



# Controlling Invasive Plants in PG&E's Hydroelectric Watersheds

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# Overview

- Invasive Plant Control Programs – Watershed Overview
- Mapping
- Results of Monitoring
- Challenges



PG&E Powerhouses Listed by river system			
<b>PIT</b>	<b>DESABLA</b>	<b>SOUTH FORK AMERICAN</b>	<b>KINGS RIVER</b>
Hat Creek #1	Toadtown	Chili Bar	Helms
Hat Creek #2	Dr. Salsar	Chili Bar	Haas
Pit #1	Centerville		Kings River
Pit #3	Lime Saddle		Bald #1
Pit #4	Coal Canyon	<b>MOKELUMNE</b>	Bald #2
Pit #5		Salt Springs	
James B. Black	<b>EEL RIVER</b>	Tiger Creek	<b>TULE RIVER</b>
Pit #6	Poster Valley	West Point	Tule
Pit #7		Electra	
<b>COW-BATTLE CREEK</b>	<b>YUBA/BEAR</b>	<b>STANISLAUS</b>	<b>KERN RIVER</b>
Kilarn	Spaulding #3	Spring Gap	Kern Canyon
Cow Creek	Spaulding #2	Stanislaus	
Volta 1	Deer Creek	Phoenix	
Volta 2	Alta		
South	Spaulding #1	<b>MERCED RIVER</b>	
Iriskip	Drum #1	Merced Falls	
Colman	Drum #2		
	Dutch Flat #1	<b>SAN JOAQUIN</b>	
	Holley	Cyano Valley	
	Wise	San Joaquin #3	
<b>FEATHER</b>	Wise #2	San Joaquin #2	
Hamilton Branch	Newcastle	San Joaquin 1A	
Butt Valley	Nasrowsa #1	AG. Wishon	
Cariboo #1		Kerckhoff #1	
Cariboo #2		Kerckhoff #2	
Oak Flat			
Baldern			
Rock Creek			
Bucks Creek			
Cresta			
Poe			

Powerhouses in the PG&E 2013 fleet with standards in italics.

# Invasive Plant Control

- Everyday activities to run hydroelectric projects have the potential to create conditions ideal for invasive plant establishment
- FERC Licenses contain a requirement to control known infestations of invasive plants
- Directed by FERC license articles and USFS license conditions

Current Programs	Upcoming
Mokelumne River (2002)	Kern Canyon
Rock Creek-Cresta (2003)	Spring Gap-Stanislaus
Bucks Creek (2006)	DeSabra-Centerville
Crane Valley (2008)	
Pit 345 (2010)	



# Prevention Measures

- Prevention is the most cost efficient way of controlling invasive plant establishment
  - Use of certified weed free materials
  - Equipment Cleaning
  - Use of California native plants for restoration



# Invasive Plants Controlled by PG&E within Hydro Watershed Lands

Klamath weed



Oblong surge



Yellow starthistle



Tocalote



Medusa head



Barbed goat grass



Spanish broom



Bull thistle



Common mullein



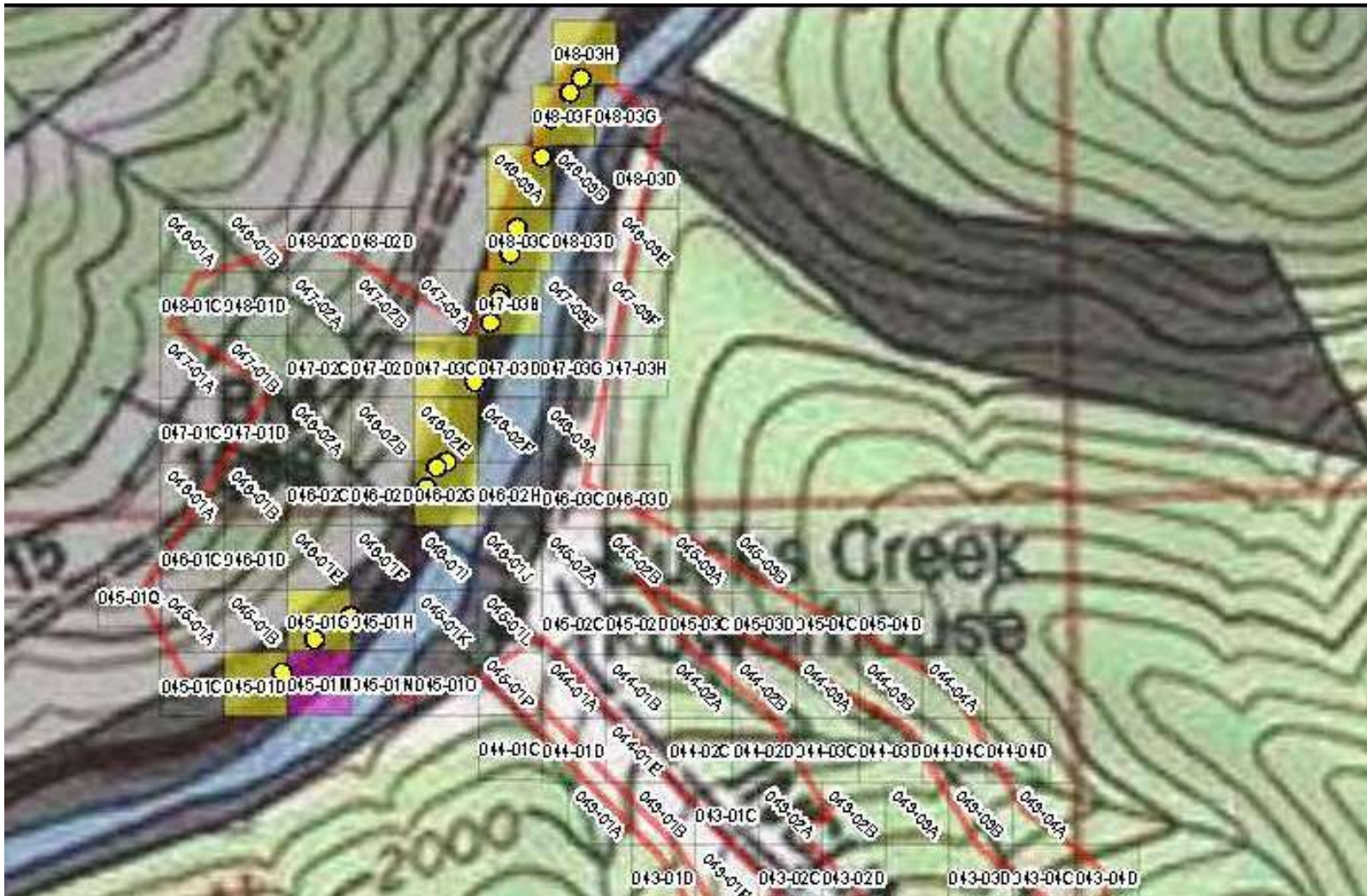


# Grid Based Mapping

- Project area divided into a grid
  - 1 or  $\frac{1}{4}$  hectare grid cells
  - Active GIS polygons updated annually
    - Species, population size, establishment vectors, environmental constraints
- Crews inspect entire grid cell to treat all plants and to monitor efficacy of treatments



# Grid Based Mapping







# Invasive Plant Treatments

- Treatments include chemical, manual and mechanical methods directed by Licensed Pest Control Advisors and Pest Control Operators.
- Botanists monitor cells post treatment to determine whether live invasive plants are present in a cell
- Efficacy measured as presence or absence of live invasive plants
- Additional measure of density provides greater understanding of population dynamics



# Results

- In general, populations of invasive plants are found in higher numbers at lower elevations of our projects.
- Most populations are fairly sparse and patchy
  - Usually 1% cover or less in a 1 hectare or  $\frac{1}{4}$  hectare grid cell.
- Populations are usually isolated to locations with continuous disturbance



# Results

- Bucks Creek – (2006-2011)
  - Spanish broom eradicated from project area since 2006
  - Yellow star thistle reduced 12% and isolated to Hwy 70 corridor
  - Populations of quack grass have increased in some areas and decreased in others
    - 9 occurrences in 2006 to 39 in 2011; Haskins Bay populations gone

# Results – Bucks Creek

Species	2011 Baseline*			2011 Monitoring		
	Total Pop. in Mgmt Cells (# of plants)	Area of Pop. Cells (hectares)	Avg. Pop. Density (plants/hectare)	Total Pop. in Mgmt Cells* (# of plants)	Area of Pop. Cells (hectares)	Avg. Pop. Density (plants/hectare)
Quackgrass ( <i>Elytrigia repens</i> )	1215	7.25	168	103	4	26
Yellow starthistle ( <i>Centaurea solstitialis</i> )	512	2.5	205	17	2	8.5

\* Total population size post treatment







# Results

- Mokolumne – (2007-2012)

Target Weed Species	Population Size	
	2007	2012
<b>Yellow star thistle</b> <i>(Centaurea solstitialis)</i>	160	42
<b>Medusahead</b> <i>(Elymus caput-medusae)</i>	800,800	88,530
<b>Klamath weed</b> <i>(Hypericum perforatum)</i>	1663	2526

# Challenges to Invasive Plant Control

## ○ Timing of treatments

- Most projects have a large elevation range over a large area(2000'-8000' on some projects)
- Many species can germinate under a variety of environmental conditions and throughout the year making it difficult to time control efforts
  - (i.e. Klamath weed, tocalote, yellow starthistle)
- The variety of species targeted for treatment have different control timing associated with them
  - balance efficiency with effectiveness

# Challenges to Invasive Plant Control

## ○ Regulatory Constraints

- Control plans and prescriptions are several years old - updating is not as simple as it would seem.
  - Difficult to add new chemicals to treatment prescriptions; requires NEPA review for use on Federal Land
- Lessons learned: start the process for herbicide use approval early – can take several years to gain final approval.

# Challenges to Invasive Plant Control

- Spreading the word to other lines of business that we have invasive plant control programs in place
  - We do a great job of including invasive plant prevention BMPs in construction packages within Hydro
  - Need to improve in this area for other lines of business
    - We are working to make the BMPs system wide
  - Need to improve within watershed equipment cleaning during construction



# Acknowledgements

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  - North State Forestry
  - Pest Management Tech





# Questions?

