

The following was presented at DMT'10  
(May 16-19, 2010).

The contents are provisional and will be  
superseded by a paper in the  
DMT'10 Proceedings.

See also earlier Proceedings (1997-2009)  
<http://ngmdb.usgs.gov/info/dmt/>

# Legacy Data: Bringing It Into The 21<sup>st</sup> Century

By Jonathan Mulder  
Engineering Geologist, C.E.G. #1352  
Groundwater and Geological Investigations Unit  
Northern Regional Office  
Department of Water Resources

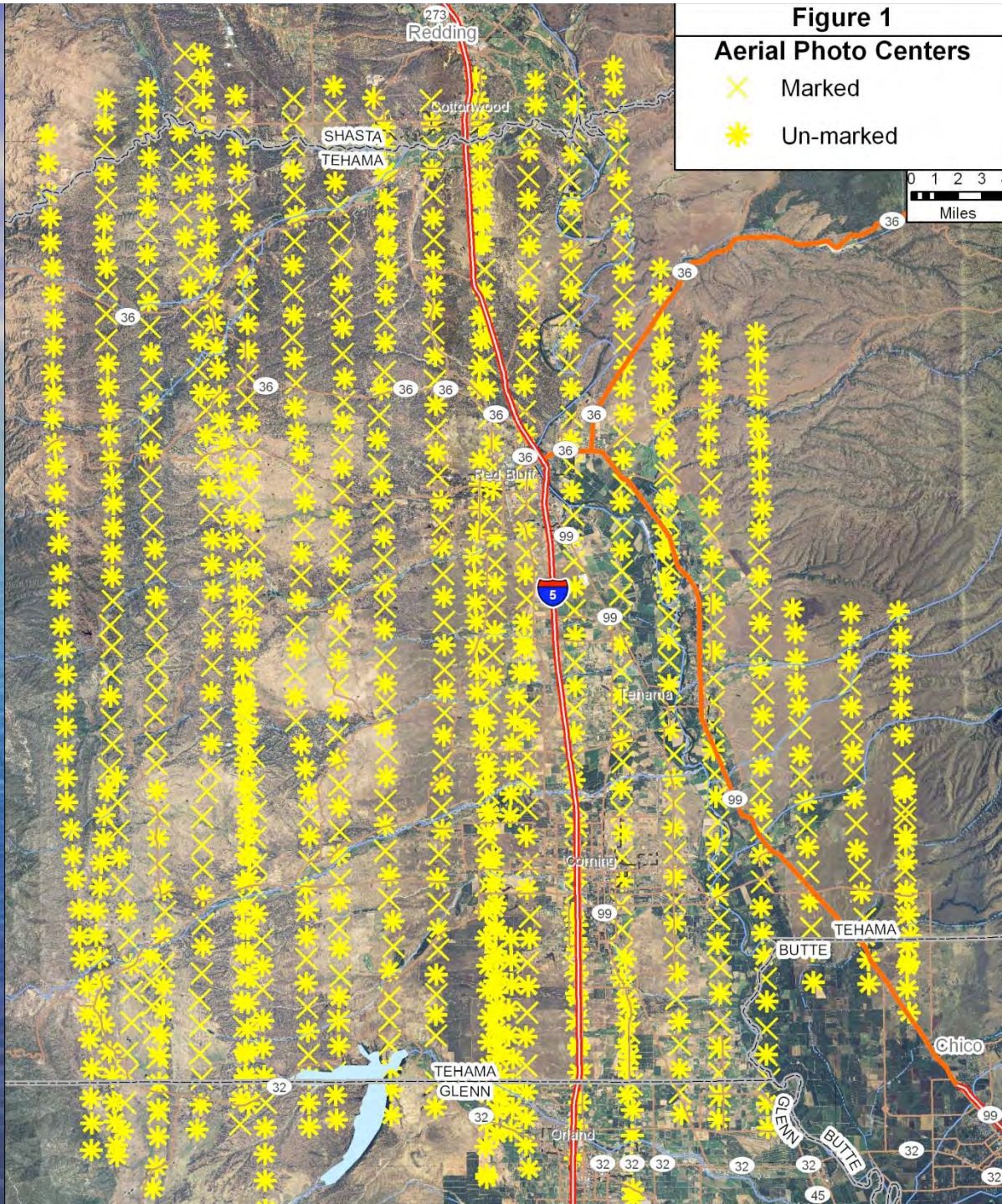
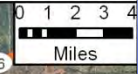




Figure 1

Aerial Photo Centers

- ✕ Marked
- ✱ Un-marked



**Figure 2**  
**Geo-Referenced**  
**Aerial Photos**

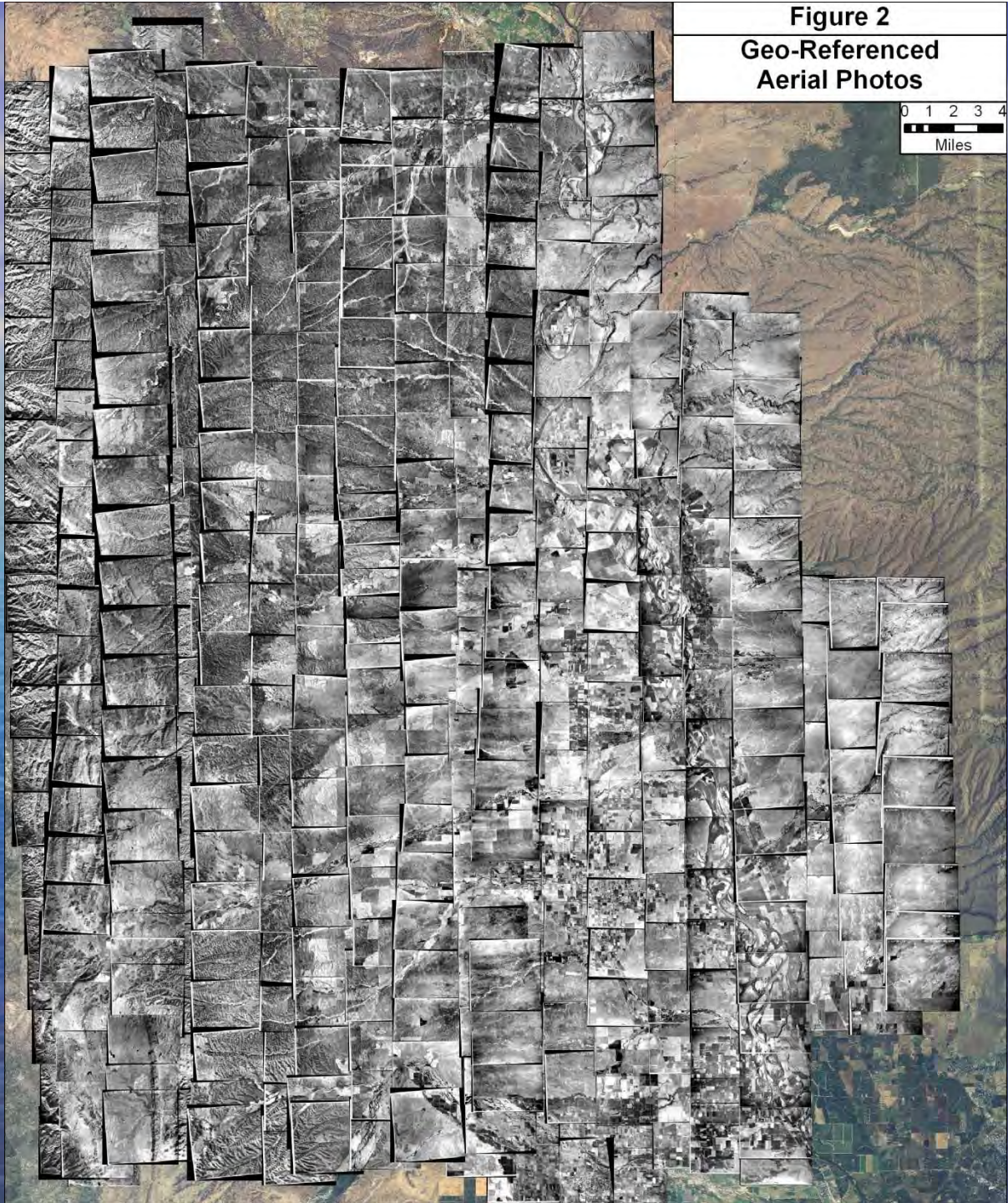
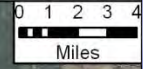
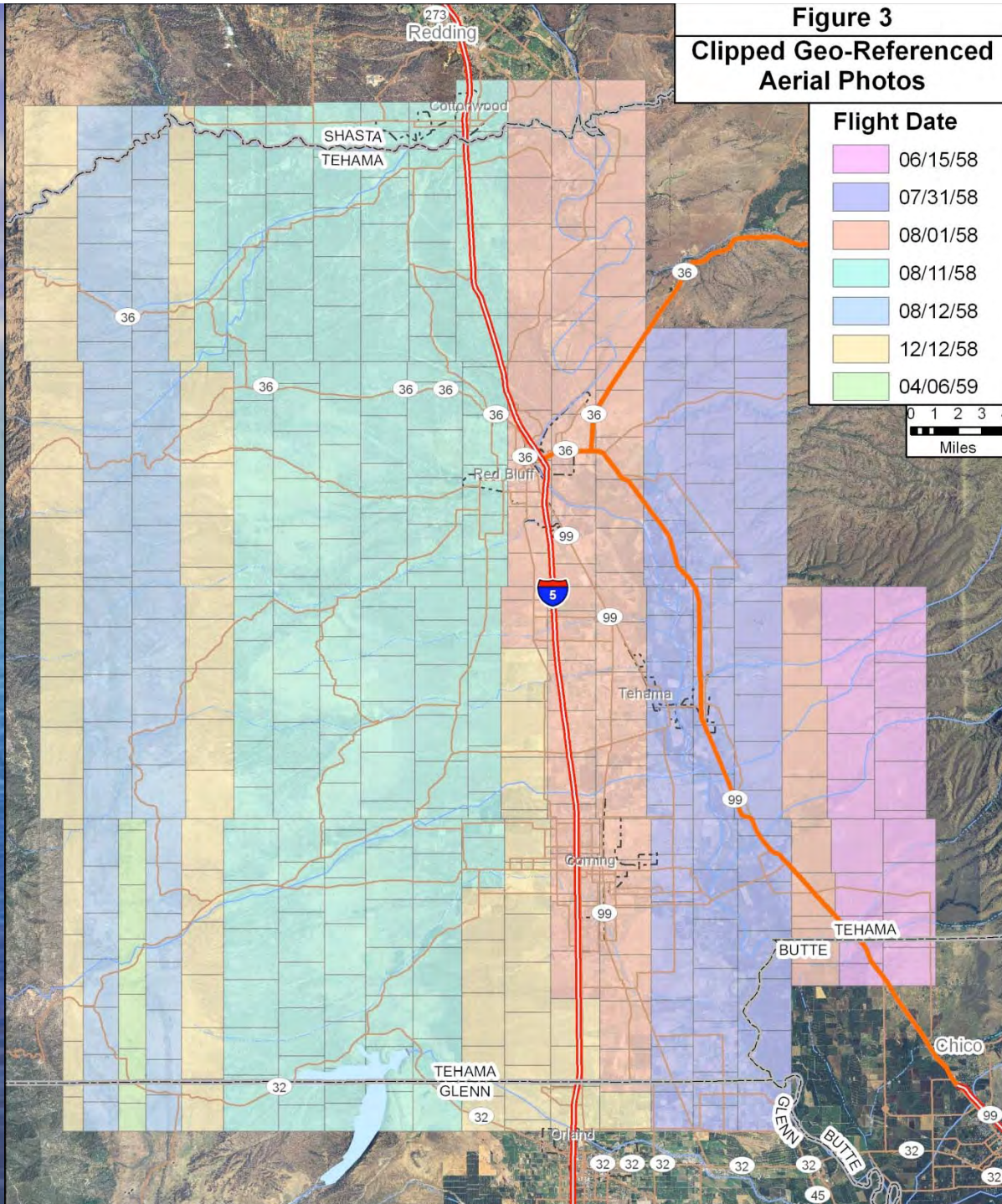
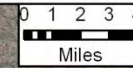


Figure 3

Clipped Geo-Referenced  
Aerial Photos

Flight Date

- 06/15/58
- 07/31/58
- 08/01/58
- 08/11/58
- 08/12/58
- 12/12/58
- 04/06/59



**Figure 4**

1958 DOQQ Imagery  
80 Complete DOQQ Coverages  
42 Partial DOQQ Coverages

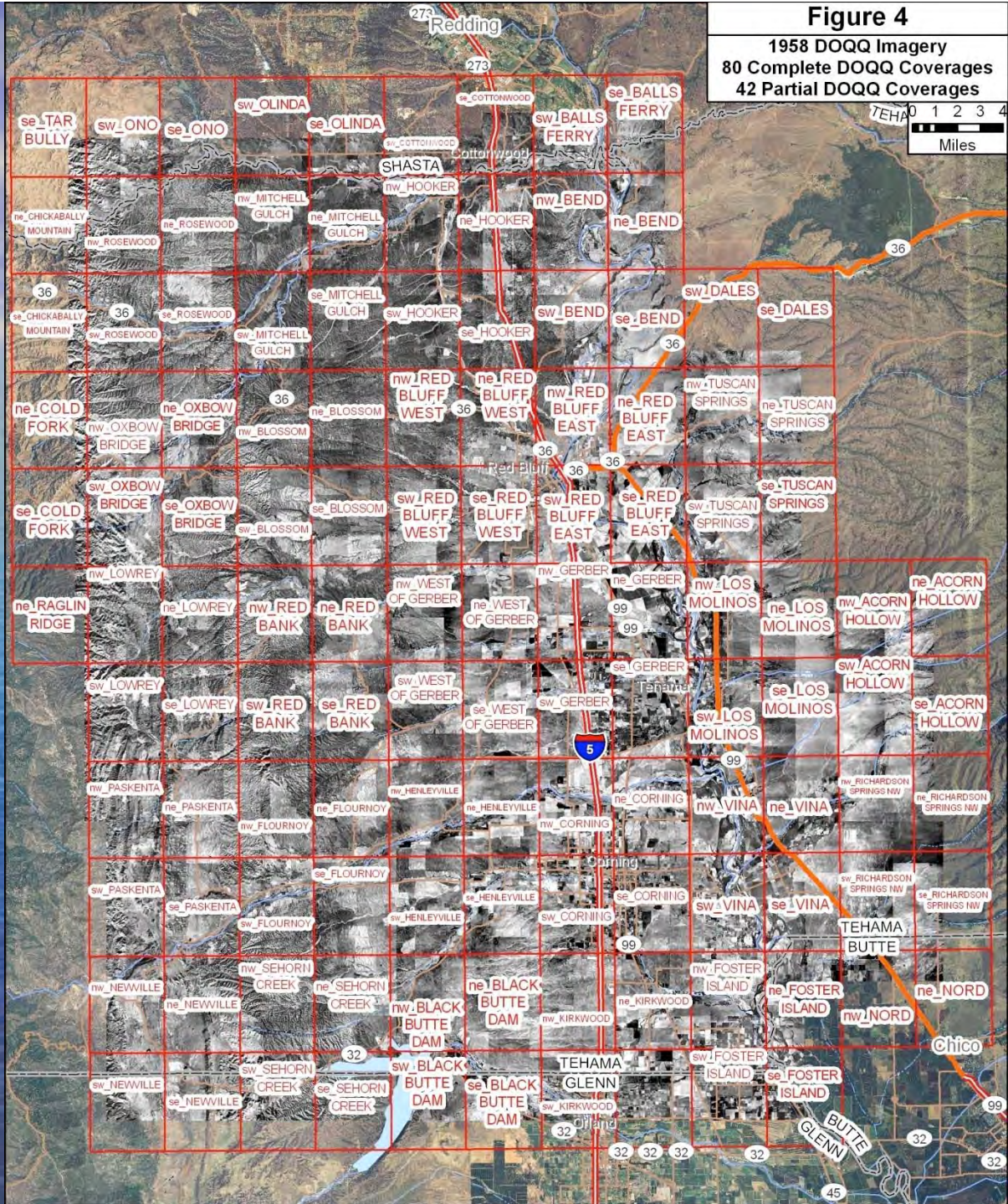
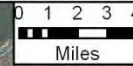


Figure 5

1958 Tehama County  
Photo Mosaic  
Atlas Sheet Index

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02-A	02-B	02-C	02-D	02-E	02-F			
03-A	03-B	03-C	03-D	03-E	03-F			
04-A	04-B	04-C	04-D	04-E	04-F			
05-A	05-B	05-C	05-D	05-E	05-F	05-G		
06-A	06-B	06-C	06-D	06-E	06-F	06-G		
07-A	07-B	07-C	07-D	07-E	07-F	07-G		
08-A	08-B	08-C	08-D	08-E	08-F	08-G		
09-A	09-B	09-C	09-D	09-E	09-F	09-G	09-H	09-I
10-A	10-B	10-C	10-D	10-E	10-F	10-G	10-H	10-I
11-A	11-B	11-C	11-D	11-E	11-F	11-G	11-H	11-I
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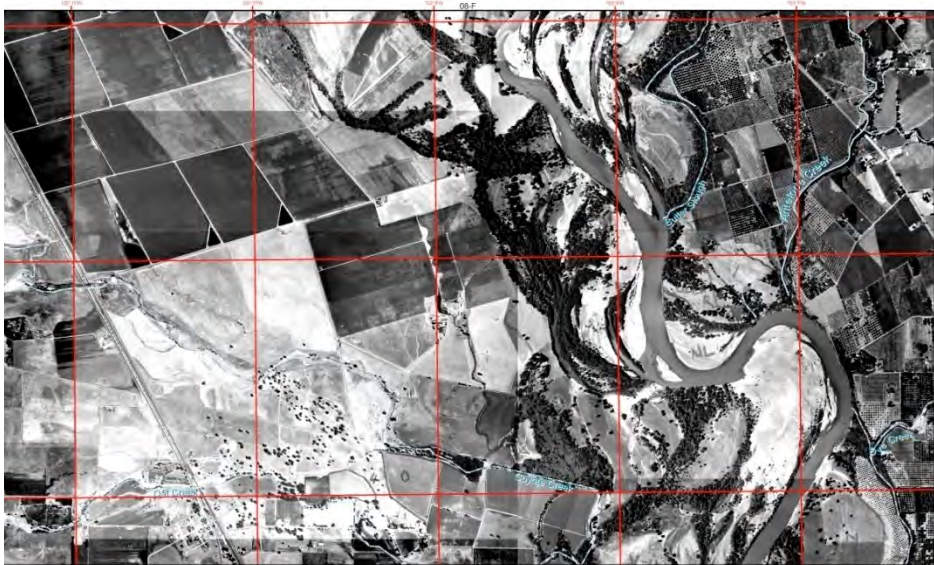
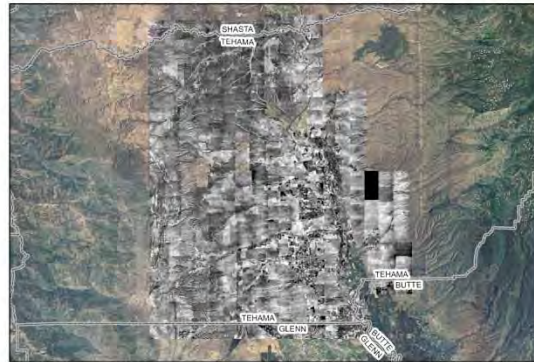




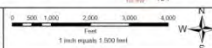


# 1958 Aerial Photo Mosaic Of Tehama County, California

By Jonathan Mulder  
 Certified Engineering Geologist #1352  
 California Department of Water Resources  
 Northern Region  
 Red Bluff, California  
 February, 2009



Sheet # 1958 Aerial Photo Mosaic Of Tehama County, California 09-F



Background Imagery  
 [1] 1958 Black & White (FSA, USDA)  
 [2] 2005 Color (NAIP, USDA)  
 Water Features: ESRI StreetMaps

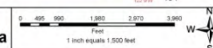
This Map created by  
 Jonathan Mulder  
 Certified Engineering Geologist #1352  
 California Department of Water Resources  
 Northern Region  
 Red Bluff, California



Sheet # 09-F



Sheet # 1958 Aerial Photo Mosaic Of Tehama County, California 09-F



Background Imagery  
 [1] 1958 Black & White (FSA, USDA)  
 [2] 2005 Color (NAIP, USDA)  
 Water Features: ESRI StreetMaps

This Map created by  
 Jonathan Mulder  
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 California Department of Water Resources  
 Northern Region  
 Red Bluff, California



Sheet # 09-F

- NEWS**
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  - [Census Bureau Maps Its Challenges for 2010](#)
  - [California's Selection of GIS as a Key Enterprise IT Strategy Featured in ArcNews](#)
  - [Governor Schwarzenegger Praises Takai, GIS at Oracle OpenWorld](#)
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- APPLICATIONS**
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  - [CEIC](#)
  - [CMLUCA](#)

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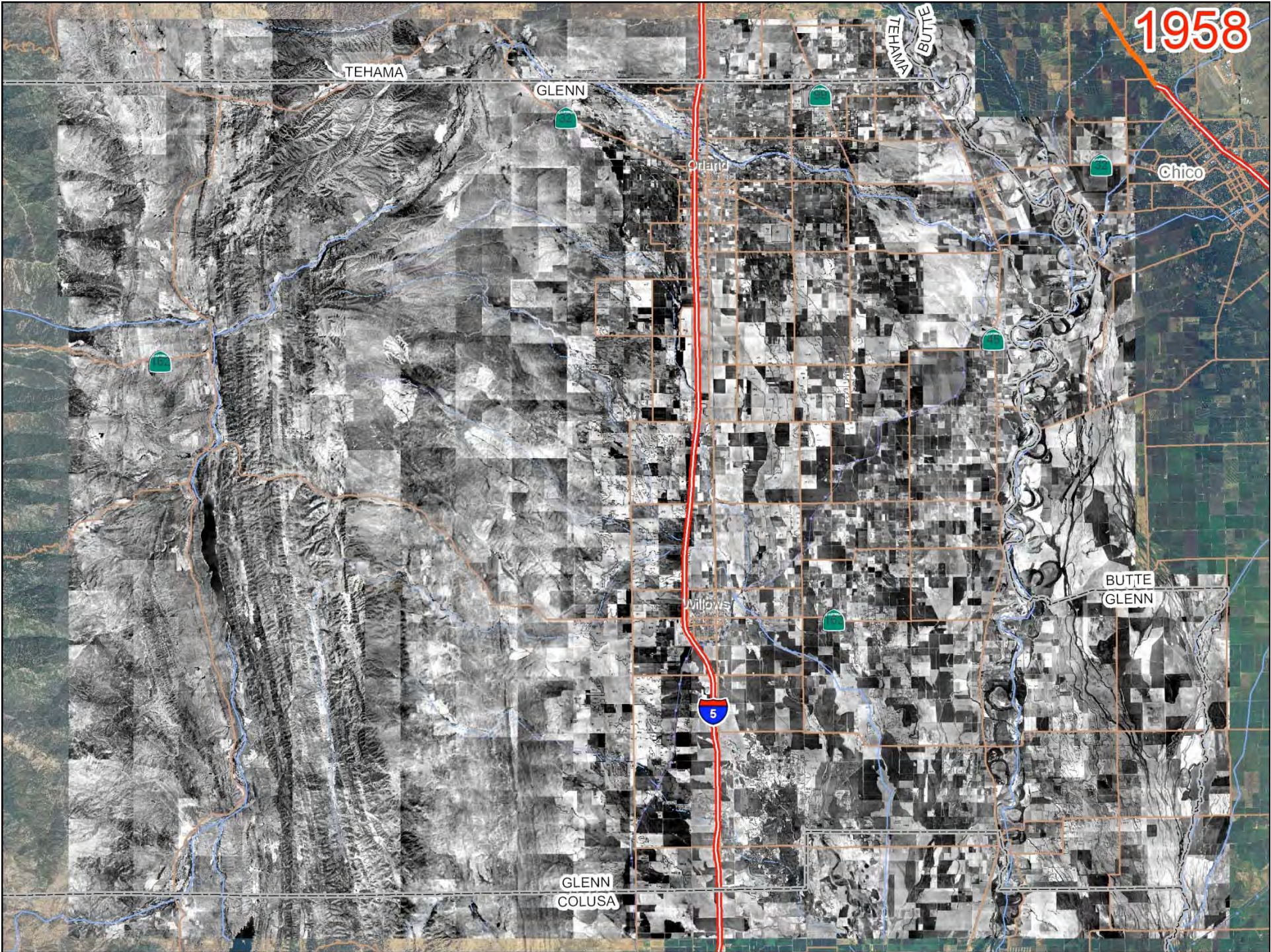
The California Spatial Information Library

### Categories » imageryBaseMapsLandCover » imagery » photos1958 » Tehama

Link Options Imagery Search Tool Search Light Help

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1958



TEHAMA

GLENN

TEHAMA  
BUTTE

Orland

Chico

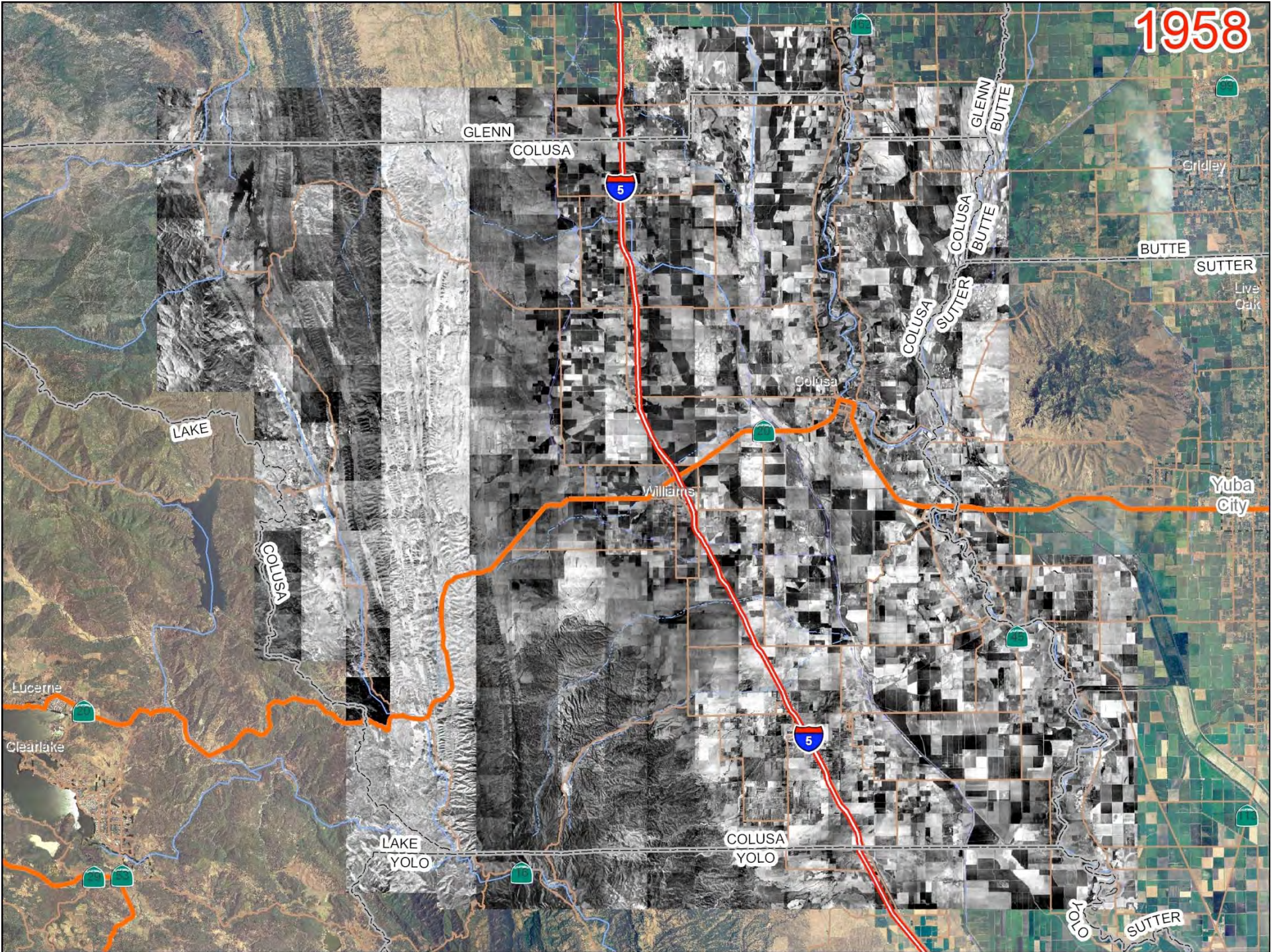
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BUTTE  
GLENN

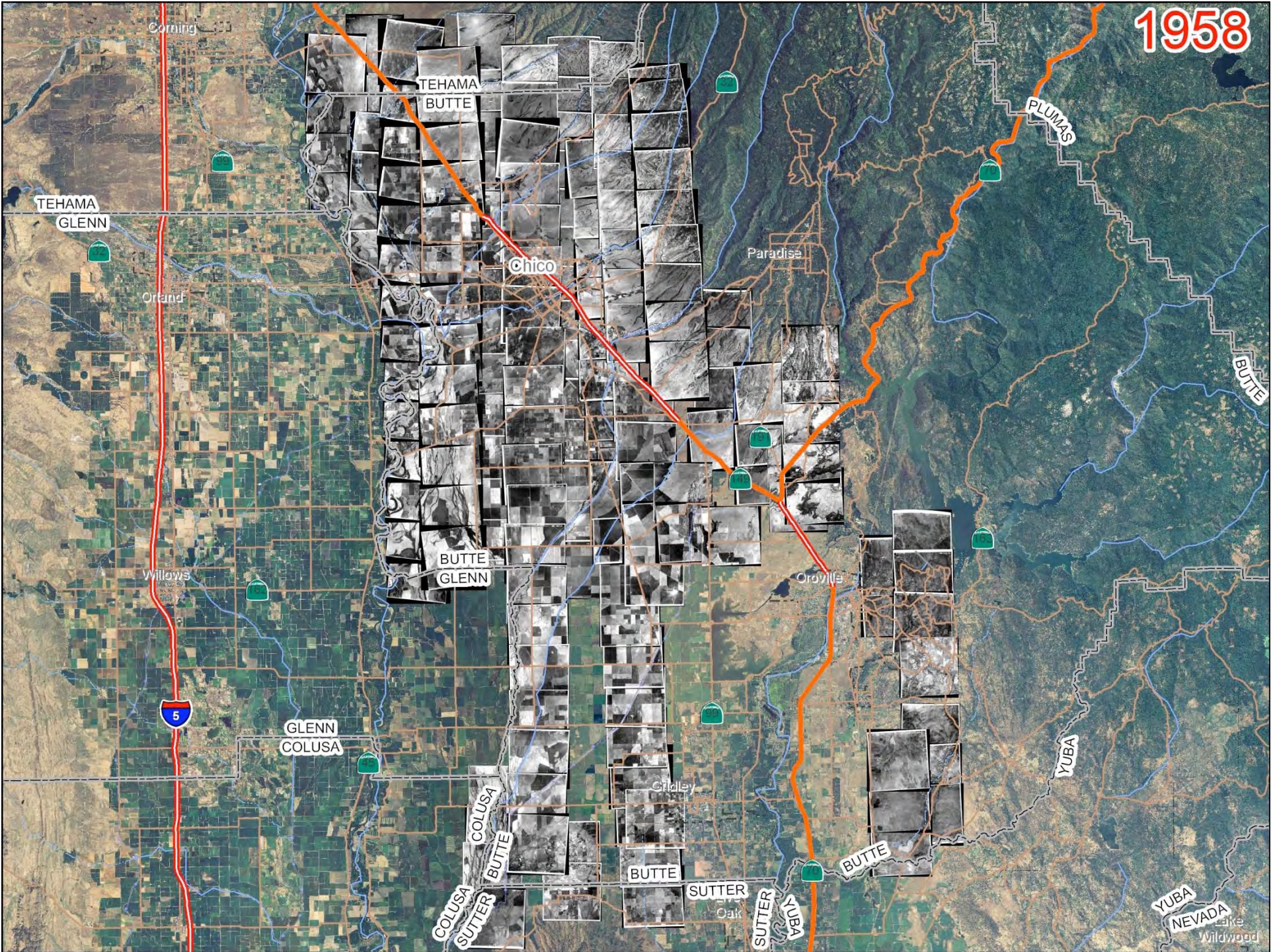


GLENN  
COLUSA

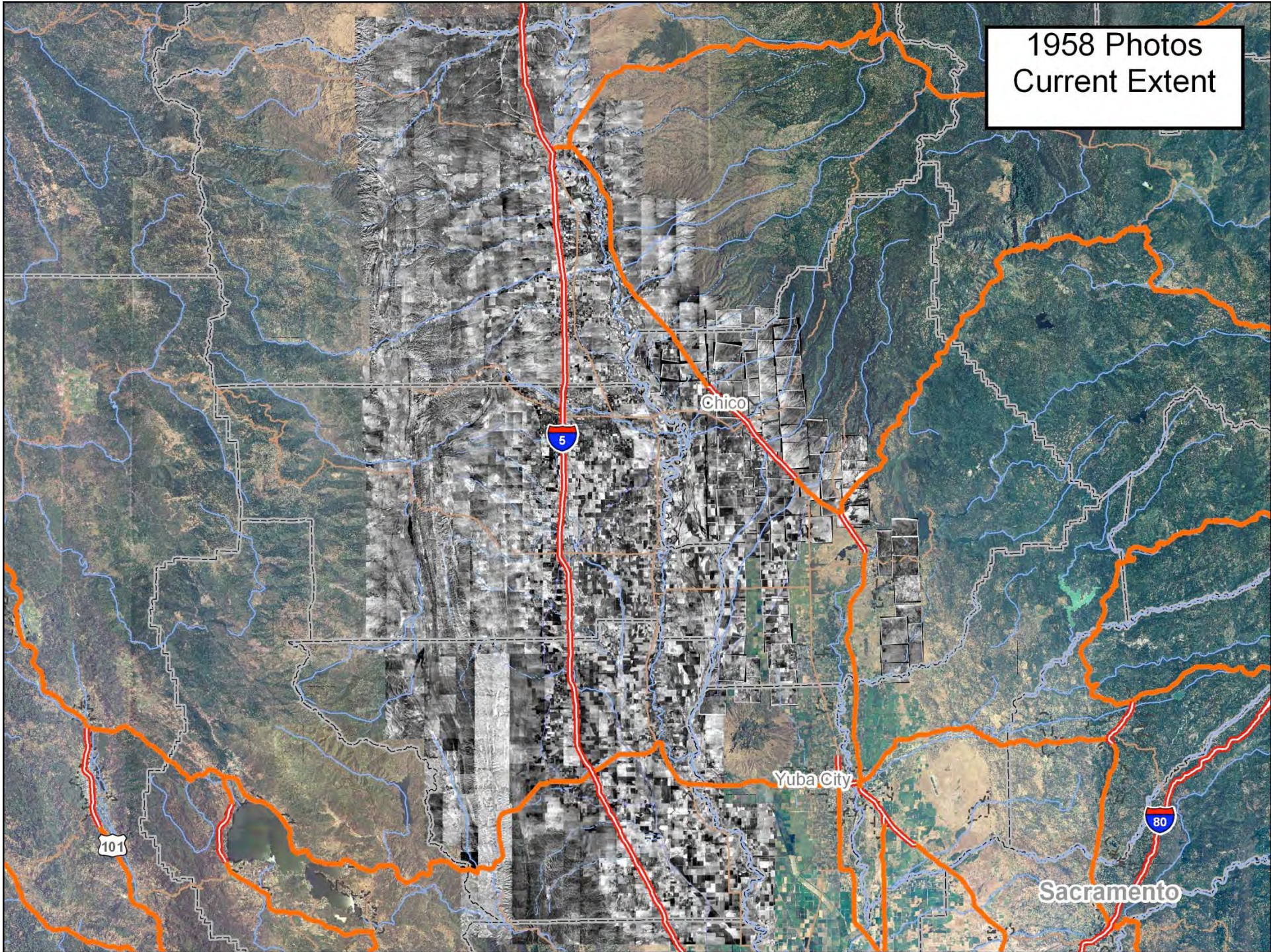
1958



1958



1958 Photos  
Current Extent



### NEWS

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- [Geospatial Revolution](#)
- [Location Privacy - Will Congress Decide?](#)
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- [Cal-Atlas Imagery Search](#)

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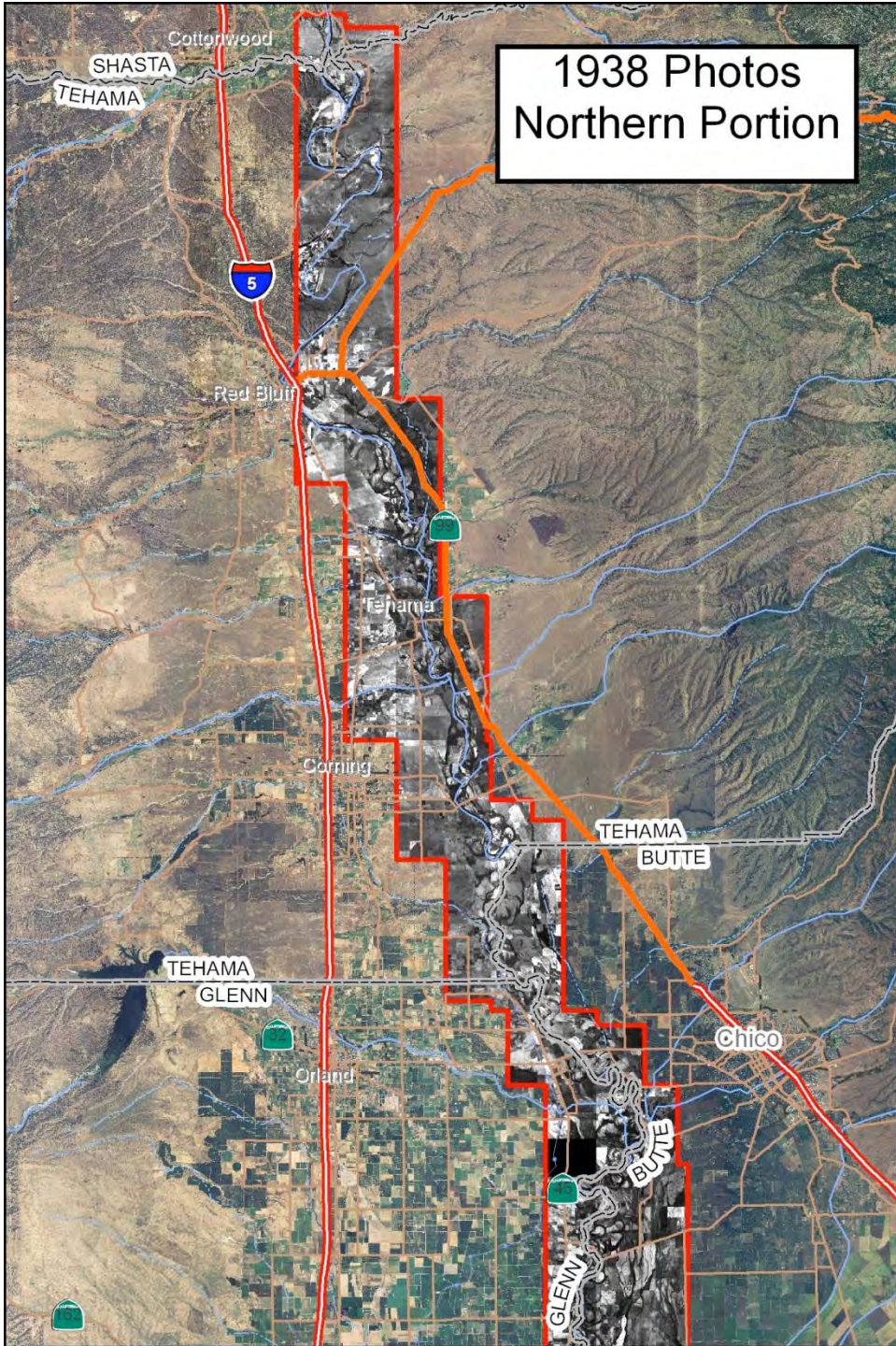
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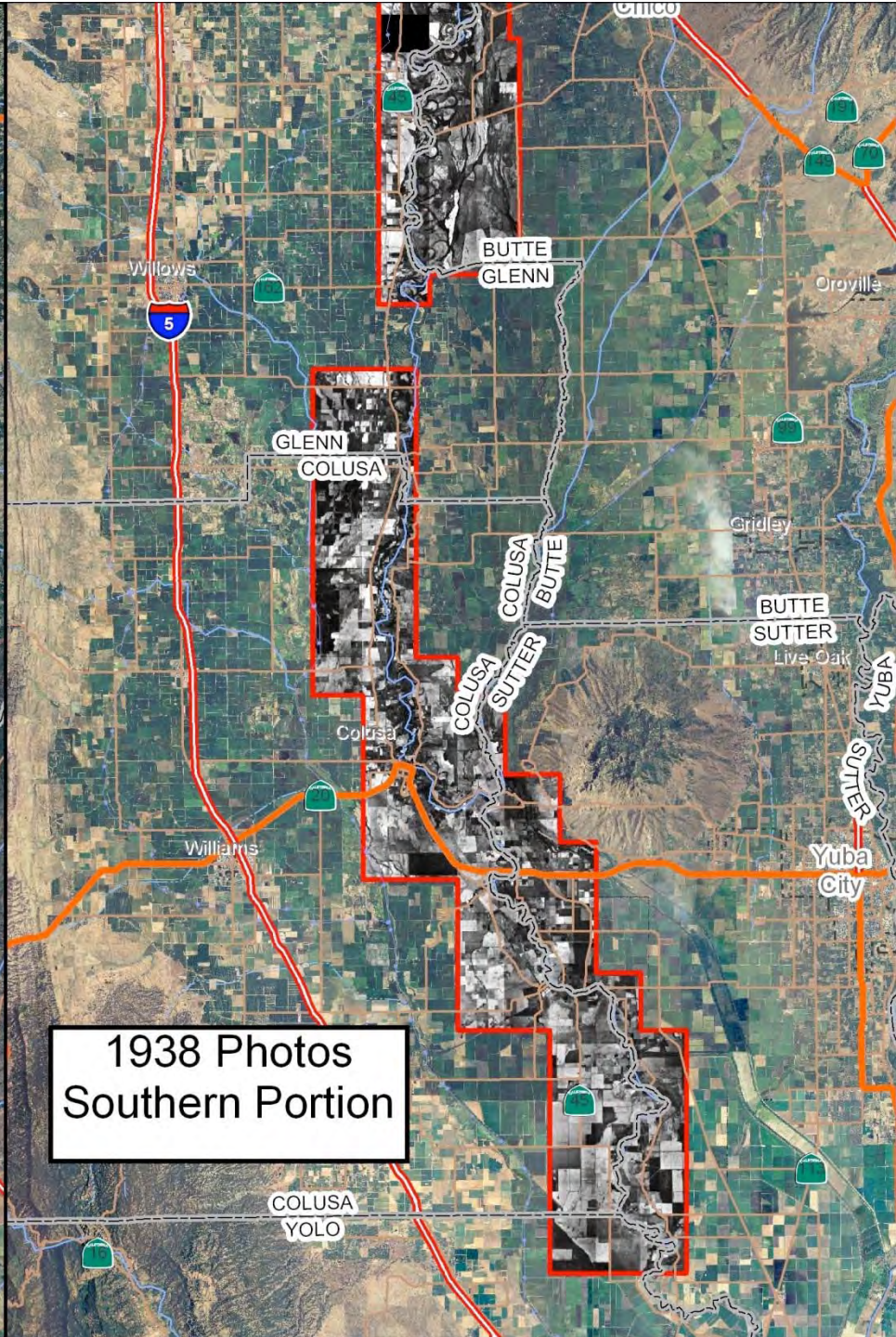
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[Link](#) [Options](#) [Imagery Search Tool](#) [Search Light](#) [Help](#)

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<a href="#">Glenn</a>		Directory	11-16-2009
<a href="#">Tehama</a>		Directory	12-3-2009



1938 Photos  
Northern Portion



1938 Photos  
Southern Portion



WAR DEPARTMENT.

# SACRAMENTO RIVER, CALIFORNIA FROM CISCO LANDING TO RED BLUFF.

Scale of Miles  
Scale of Feet

U.S. ENGINEER OFFICE, SAN FRANCISCO, CAL.

*Comd'g Engineer* *Assistant*

PLATE NO. 1011

CORPS OF ENGINEERS, U.S. ARMY

NOTE  
 This map was prepared by the U.S. Army Corps of Engineers, U.S. Army, under the direction of the Chief of Engineers, U.S. Army, and is published by the War Department, U.S. Army, as a public document. It is not to be used for any other purpose without the express permission of the Chief of Engineers, U.S. Army.

Scale of Miles  
 Scale of Feet

Published by the War Department, U.S. Army, at the U.S. Army Engineer Office, San Francisco, California, 1901.



## NOTES

Elevations are in feet above datum of Engineer Department U. S. Army; which is 3.6 feet below mean sea level as determined by the U. S. Coast and Geodetic Survey. This datum is approximately extreme low water at Collinsville and mean lower low water at Bencica.

Soundings are expressed in feet below the water surface; elevations of which at intervals are given. These represent the elevation of the water surface to which the soundings shown on the map were reduced.

Rectangular coordinates are shown thus.

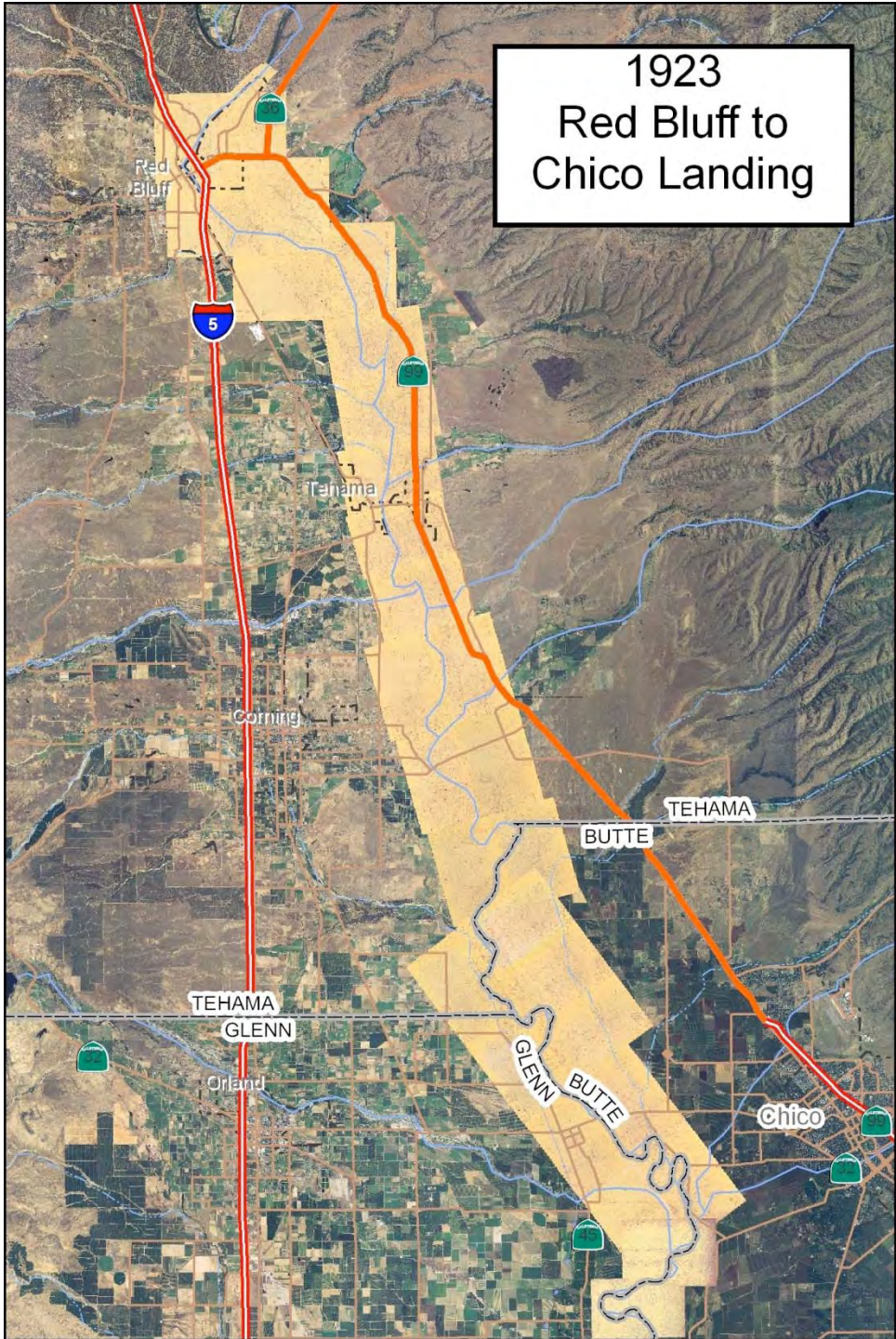
412,000 N.

The axes of the coordinates are the meridian of longitude  $121^{\circ} 34'$  and the arc of a great circle at right angles to that meridian at latitude  $38^{\circ} 40'$ ; the whole area covered by the system having been treated as a plane surface.

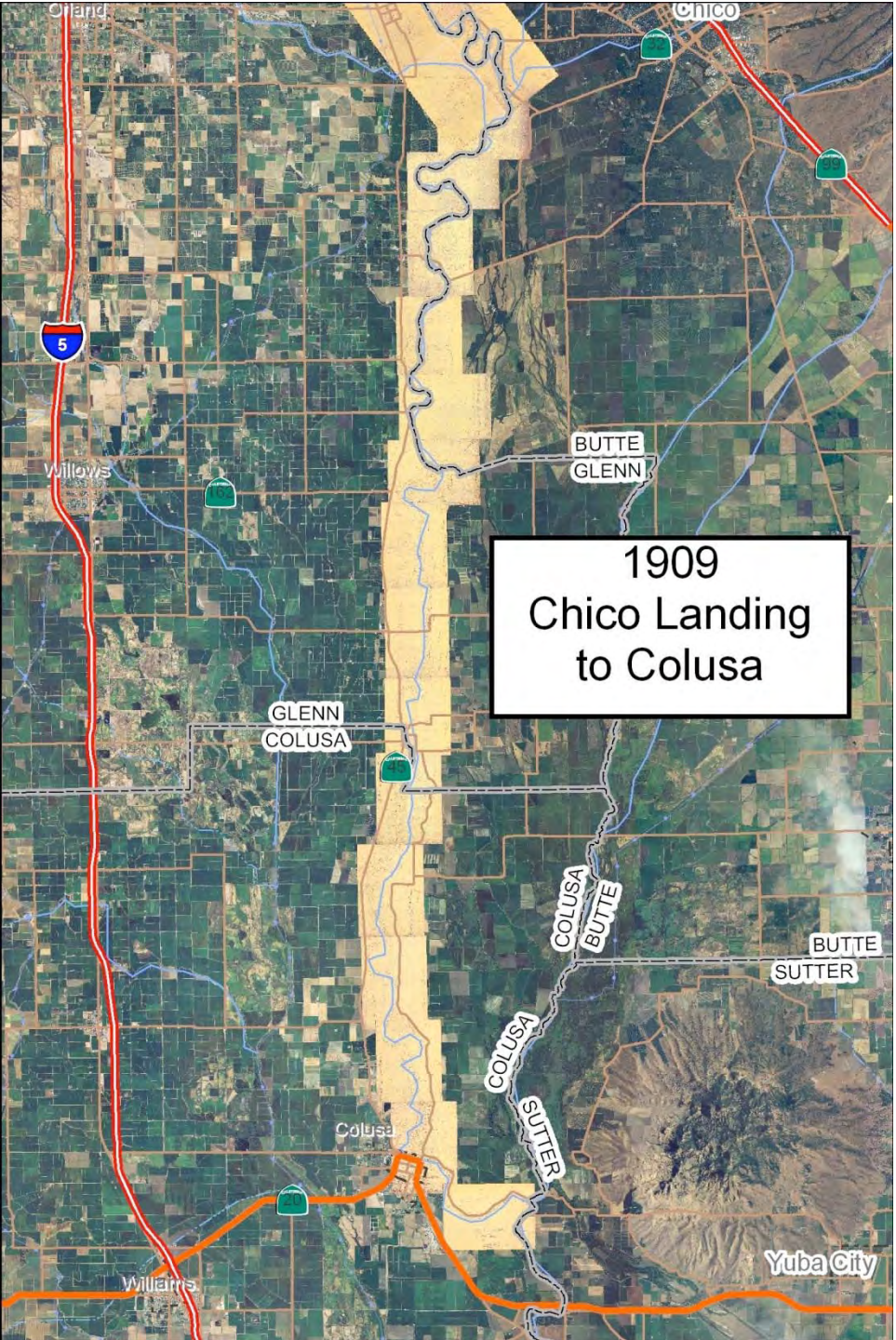
Bench marks are indicated thus.  $\odot$  Those lettered on the map (U. S. E. D. B. M. No.—Elev.—) are 3 inch galvanized pipes with brass caps so marked and set in concrete. Those lettered on the map (U. S. G. S. B. M. No.—Elev.—) have caps marked United States Geological Survey and are the standard iron post B. M's. of that Survey. They all serve as reference points for elevations and positions.

Property lines; unfenced ———— Fences x—x—x—x—x—x—x—  
Traverse lines; chained —○—○—○—○—○—○—○—  
County lines ————— Railroads ++++++  
Township and Range lines ————— Section lines ————

444,000 W.



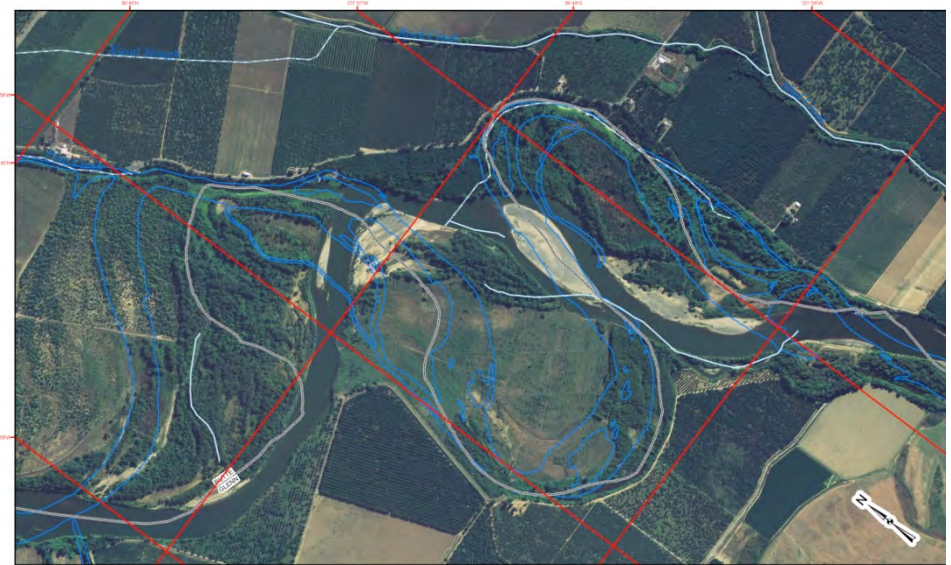
1923  
Red Bluff to  
Chico Landing



1909  
Chico Landing  
to Colusa

# Sacramento River (circa 1923) From Red Bluff to Chico Landing U.S. Army Corps of Engineers Map Base

By Jonathan Mulder  
Certified Engineering Geologist #1352  
California Department of Water Resources  
Northern Region  
Red Bluff, California  
February, 2009



- [Location Policy vsm Congress Decide?](#)
- [How to Build a Spatial Law and Policy Community?](#)
- [More...](#)

**APPLICATIONS**

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- [CEIC](#)
- [CMLUCA](#)
- [Cal-Atlas Imagery Search](#)

**ORGANIZATIONS**

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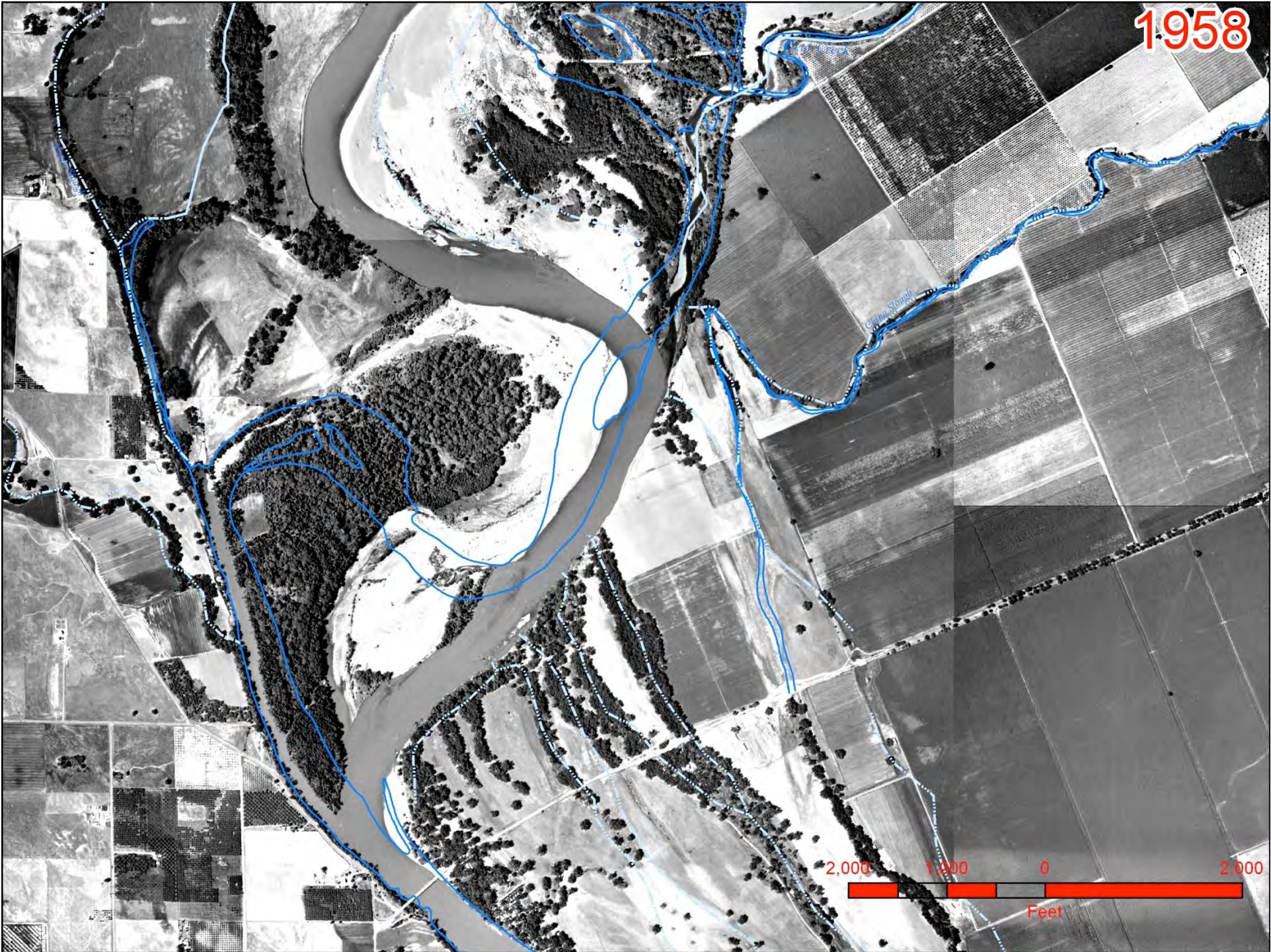
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- [Cal-Atlas Downloads](#)
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**SACRIVERMAPS**

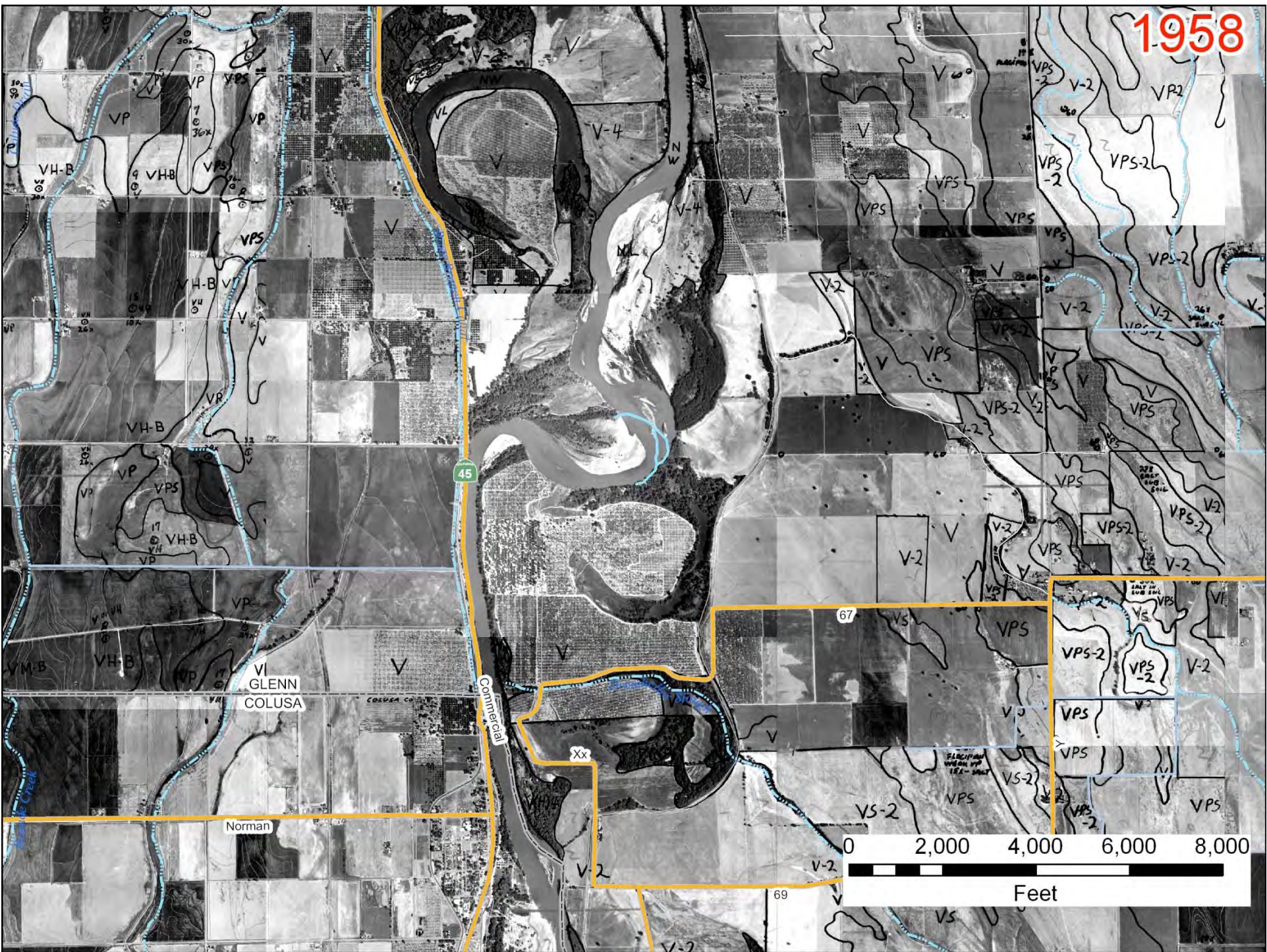
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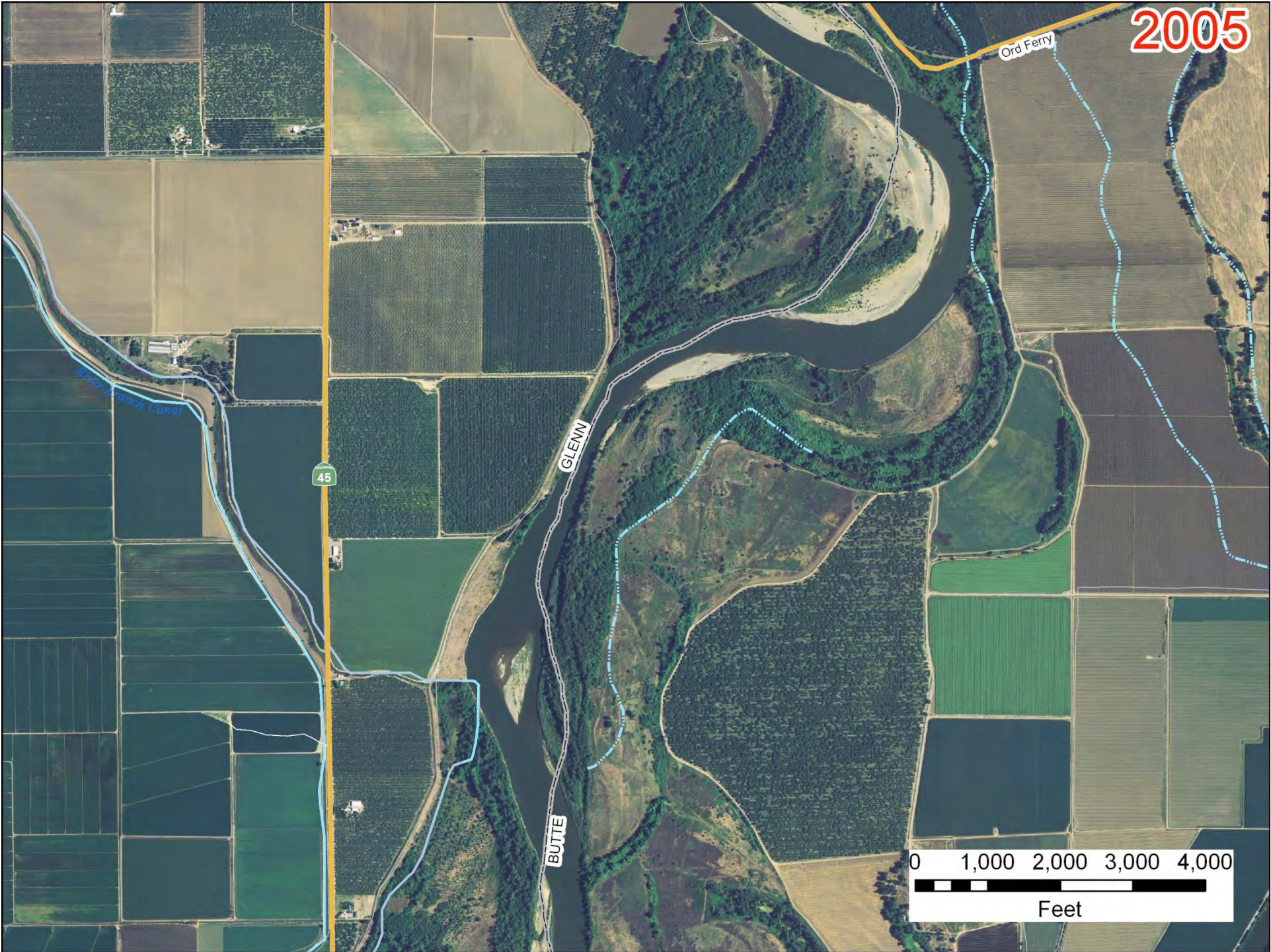
1958



1958



2005



45

GLENN

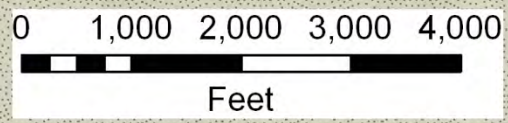
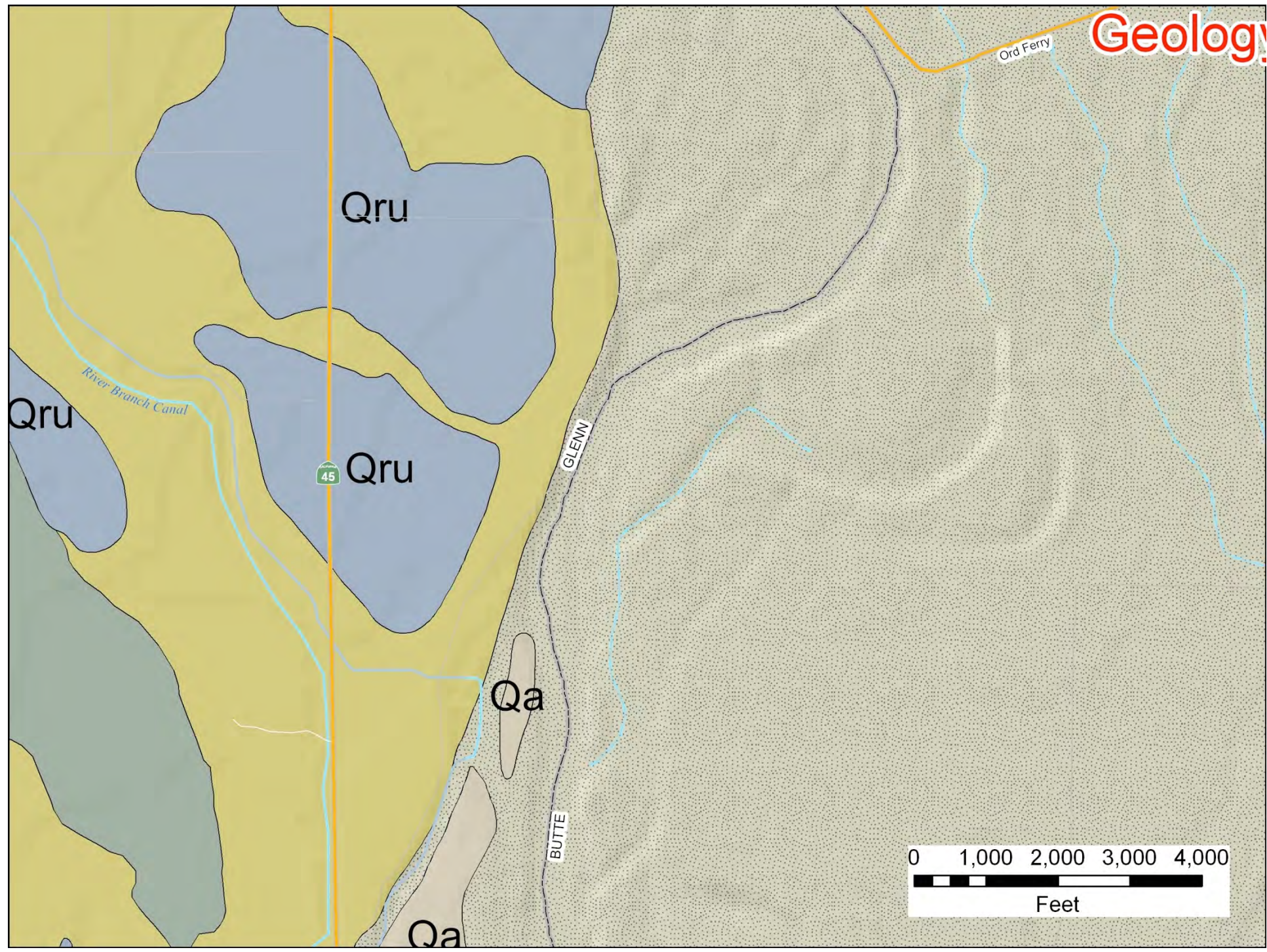
BUTTE

Ord Ferry

0 1,000 2,000 3,000 4,000

Feet





# Next Steps...

Complete 1958 coverage for Butte County

Move on down the Sacramento Valley:

Sutter County

Yuba County

Placer County

Yolo County

Sacramento County

Solano County

# Next Steps (continued)...

Geo-reference legacy mapping for Sacramento River

1890's Map Sheets

1930's Map Sheets

1940's Map Sheets

Continue 1938 rectification after completion of 1958 imagery

\$\$\$

*A tool for  
intelligent resource management  
and land-use development.*



*Thank you!*

Jonathan Mulder

Mulder@water.ca.gov



# Legacy Data: Bringing It Into The 21<sup>st</sup> Century

By Jonathan Mulder  
Engineering Geologist, C.E.G. #1352  
Groundwater and Geological Investigations Unit  
Northern Regional Office  
Department of Water Resources



1958 – Aerial Photo Surveys of agricultural areas throughout California

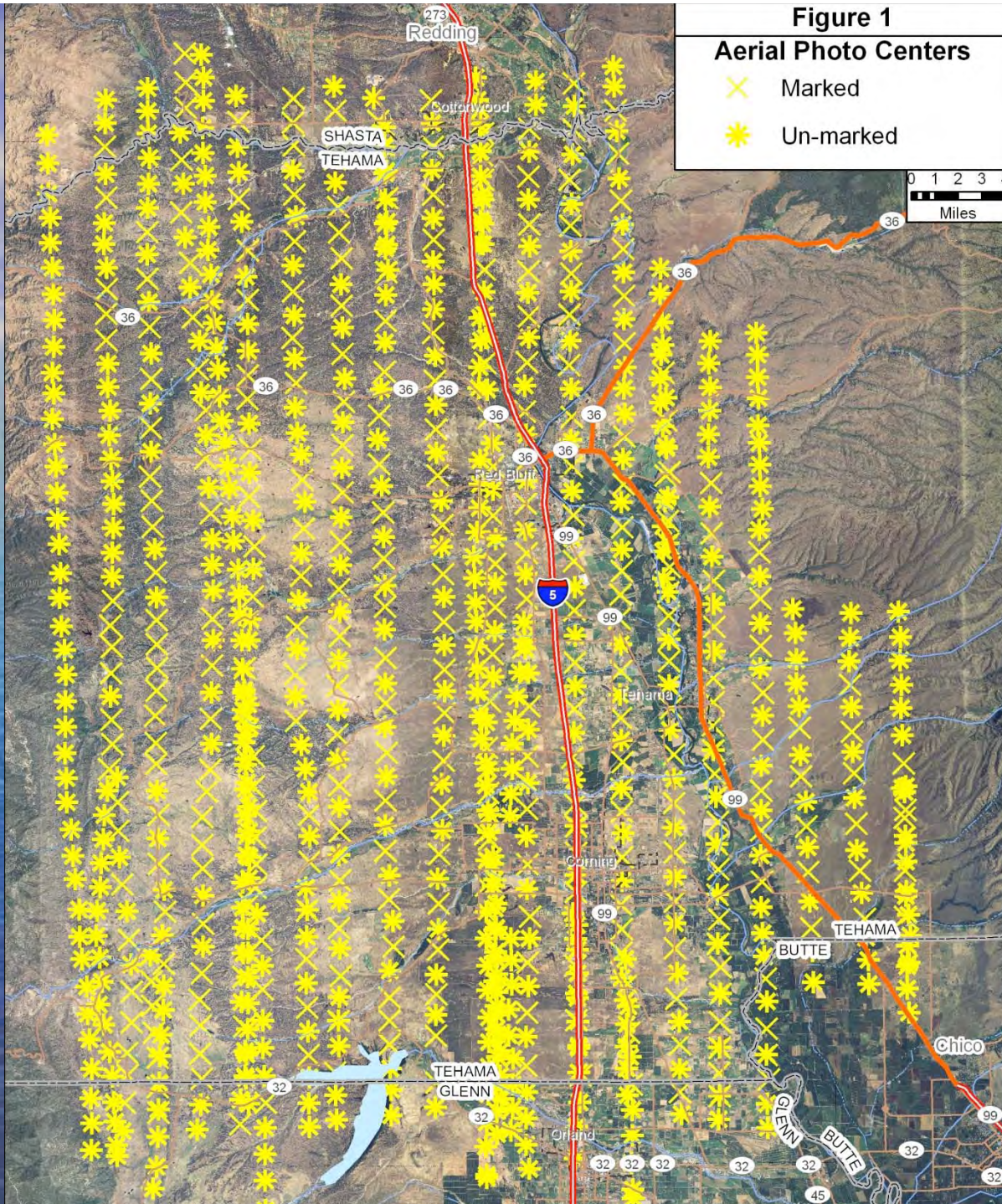
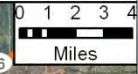


By Farm Services Agency (FSA) of United States Department of Agriculture (USDA)

Figure 1

Aerial Photo Centers

- ✕ Marked
- ✱ Un-marked



**Figure 2**  
**Geo-Referenced**  
**Aerial Photos**

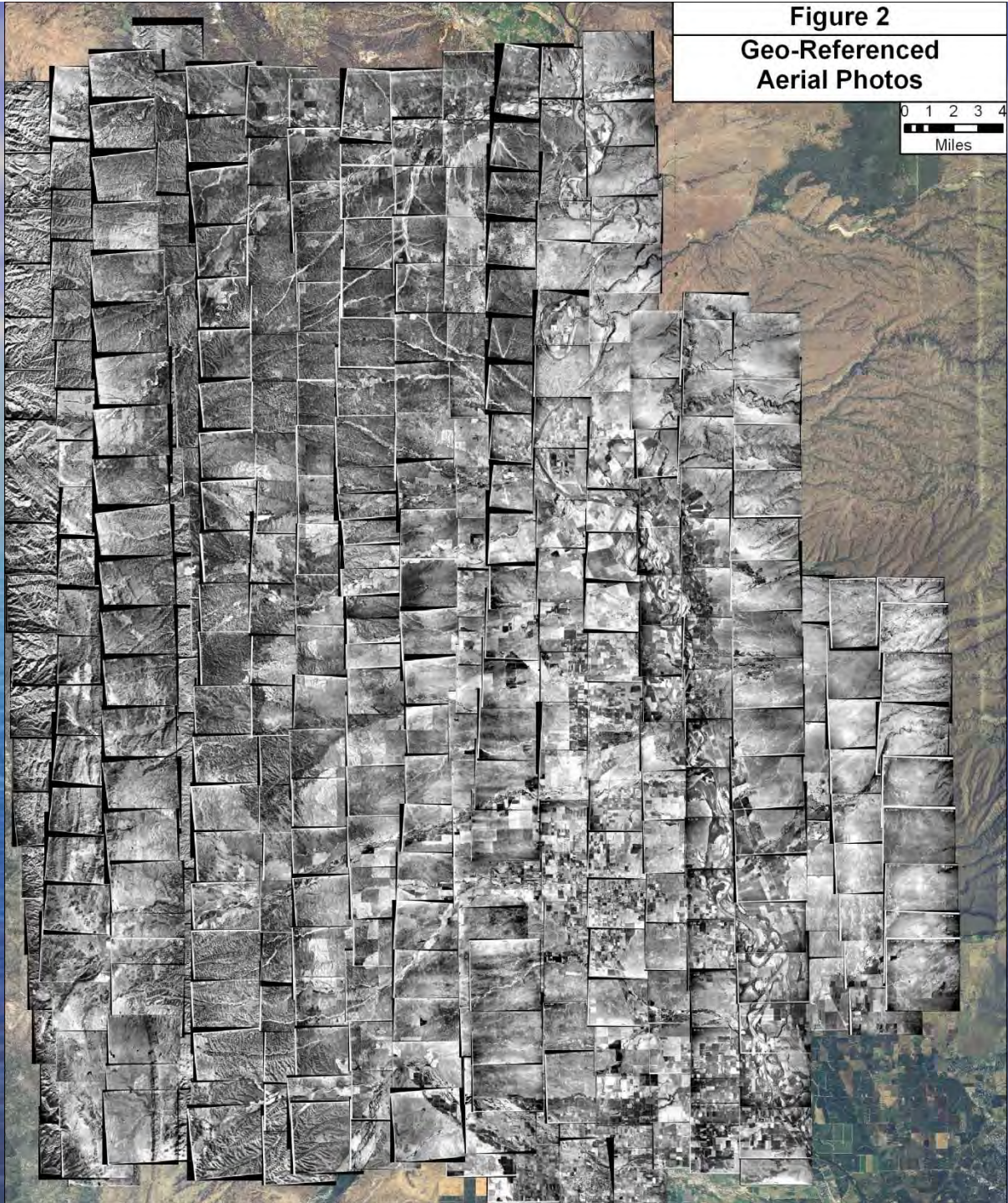
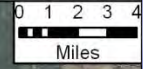


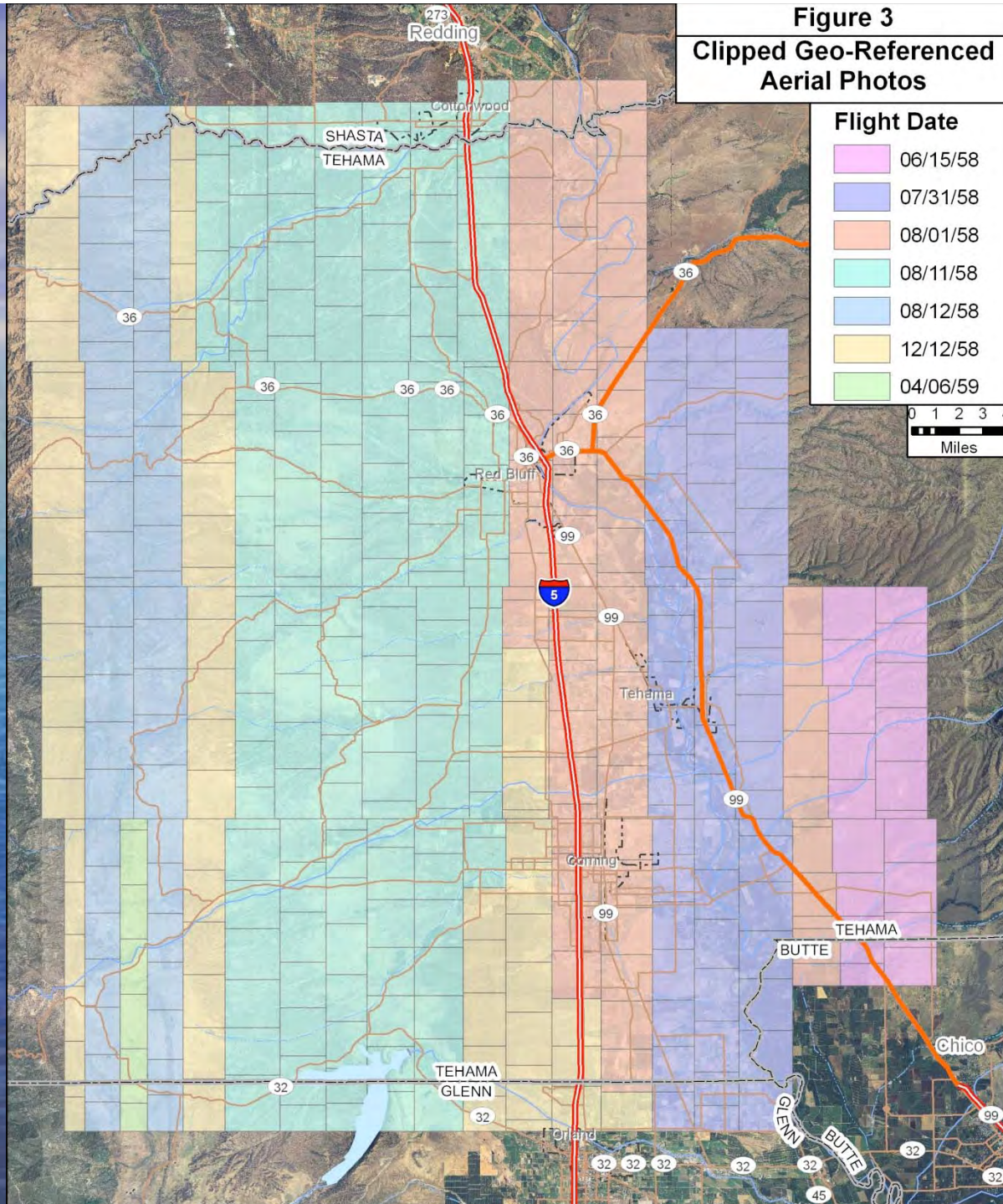
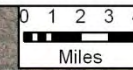


Figure 3

Clipped Geo-Referenced  
Aerial Photos

Flight Date

- 06/15/58
- 07/31/58
- 08/01/58
- 08/11/58
- 08/12/58
- 12/12/58
- 04/06/59



**Figure 4**

1958 DOQQ Imagery  
80 Complete DOQQ Coverages  
42 Partial DOQQ Coverages

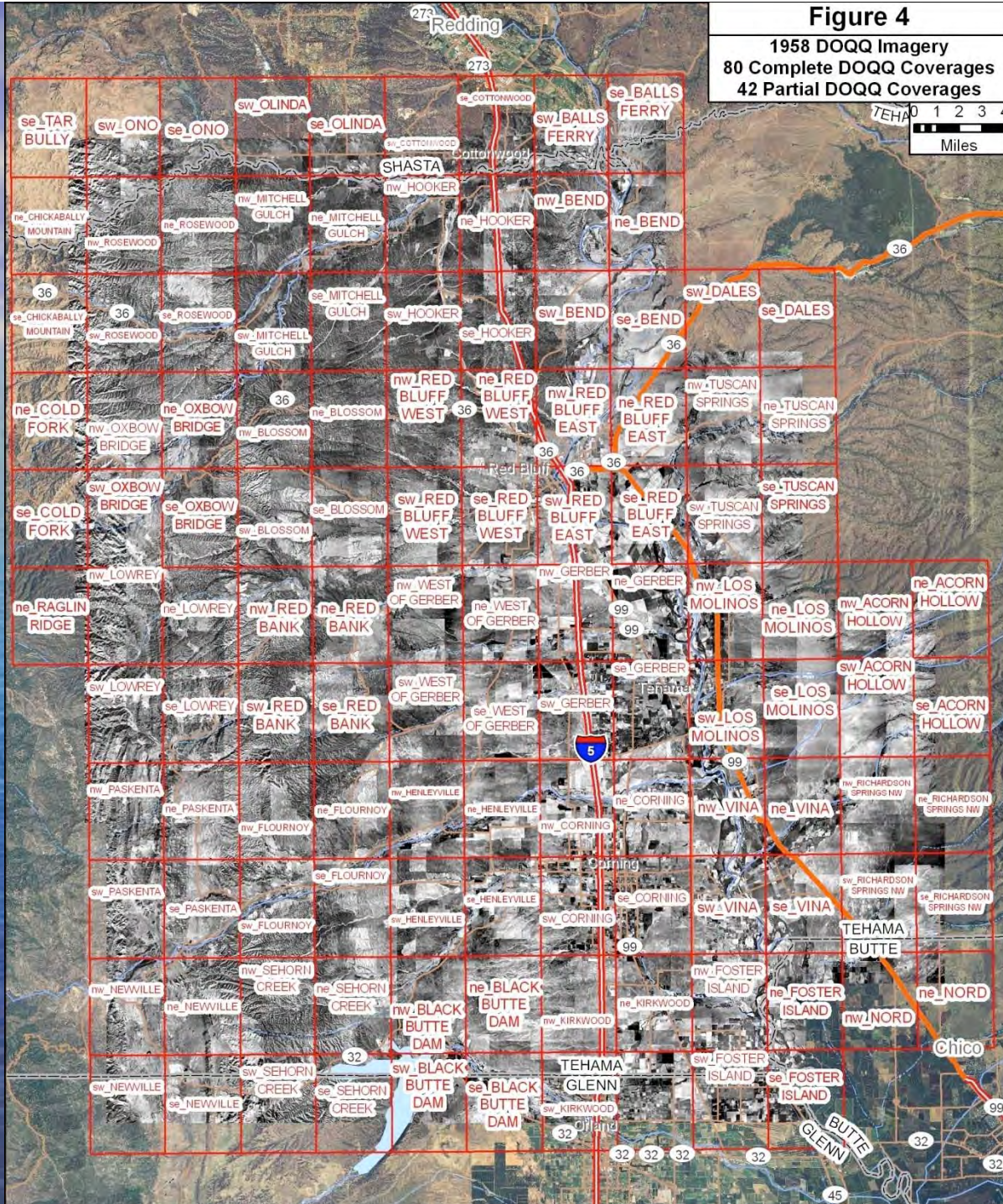
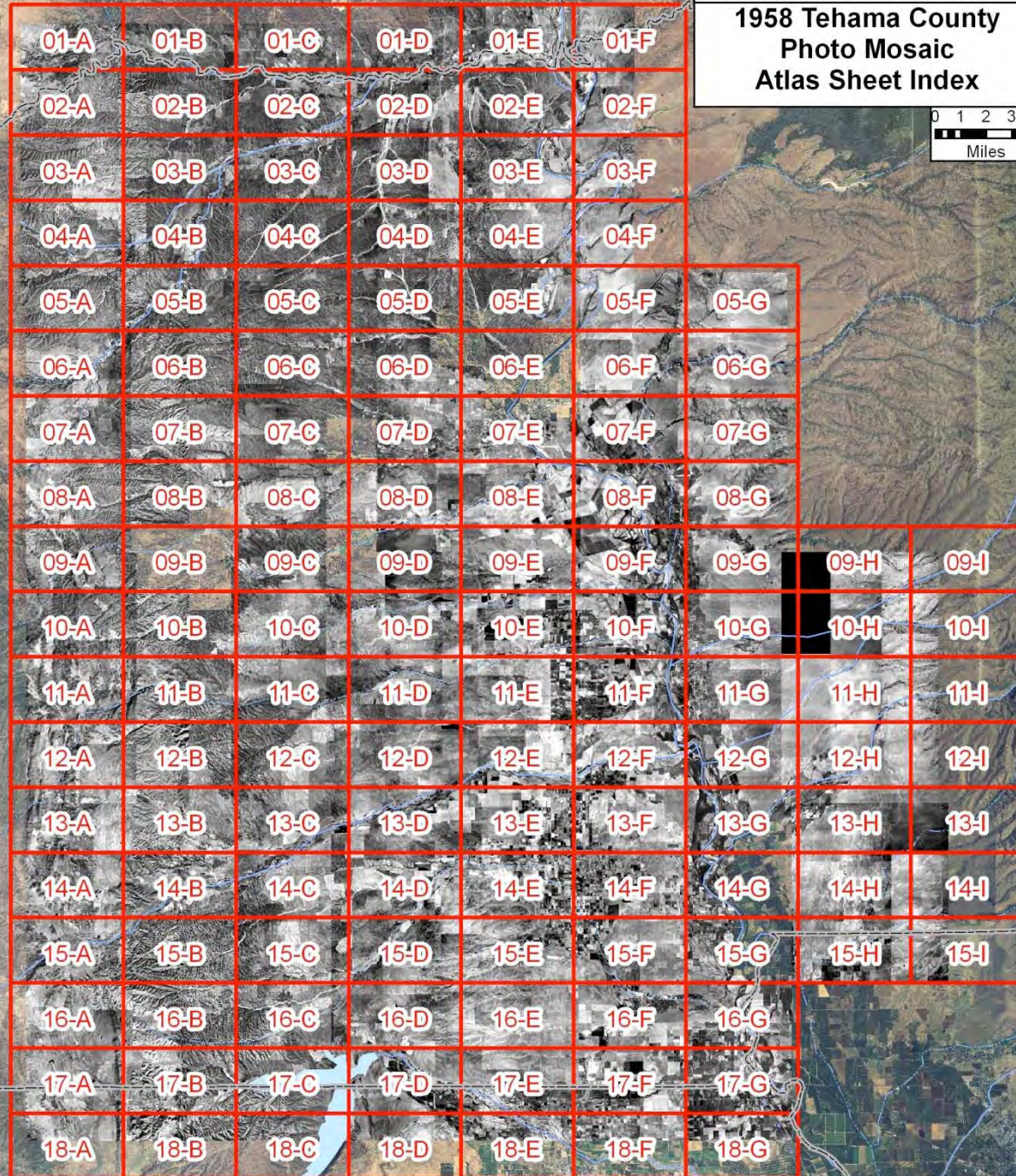


Figure 5

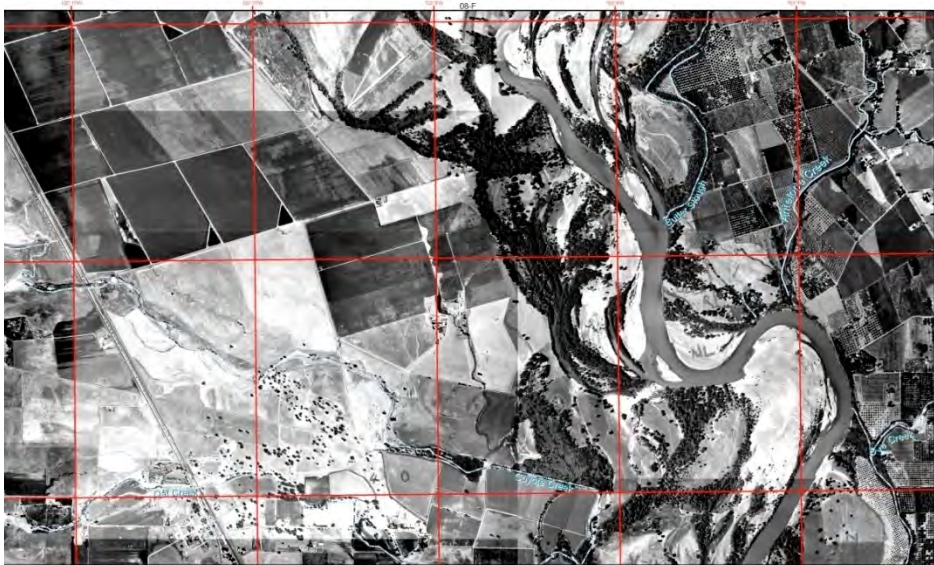
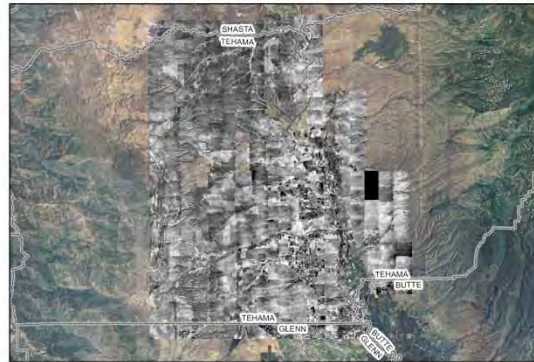
1958 Tehama County  
Photo Mosaic  
Atlas Sheet Index



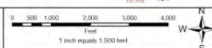


# 1958 Aerial Photo Mosaic Of Tehama County, California

By Jonathan Mulder  
 Certified Engineering Geologist #1352  
 California Department of Water Resources  
 Northern Region  
 Red Bluff, California  
 February, 2009



Sheet # 1958 Aerial Photo Mosaic Of Tehama County, California 09-F



Background Imagery  
 [1] 1958 Black & White (FSA, USDA)  
 [2] 2005 Color (NAIP, USDA)  
 Water Features: ESRI StreetMaps

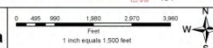
This Map created by  
 Jonathan Mulder  
 Certified Engineering Geologist #1352  
 California Department of Water Resources  
 Northern Region  
 Red Bluff, California



Sheet # 09-F



Sheet # 1958 Aerial Photo Mosaic Of Tehama County, California 09-F



Background Imagery  
 [1] 1958 Black & White (FSA, USDA)  
 [2] 2005 Color (NAIP, USDA)  
 Water Features: ESRI StreetMaps

This Map created by  
 Jonathan Mulder  
 Certified Engineering Geologist #1352  
 California Department of Water Resources  
 Northern Region  
 Red Bluff, California



Sheet # 09-F

**NEWS**

- [Update: Google Maps News RoundUp](#)
- [Google Real Estate Search - Now in U.S.](#)
- [Census Bureau Maps Its Challenges for 2010](#)
- [California's Selection of GIS as a Key Enterprise IT Strategy Featured in ArcNews](#)
- [Governor Schwarzenegger Praises Takai, GIS at Oracle OpenWorld](#)

[More...](#)

**APPLICATIONS**

- [GeoFinder](#)
- [CEIC](#)
- [CMLUCA](#)

**ORGANIZATIONS**

- [CGIA](#)
- [GIS Council](#)
- [USGS](#)
- [FGDC](#)

**RELATED LINKS**

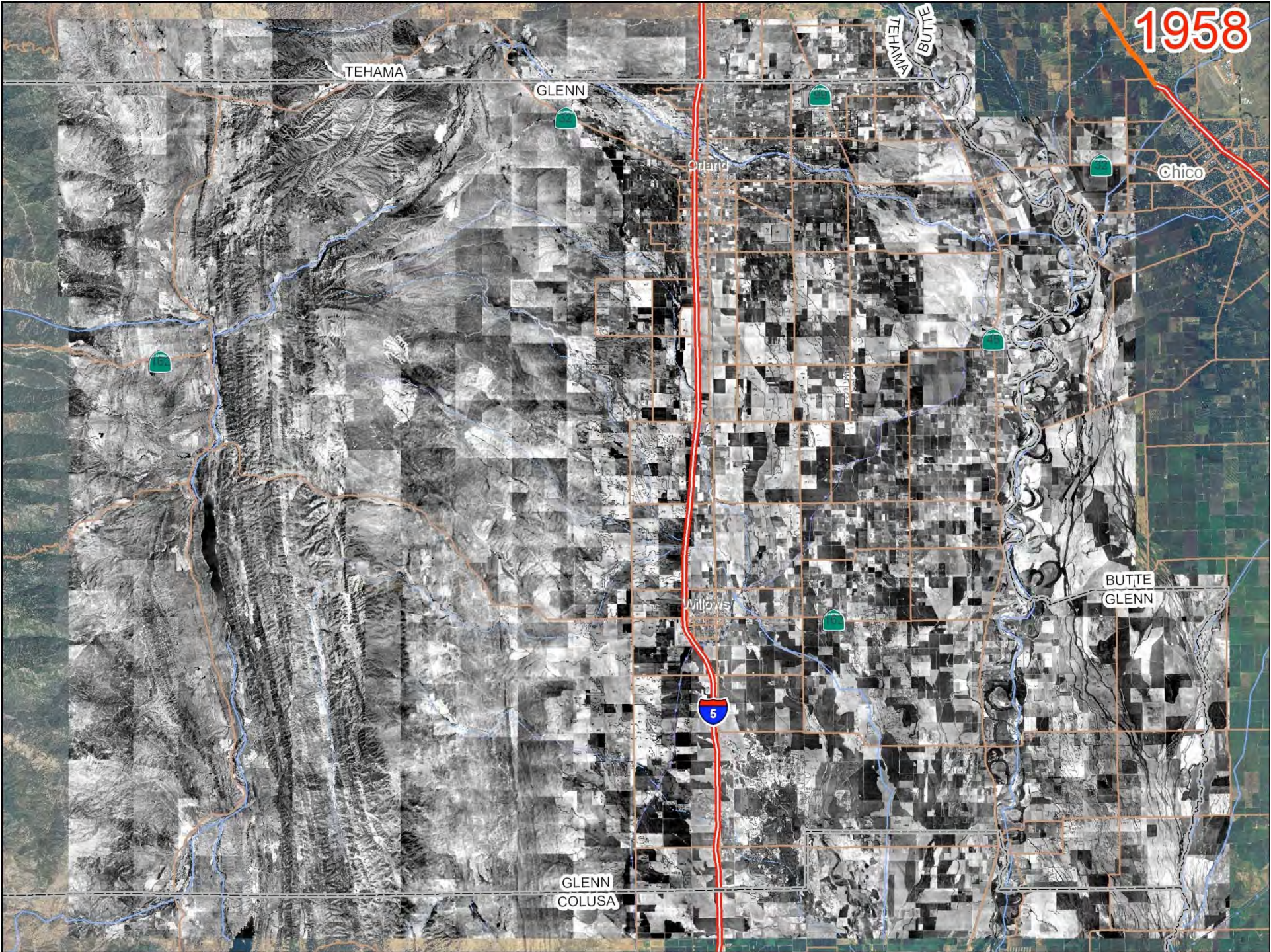
The California Spatial Information Library

**Categories » imageryBaseMapsLandCover » imagery » photos1958 » Tehama**

Link
  Options
  Imagery Search Tool
  Search Light
  Help

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1958



TEHAMA

GLENN

TEHAMA  
BUTTE

Orland

Chico

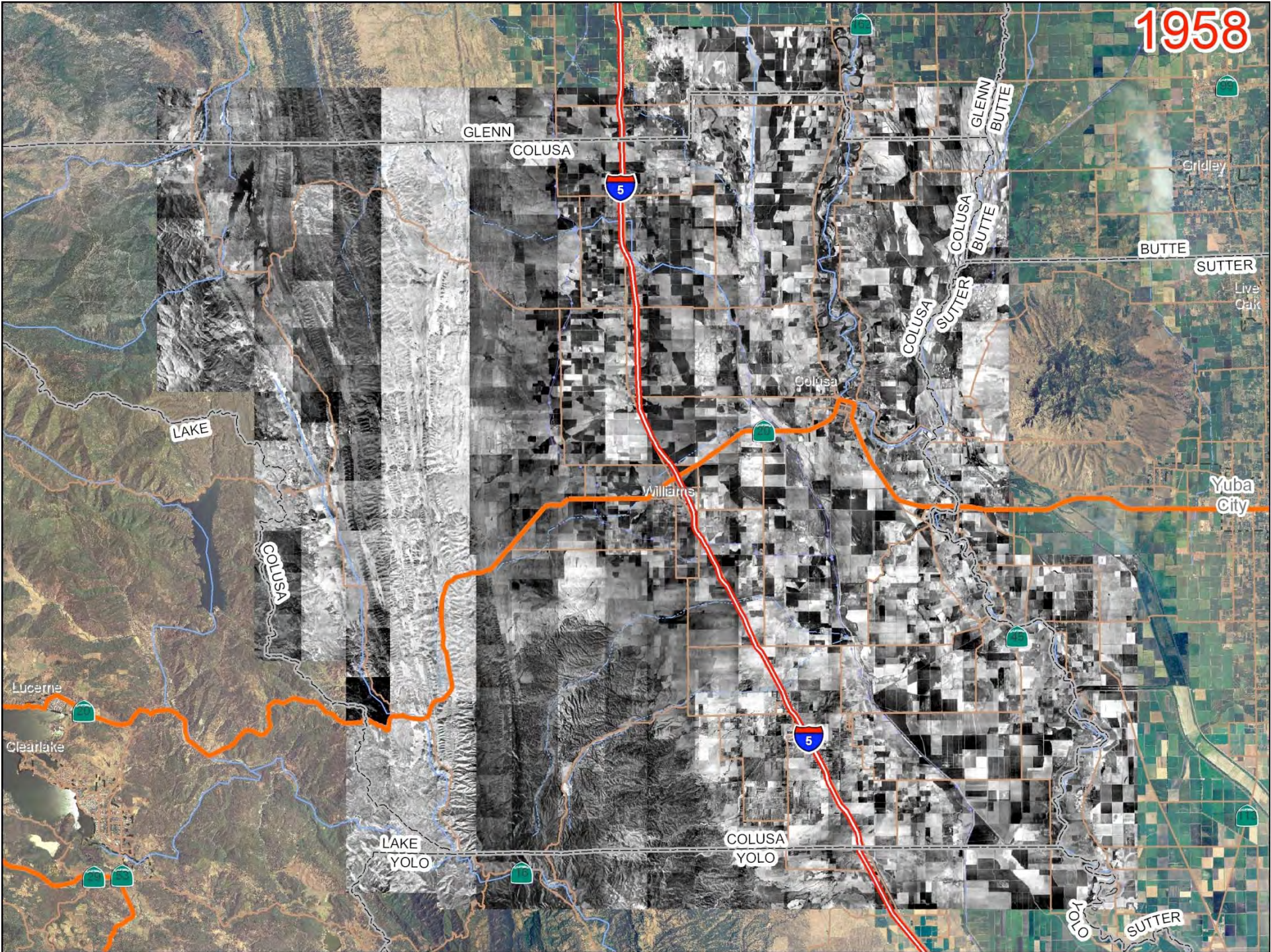
Willows

BUTTE  
GLENN

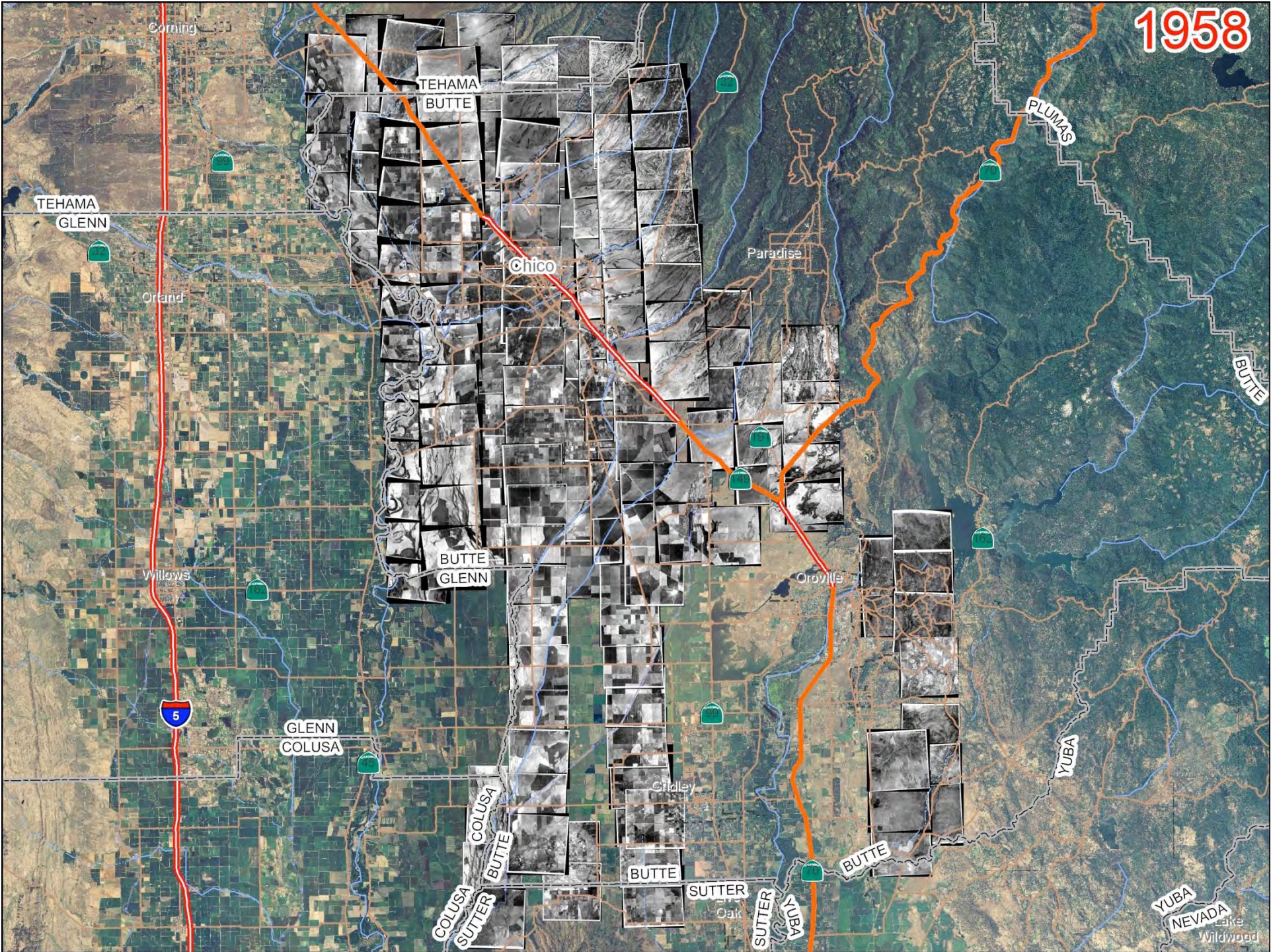


GLENN  
COLUSA

1958



1958



TEHAMA  
GLENN

TEHAMA  
BUTTE

PLUMAS

Chico

Paradise

BUTTE

BUTTE  
GLENN

Orville

5

GLENN  
COLUSA

COLUSA  
BUTTE

Citale

YUBA

BUTTE

SUTTER  
Oak

BUTTE

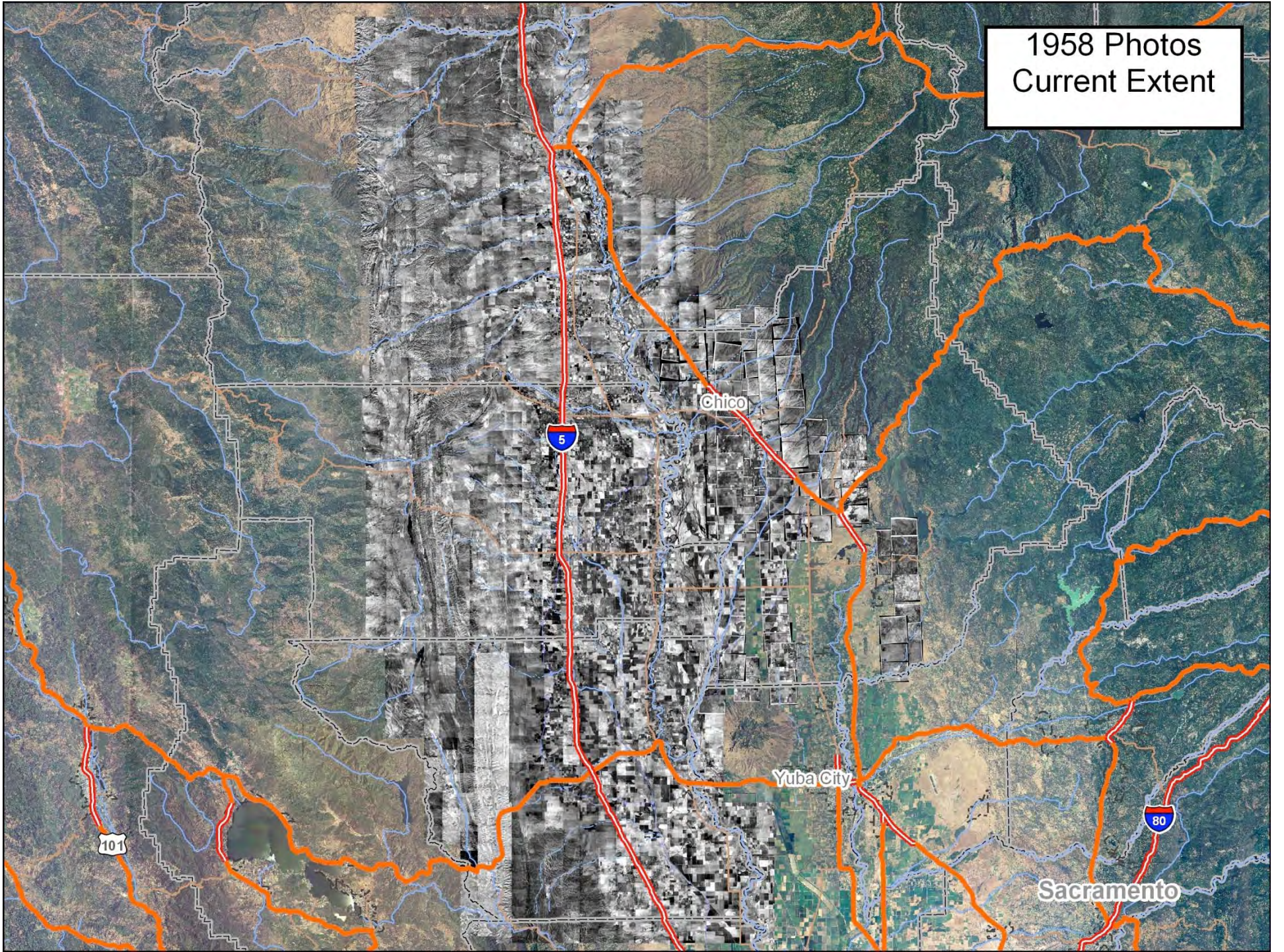
COLUSA  
SUTTER

SUTTER  
YUBA

YUBA  
NEVADA  
Wildwood



1958 Photos  
Current Extent



### NEWS

- [Jack Dangermond on "Spatial Analysis and the Geoweb"](#)
- [New Survey on GIS Use in Public Works in US and Canada](#)
- [Geospatial Revolution](#)
- [Location Privacy - Will Congress Decide?](#)
- [How to Build a Spatial Law and Policy Community?](#)

[More...](#)



### APPLICATIONS

- [GeoFinder](#)
- [CEIC](#)
- [CMLUCA](#)
- [Cal-Atlas Imagery Search](#)

### ORGANIZATIONS

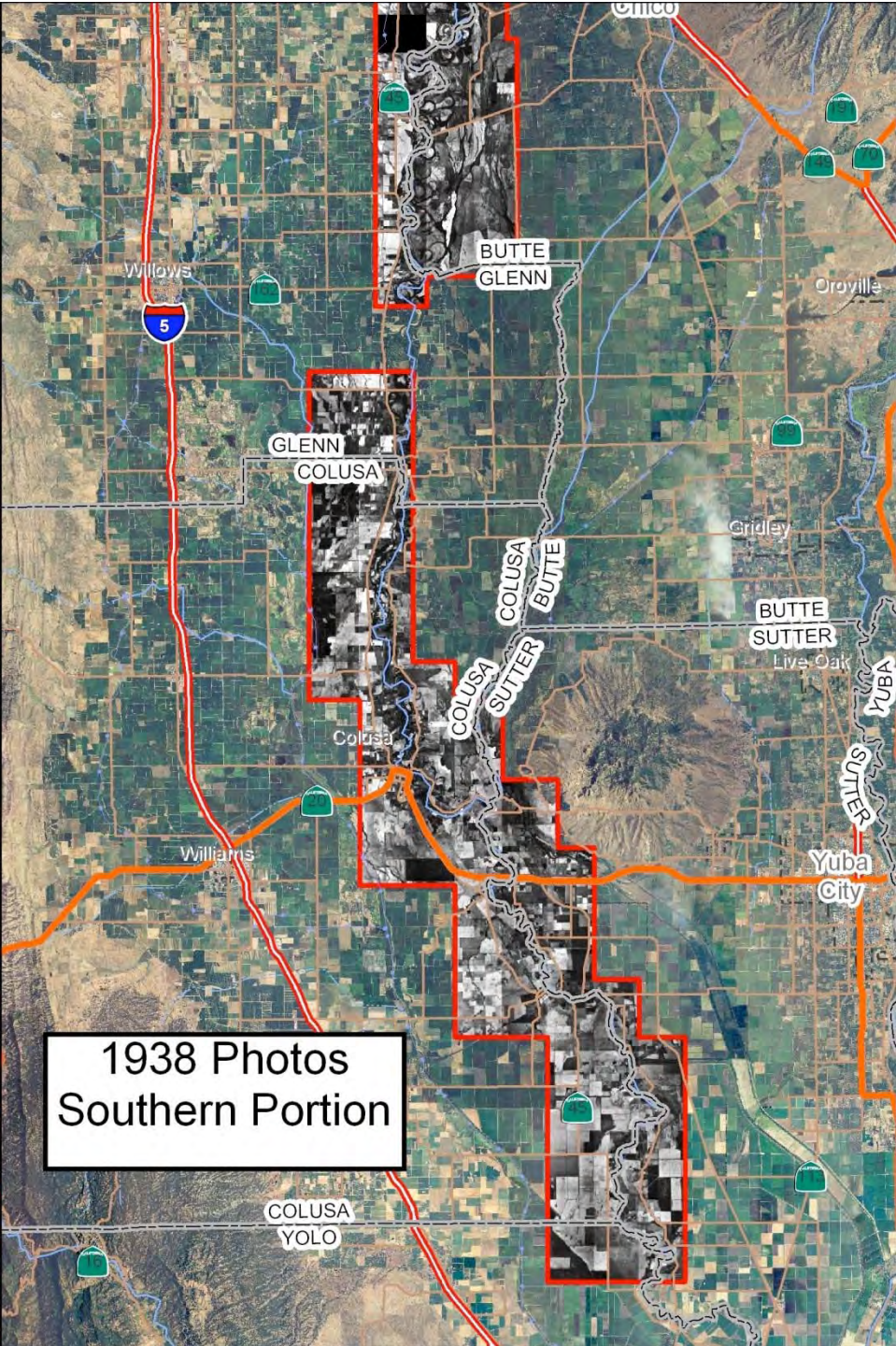
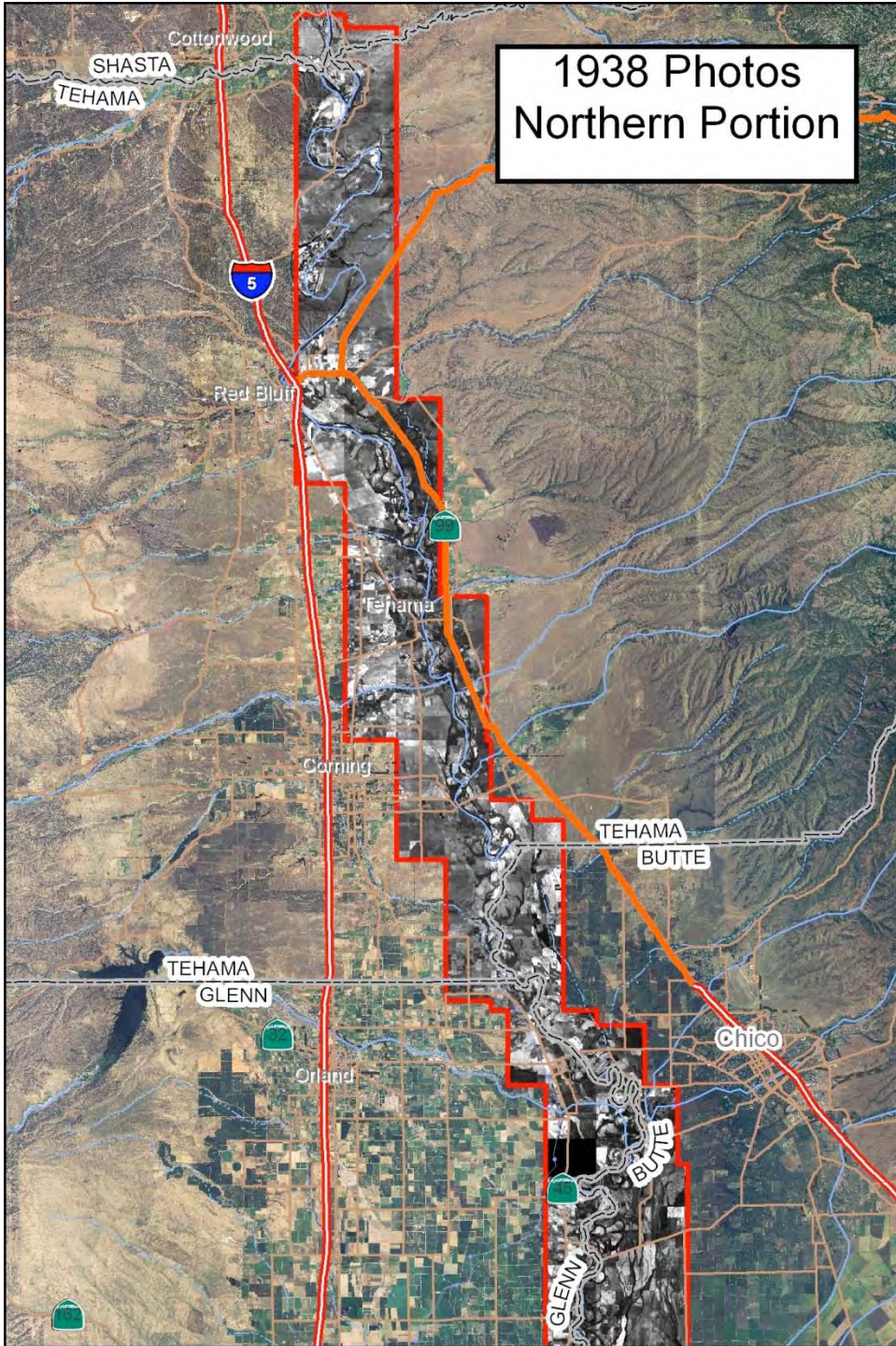
- [CGIA](#)
- [GIS Council](#)
- [USGS](#)
- [FGDC](#)

### RELATED LINKS

Categories » [imageryBaseMapsLandCover](#) » [imagery](#) » [photos1958](#)

[Link](#) [Options](#) [Imagery Search Tool](#) [Search Light](#) [Help](#)

Filename	Info	Size	Last Modified
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Glenn		Directory	11-16-2009
Tehama		Directory	12-3-2009



WAR DEPARTMENT.

### SACRAMENTO RIVER, CALIFORNIA FROM CISCO LANDING TO RED BLUFF.

Scale of Miles  
Scale of Feet

U.S. ENGINEER OFFICE, SAN FRANCISCO, CAL.

*Comd. G. Stanley*  
*Major*

*W. H. H. H.*  
*Major*

Scale of Feet  
FILE NO. 3475 1882

CORPS OF ENGINEERS, U.S. ARMY

**NOTES**  
 1. This map was prepared from the original topographic map of the Sacramento River, California, from Cisco Landing to Red Bluff, by the U.S. Engineer Office, San Francisco, California, in 1882. It is a reproduction of the original map, and is not a new survey.  
 2. The map is a reproduction of the original map, and is not a new survey. It is a reproduction of the original map, and is not a new survey.  
 3. The map is a reproduction of the original map, and is not a new survey. It is a reproduction of the original map, and is not a new survey.  
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 10. The map is a reproduction of the original map, and is not a new survey. It is a reproduction of the original map, and is not a new survey.



## NOTES

Elevations are in feet above datum of Engineer Department U. S. Army; which is 3.6 feet below mean sea level as determined by the U. S. Coast and Geodetic Survey. This datum is approximately extreme low water at Collinsville and mean lower low water at Bencica.

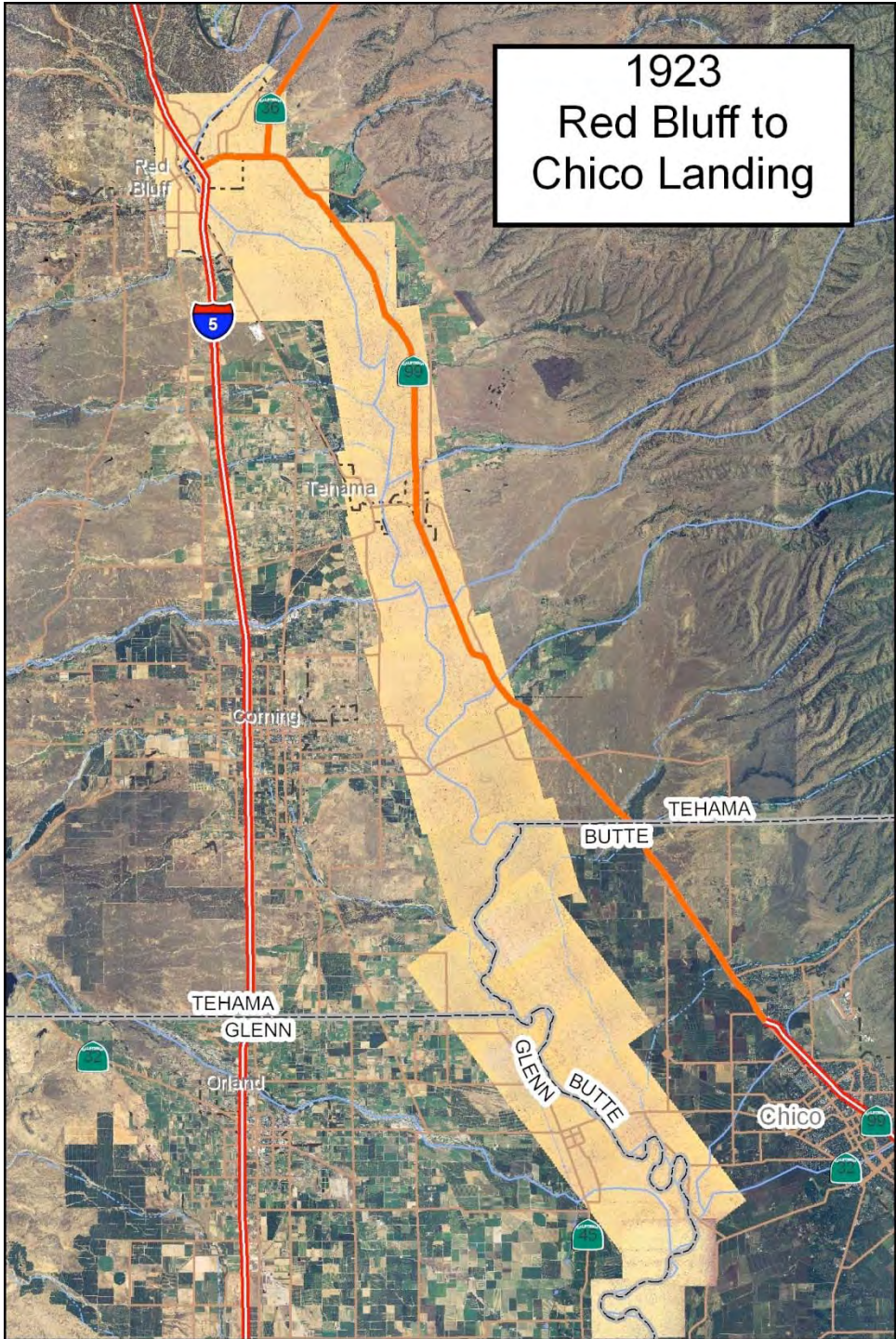
Soundings are expressed in feet below the water surface; elevations of which at intervals are given. These represent the elevation of the water surface to which the soundings shown on the map were reduced.

Rectangular coordinates are shown thus. *412,000 N.*  
The axes of the coordinates are the meridian of longitude  $121^{\circ} 34'$  and the arc of a great circle at right angles to that meridian at latitude  $38^{\circ} 40'$ ; the whole area covered by the system having been treated as a plane surface.

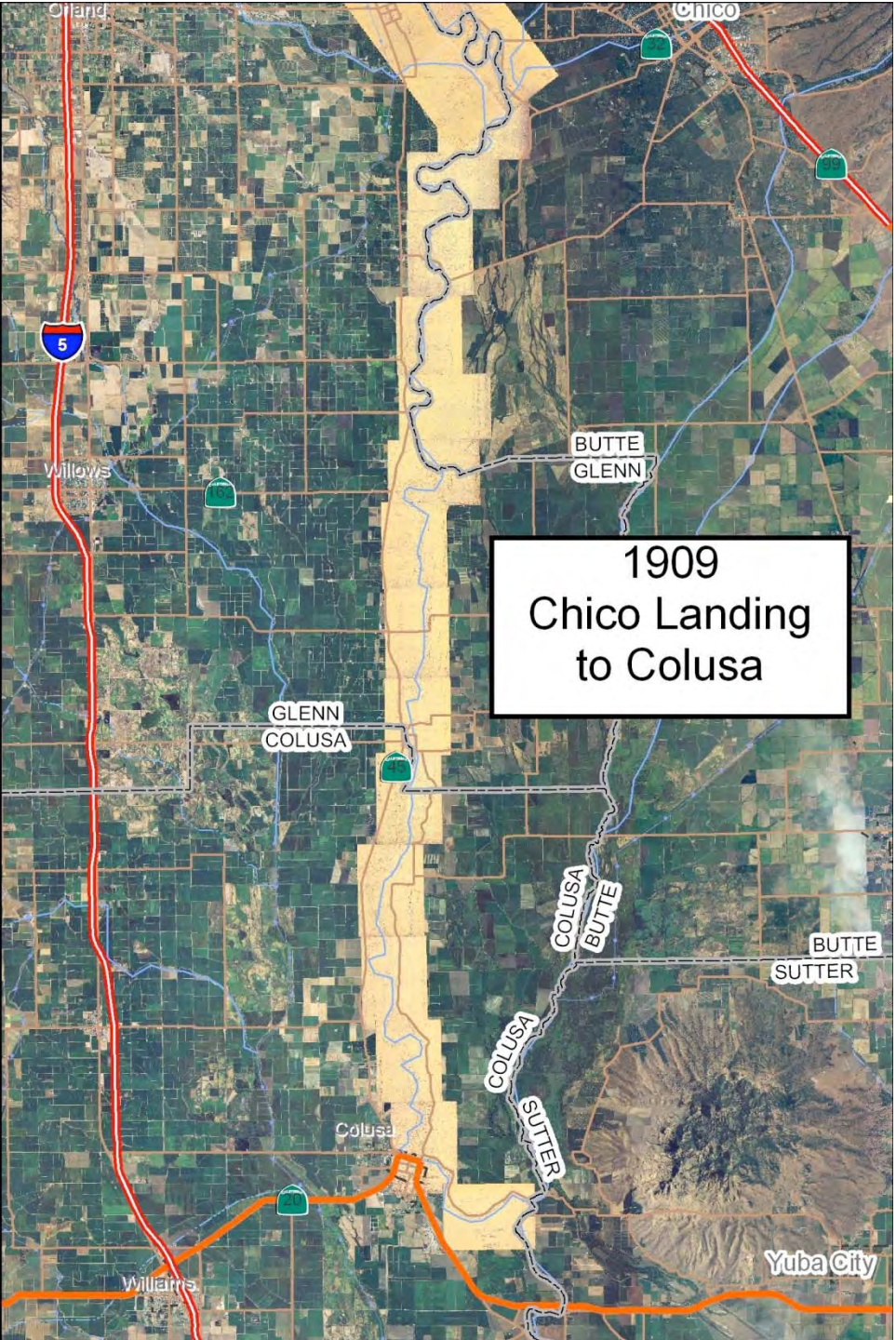
Bench marks are indicated thus.  $\odot$  Those lettered on the map (U. S. E. D. B. M. No.—Elev.—) are 3 inch galvanized pipes with brass caps so marked and set in concrete. Those lettered on the map (U. S. G. S. B. M. No.—Elev.—) have caps marked United States Geological Survey and are the standard iron post B. M's. of that Survey. They all serve as reference points for elevations and positions.

Property lines; unfenced ———— Fences ————  
Traverse lines; chained —○—○— Stadia —○—○—  
County lines ———— Railroads ————  
Township and Range lines ———— Section lines ————

444,000 W.



1923  
Red Bluff to  
Chico Landing



1909  
Chico Landing  
to Colusa

# Sacramento River (circa 1923) From Red Bluff to Chico Landing U.S. Army Corps of Engineers Map Base

By Jonathan Mulder  
Certified Engineering Geologist #1352  
California Department of Water Resources  
Northern Region  
Red Bluff, California  
February, 2009



**Sheet # 17** Sacramento River (circa 1923)  
From Red Bluff to Chico Landing  
U.S. Army Corp of Engineers Map Base

Map Source: U.S. Army Corps of Engineers (Map File # 6-13-593)  
Mapped between 1917 and 1923  
Dark blue line work denotes waters edge from Corp map.  
Light blue line work denotes stream features from ESRI Street Maps

Blue Atlas created by Jonathan Mulder  
Certified Engineering Geologist #1352  
California Department of Water Resources  
Northern District  
Red Bluff, California

**Sheet # 17**



**Sheet # 17** Sacramento River (2005)  
From Red Bluff to Chico Landing  
2005 Aerial Photo Base

Photo Source: USDA National Agricultural Imagery Program (NAIP)

Dark blue line work denotes waters edge from 1923 Corp map  
Light blue line work denotes stream features from ESRI Street Maps

Blue Atlas created by Jonathan Mulder  
Certified Engineering Geologist #1352  
California Department of Water Resources  
Northern District  
Red Bluff, California

**Sheet # 17**

- [Location Policy vsm Congress Decide?](#)
- [How to Build a Spatial Law and Policy Community?](#)
- [More...](#)



#### APPLICATIONS

- [GeoFinder](#)
- [CEIC](#)
- [CMLUCA](#)
- [Cal-Atlas Imagery Search](#)

#### ORGANIZATIONS

- [CGIA](#)
- [GIS Council](#)
- [USGS](#)
- [FGDC](#)

#### RELATED LINKS

- [DFG's Atlas of Biodiversity](#)
- [Cal-Atlas Downloads](#)
- [Search Tool](#)
- [Imagery Partners](#)

### SACRIVERMAPS

#### Release01

2009-11-17 11:10

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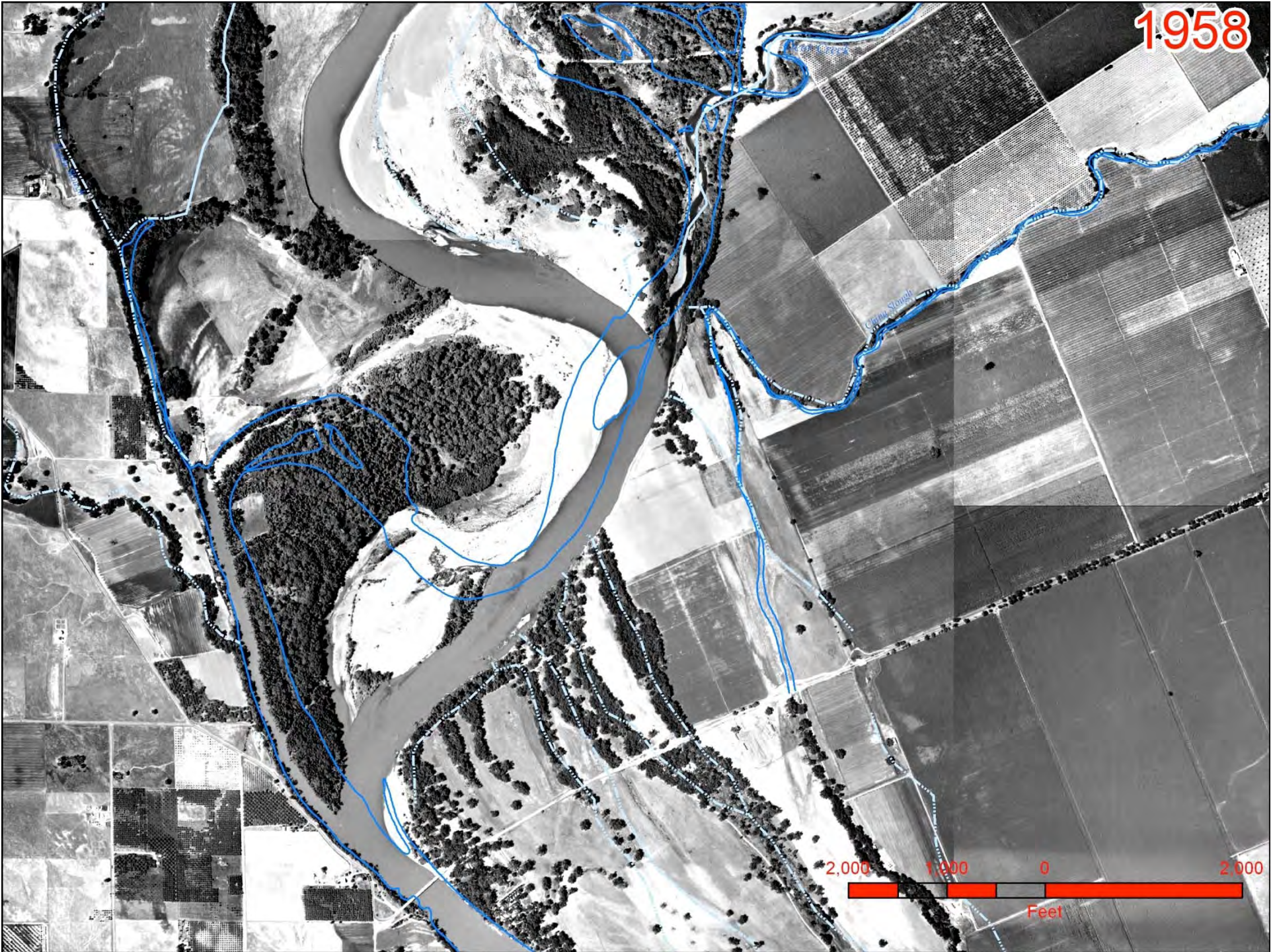
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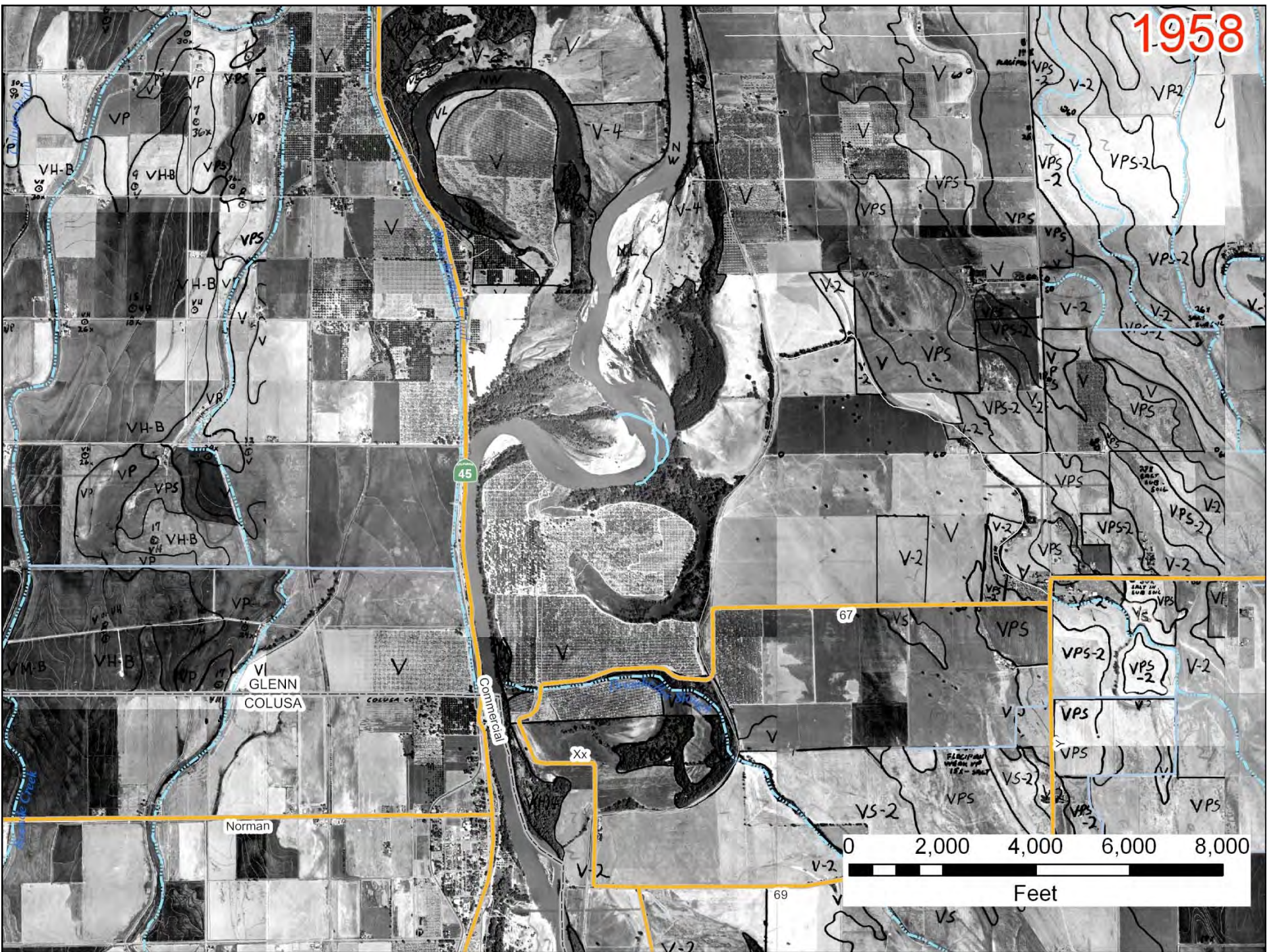
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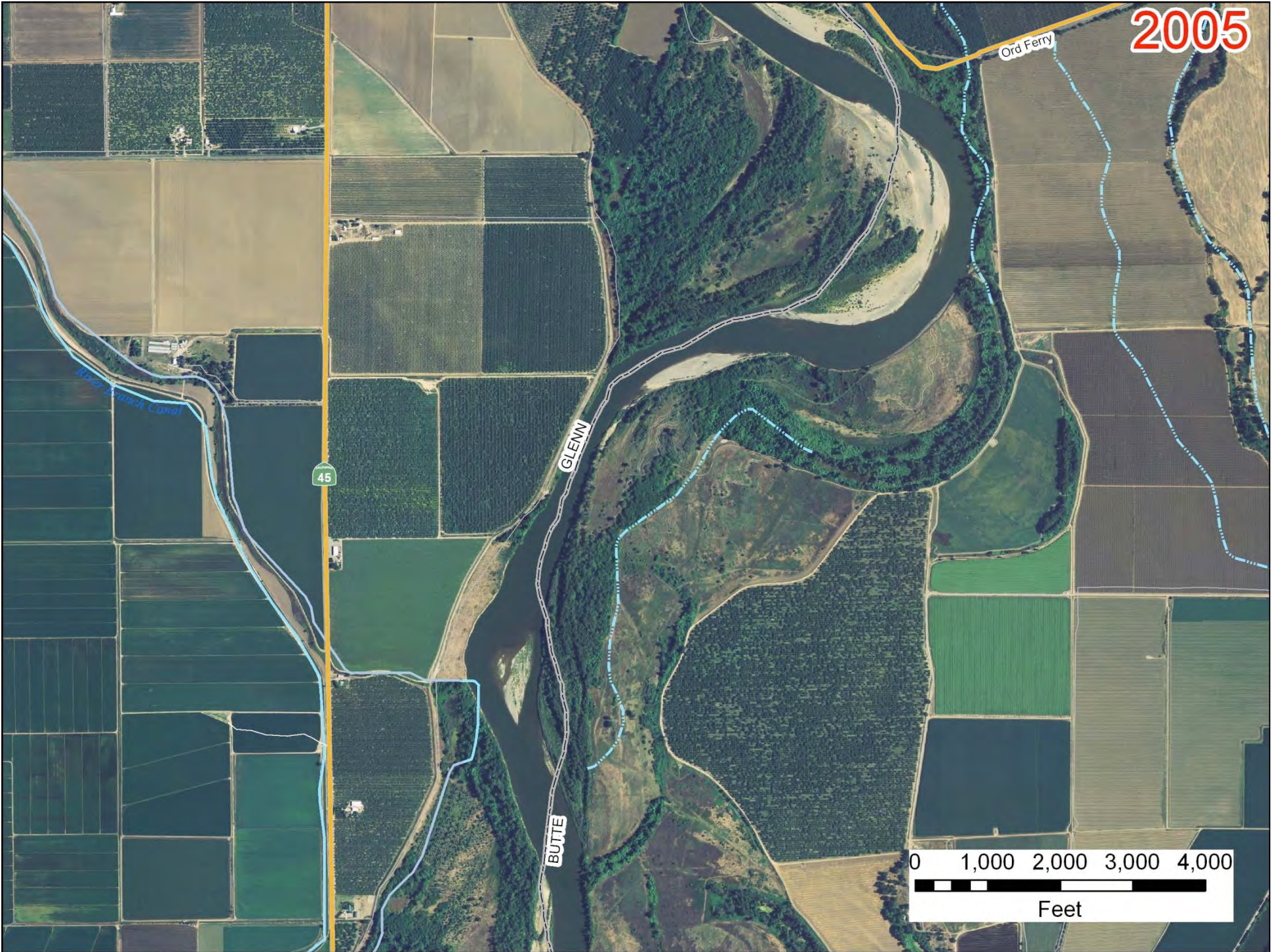
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1958



2005



45

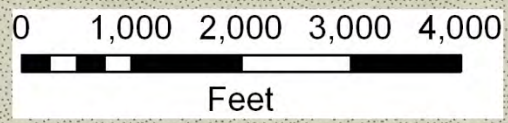
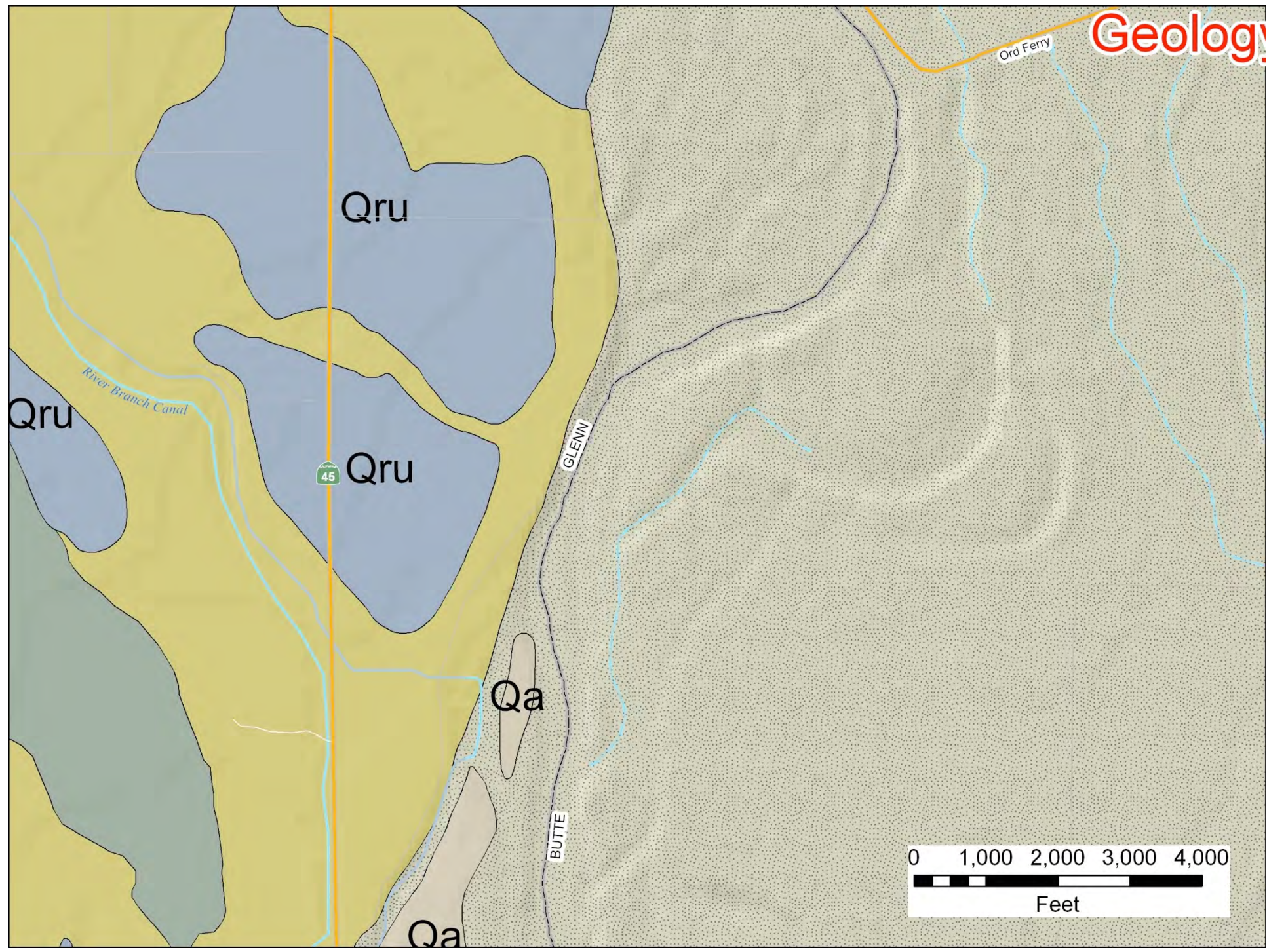
GLENN

BUTTE

Ord Ferry

0 1,000 2,000 3,000 4,000

Feet



# Next Steps...

Complete 1958 coverage for Butte County

Move on down the Sacramento Valley:

Sutter County

Yuba County

Placer County

Yolo County

Sacramento County

Solano County

# Next Steps (continued)...

Geo-reference legacy mapping for Sacramento River

1890's Map Sheets

1930's Map Sheets

1940's Map Sheets

Continue 1938 rectification after completion of 1958 imagery

\$\$\$

*A tool for  
intelligent resource management  
and land-use development.*



*Thank you!*

Jonathan Mulder

Mulder@water.ca.gov

