



*Pine Gulch-Bolinas Watershed*

Area	Hydrologic Units	Calwater Subbasins ---	(Planning Watersheds)
10,661 Acres	18050005	2201300001	Pine Gulch Creek (5701 Acres)
4,314 Hectares	4th Field HUC	2201300002	Audobon Canyon (4960 Acres)
17 Square Miles			

Location	2201
Marin County	4th Field Calwater

Species Potential	Miles of Streams with Species Present
Central California Coast <b>Steelhead</b> North Coastal Diversity Stratum - Dependent Population	<u>Steelhead</u> 8 NOAA Fisheries, Critical Habitat Redesignation, 2005
Central California Coast <b>Coho</b> Coastal Gualala Diversity Stratum - Dependent Population	<u>Coho</u> 5 CDFG, Coho Distribution, May 2007

Critical Habitat	
Central California Coast Steelhead	8 Miles of Stream
Central California Coast Coho	All accessible river reaches between Punta Gorda & San Lorenzo River including 2 San Francisco Bay streams: Arroyo Corte Madera del Presidio and Corte Madera Creek (64 FR 24049)

Coho Intrinsic Potential	
Km of Historical Coho IP (21.5 C mask)	12
% of IP (21.5 C Mask) with Current Coho Distribution	60%

Spence, B. C., et al., 2008. A framework for assessing the viability of threatened and endangered salmon and steelhead in the North-Central California Coast Recovery Domain. NOAA Tech Memo NMFS-SWFSC-423.

Miles of Waterway <sup>A</sup>	Miles	Number of Dams <sup>C</sup>
Naturally Occurring Waterways		0
Intermittent Stream	20	
Perennial Stream	22	

<sup>C</sup>Passage Assessment Database, Pacific States Marine Fisheries Commission, 2008

<sup>A</sup>USGS National Hydrography Dataset, High Resolution, 2004. 1:24,000

USGS Gaging Stations <sup>B</sup>	Number of Barriers <sup>C</sup>
11460170 Pine Creek at Bolinas	12 0 Dams 3 Road Crossings (1 Impassable) 9 Diversions

<sup>C</sup>Passage Assessment Database, Pacific States Marine Fisheries Commission, 2008

Average Annual Precipitation <sup>E</sup>	Average Annual Precipitation Range <sup>E</sup>
33.8"	27.5 - 45"

<sup>E</sup>California Mean Annual Precipitation Zones, 1900-1960, CA Department of Forestry, 1990



<b>Roads<sup>A</sup></b>		Miles
Roads in Watershed		
Primary Road / Highway		0
Secondary and connecting road, state highways		8
Local, neighborhood, and rural road, city street, unseparated		32
Vehicular trail, 4WD		2
Driveway or service road		0
<b>Total Miles</b>		

<b>Road Density</b>		
Miles of Roads per SqMi of Watershed		2.5
Miles of Roads per SqMi of 100m Riparian Buffer*		2.4

\*Buffer is 100 meters on either side of the stream centerline

<sup>A</sup>U.S. Census Bureau - Tiger 2000, 2002. 1:24,000

<b>Slope<sup>D</sup></b>	Acres	Percent of watershed
Lands of 0-2 percent slope	129	1%
Lands of 2-4 percent slope	198	2%
Lands of 4-10 percent slope	689	6%
Lands of 10-15 percent slope	676	6%
Lands of 15-30 percent slope	2,557	24%
Lands of 30-60 percent slope	4,977	47%
Lands of 60-100 percent slope	1,424	13%
Lands of 100-117 percent slope	13	0%

<b>Elevation Range</b>	0 - 2090 ft.	0 - 637 m
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<sup>D</sup>Slope derived from USGS 10 meter Digital Elevation Models (DEM's)

<b>Vegetation<sup>G</sup></b>	Acres	Percent of watershed
Agriculture	42	0%
Annual grassland	1,334	13%
Barren	133	1%
Conifer Forest		
Closed Cone-Pine-Cypress	5	0%
Douglas Fir	3,662	34%
Montane Hardwood-Conifer	467	4%
Redwood	1,275	12%
Hardwood Forest		
Montane Riparian	12	0%
Hardwood Woodland		
Coastal Oak Woodland	2,006	19%
Eucalytus	84	1%
Valley Foothill Riparian	166	2%
Herbaceous	190	2%
Shrub	902	8%
Urban	255	2%
Water	42	0%
Wetland	49	0%

<sup>G</sup>Multi-source Land Cover Data (2002 v2), CA Department of Forestry, 2002. 100 meter Grid

<b>Erodability of Watershed<sup>F</sup></b>	Acres	Percent of watershed
Watershed not ranked		

<sup>F</sup>Department of Conservation, Division of Mines and Geology; minimum mapping unit: approx. 8000 acres  
Watersheds were rated based on slope, precipitation, and lithologic susceptibility to failure. Total erosion potential is based on a combination of the landslide potential, debris slide potential, and the surface erosion potential. Rating 0-10 [0 = Low slide potential, 10 = High slide potential]



<b>Land Ownership<sup>H</sup></b>	<b>Acres</b>	<b>Percent of watershed</b>
Private	2,382	22%
Local (Open Space / Water District)	89	1%
State, Fish & Game	1	0%
State, Parks & Recreation	1,521	14%
Federal (NPS)	6,527	61%
Federal (Military)	141	1%

<sup>H</sup>Management Landscape, CA Department of Forestry, 2002

<b>Population<sup>I</sup></b>	<b>Housing<sup>I</sup></b>
Total Population within the watershed -- 895 People	Total Housing Units within the watershed -- 541 Houses
	Housing Density
	0 to Less than 1 Housing Unit / 160 Acres 88%
	1 Unit / 160 Acres to 1 Unit / 20 Acres 5%
	1 Unit / 20 Acres to 1 Unit / 5 Acres 2%
	1 Unit / 5 Acres to 2 Units / Acre 4%
	2 Units / Acres to Greater than or Equal to 5 Units / Acre 0%

<sup>I</sup>Census 2000 Block Data (Migrated), CA Department of Forestry, 2003



## Pine Gulch-Bolinas

Vegetation density and age class in the entire watershed

California Department of Forestry and Fire Protection; fveg02\_2. Vector digital dataset. 100m Grid, 2002.

Acres													
Size	Density	Agriculture	Barren	Conifer Forest	Conifer Woodland	Hardwood Forest	Hardwood Woodland	Herbaceous	Shrub	Urban	Water	Wetland	Grand Total by Size class
Not Determined	Not Determined	42	133					1525	3	255	42	49	
	S												
	P			25			7						
	M			348			124						
Seedling	D			232			203						
	<b>Total</b>	42	133	605			334	1525	3	255	42	49	2987
	S												
	P												
Sapling	M												
	D												
	<b>Total</b>												0
	S												
Pole	P												
	M			17		12	10						
	D			111			17						
	<b>Total</b>			129		12	27						168
Small Tree	S												
	P			3			7						
	M			12			3						
	D			796			504						
Medium/Large Tree	<b>Total</b>			811		12	514						1325
	S			15			17						
	P			40			42						
	M			175			57						
Multi Layered	D			3541			1243	900					
	<b>Total</b>			3771			1359	900					6029
	S												
	P												
Medium/Large Tree	M			12			5						
	D			45			17						
	<b>Total</b>			57			22						79
	S												
Multi Layered	P												
	D			37									
	<b>Total</b>			37									37
	S												
<b>Grand Total by Species Type</b>		42	133	5409		12	2256	1525	902	255	42	49	10626

SIZE	Description	Diameter at Breast Height (DBH)
Not Determined		N/A
Seedling		Less Than 1 inch
Sapling		1 to 6 inches
Pole		6 to 11 inches
Small Tree		11 to 24 inches
Medium/Large Tree		Greater Than 24 inches
Multi Layered		Size 5 Over Size 4 Or 3; Total Tree Crown Closure Greater Than 60%

Percent													
Size	Density	Agriculture	Barren	Conifer Forest	Conifer Woodland	Hardwood Forest	Hardwood Woodland	Herbaceous	Shrub	Urban	Water	Wetland	Grand Total by Size class
Not Determined	Not Determined	0%	1%					14%	0%	2%	0%	0%	
	S												
	P			0%			0%						
	M			3%			1%						
Seedling	D			2%			2%						
	<b>Total</b>	0%	1%	6%			3%	14%	0%	2%	0%	0%	28%
	S												
	P												
Sapling	M												
	D												
	<b>Total</b>												0%
	S												
Pole	P												
	M			0%		0%	0%						
	D			1%			0%						
	<b>Total</b>			1%		0%	0%						2%
Small Tree	S												
	P			0%		0%	0%						
	M			0%		0%	0%						
	D			7%		5%	5%						
Medium/Large Tree	<b>Total</b>			8%		5%	5%						12%
	S			0%		0%	0%						
	P			0%		0%	0%						
	M			2%		1%	1%						
Multi Layered	D			33%		12%	8%						
	<b>Total</b>			35%		13%	8%						57%
	S												
	P												
Multi Layered	M			0%		0%	0%						
	D			0%		0%	0%						
	<b>Total</b>			1%		0%	0%						1%
	S												
Multi Layered	P												
	D			0%									
	<b>Total</b>			0%									0%
	S												
<b>Grand Total by Species Type</b>		0%	1%	51%		0%	21%	14%	8%	2%	0%	0%	100%

SIZE (SHRUB)	Desc.	Crown Decadence	DENSITY	Description
Not Determined		N/A		None
Seedling Shrub		Seedlings or sprouts < 3 years	S	10 to 24%
Young Shrub		None	P	25 to 39%
Mature Shrub		1 - 25%	M	40 to 59%
Decadent Shrub		> 25%	D	60 to 100%

**Pine Gulch-Bolinas**

Vegetation within Riparian Buffer (100 meter on either side of stream)

California Department of Forestry and Fire Protection; fveg02\_2. Vector digital dataset. 100m Grid, 2002.

Acres										Percent																				
Size	Density	Agriculture	Barren	Conifer Forest	Conifer Woodland	Hardwood Forest	Hardwood Woodland	Herbaceous	Shrub	Urban	Water	Wetland	Grand Total by Size class	Size	Density	Agriculture	Barren	Conifer Forest	Conifer Woodland	Hardwood Forest	Hardwood Woodland	Herbaceous	Shrub	Urban	Water	Wetland	Grand Total by Size class			
Not Determined	Not Determined	7	79					262	5	96	62	42	864	Not Determined	Not Determined	0%	2%					7%	0%	3%	2%	1%	24%			
	S															S														
	P				5			2								P				0%			0%							
	M				106			52								M				3%			1%							
Seedling	D				74			72						D				2%			2%									
	Total	7	79		185			126	262	5	96	62	42	Total	0%	2%	5%				4%	7%	0%	3%	2%	1%	24%			
	S													S																
	P													P																
Sapling	M													M																
	D													D																
	Total													Total														0		
	S													S																
Pole	P													P																
	M						10	5						M					0%	0%										
	D					20		5						D				1%		0%	0%									
	Total					20		10	10					Total				1%		0%	0%							40		
Small Tree	S													S																
	P													P																
	M													M																
	D													D																
Medium/Large Tree	Total													Total																
	S													S																
	P													P																
	M													M																
Multi Layered	D													D																
	Total													Total																
	S													S																
	P													P																
Grand Total by Species Type	M													M																
	D													D																
	Total													Total																
	Total	7	79	1751	0	10	1140	262	126	96	62	42	3575	Total	2%	49%			0%	32%	7%	4%	3%	2%	1%	100%				

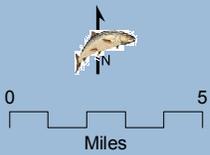
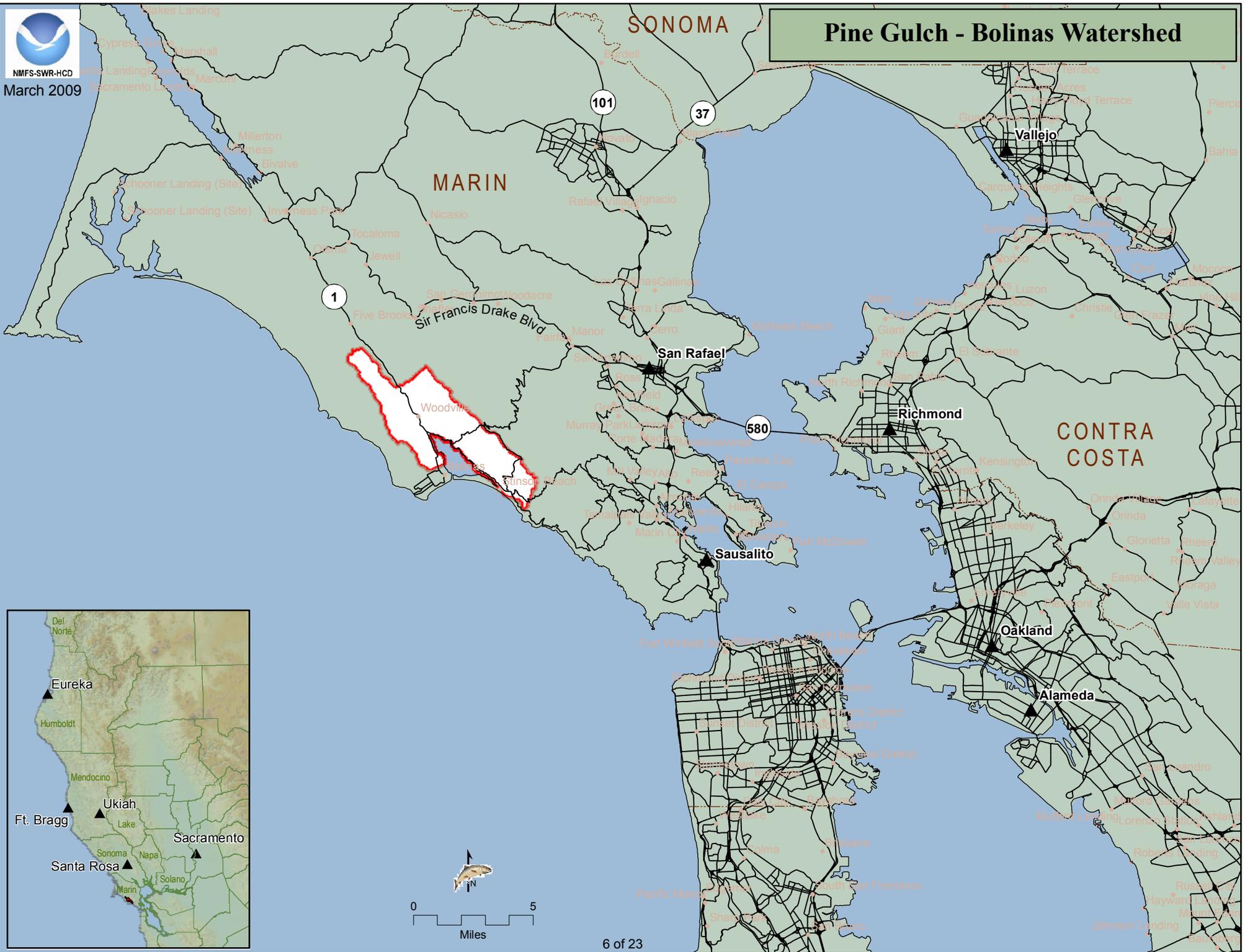
SIZE	Description	Diameter at Breast Height (DBH)
Seedling	Less Than 1 inch	
Sapling	1 to 6 inches	
Pole	6 to 11 inches	
Small Tree	11 to 24 inches	
Medium/Large Tree	Greater Than 24 inches	
Multi Layered	Size 5 Over Size 4 Or 3; Total Tree Crown Closure Greater Than 60%	

SIZE (SHRUB)	Desc.	Crown Decadence	DENSITY	Description
Not Determined		N/A	S	10 to 24%
Seedling Shrub		Seedlings or sprouts < 3 years	P	25 to 39%
Young Shrub		None	M	40 to 59%
Mature Shrub		1 - 25%	D	60 to 100%
Decadent Shrub		> 25%		



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# Pine Gulch - Bolinas Watershed

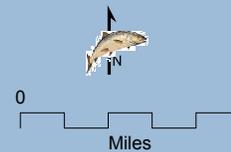




NMFS-SWR-HCD

March 2009

# Pine Gulch - Bolinas Watershed

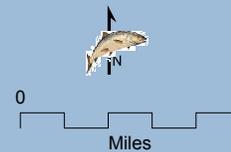




NMFS-SWR-HCD

March 2009

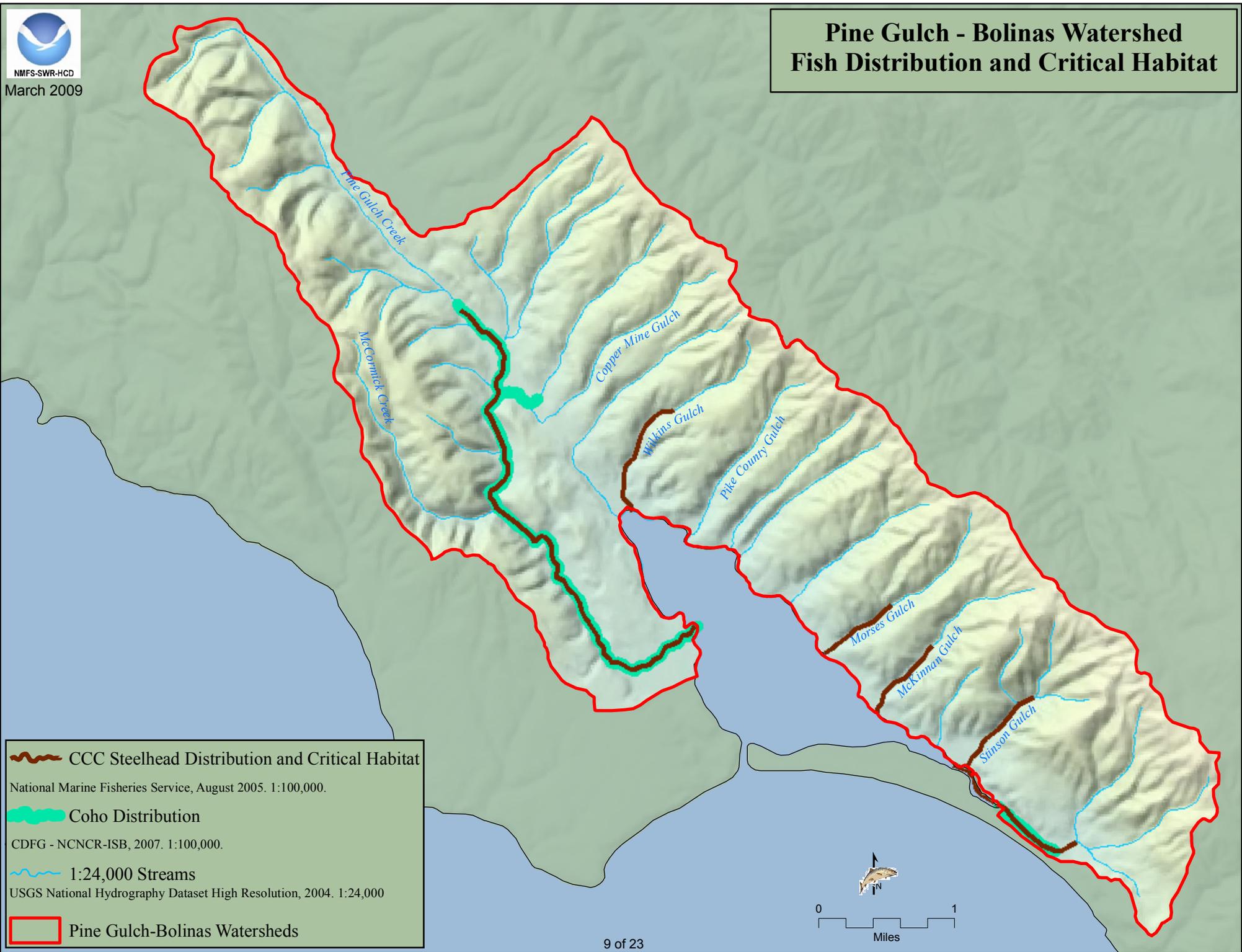
# Pine Gulch - Bolinas Watershed





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# Pine Gulch - Bolinas Watershed Fish Distribution and Critical Habitat

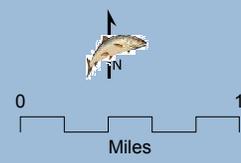


 CCC Steelhead Distribution and Critical Habitat  
National Marine Fisheries Service, August 2005. 1:100,000.

 Coho Distribution  
CDFG - NCNCR-ISB, 2007. 1:100,000.

 1:24,000 Streams  
USGS National Hydrography Dataset High Resolution, 2004. 1:24,000

 Pine Gulch-Bolinas Watersheds





NMFS-SWR-HCD

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# Pine Gulch - Bolinas Watershed Steelhead Current vs. Historical



 Current CCC Steelhead Distribution

National Marine Fisheries Service, August 2005. 1:100,000.

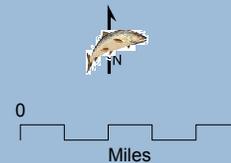
 Steelhead Intrinsic Potential

NMFS SWR Fisheries Science Center, 2005.  
Potential historical suitable habitat

 1:24,000 Streams

USGS National Hydrography Dataset High Resolution,  
2004. 1:24,000

 Pine Gulch-Bolinas Watersheds





March 2009

# Pine Gulch - Bolinas Watershed Coho Current vs. Historical

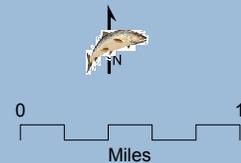


 Current Coho Distribution  
 CDFG - NCNCR-ISB, 2007. 1:100,000.

 Coho Intrinsic Potential  
 NMFS SWR Fisheries Science Center, 2005.  
 Potential historical suitable habitat

 1:24,000 Streams  
 USGS National Hydrography Dataset High Resolution,  
 2004. 1:24,000

 Pine Gulch-Bolinas Watersheds

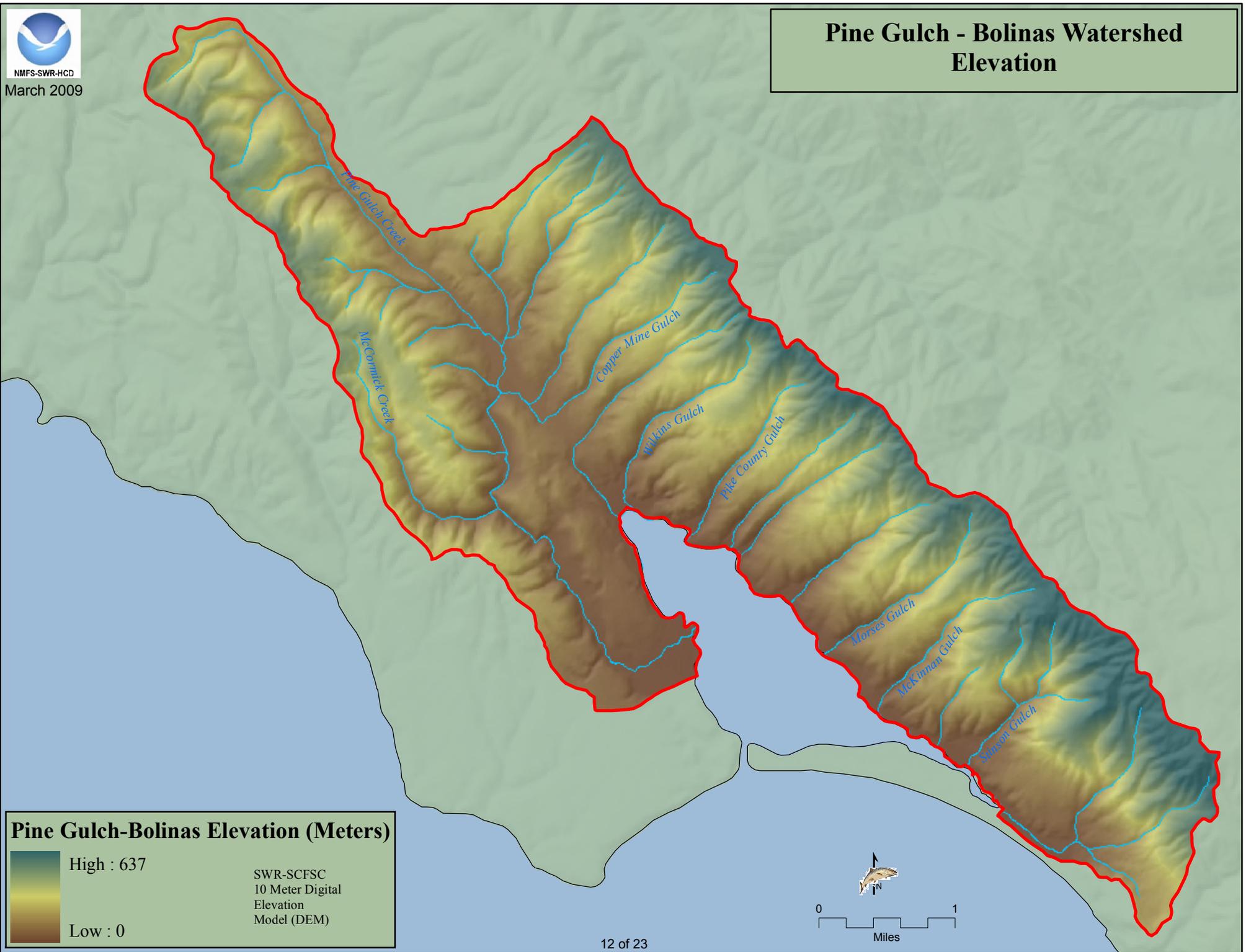




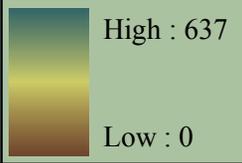
NMFS-SWR-HCD

March 2009

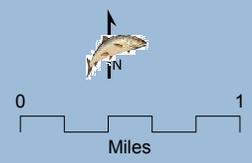
# Pine Gulch - Bolinas Watershed Elevation



## Pine Gulch-Bolinas Elevation (Meters)



SWR-SCFSC  
10 Meter Digital  
Elevation  
Model (DEM)

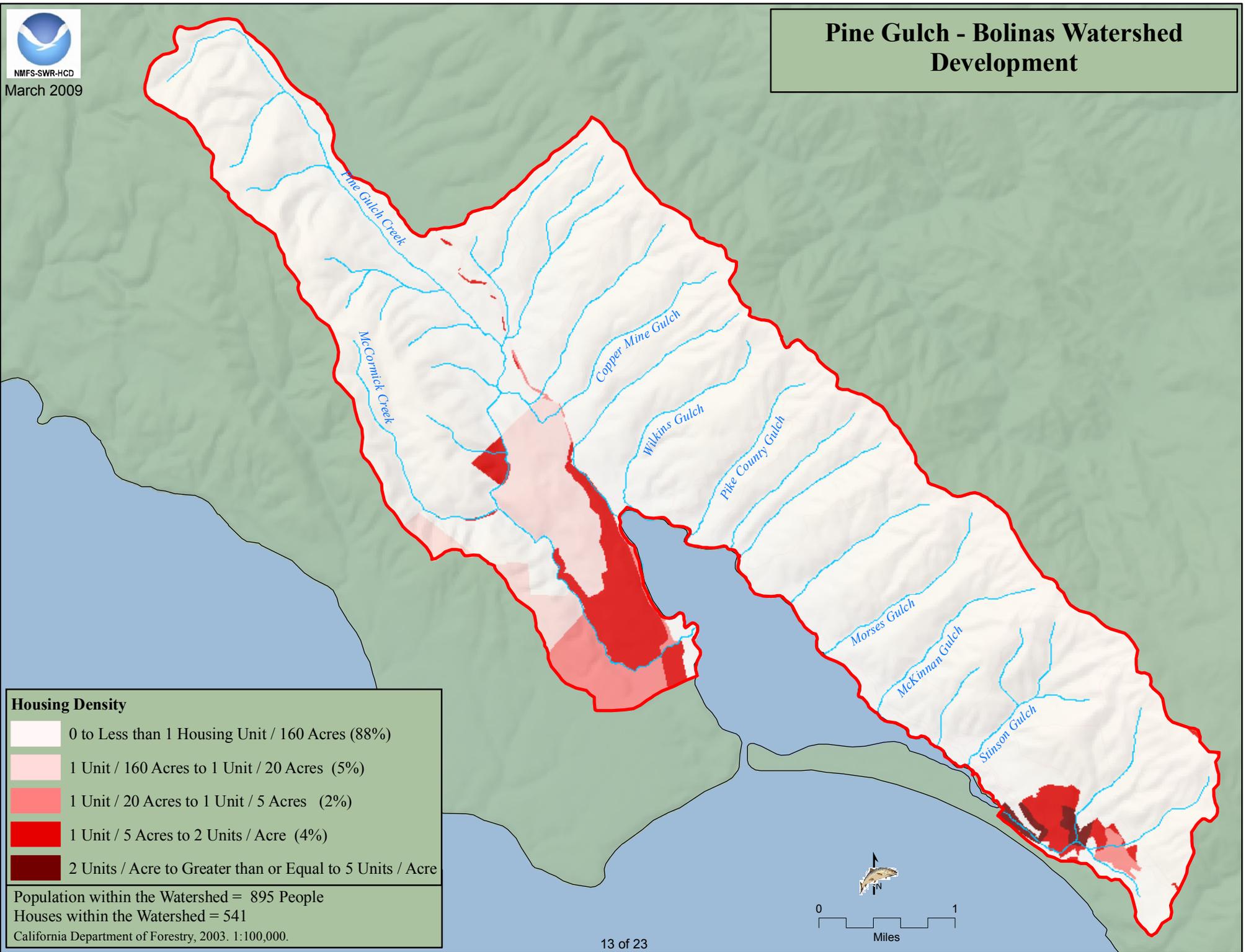




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# Pine Gulch - Bolinas Watershed Development



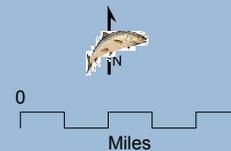
## Housing Density

- 0 to Less than 1 Housing Unit / 160 Acres (88%)
- 1 Unit / 160 Acres to 1 Unit / 20 Acres (5%)
- 1 Unit / 20 Acres to 1 Unit / 5 Acres (2%)
- 1 Unit / 5 Acres to 2 Units / Acre (4%)
- 2 Units / Acre to Greater than or Equal to 5 Units / Acre

Population within the Watershed = 895 People

Houses within the Watershed = 541

California Department of Forestry, 2003. 1:100,000.

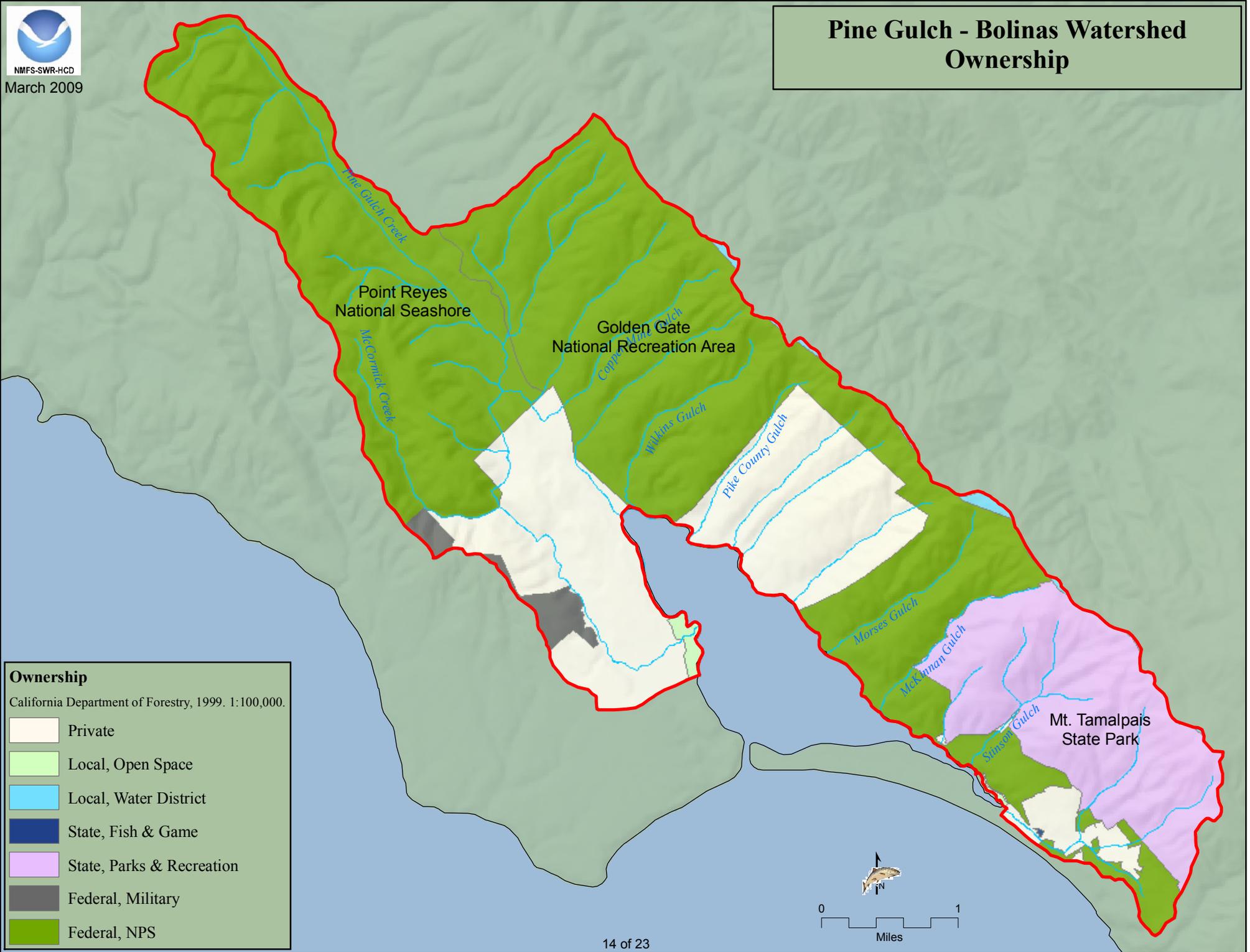




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# Pine Gulch - Bolinas Watershed Ownership





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# Pine Gulch - Bolinas Watershed Road Density





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# Pine Gulch - Bolinas Watershed Road Density in the Riparian Corridor



 1:24,000 Streams

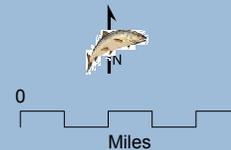
USGS National Hydrography Dataset, 2004. 1:24,000

 Road Segments within the 200 meter Riparian Corridor

U.S. Census Bureau - Tiger 2000, 2002. 1:24,000

 200 Meter Riparian Buffer (100 m on either side of stream centerline)

Overall Riparian Corridor Density = 2.4 Miles / SqMi of Corridor



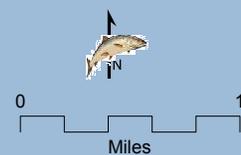
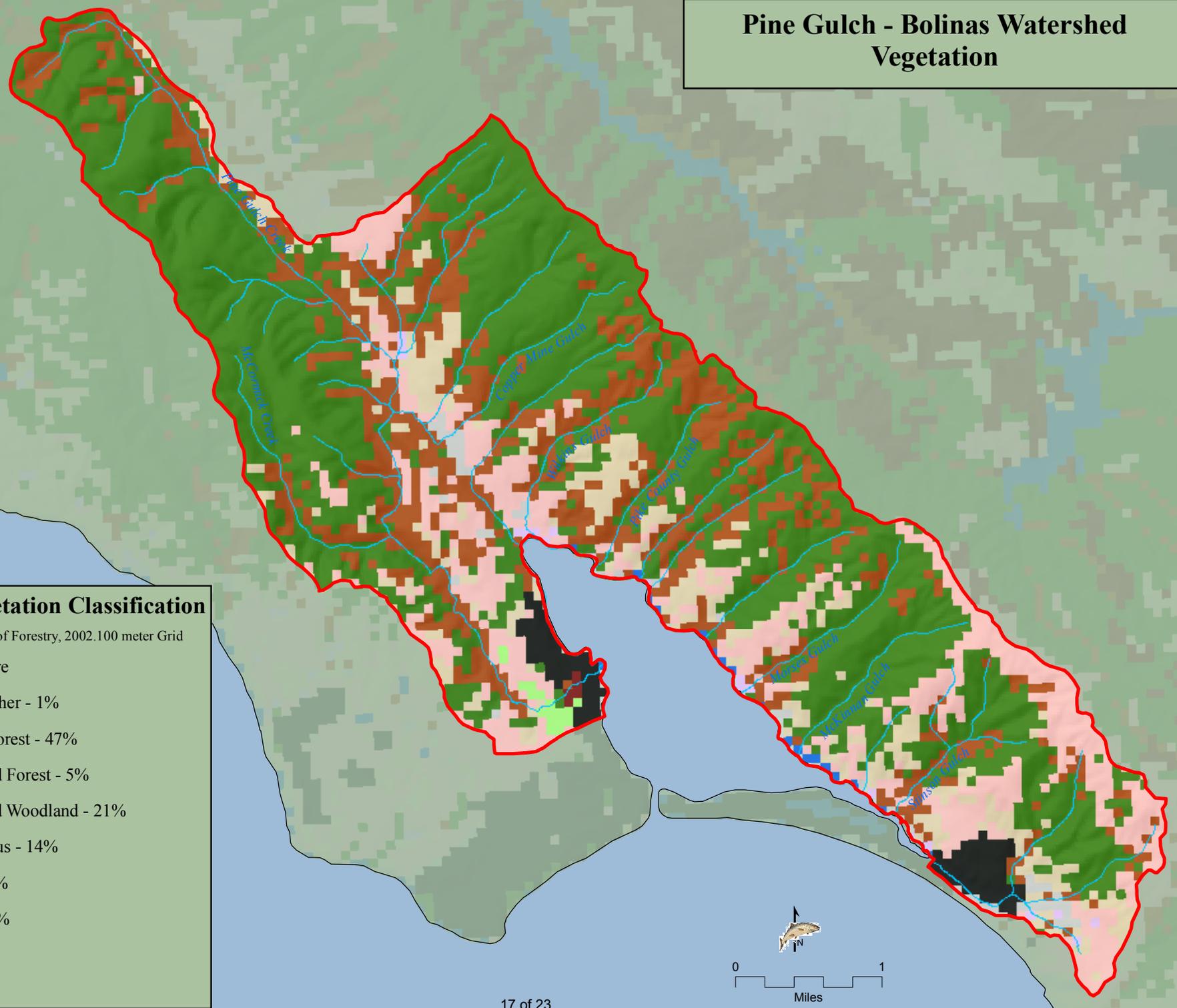
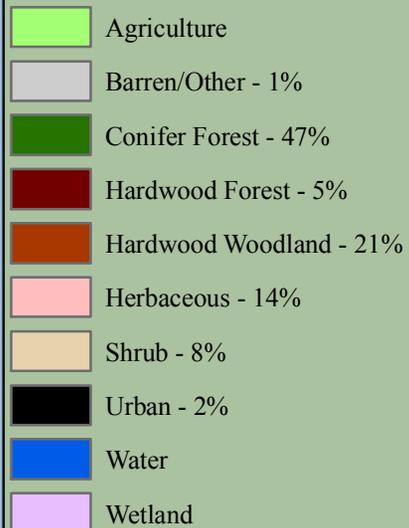


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# Pine Gulch - Bolinas Watershed Vegetation

## WHR13 Vegetation Classification

California Department of Forestry, 2002.100 meter Grid

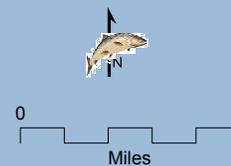
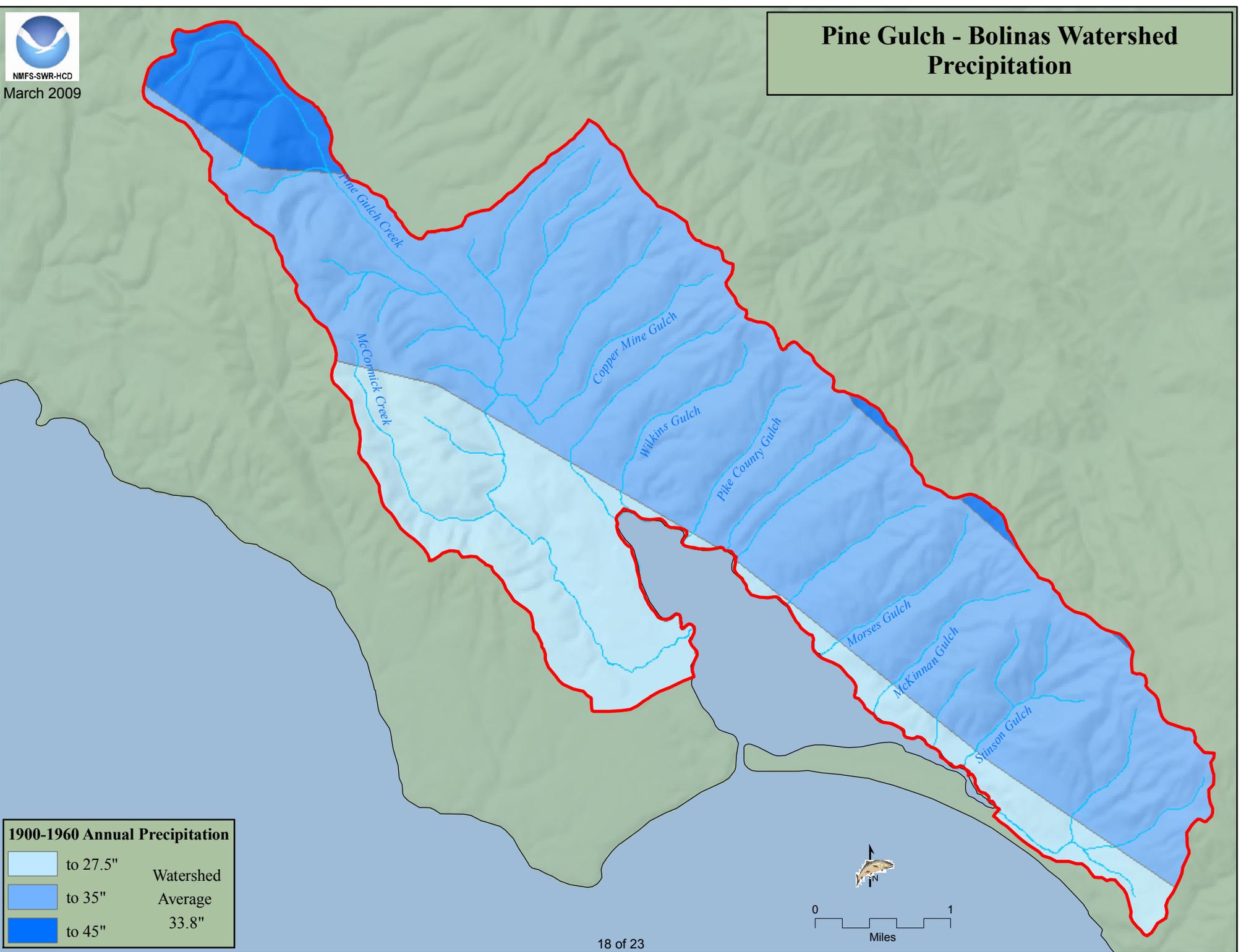




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# Pine Gulch - Bolinas Watershed Precipitation





NMFS-SWR-HCD

March 2009

# Pine Gulch - Bolinas Watershed Flood Zone

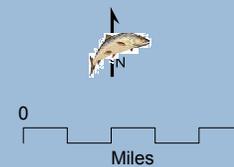


## FEMA Flood Zones

FEMA, 1996. 1:24,000

 100 Year Flood Zone

 500 Year Flood Zone





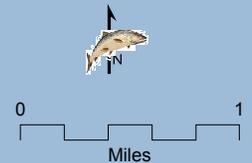
NMFS-SWR-HCD  
March 2009

# Pine Gulch - Bolinas Watershed Barriers / Discharge / Gages



hazardous & Solid Waste Sites  
 Mine  
 Gage Station  
 BASINS, USEPA, 2001.  
**Barrier Type, Barrier Status**  
 CA Fish Passage Assessment, PSMFC, 2008  
 Diversion, Unknown  
 Road crossing, Total  
 Road crossing, Unknown

CALTRANS HWY 1  
 PACIFIC BELL  
 NATIONAL PARK STINSON BEACH  
 PACIFIC BELL





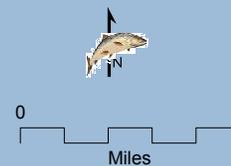
NMFS-SWR-HCD  
March 2009

# Pine Gulch - Bolinas Watershed Public Consultation Tracking System



● PCTS Record

Current as of Jan. 2009.  
Only those records with a  
Latitude and Longitude  
entered appear here



## References

### **Watersheds**

calwater\_ver2\_2  
vector digital data  
California Watersheds (CALWATER 2.2)  
California Department of Forestry and Fire  
Protection  
1:24,000  
1999  
<http://www.ca.nrcs.usda.gov/features/calwater/>

### **Distribution**

Coho\_Distribution  
vector digital data  
Eric Haney - CDFG - NCNCR-ISB  
1:100,000  
2006  
Draft  
<http://www.calfish.org/>

CCC\_Steelhead\_Distribution\_06\_2005  
vector digital data  
National Marine Fisheries Service (NOAA  
Fisheries)  
1:100,000  
August 2005  
<http://swr.nmfs.noaa.gov/salmon/layers/finalgis.htm>

### **Critical Habitat**

CCC\_Steelhead\_ch\_06\_2005  
vector digital data  
National Marine Fisheries Service (NOAA  
Fisheries)  
1:100,000  
August 2005  
<http://swr.nmfs.noaa.gov/salmon/layers/finalgis.htm>

### **Hydrology**

1805 NHD Flowline  
vector digital data  
National Hydrography Dataset High Resolution  
United States Geological Survey  
1:24,000  
2004

### **Dams**

Dams\_2005  
vector digital data

Goslin, M.,  
Santa Cruz Fishery Science Center  
National Marine Fisheries Service  
2005  
<http://swfsc.noaa.gov/>

### **Barriers and Diversions**

pad\_september2006  
vector digital data  
California Fish Passage Assessment Database  
Pacific States Marine Fisheries Commission  
September 2006  
<http://www.calfish.org/>

### **Gaging Stations**

gages  
vector digital data  
Better Assessment Science Integrating point and  
Nonpoint Sources (BASINS)  
United States Environmental Protection Agency  
2001  
<http://www.epa.gov/waterscience/basins/>

### **Precipitation**

California Mean Annual Precipitation Zones, 1900-  
1960  
Vector digital data  
California Department of Forestry and Fire  
Protection 1990  
1:100,000  
<http://frap.cdf.ca.gov/data/frapgisdata/select.asp>

### **Roads**

TGRR00  
vector digital data  
Roads  
United States Census Bureau  
1:100000  
2000  
<http://www.census.gov/geo/www/tiger/>

### **Elevation**

Spln\_mos\_02  
10 Meter Digital Elevation Model (DEM)  
NOAA Fisheries, Santa Cruz Laboratory  
2003

## **Vegetation**

fveg02\_2

raster digital data

Multi-source Land Cover Data

California Department of Forestry and Fire Protection

100 meter Grid

2002

<http://frap.cdf.ca.gov/data/frapgisdata/select.asp>

## **Land Ownership**

GOVTOWNA

vector digital data

California Department of Forestry Forest and Rangeland Resources Assessment Program

Bureau of Land Management Surface Management

1:100,000

September 1999

<http://old.casil.ucdavis.edu/casil/gis.ca.gov/teale/govtowna/>

## **Developed Area and Population**

Census 2000 Block Data (Migrated)

vector digital data

California and the Department of Forestry and Fire Protection, FRAP

2003

1:100,000

<http://frap.cdf.ca.gov/data/frapgisdata/select.asp>

## **Imagery**

naip\_1-1\_2n\_s\_ca041\_2006\_2 (Marin)

remote-sensing image

raster digital data

National Agriculture Imagery Program (NAIP)

USDA-FSA Aerial Photography Field Office

Salt Lake City, Utah

2006

<http://datagateway.nrcs.usda.gov/GatewayHome.html>

## **Historic Suitable Habitat (Coho, Steelhead)**

Intrinsic Potential Model

vector digital data

NOAA Fisheries

Santa Cruz Laboratory, Santa Cruz, CA

2005

<http://swfsc.noaa.gov/>

## **Toxins**

Hazardous\_&\_solid\_waste\_sites

Better Assessment Science Integrating point and Nonpoint Sources (BASINS)

vector digital data

United States Environmental Protection Agency

2001

<http://www.epa.gov/waterscience/basins/>

mines

vector digital data

Better Assessment Science Integrating point and Nonpoint Sources (BASINS)

United States Environmental Protection Agency

2001

<http://www.epa.gov/waterscience/basins/>

## **Records Management System (RMS)**

### **Public Consultation Tracking System (PCTS)**

National Marine Fisheries Service

Oracle Databases

2008

## **Flood Zones**

FEMA Flood Insurance Maps 1996

Vector digital data

Federal Emergency Management Agency

Q3 Flood Data Program

1996

<http://www.fema.gov/>