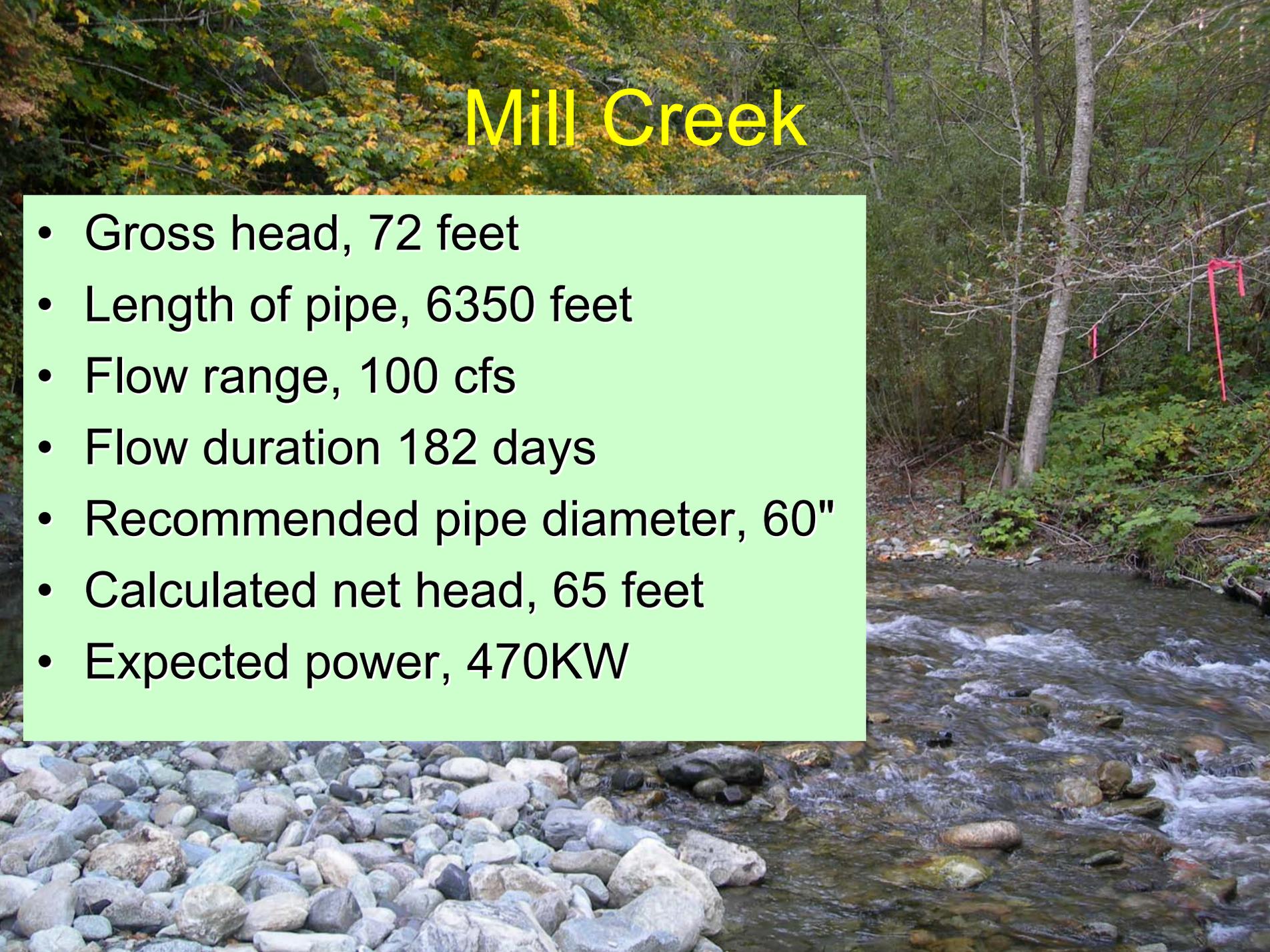
-  Pge_connect.shp
-  Mill Creek hydro sites
-  Creeks.shp
-  Trinity River
-  Roads
-  Reservation Streams
-  Mill Creek Watershed
-  Contour at 80 ft.



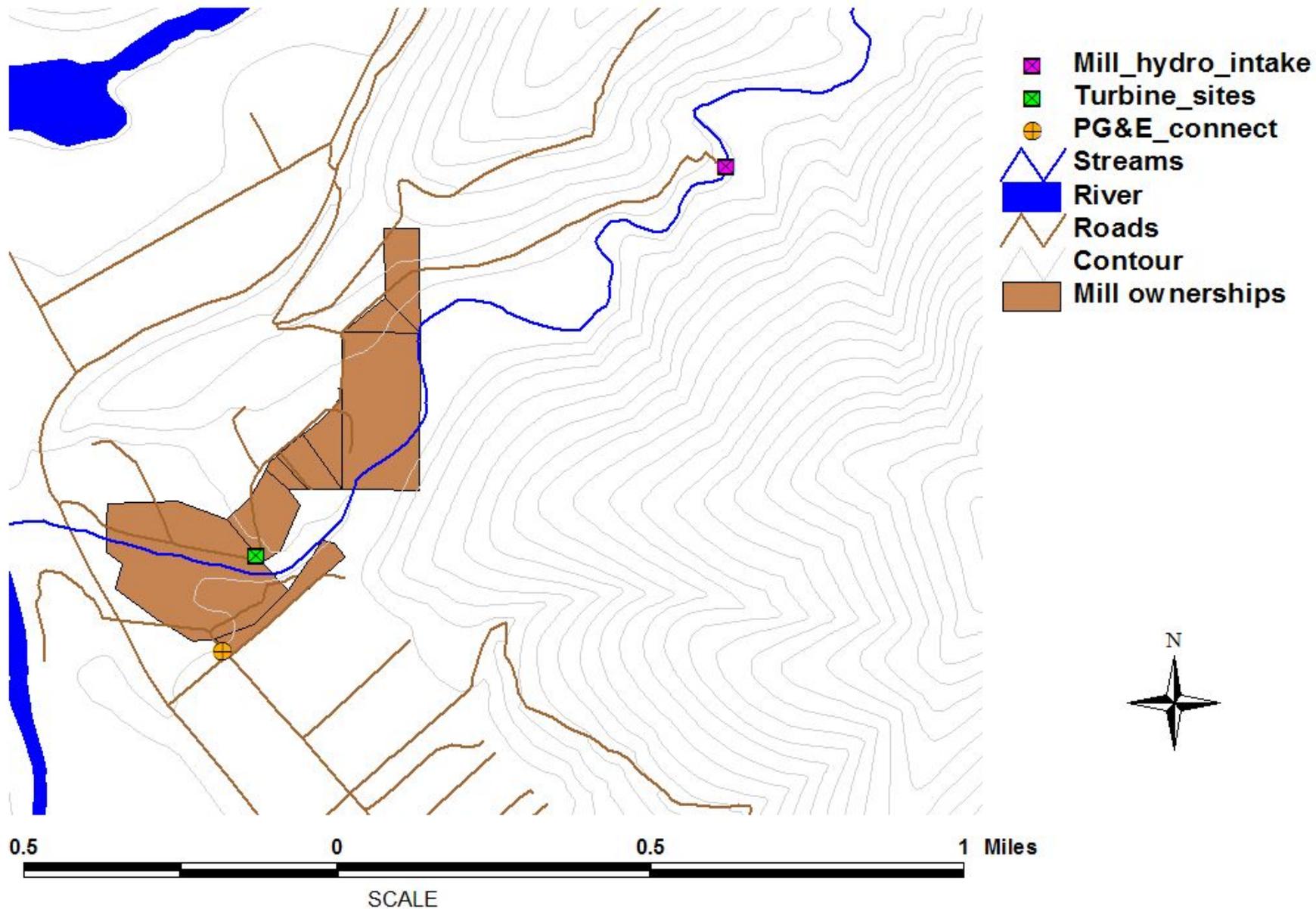


Mill Creek

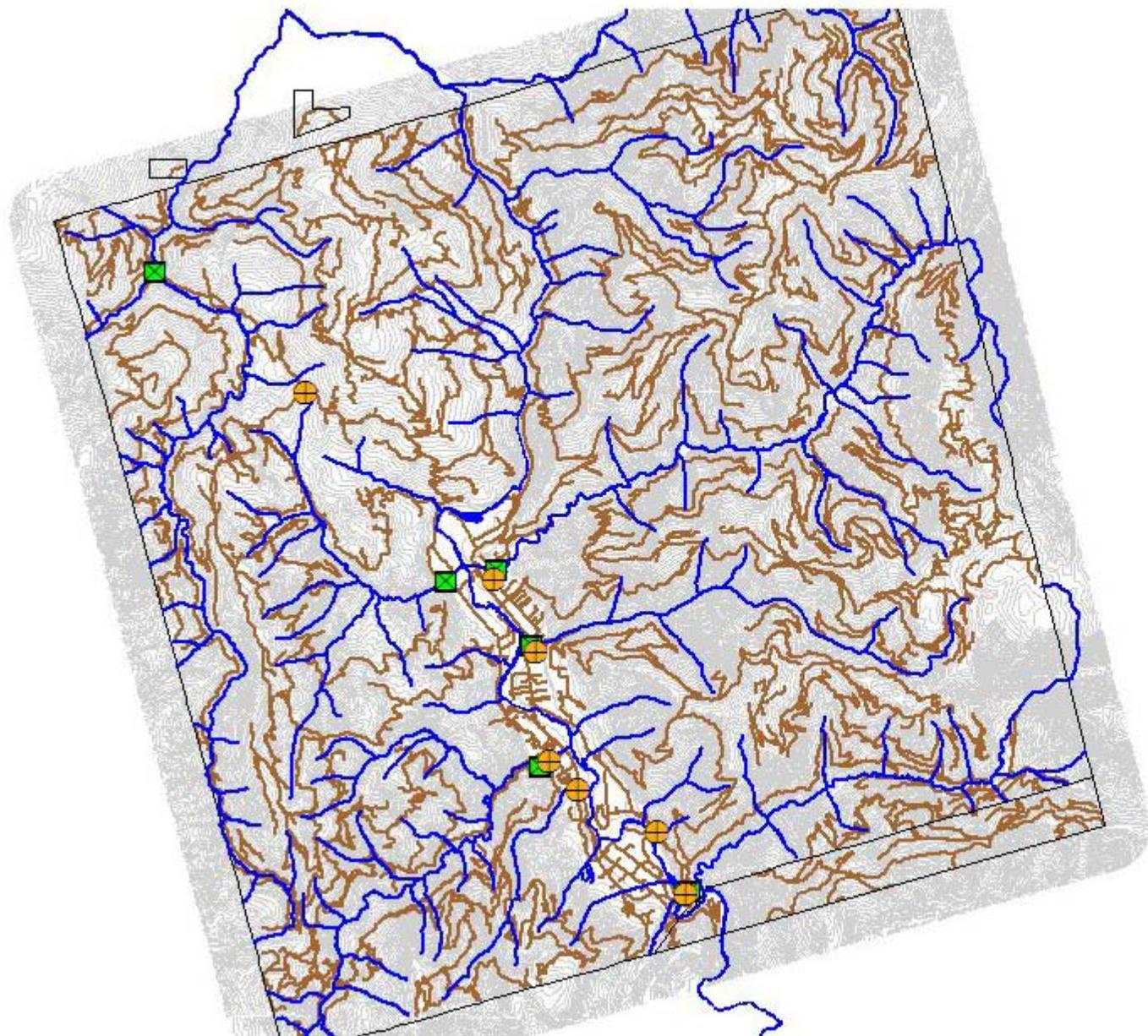
- Gross head, 72 feet
- Length of pipe, 6350 feet
- Flow range, 100 cfs
- Flow duration 182 days
- Recommended pipe diameter, 60"
- Calculated net head, 65 feet
- Expected power, 470KW



Lower Mill Creek Ownerships



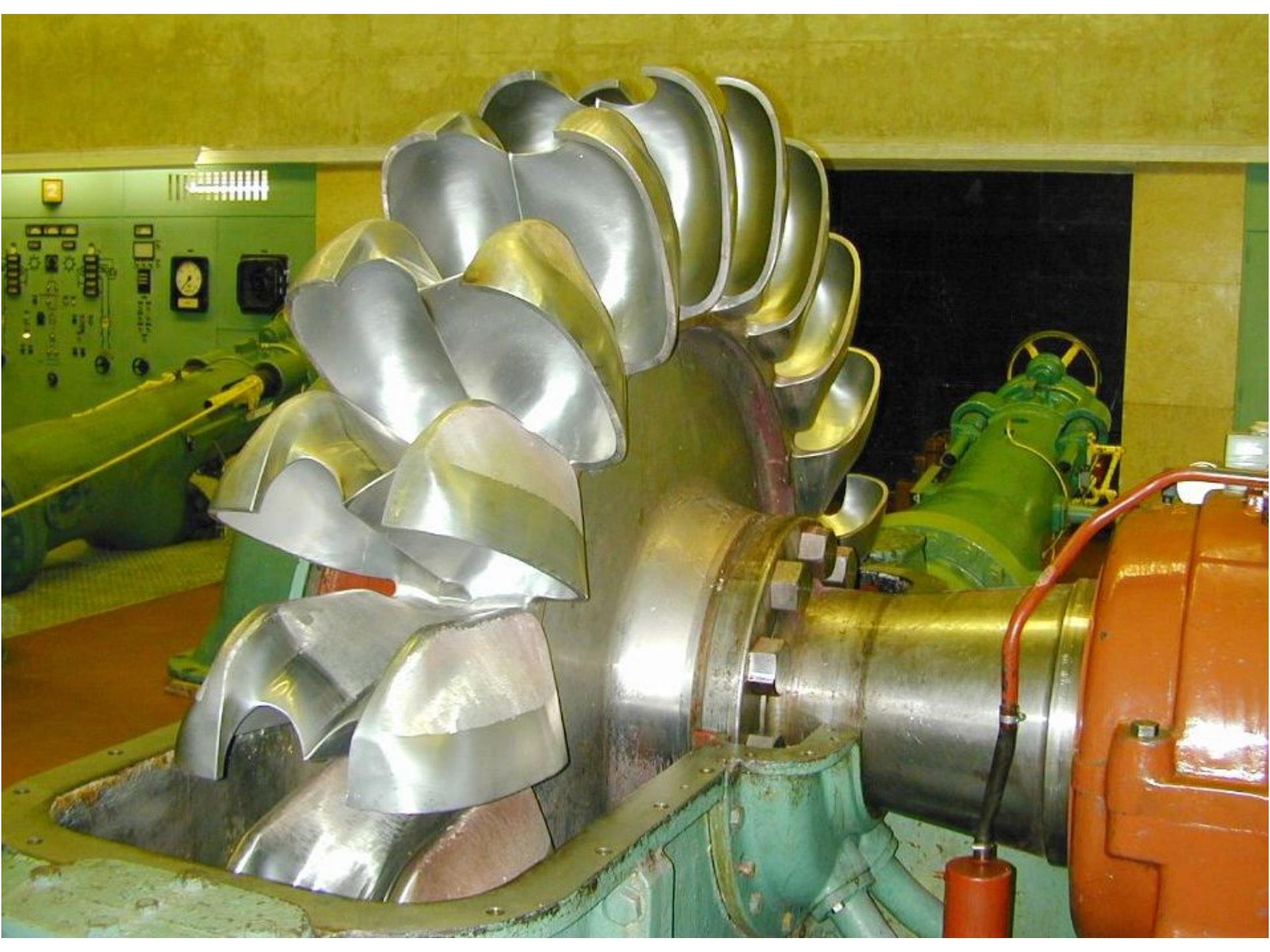
PG&E Connections

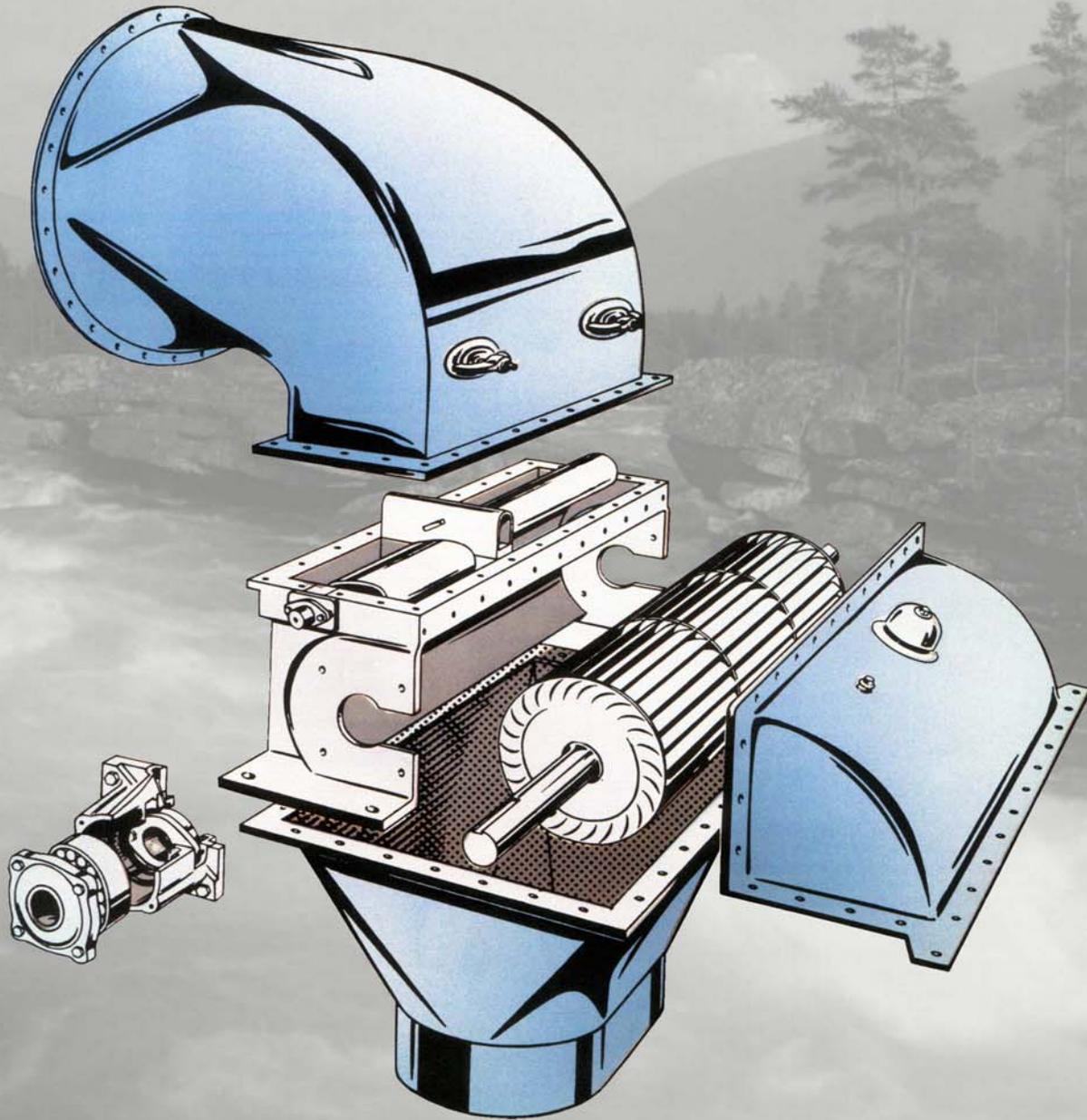


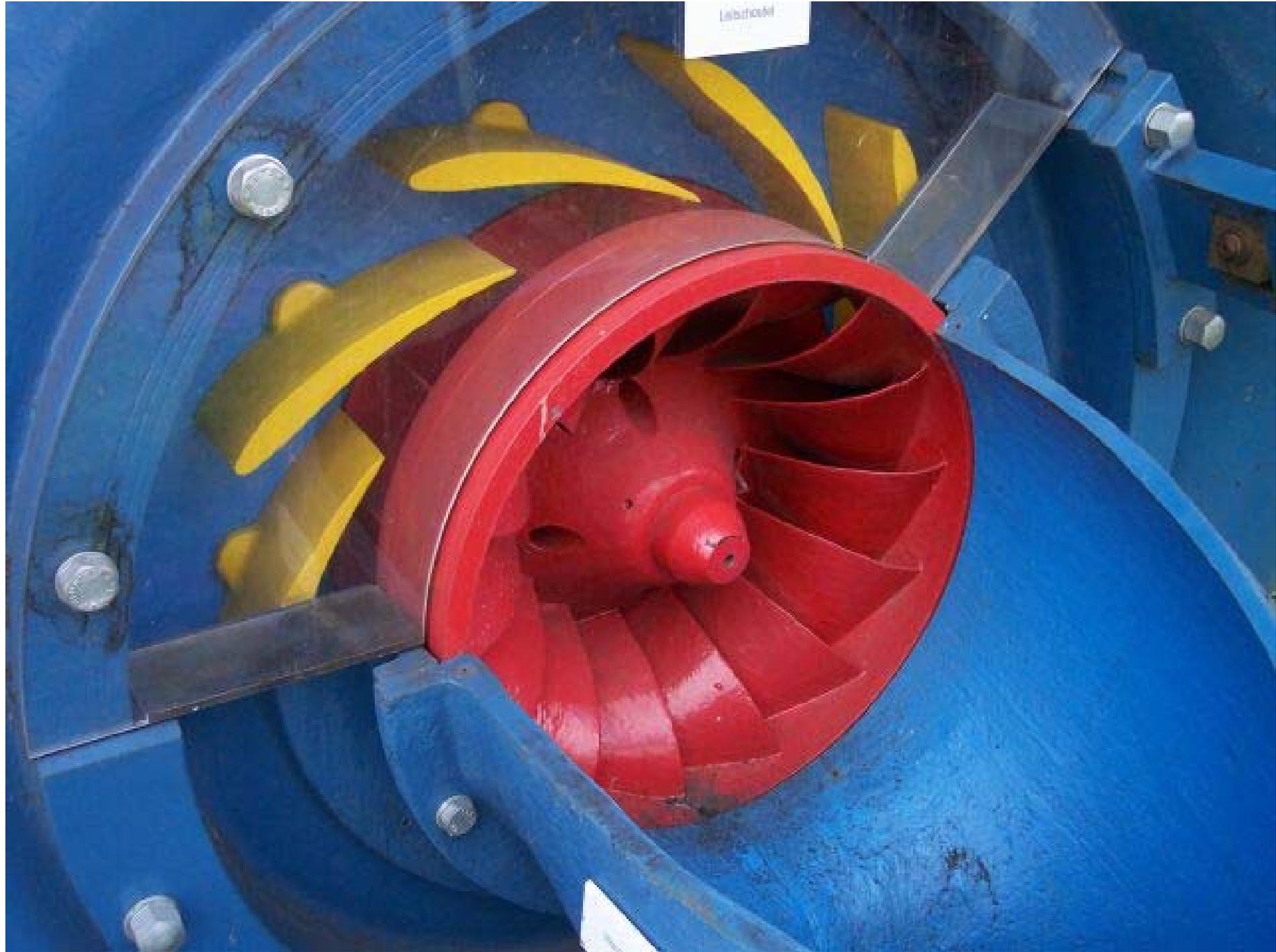
- PG&E_connect
- Turbine_sites
- Streams
- Reservation
- River
- Roads
- Contour



4 0 4 8 12 Miles







**Bottom Line
Hoopa Tribe Hydro Projects**

	KW Size of Turbine	Power Purchase / KWH	Annual Revenue	Total Cost of Installation	25% Down Payment	Loan Amt (Total Cost less down payment)	6% Note, amortized over 10 yr., annual payments	Revenue - Cost
Soctish Creek	1300	0.092	310,003	1,739,960	\$434,990	1,304,970	173,854	136,149
Supply Creek Option	1100	0.092	262,310	1,541,825	\$385,486	1,156,369	154,057	108,253

In The Future

Develop Supply Creek

- Run Tribal office during power outage
- Generate revenue otherwise

Soctish Creek after Supply is 2 years running

Investigate other streams – excellent opportunity

Investigate Biomass generation

Develop Solar – huge potential

Hydrogen fuel cell?????? Shatz Energy Lab

Explore wind but don't expect much