



# Resource Impacts From Marijuana Cultivation in Northern California

**California Department of Fish  
and Wildlife  
Habitat Conservation Branch  
Region 1, Coastal Conservation  
Planning**



# The Greed Rush





215

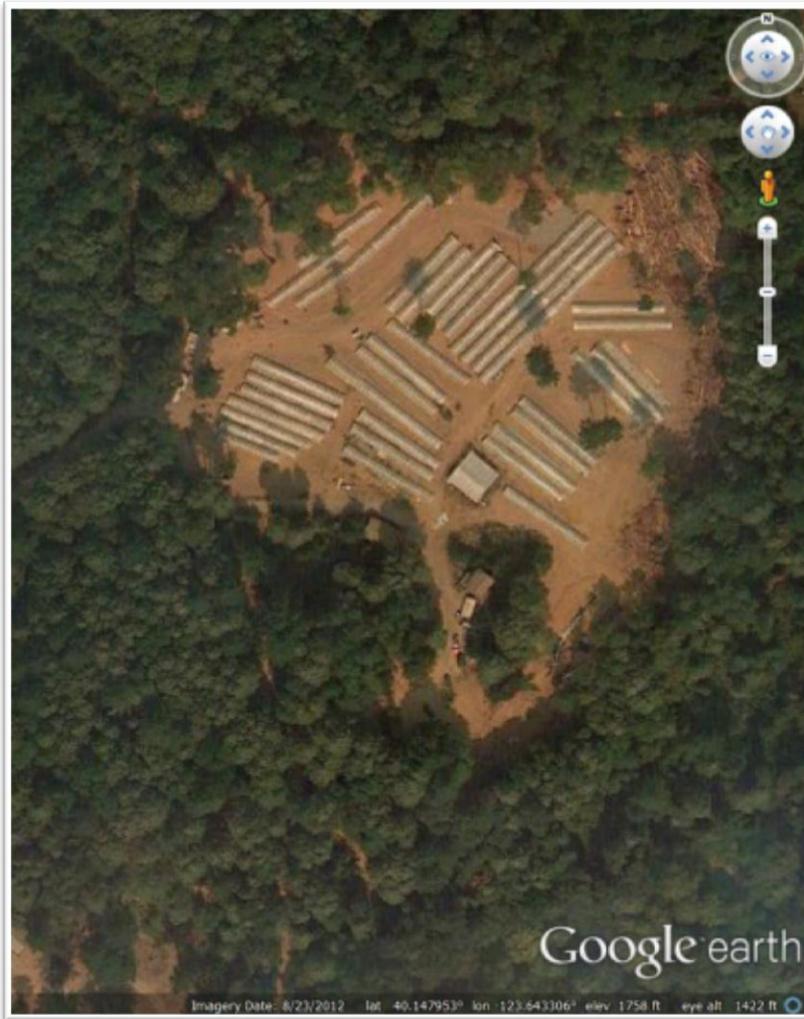
**Forest Clearing and Hilltop  
Grading For Grows 9/19/13**



Grows on Unstable  
Slopes 9/19/13

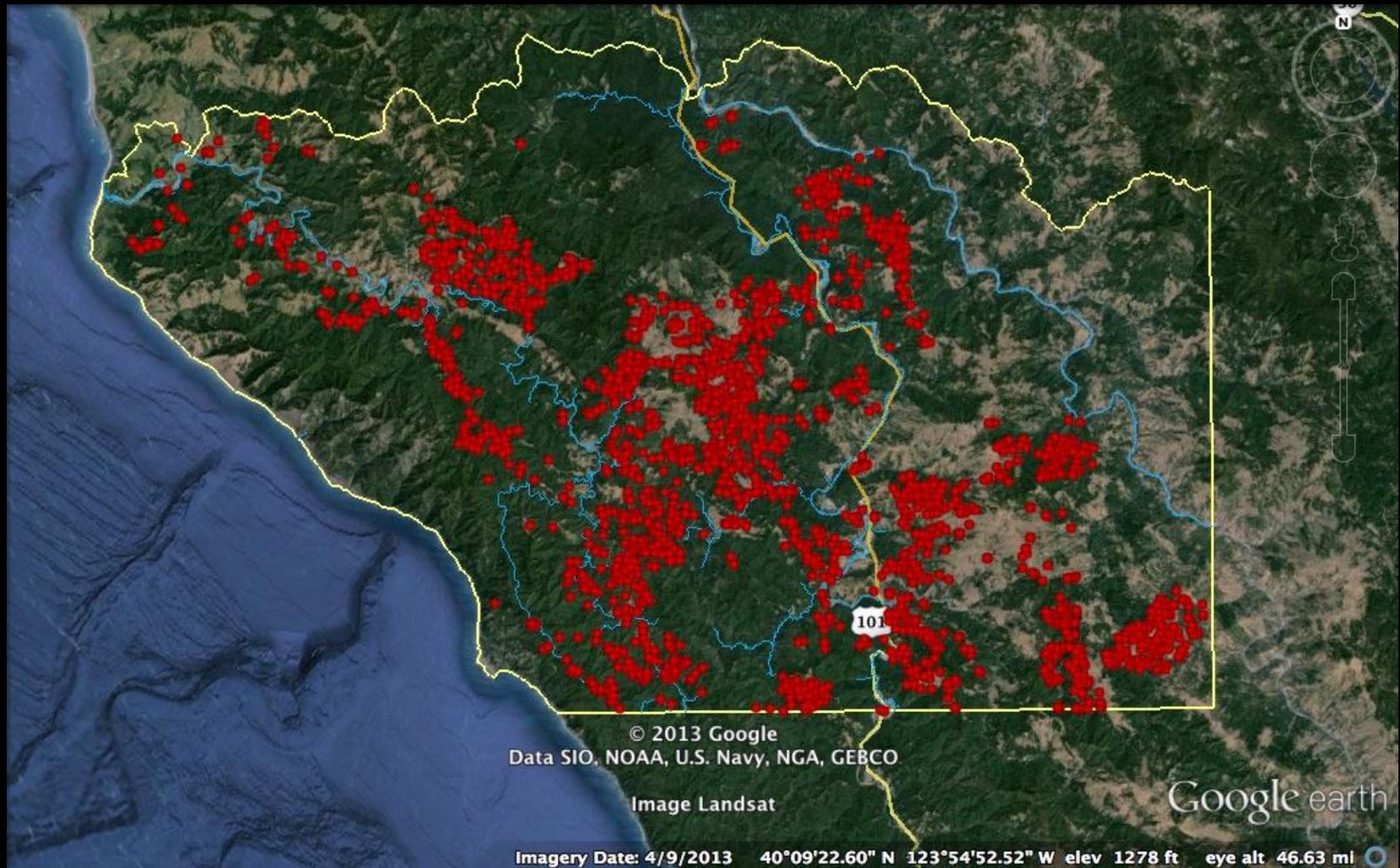


## Natural Resource Impacts



- Water Diversion: during low-flow periods, no screening, oversized pumps
- Pollutants: sediment, petroleum products, fertilizers, killing agents
- No BMPs or riparian/stream protection areas
- Conversion/fragmentation of lands

# Southern Humboldt



# Post Mountain 2005-2012



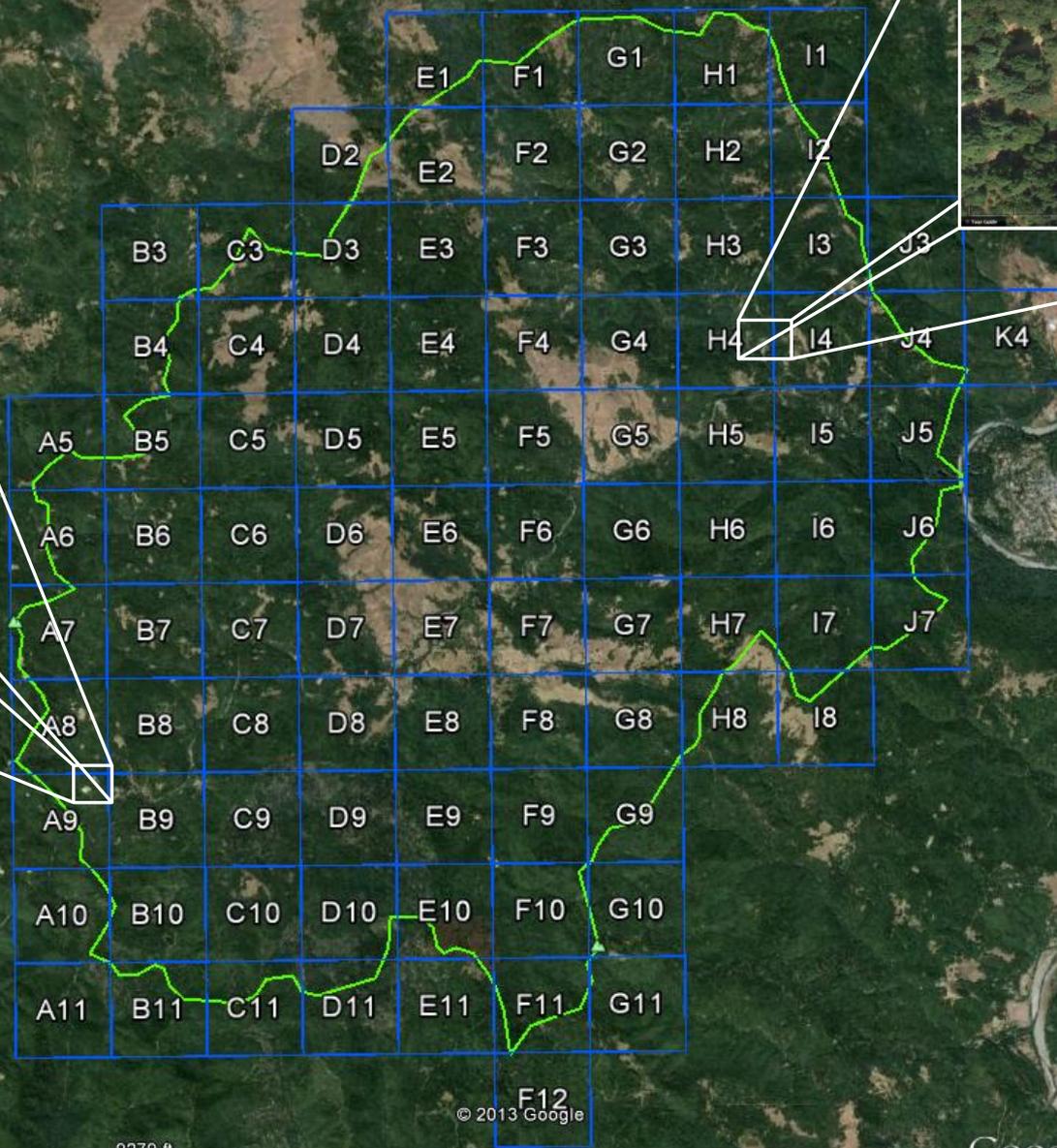
# Post Mountain 2005-2012



# CDFW Case Study

- Mapped grows in four watersheds
- Counted plants and greenhouses
- Estimated water use
- Developed water budget
- Measured growth in activity from 2009 to 2012





Redway

9279 ft

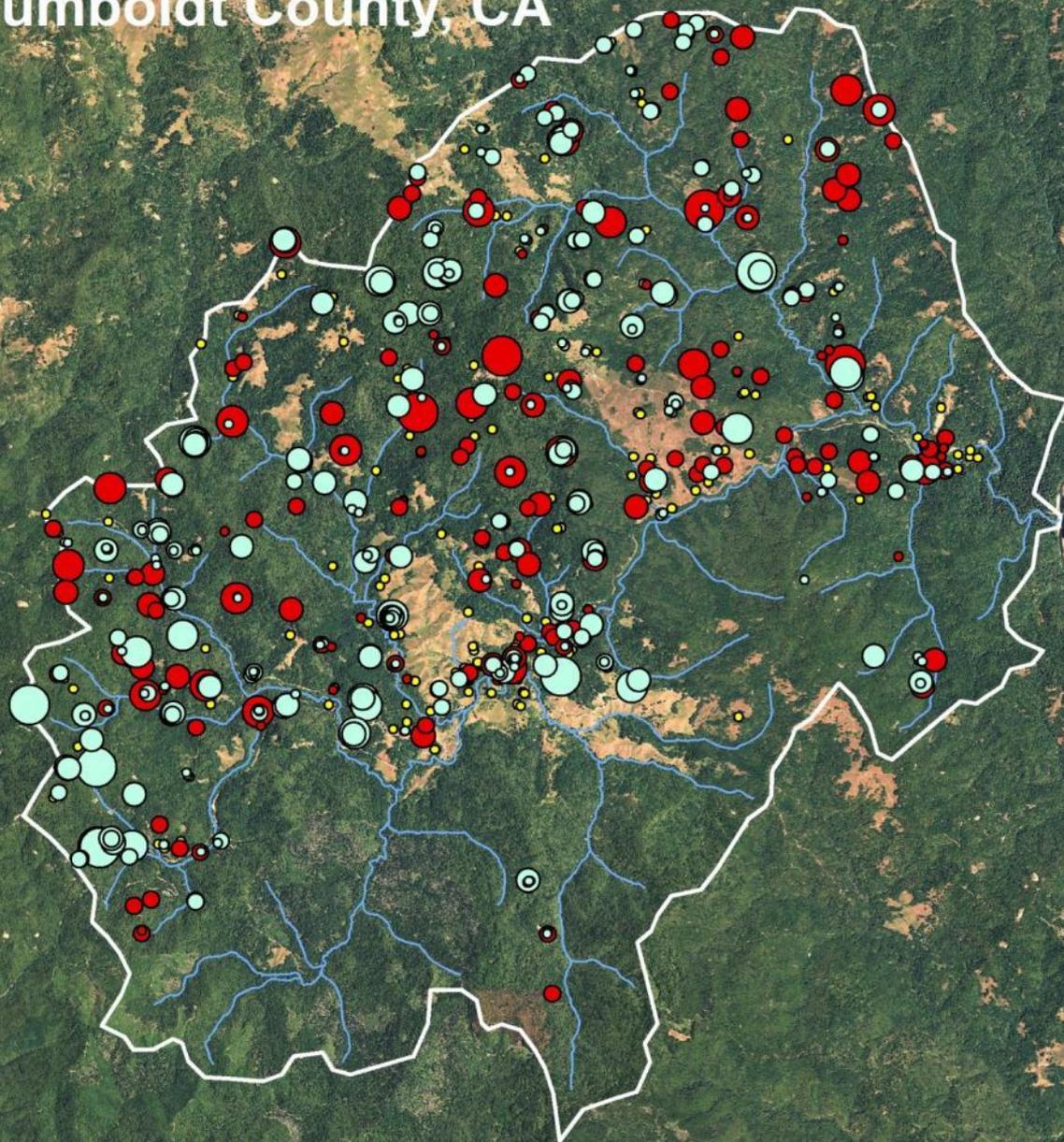
© 2013 Google

Google earth

Tour Guide

Imagery Date: 8/23/2012 lat 40.073561° lon -123.846866° elev 629 ft eye alt 40097 ft

# Redwood Creek Watershed, Tributary to the South Fork Eel River Humboldt County, CA



## Legend

Watershed Boundary (23.3 mi<sup>2</sup>)

Residences  
Estimated Total Water Use  
Per Day: 49,170 Gal

### Greenhouses

Area in Square Feet

	60 - 350	<b>Total Area of Greenhouses:</b> 201,444 ft <sup>2</sup>  <b>Estimated Total Water Use</b> Per Season: 7,251,984 Gal  <b>Estimated Total Water Use</b> Per Day: 48,346 Gal
	351 - 665	
	666 - 1280	
	1281 - 2720	
	2721 - 4800	

### Outdoor Grows

Number of plants

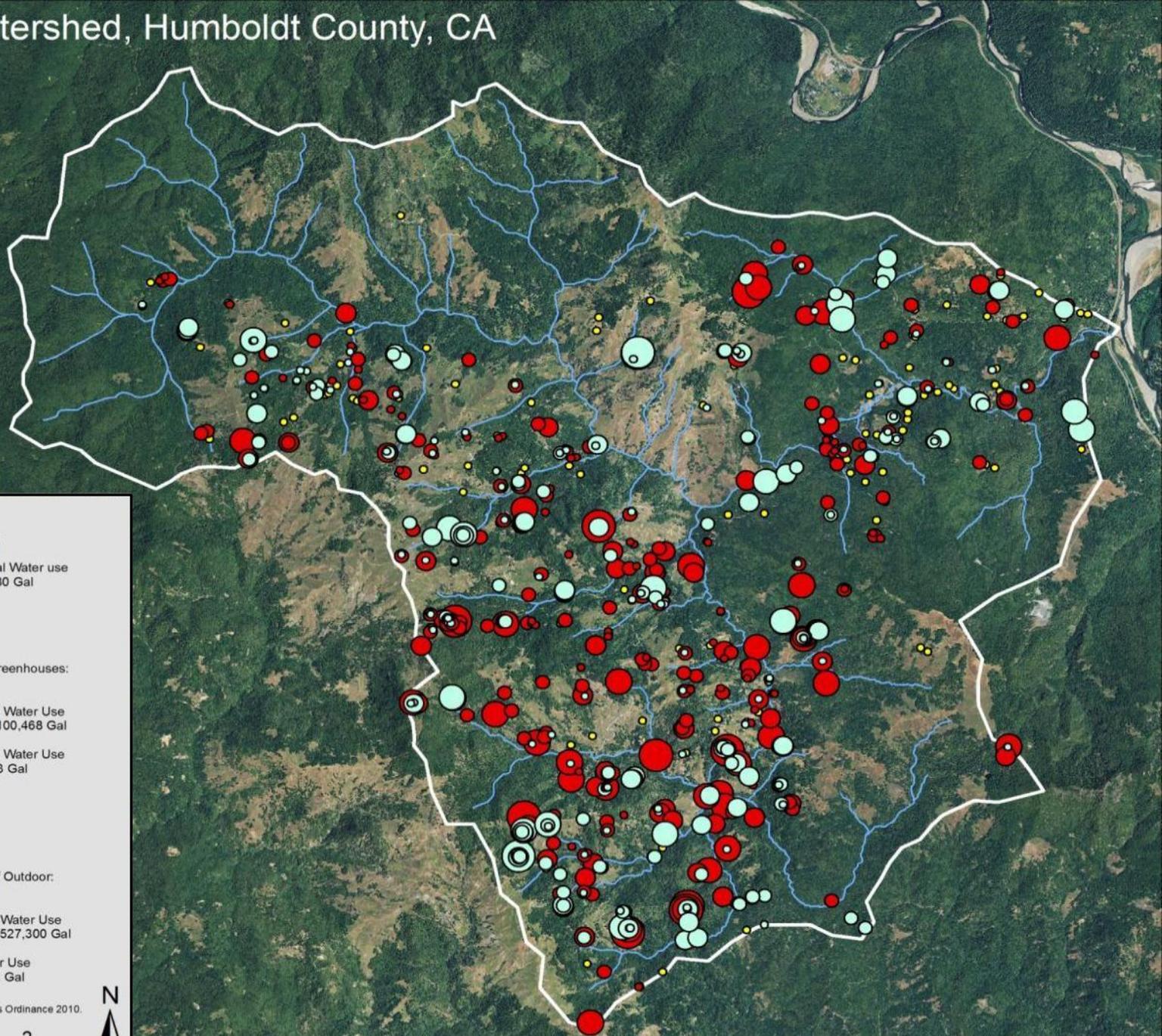
	5 - 23	<b>Total number of outdoor</b> plants: 10,475  <b>Estimated Total Water Use</b> Per Season: 9,427,500 Gal  <b>Estimated Total Water Use</b> Per Day: 62,850 Gal
	24 - 47	
	48 - 85	
	86 - 185	
	186 - 334	

Water estimates derived  
from HGA 2010

0 1 2 Miles



# Salmon Creek Watershed, Humboldt County, CA



**Legend**

□ Watershed Boundary (36.9 mi<sup>2</sup>)

● Residences Estimated Total Water use per Day: 31,680 Gal

**Greenhouses**

**Area in Square Feet**

- 78 - 540 Total Area of Greenhouses: 225,013 ft<sup>2</sup>
- 541 - 1008 Estimated Total Water Use per Season: 8,100,468 Gal
- 1009 - 2100 Estimated Total Water Use per Day: 54,003 Gal
- 2101 - 3510
- 3511 - 6000

**Outdoor Grows**

**Number of Plants**

- 0 - 19 Total Number of Outdoor: 11,697 plants
- 20 - 38
- 39 - 65 Estimated Total Water Use per Season: 10,527,300 Gal
- 66 - 120 Estimated Water Use per Day: 70,182 Gal
- 121 - 350

\* Water use estimates derived from HGA Medical Cannabis Ordinance 2010.

0 0.25 0.5 1 1.5 2 Miles

# Redwood Creek Watershed, Tributary to the Pacific Ocean Humboldt County, CA

Watershed Overview



**Legend**

- Watershed Boundary (279.9 mi<sup>2</sup>)
- Residences Estimated Total Water Use Per Day: 33,330 Gal

**Greenhouses**

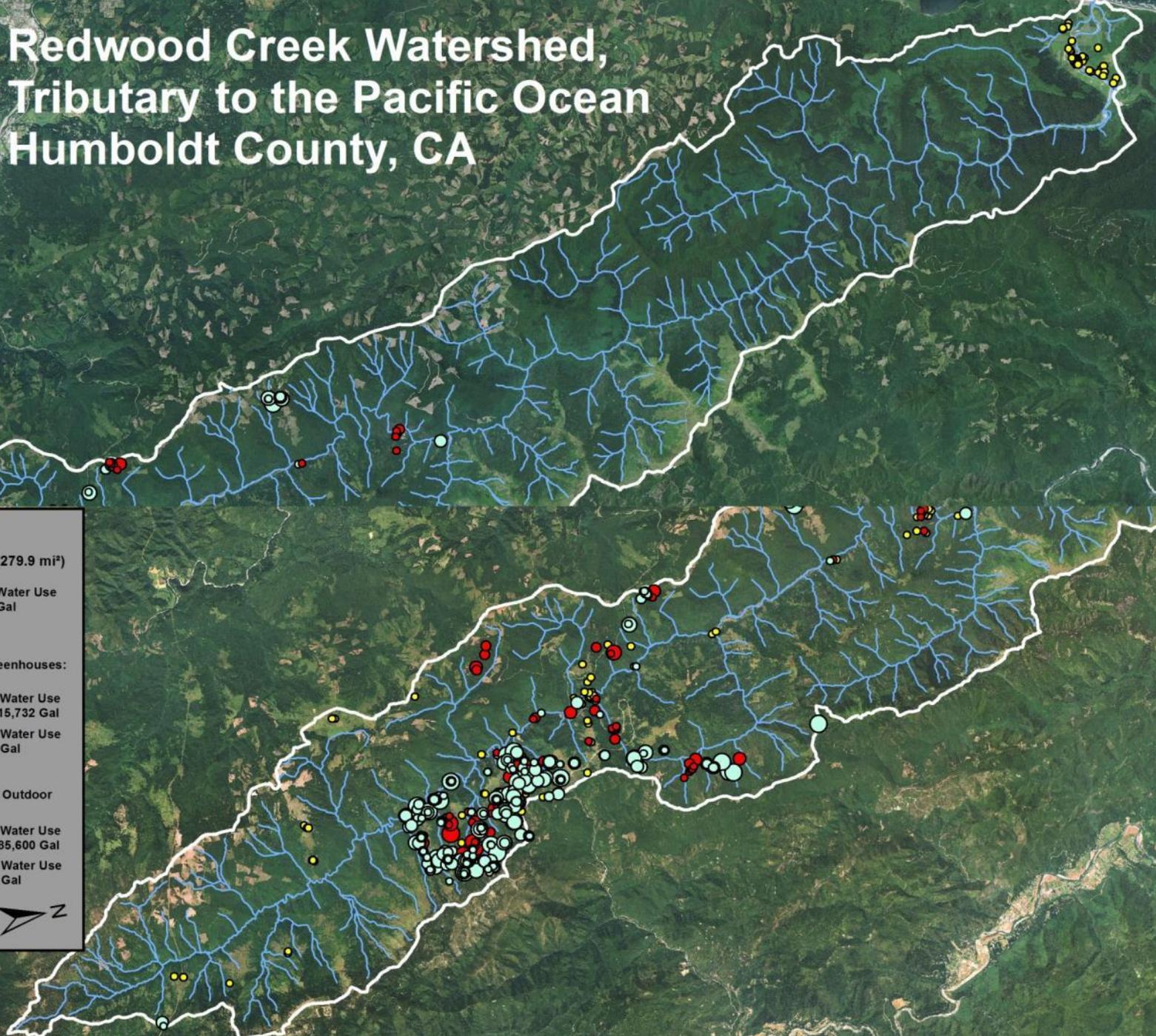
<b>Area in Square Feet</b>	<b>Total Area of Greenhouses:</b>
125 - 520	275,437 ft <sup>2</sup>
521 - 864	
865 - 1300	Estimated Total Water Use Per Season: 9,915,732 Gal
1301 - 1984	
1985 - 3500	Estimated Total Water Use Per Day: 66,104 Gal

**Outdoor Grows**

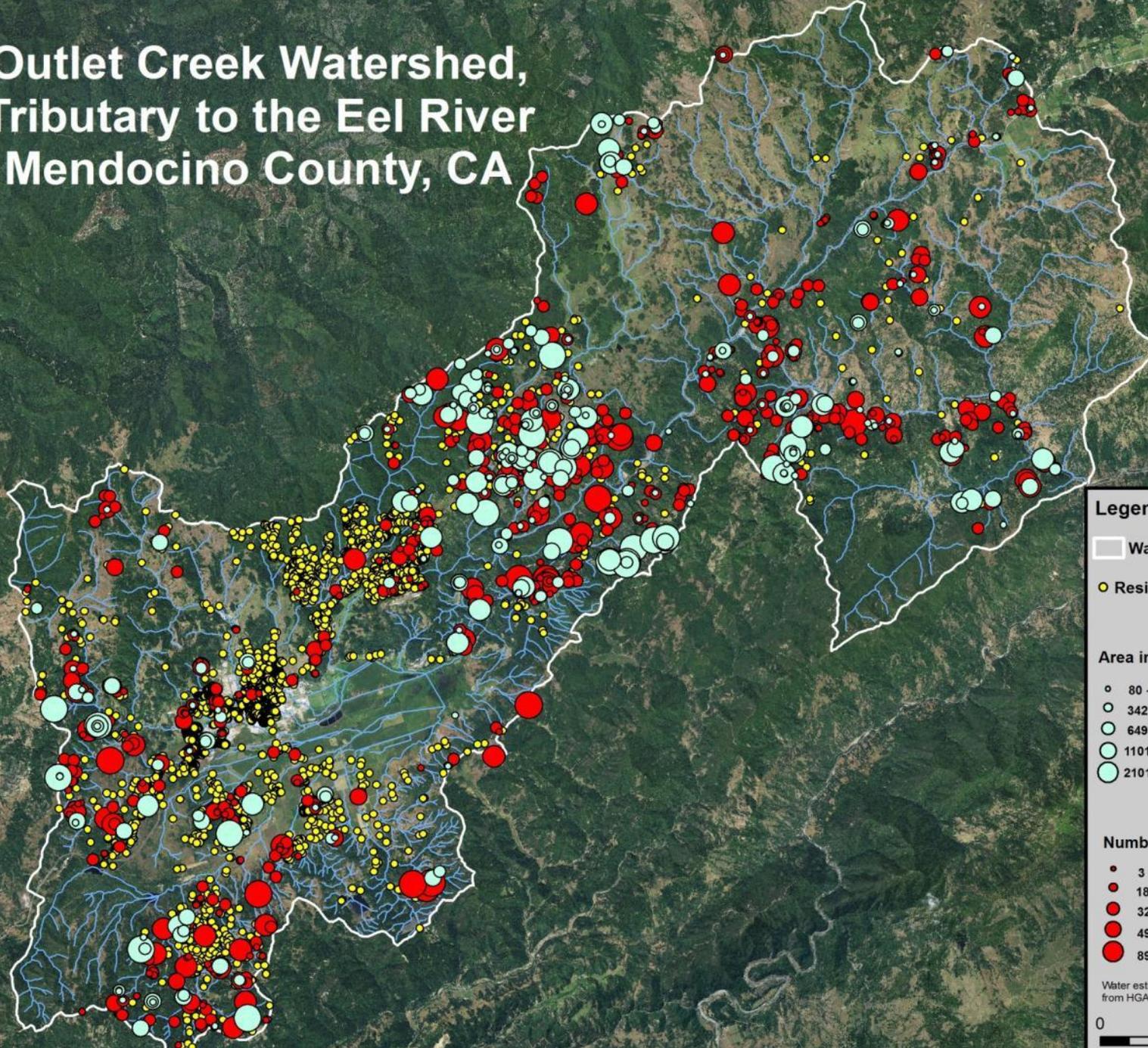
<b>Number of Plants</b>	<b>Total Number of Outdoor Plants:</b>
4 - 32	5984
33 - 63	
64 - 118	Estimated Total Water Use Per Season: 5,385,600 Gal
119 - 200	
201 - 400	Estimated Total Water Use Per Day: 35,904 Gal

Water estimates derived from HGA 2010

0 1 2 4 Miles



# Outlet Creek Watershed, Tributary to the Eel River Mendocino County, CA



## Legend

□ Watershed Boundary (161.9 mi<sup>2</sup>)

● Residences Estimated Total Water Use per Day: 594,825 Gal

### Greenhouses

#### Area in Square Feet

○ 80 - 341	Total Area of Greenhouses: 229,501 ft <sup>2</sup>
○ 342 - 648	Estimated Total Water Use per Season: 8,262,036 Gal
○ 649 - 1100	Estimated Total Water Use per Day: 55,080 Gal
○ 1101 - 2100	
○ 2101 - 5040	

### Outdoor Grows

#### Number of Plants

● 3 - 17	Total Number of Outdoor Plants: 16,843
● 18 - 31	Estimated Total Water Use per Season: 15,158,700
● 32 - 48	Estimated Total Water Use per Day: 101,058
● 49 - 88	
● 89 - 221	

Water estimates derived from HGA 2010

0 1 2 Miles



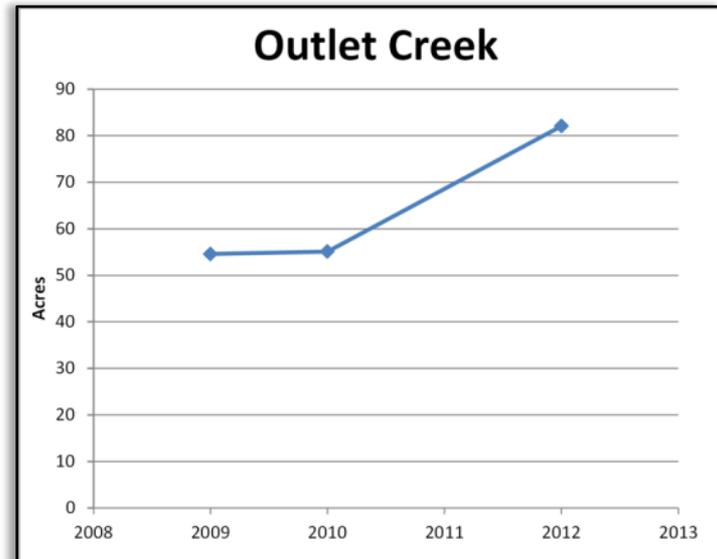
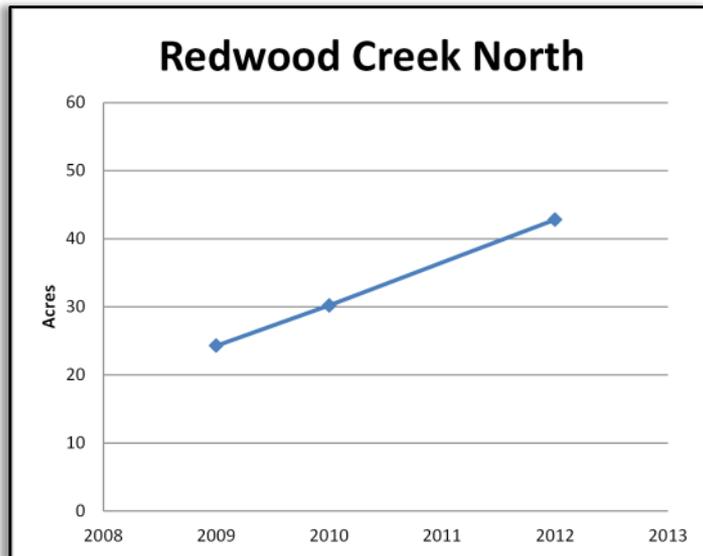
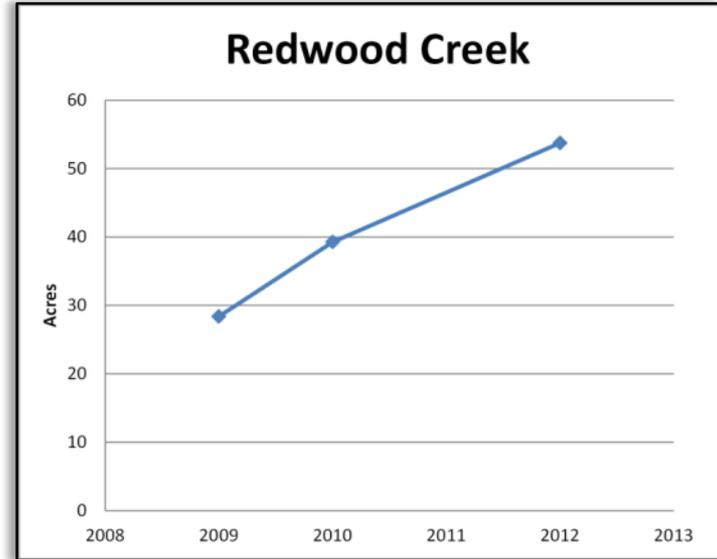
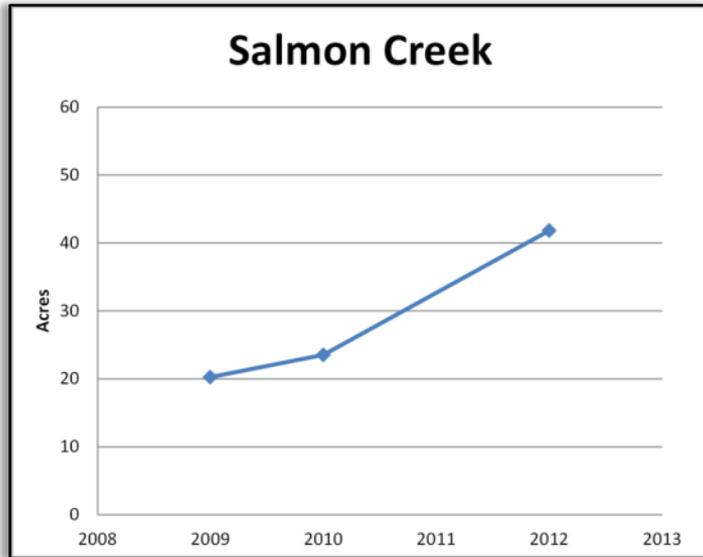
# Totals of Plants and Greenhouses

TABLE 1. Total Number of Cultivation Sites, Outdoor Plants and Estimated Plants per Greenhouse for each Subject Watershed.

	Redwood Creek (67.3 km <sup>2</sup> )	Salmon Creek (95.6 km <sup>2</sup> )	Redwood Creek North (730 km <sup>2</sup> )	Outlet Creek (419 km <sup>2</sup> )
Total outdoor cultivation sites	231	306	120	633
Total outdoor plants	10,475	11,697	5,984	16,843
Plant : Land area ( $\frac{1}{km^2}$ )	173.7	122.4	8.2	40.2
Total Greenhouses	324	302	273	320
Estimated Total Plants in Greenhouses	8,053	8,851	11,029	9,180
Greenhouse : Land Area ( $\frac{1}{km^2}$ )	4.8	3.1	0.4	0.8
<b>Total Plants per Watershed*</b>	<b>18,528</b>	<b>20,548</b>	<b>17,013</b>	<b>26,023</b>

\*Field data indicate these totals may be underestimates.

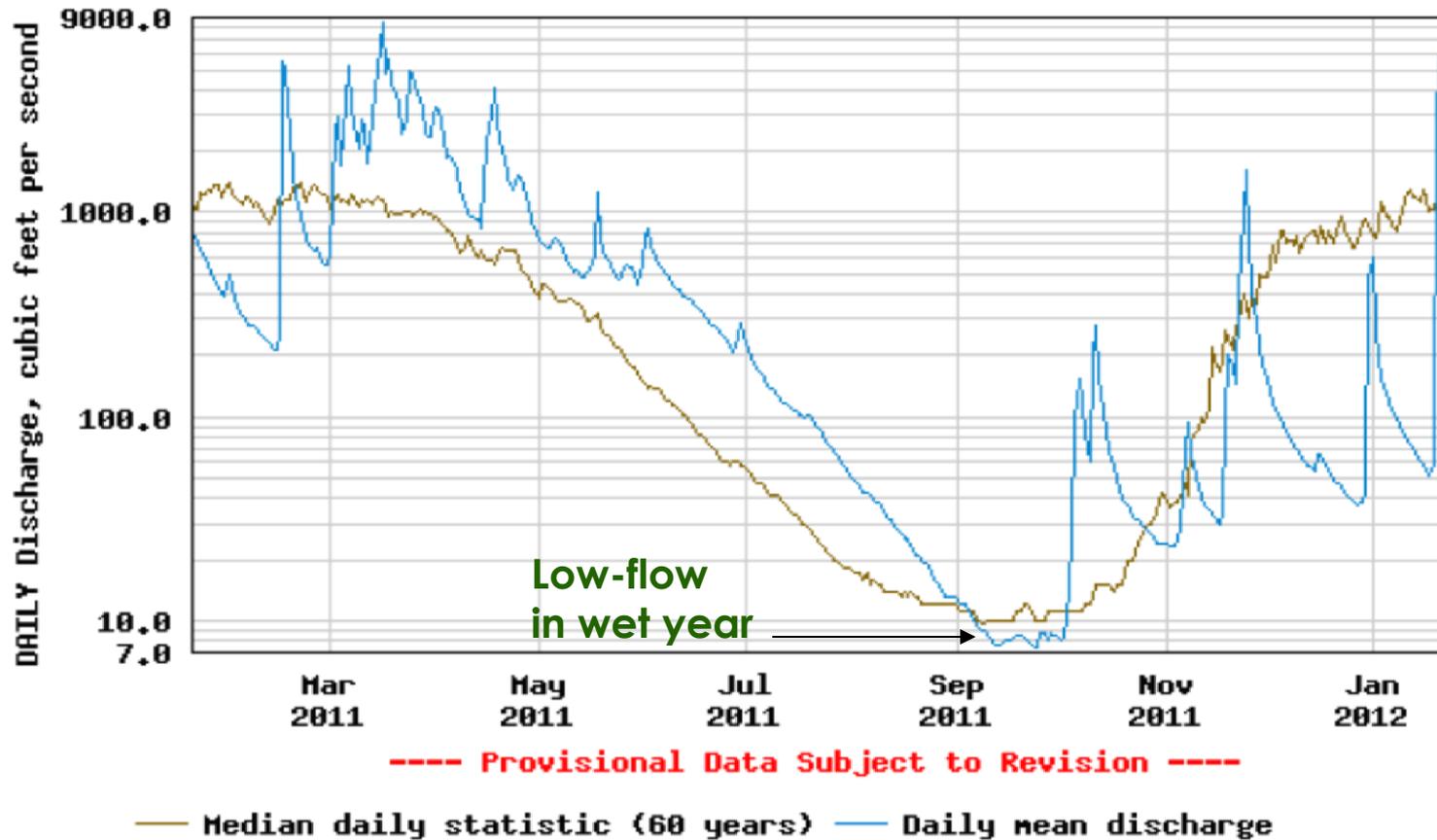
## Trends in Growth



## Hydrologic Monitoring



### USGS 11478500 VAN DUZEN R NR BRIDGEVILLE CA



# Water Use Estimates

TABLE 3. Estimated Water Use for Marijuana Cultivation. *Water use estimates were calculated based on a figure of 6 gallons per plant per day (HGA 2010).*

	Redwood Creek	Salmon Creek	Redwood Creek North	Outlet Creek
Daily Water Use (gpd)	111,167	123,289	102,078	156,138
Minimum Streamflow (gpd)	387,763	581,645	---	---
Percent Use	<b>28.7%</b>	<b>21.2%</b>	---	---
Water Use per 150 Day Season (gal)	16,675,308	18,493,344	15,311,700	23,420,700

# Conclusions

- Average est. number of outdoor MCS/watershed = **322**
- Average number of greenhouses/watershed = **304**
- Average number of plants/watershed = **20,526** (total = 82,104)
- Estimated volume of stream flow consumed by plants during dry summer low flow (two watersheds) = **20-30%**
- Number and size of grows increased by **68% to 104%** from 2009-2012

***Preliminary results indicate that it is highly likely that marijuana cultivation in the four study watersheds has significant negative effects on watershed health and sensitive aquatic species.***

# Discussion

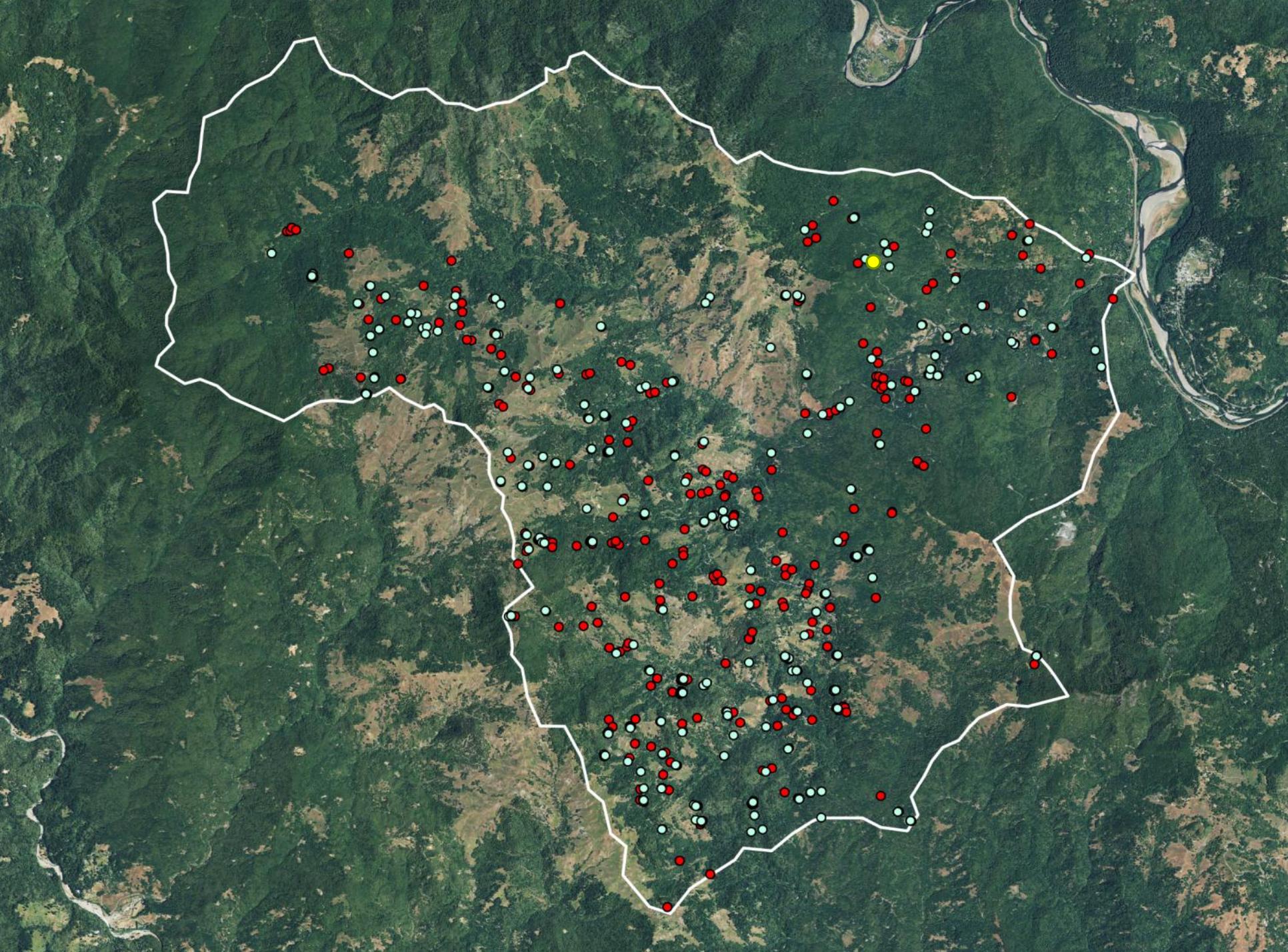


## Cal Fire <3 Acre Exemptions (2008-2013)

- Showing 116 Exemptions - Humboldt/West Trinity
- Exclusion of Residential exemptions.
- 5 Exemptions Redwood Creek North – all timber.
- 1 Exemption in Salmon Creek.
- No Exemptions in Redwood Creek.





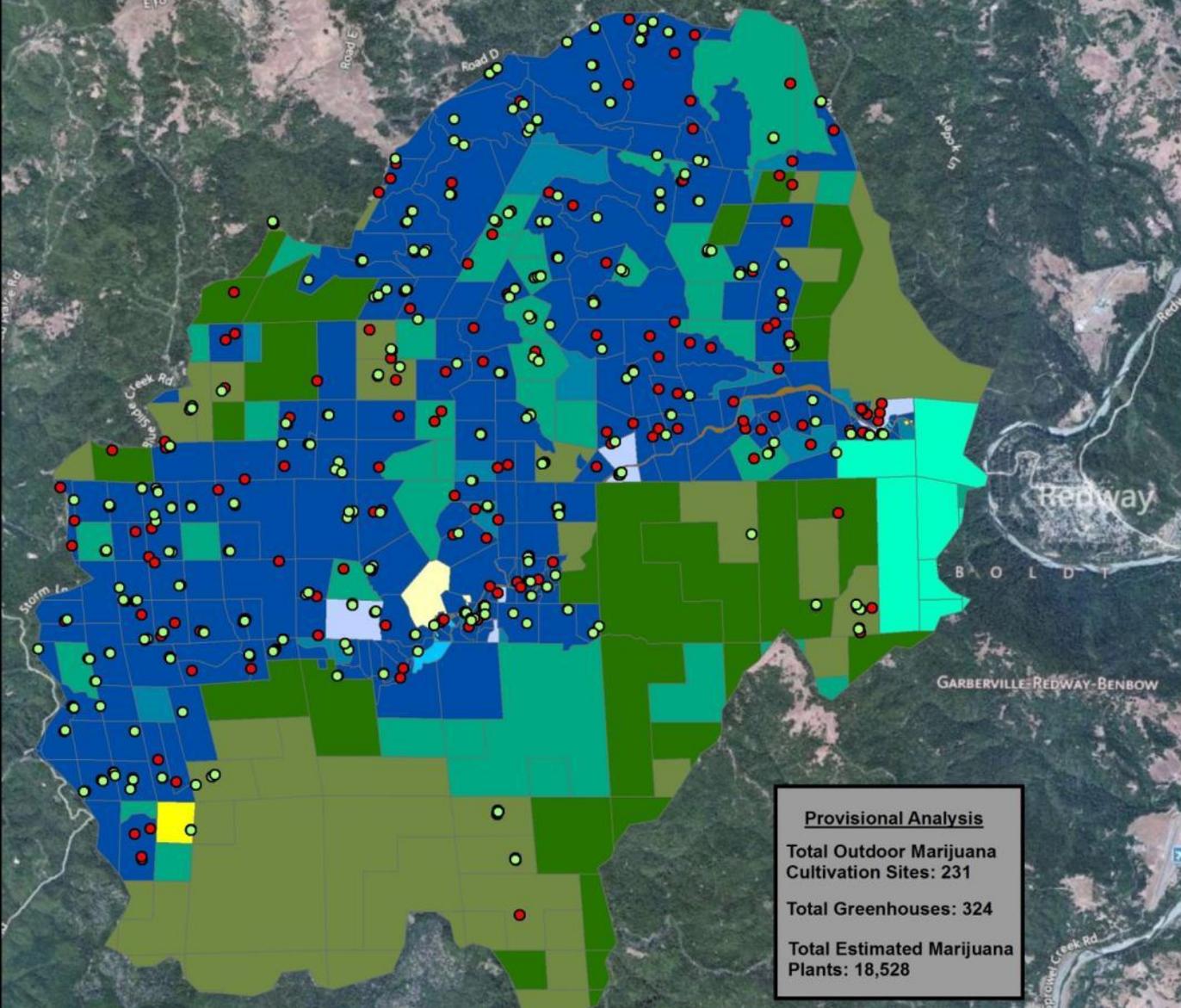


# Discussion

The majority of cultivation occurs on rural residential land.



# Redwood Creek Watershed, Tributary to the South Fork Eel River, Humboldt County, CA



### Legend

- Outdoor Marijuana Cultivation Sites
- Greenhouses

### Humboldt County Land Use Descriptions

- 100% TPZ
- Portion TPZ
- Rural w/Timber Infl
- Rural Residential
- Rural - Vacant
- Single Family Residential
- Public/Schools/Non-taxable
- Manufactured Home on Fee Parcel
- Commercial
- Subject to Exemption

Data Source: Humboldt County Parcel Layer version 4.7  
Humboldt County Planning and Building Department  
Accessed 10/02/13

Provisional Analysis

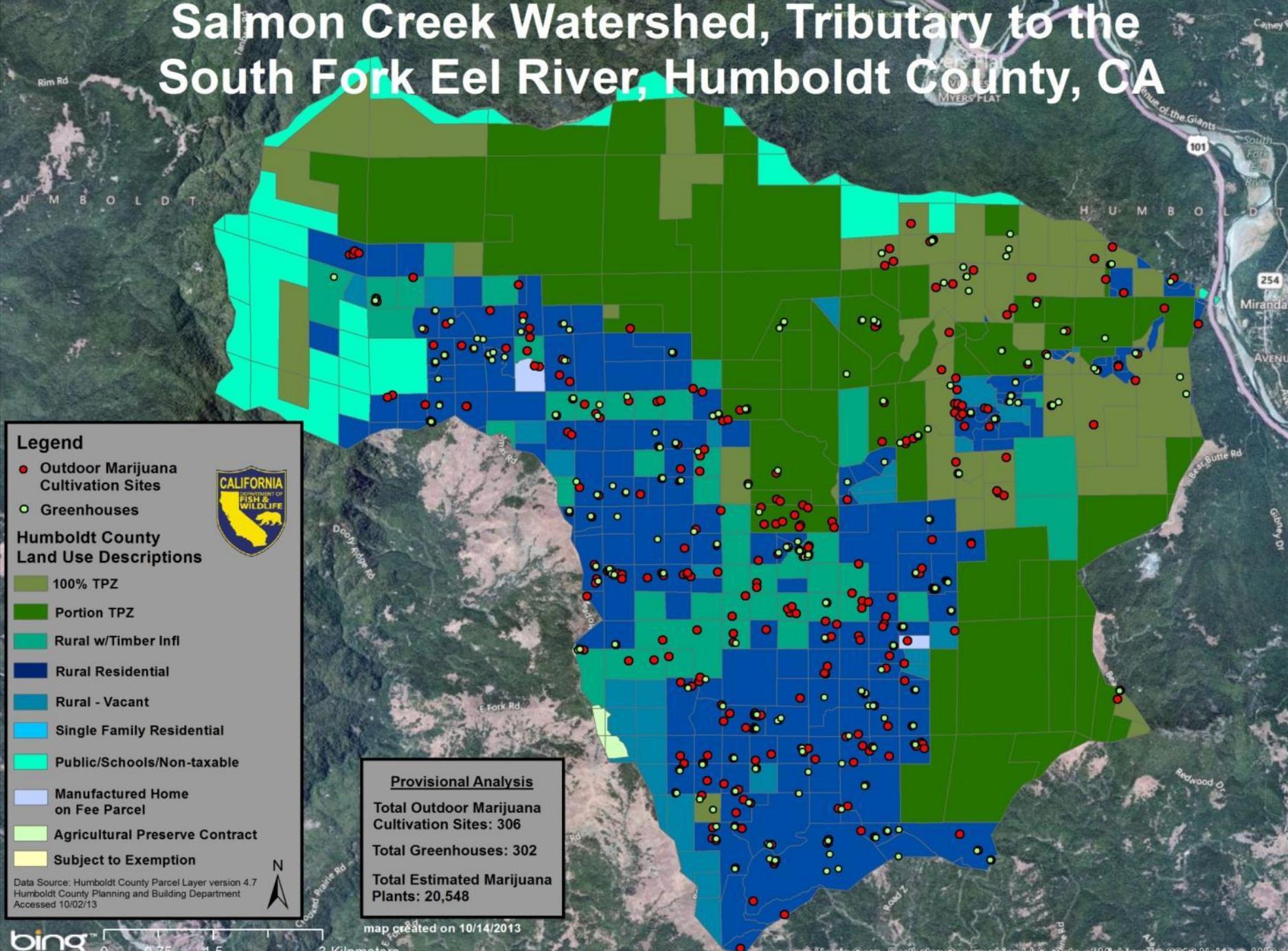
Total Outdoor Marijuana Cultivation Sites: 231

Total Greenhouses: 324

Total Estimated Marijuana Plants: 18,528

map created on 10/14/13

# Salmon Creek Watershed, Tributary to the South Fork Eel River, Humboldt County, CA



## Legend

- Outdoor Marijuana Cultivation Sites
- Greenhouses



## Humboldt County Land Use Descriptions

- 100% TPZ
- Portion TPZ
- Rural w/Timber Infl
- Rural Residential
- Rural - Vacant
- Single Family Residential
- Public/Schools/Non-taxable
- Manufactured Home on Fee Parcel
- Agricultural Preserve Contract
- Subject to Exemption

Data Source: Humboldt County Parcel Layer version 4.7  
 Humboldt County Planning and Building Department  
 Accessed 10/02/13



**Provisional Analysis**  
 Total Outdoor Marijuana Cultivation Sites: 306  
 Total Greenhouses: 302  
 Total Estimated Marijuana Plants: 20,548

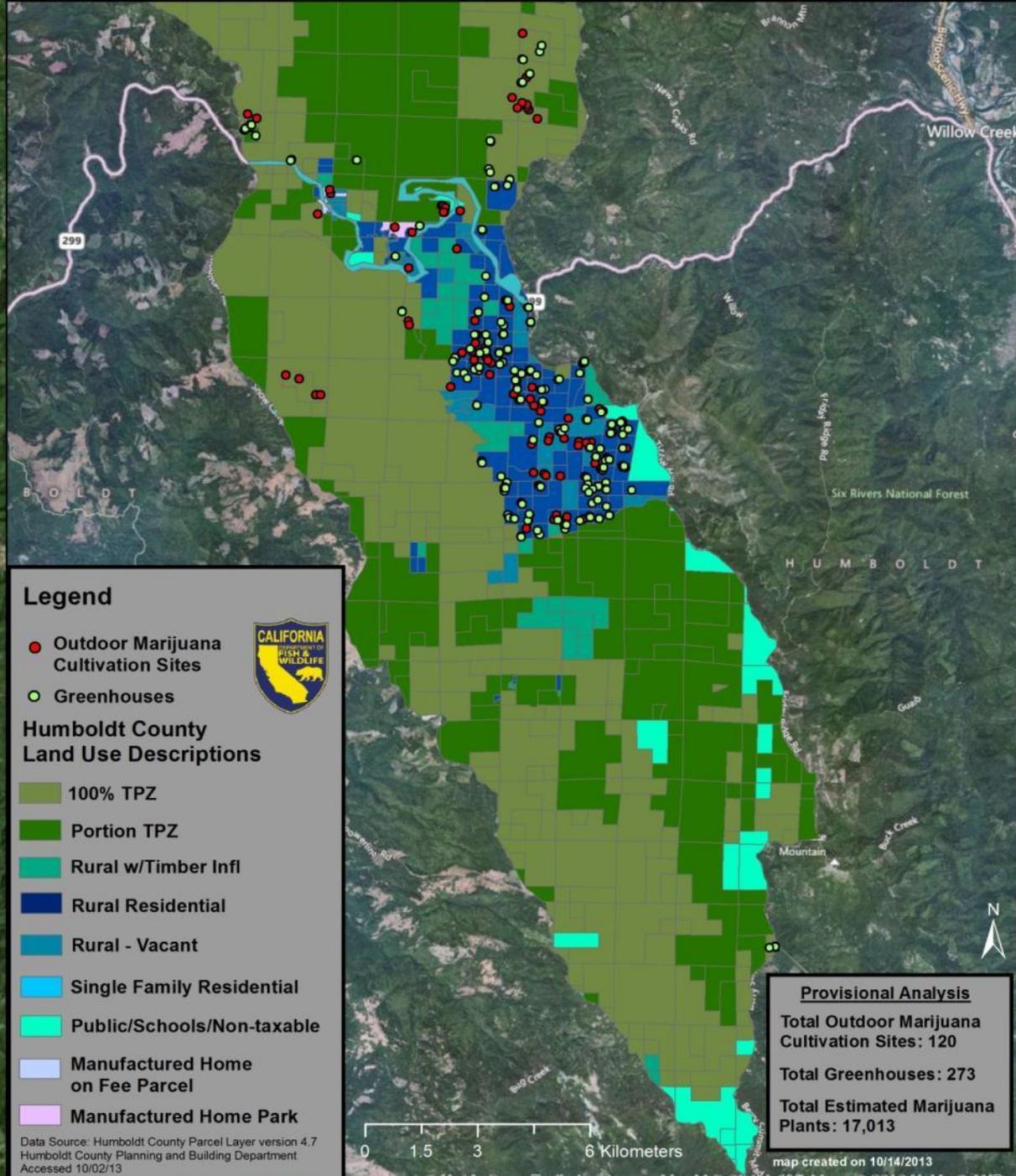
# Redwood Creek Watershed, Humboldt County, CA

Redwood National and State Parks

0 2.5 5 10 Kilometers



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## Legend

● Outdoor Marijuana Cultivation Sites

○ Greenhouses

## Humboldt County Land Use Descriptions

- 100% TPZ
- Portion TPZ
- Rural w/Timber Infl
- Rural Residential
- Rural - Vacant
- Single Family Residential
- Public/Schools/Non-taxable
- Manufactured Home on Fee Parcel
- Manufactured Home Park



Data Source: Humboldt County Parcel Layer version 4.7  
Humboldt County Planning and Building Department  
Accessed 10/02/13

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# Outlet Creek Watershed, Tributary to the Eel River, Mendocino County, CA

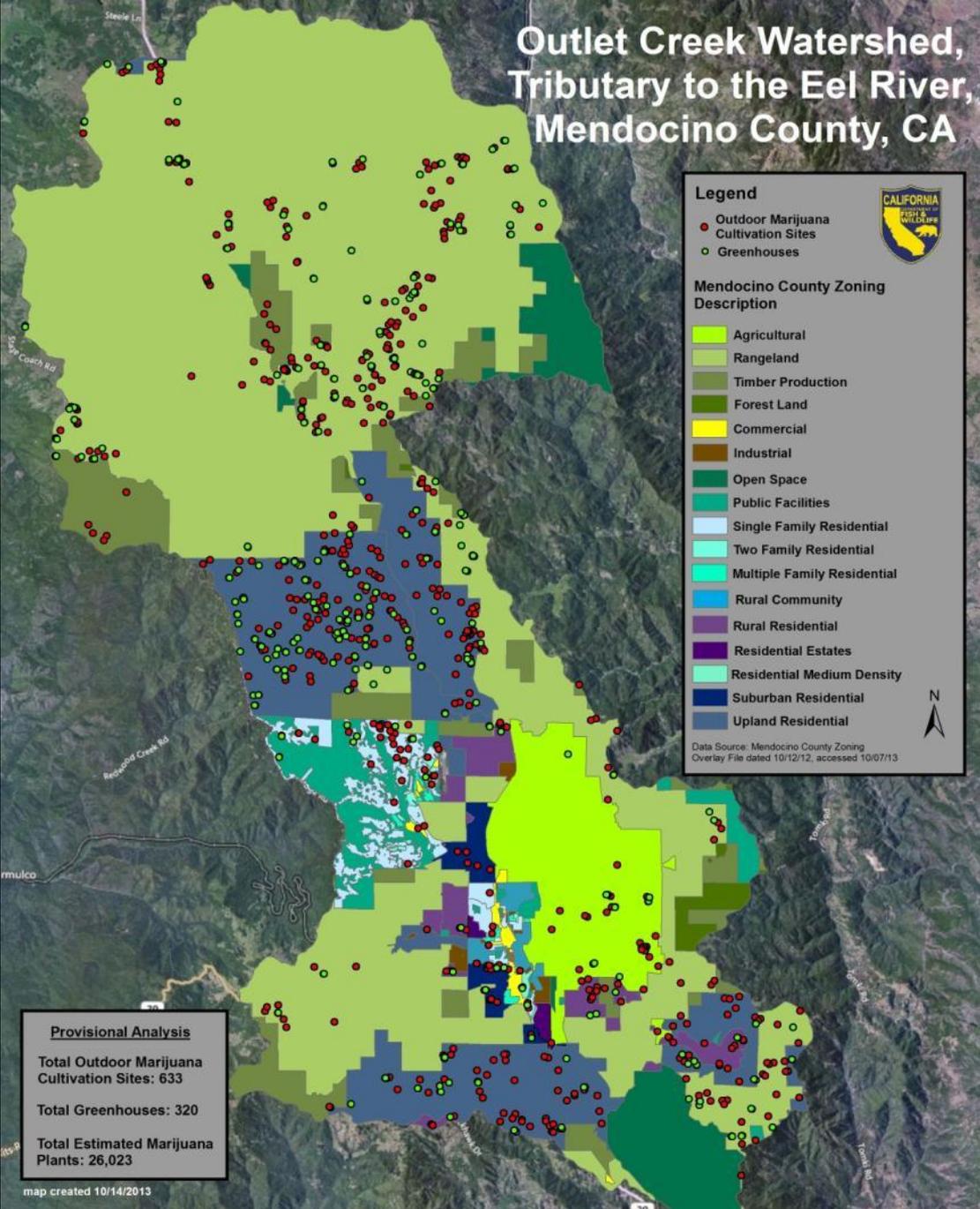
**Legend**

- Outdoor Marijuana Cultivation Sites
- Greenhouses

**Mendocino County Zoning Description**

- Agricultural
- Rangeland
- Timber Production
- Forest Land
- Commercial
- Industrial
- Open Space
- Public Facilities
- Single Family Residential
- Two Family Residential
- Multiple Family Residential
- Rural Community
- Rural Residential
- Residential Estates
- Residential Medium Density
- Suburban Residential
- Upland Residential

Data Source: Mendocino County Zoning Overlay File dated 10/12/12, accessed 10/07/13



**Provisional Analysis**

Total Outdoor Marijuana Cultivation Sites: 633

Total Greenhouses: 320

Total Estimated Marijuana Plants: 26,023

map created 10/14/2013

# 2013 Field Investigations

1. Number of plants/greenhouse grossly underestimated = double number of plants/greenhouse.
2. Number and size of MCS increased dramatically in 2013.
3. Observed fish kills.

## Coho Stream with heavy presence of grows upstream.

**Fall**



**Summer**



## Documented Fish Kills



# Thank you!

Questions?

Scott Bauer, DFW Coho Recovery,  
ph (707) 441-2011

Adam Cockrill

Jen Olson

DFW Scientific Aids