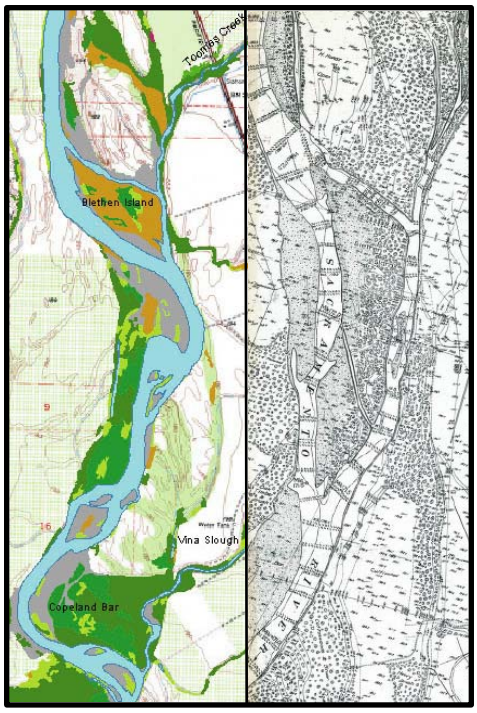
THE CENTRAL VALLEY HISTORIC MAPPING PROJECT



By

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INTRODUCTION

In 2001, the US Fish and Wildlife Service (USFWS) and the U.S. Bureau of Reclamation (BOR) contracted with the California State University, Chico Research Foundation (Department of Geography and Planning and the Geographical Information Center) to develop a set of historic natural vegetation maps for the Great Central Valley of California (GCV). Natural vegetation in the GCV was divided into eight classification types: valley foothill hardwood, chaparral, grassland, riparian, alkali desert scrub, wetlands, aquatic and other floodplain habitat.

A geographic information system (GIS) was created to quantify vegetation changes over the last 100 years. Four maps which represented the pre 1900, 1940, 1960, and 1990 eras were produced to identify major changes that have occurred in the GCV due, in part, to hydrologic alterations associated with the Central Valley Project (1945) and the California State Water Project (1968).

SUMMARY

Development of the map set and GIS consisted of researching libraries for archival information, developing GIS tools for data input, and displaying and analyzing information from a variety of agency and academic sources. Over seven hundred maps were scanned and will ultimately be made available on a library site for viewing and/or downloading.

The Pre-1900 Base Map was the most difficult to construct due to the limited information recorded at that time. Vegetation polygons were developed from several independent map sources. The quality of information on the source maps varies by area and by source. Map series were more readily available for the 1945, 1960 and 1990 time periods.

The maps are GIS-based and can be used to estimate vegetation change over time. In all cases attempts were made to gather the best information available and to create a bank of accessible information that can be utilized in future research efforts.

We see this project as a good base for continued additions and refinements rather than as an end product. We would like to invite other interested federal and state agencies to participate in the project.

PROJECT METHODOLOGY

The project was completed in four stages: research, data capture and input, map/GIS compilation, and analysis. In addition, web site was produced which has downloadable maps and tables.

Research

Research began using an initial list of contacts and data sources provided by FWS and BOR. Additional maps were located and analyzed for content and accuracy. Where available, digital GIS coverages were requested and stored on a California State University, Chico server along with data sources and metadata.

Project staff visited numerous libraries and government agency offices to obtain and evaluate historical vegetation information from archived maps or other media. The major University libraries visited included:

- California State University, Chico
- University of California, Davis
- University of California, Berkeley (Bancroft Library and Water Resource Center Archives), and
- University of California, Santa Cruz.

The government agency libraries and offices that were visited included the:

- California Department of Water Resources-Central District,
- U.S. Fish and Wildlife Service
- U.S. Bureau of Reclamation,
- California State Library, and
- State Lands Commission.

Other private and government agency offices utilized include the:

- California Department of Water Resources (DWR)-Northern District ,
- National Archives and Records Administration, and
- California Historical Society.

Relevant map information was evaluated for its contribution to this project and its ability to be digitally converted. Not all maps could be used, however. The Bancroft Library at UC Berkeley, for example, had several useful historic maps but library policy prohibits the scanning of archived objects. In other cases, the available information was too numerous and detailed to realistically contribute to the final project (i.e., historic air photos).

Project staff also contacted numerous individuals throughout the GVC during the course of the project. Special thanks is extended to Bryant Stergiss of the State Lands Commission, Pat Parsons and Tito Cervantes at DWR-Northern District, Ed Morris and Rich Cooke at DWR-Central District, and Tom Hawkins, Steve Turner, and Dave Bilyeu at DWR-Headquarters. Additional support and expertise was provided from the following people: Tom Griggs, Adjunct Professor, CSU, Chico, and Peter Vorster, Bay Institute, and J. Phyllis Fox. Dr. Tom Krabacher and Dr. Jerry White at California State University, Sacramento and Dr. William Preston at California State Polytechnic University, San Luis Obispo peer reviewed the four large regional maps, and made valuable comments. Bill Preston's comments regarding the historical geography of the San Joaquin Valley were particularly useful.

Data Capture and Input

Selected maps were scanned using a wide format 400-dpi full color scanner. The images were processed and adjusted using Adobe Photoshop enhancement software. The images were compressed using Lizard Tech's Mr. SID compression software, and spatially registered and projected into Albers for use with ESRI ArcView GIS software. Data from the rectified scanned maps were digitized from these registered images. The 700 plus scanned maps are catalogued at http://maps.csuchico.edu.

Many agencies did not allow maps to leave the premises, so, in many cases, it was necessary to bring the scanner to the maps. However, most offices were extremely cooperative with helping with project goals. The 400-dpi images were extremely large and necessitated the use of compression software to handle the unmanageable file sizes.

Geo-referencing means transforming scanned images into maps with reference coordinates. Geo-referenced maps register with other coverages when they are brought into a GIS such as ArcView. Natural vegetation boundaries were "heads-up" (onscreen) digitized in ArcView and each vegetation polygon was referenced to a source data file.

Map/GIS Compilation

The base map (pre-1900) was the most difficult map to compile as it came from a variety of sources and scales. In some instances, only U.S.G.S. topographic maps or generalized regional information could be found. In another instance, U.S. War Department Debris Commission maps from the 1912-1920 time period were used because they depicted vegetation along waterways that we assumed to be riparian species.

Final analyses consisted of viewing and ranking the existing relic native vegetation coverages. Each classified polygon has a corresponding database record outlining source data information, including the source name, time period classification, original classification, and a source ranking from 0.1-0.9. Source data was ranked according to the following factors:

- *scale*
- *appropriate time period*
- *focus or intention of the map, and*
- *classification used on the original data.*

Figure 1 – Source Ranking Criteria

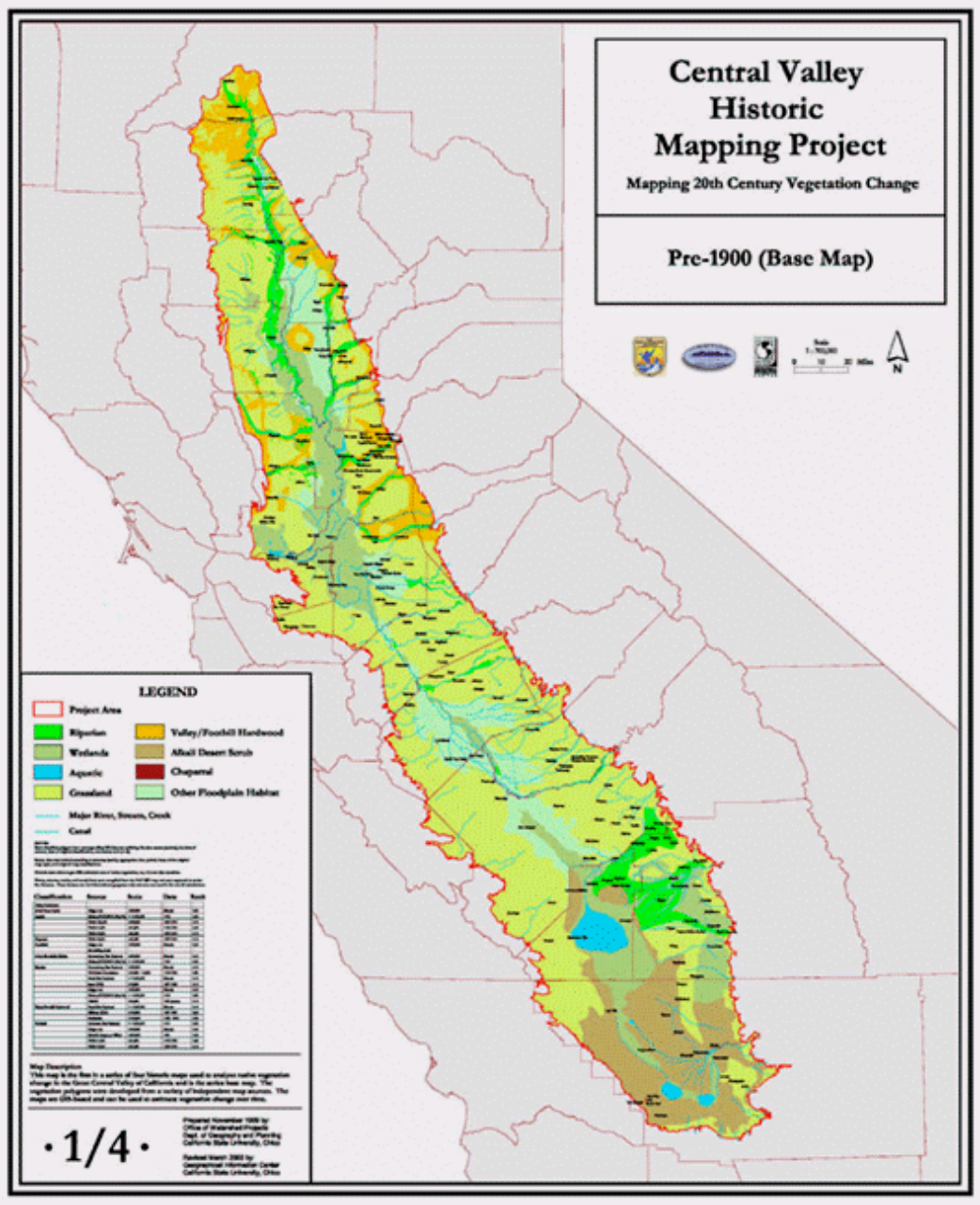
Rank	Original Scale	Date Relevance to Time Period	Source Topic	Original Values
0.1 (Low)	<1:500,000	Potential, historic	Extremely unrelated	Extreme difference
0.3	>=1:500,000	+/- 100 years	Moderately unrelated	Significant difference
0.5	>=1:250,000	+/- 50 years	Equal target	Moderate difference
0.7	>=1:100,000	+/- 10 years	Significant target	Similar value
0.9 (High)	>=1:24,000	+/- 5 years	Exact target	Exact value

NOTES:
-Source topic refers to focus or intention of the map
-Original values are classifications used on the original data

Once a rank was determined for each of the four factors, an average was taken. This average represents the overall ranking for the source.

Using existing map coverages and the project expectations, a timeframe for each map set was determined and each frame became a snapshot of the best information available for a particular period of time. The map set consists of two bookends -- a pre 1900 historic coverage map and a modern coverage map -- and two mid-20th century maps, 1945 and 1960. These two dates were selected because they immediately preceded the completion of major features of the Central Valley Project and the California Water Project.

Figure 2 - Historic Vegetation Base Map (Pre-1900)



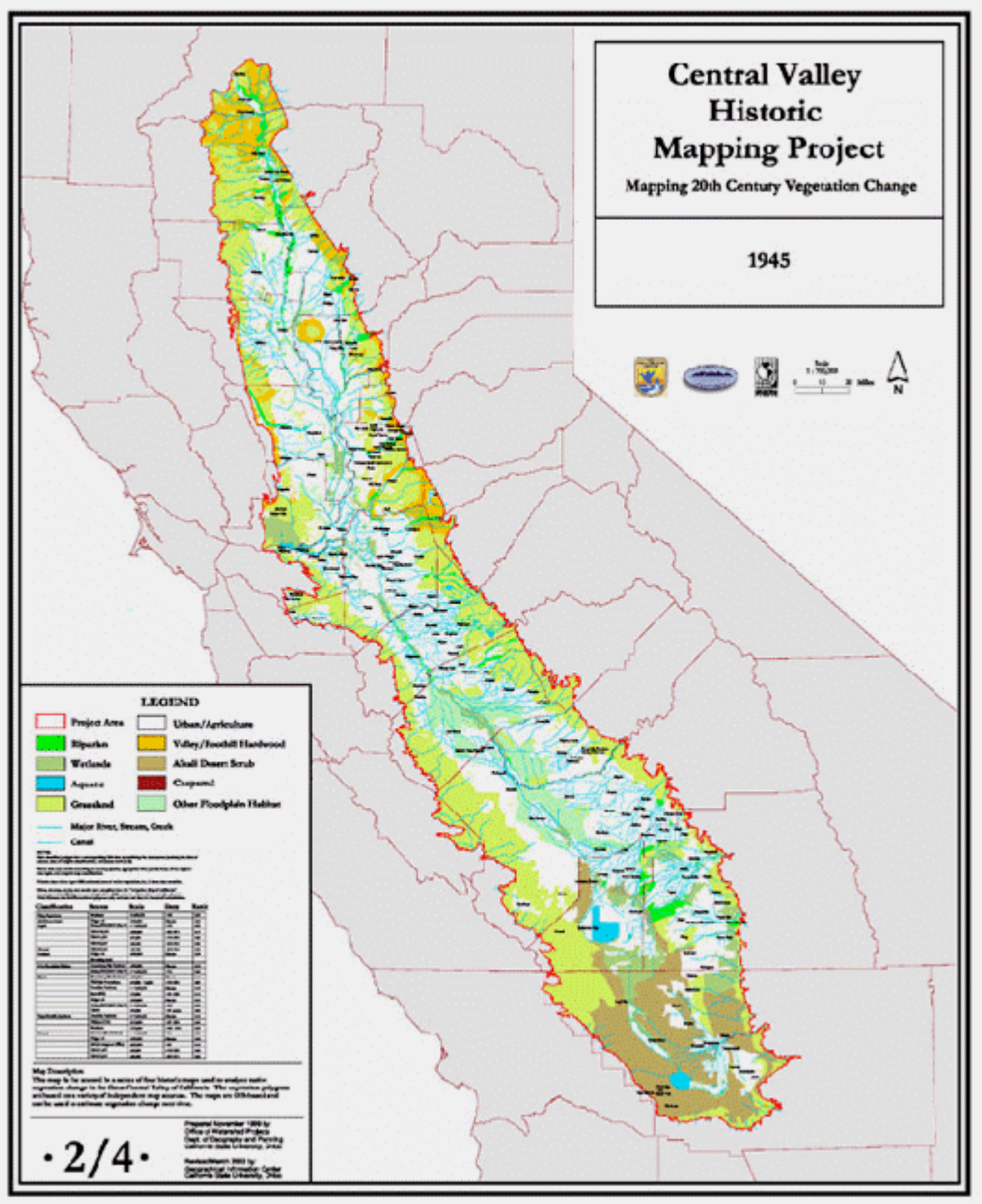
This historic vegetation map consists of the best available historical vegetation information for the pre-1900 period. It is a patchwork of sources, scales, and dates. A date has not been assigned to this base map, as it would add confusion to the querying function of the GIS (The earliest source map is dated 1874). However, given the information available, the Pre-1900 map provides a snapshot of the most likely pre Euro-American vegetation cover.

Table 1 - Source Data for Pre-1900 Base Map

Classification	Source	Scale	Date	Rank
Urban/Agriculture	-	-	-	-
Alkali desert scrub	Griggs et al	1:250,000	Historic	0.35
Aquatic	Holmes/STATSGO (Bay Institute)	>=1:500,000	1916	0.50
	USGS 250,000	1:250,000	1903-1910	0.75
	USGS 31,680	1:31,680	1910-1925	0.65
	USGS 62,500	1:62,500	1902-1948	0.75
Chaparral	USGS 62,500	1:62,500	1902-1948	0.75
Grassland	Griggs et al	1:250,000	Historic	0.35
	(Remaining areas)	-	-	-
Other floodplain habitat	Gronenburg (Bay Institute)	1:250,000	Historic	0.35
	Holmes/STATSGO (Bay Institute)	1:250,000	Historic	0.45
Riparian	Gronenburg (Bay Institute)	1:250,000	Historic	0.45
	US Debris Commission	1:24,000-1:4,000	1910-1924	0.80
	Dutzi (Bay Institute)	>=1:500,000	Historic	0.45
	Snow (GIC)	1:12,000	1991-1998	0.70
	Griggs et al	1:250,000	Historic	0.35
	Holmes/STATSGO (Bay Institute)	>=1:500,000	1916	0.50
	USFWS	1:24,000	1981-Present	0.75
Valley/foothill hardwoods	Dutzi (Bay Institute)	>=1:500,000	Historic	0.35
	Pillsbury (CDF)	1:100,000	1981-1990	0.55
	Weislander	1:100,000	1930-1940	0.55
Wetlands	Alexander (Bay Institute)	>=1:500,000	1874	0.55
	Griggs et al	1:250,000	Historic	0.35
	Hall (CA Engineer Office)	1:500,000	1887	0.60
	USGS 31,680	1:31,680	1910-1925	0.65
	USGS 62,500	1:62,500	1902-1948	0.75

The composite final map was reviewed by historical geographers Holtgrieve and Preston and edited to eliminate errors and incorrect information that appeared on some of the source maps.

Figure 3 - 1945 Map

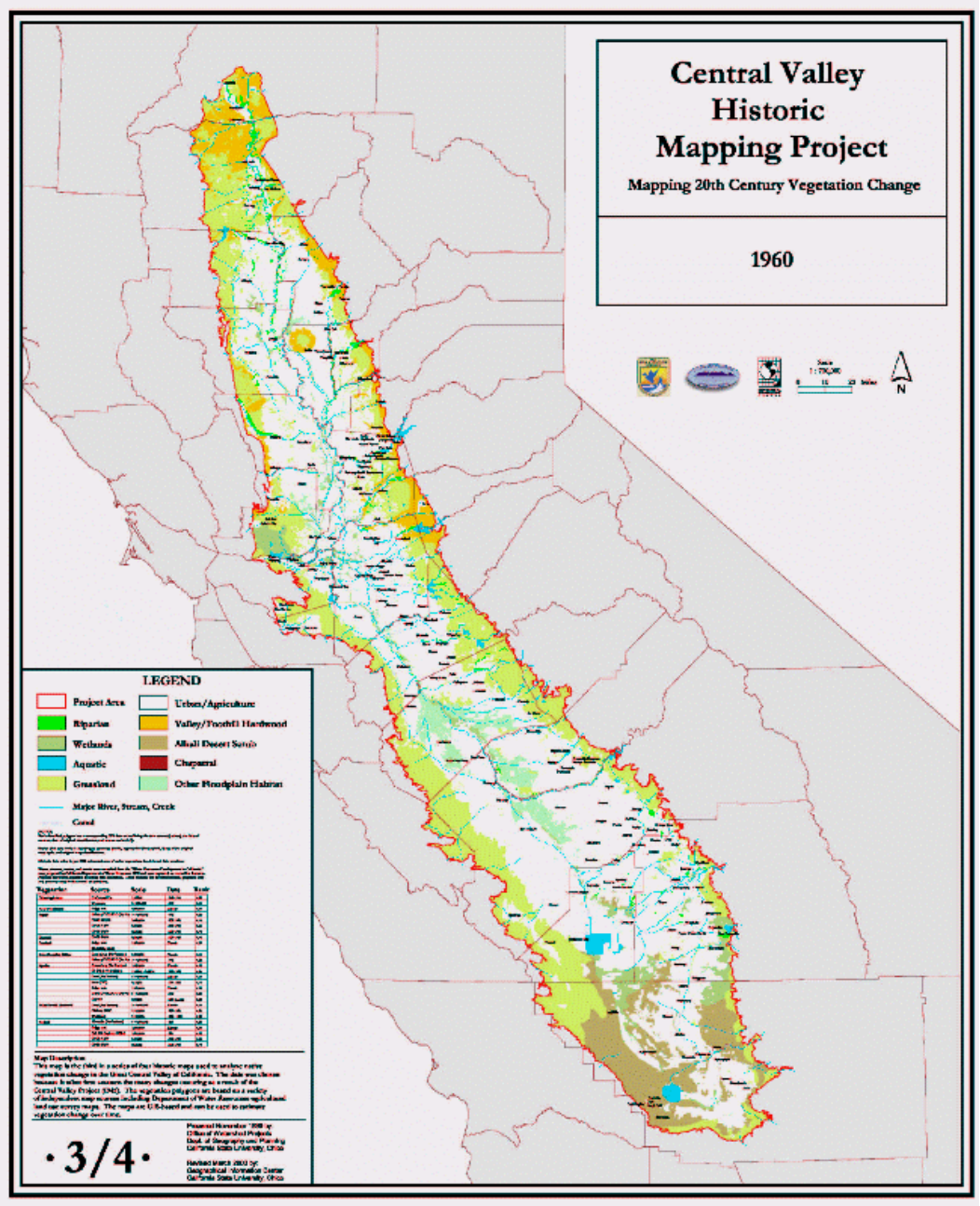


The 1945 Map uses “impact” information, the extent of urban and agricultural data, to subtract the native vegetation identified in the base map. The impact information was identified from the Weislander GIS data layer and the 1960 DWR land use information and was used to resolve inconsistencies. It was assumed that areas mapped as native vegetation in 1960 were also in native vegetation in 1945.

Table 2 - Source Data for 1945 Map

Classification	Source	Scale	Date	Rank
Urban/Agricultural	Weislander	1:1,000,000	1945	0.50
Alkali desert scrub	Griggs et al	1:250,000	Historic	0.35
Aquatic	Holmes/STATSGO (Bay Institute)	>=1:500,000	1916	0.50
	USGS 250,000	1:250,000	1903-1910	0.70
	USGS 31,680	1:31,680	1910-1925	0.65
	USGS 62,500	1:62,500	1902-1948	0.80
Chaparral	USGS 62,500	1:62,500	1902-1948	0.80
Grassland	Griggs et al	1:250,000	Historic	0.35
	(Remaining areas)	-	-	-
Other floodplain habitat	Gronenburg (Bay Institute)	1:250,000	Historic	0.45
	Holmes/STATSGO (Bay Institute)	>=1:500,000	1916	0.50
Riparian	Gronenburg (Bay Institute)	1:250,000	Historic	0.45
	US Debris Commission	1:24,000-1:4,000	1910-1924	0.80
	Dutzi (Bay Institute)	>=1:500,000	Historic	0.45
	Snow (GIC)	1:12,000	1991-1998	0.75
	Griggs et al	1:250,000	Historic	0.35
	Holmes/STATSGO (Bay Institute)	>=1:500,000	1916	0.50
	USFWS	1:24,000	1981-Present	0.80
Valley/foothill hardwoods	Dutzi (Bay Institute)	>=1:500,000	Historic	0.45
	Pillsbury (CDF)	1:100,000	1981-1990	0.60
	Weislander	1:100,000	1930-1940	0.60
Wetlands	Alexander (Bay Institute)	>=500,000	1874	0.50
	Griggs et al	1:250,000	Historic	0.35
	Hall (CA Engineer Office)	1:500,000	1887	0.45
	USGS 31,680	1:31,680	1910-1925	0.65
	USGS 62,500	1:62,500	1902-1948	0.80

Figure 4 - 1960 Map

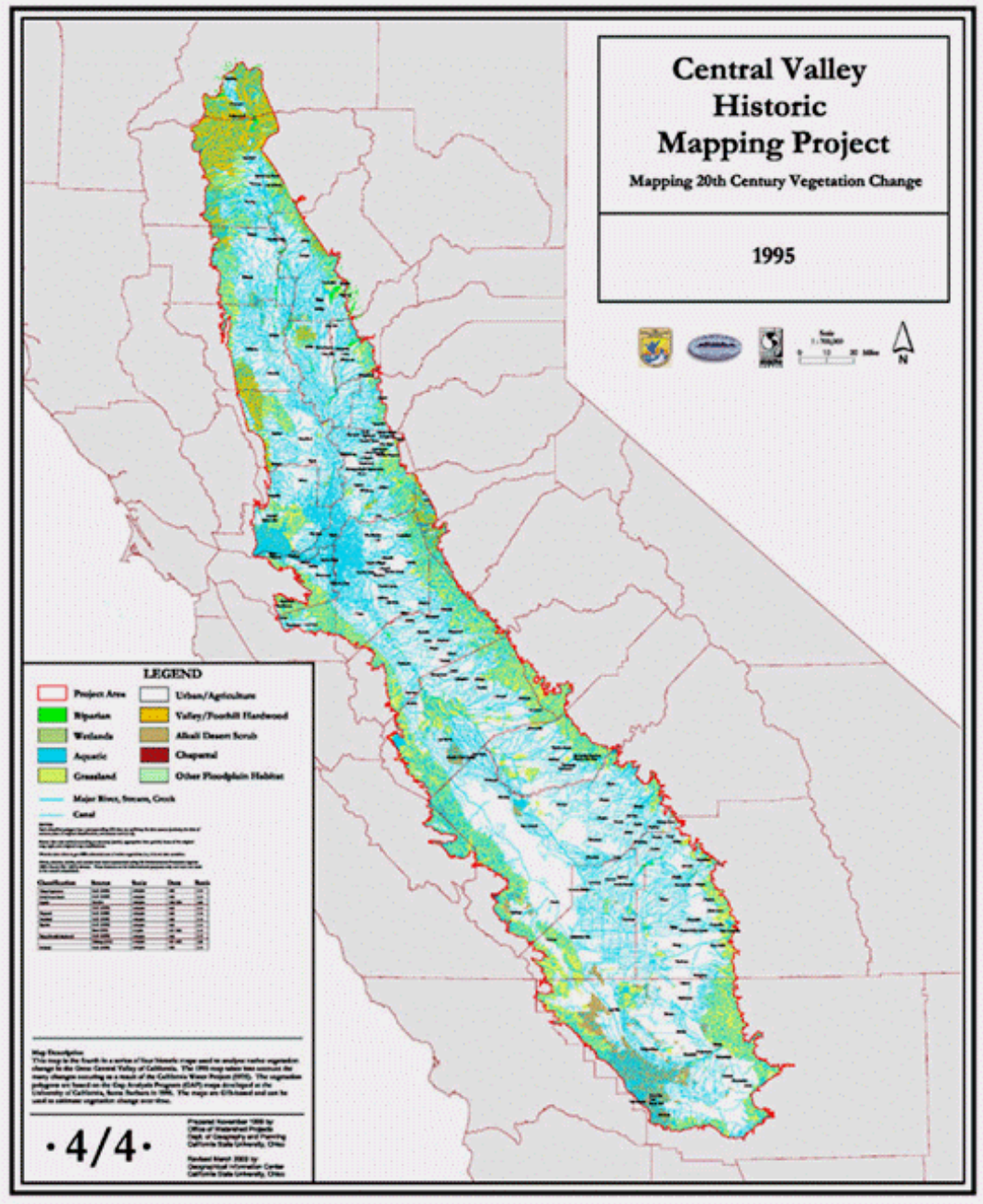


The 1960 Map uses more recent “impact” information from DWR land use maps to subtract the remaining existing vegetation from the 1945 and Pre-1900 maps.

Table 3 - Source Data for 1960 Map

Classification	Source	Scale	Date	Rank
Urban/Agricultural	DWR Land Use	1:24,000	1958-1970	0.85
	Weislander	1:1,000,000	1945	0.40
Alkali desert scrub	Griggs et al	1:250,000	Historic	0.35
Aquatic	Holmes/STATSGO (Bay Institute)	>=1:500,000	1916	0.50
	USGS 250,000	1:250,000	1903-1910	0.70
	USGS 31,680	1:31,680	1910-1925	0.65
	USGS 62,500	1:62,500	1902-1948	0.75
Chaparral	USGS 62,500	1:62,500	1902-1948	0.75
Grassland	Griggs et al	1:250,000	Historic	0.35
	(Remaining areas)	-	-	-
Other floodplain habitat	Gronenburg (Bay Institute)	1:250,000	Historic	0.45
	Holmes/STATSGO (Bay Institute)	>=1:500,000	1916	0.50
Riparian	Gronenburg (Bay Institute)	1:250,000	Historic	0.45
	US Debris Commission	1:24,000-1:4,000	1910-1924	0.80
	Dutzi (Bay Institute)	>=1:500,000	Historic	0.45
	Snow (GIC)	1:12,000	1991-1998	0.75
	Griggs et al	1:250,000	Historic	0.35
	Holmes/STATSGO (Bay Institute)	>=1:500,000	1916	0.50
	USFWS	1:24,000	1981-Present	0.80
Valley/foothill hardwoods	Dutzi (Bay Institute)	>=1:500,000	Historic	0.45
	Pillsbury (CDF)	1:100,000	1981-1990	0.60
Wetlands	Alexander (Bay Institute)	>=500,000	1874	0.50
	Griggs et al	1:250,000	Historic	0.35
	Hall (CA Engineer Office)	1:500,000	1887	0.45
	USGS 31,680	1:31,680	1910-1925	0.65
	USGS 62,500	1:62,500	1902-1948	0.75

Figure 5 - 1995 Map



The 1995 Map is taken from the GAP coverage produced at the University of California, Santa Barbara.

Table 4 - Source Data for 1995 Map

Classification	Source	Scale	Date	Rank
Urban/Agricultural	GAP (UCSB)	1:250,000	1995	0.75
Alkali desert scrub	GAP (UCSB)	1:250,000	1995	0.75
Aquatic	US EPA	1:250,000	1980-1990	0.65
Chaparral	GAP (UCSB)	1:250,000	1995	0.75
Chaparral	GAP (UCSB)	1:250,000	1995	0.75
Grassland	GAP (UCSB)	1:250,000	1995	0.75
Riparian	GAP (UCSB)	1:250,000	1995	0.75
Valley/foothill hardwoods	Snow (GIC)	1:12,000	1991-1998	0.75
Valley/foothill hardwoods	GAP (UCSB)	1:250,000	1995	0.75
Wetlands	Pillsbury	1:100,000	1981-1990	0.60
Wetlands	GAP (UCSB)	1:250,000	1995	0.75

ANALYSIS - QUERYING THE GIS

ArcView shape (SHP) files adapted from these historical maps can be downloaded from the CD provided with this report. Also, a web site at California State University, Chico, will provide a PDF download for each of these maps and a link to the scanned maps on a California State University, Chico Library server.

Using the associated GIS database, queries can be made to estimate qualitative vegetation changes at the regional level. When querying the *Central Valley Historic Mapping Project* (CVHMP) GIS, however, it is crucial to understand the limitations of these digital coverages as the maps were created using a variety of independent sources and at varying scales, accuracies and completeness. While some of the project data (DWR land use information, remnant coverages) can be used in finer-level analyses in association with other appropriate-quality data, it is strongly suggested that queries be limited to general rather than to specific locations.

To assist the user, the quality of each polygon was referenced and ranked from .1 (lowest value to the project) to .9 (highest) based on scale, date, topic value (focus or theme), and data value (classification units). Where they could be identified, errors or incorrect portions of the final maps were edited by persons with extensive regional-historical knowledge. As better information becomes available, additional edits will be required.

OBSERVATIONS ON HISTORIC LAND COVER PATTERNS

A history of vegetation mapping in California by Wilmer Colwell Jr. is contained in Barbour and Major's *Terrestrial Vegetation of California,* 1995, pages 195-220. It was not until 1926 that vegetation mapping in California began on a large scale, (Colwell, 196). "Fifty years of mapping vegetation in California at different levels of classification and intensity by various agencies has resulted in a variety of information that is fully compatible for uniform application throughout the state" (Cowell, 218). Most of this early mapping was done by the U.S. Forest Service and largely covered areas with potentially marketable tree cover. Two noteworthy and useful products were works by Kuchler (1977) and Weislander (1941). Weislander's work involved detailed mapping on USGS quadrangles of vegetation patterns as they existed in the 1930s and 1940s. Whereas the Weislander maps showed actual vegetation patterns at the time of field investigation, the Kuchler maps give potential or virgin vegetation as it may have existed before Euro-American settlement (Colwell, 218,218). Both are used where appropriate in this discussion.

Table 5 and Figure 6 show nine land cover classifications which comprise the 14.7 million acres of the Great Central Valley of California. For more recent dates it would obviously be possible to have a finer grain map with more classifications but comparison with the earlier maps would be impossible because of the lack of detail in the earlier years. In fact, no maps specifically showing native grasslands are known to exist on early maps nor are areas shown here as "other floodplain" detailed further as wetlands, grasslands or aquatic. However, generalized soils maps (Statsgo) indicate where these grasslands were likely to have been.

Table 5 – Valley wide Land Cover Changes

	1900	1945	1960	PRESENT
LAND COVER	**acres**	**acres**	**acres**	**acres**
urban\agriculture	0	6346459	8169169	9690262
riparian	1021584	368989	246429	132586
wetlands	2040766	793907	544645	133261
aquatic	241168	141974	89627	261683
grassland	7085483	3946049	3283692	3198301
valley/foothill hardwood	1165114	873315	805828	852767
alkali desert scrub	1755724	1545084	1120461	431196
chaparral	3469	3467	3293	11254
other floodplain habitat	1424137	718201	474355	
TOTAL	**14737445**	**14737445**	**14737499**	**14711310**

With those caveats given, a comparison of coverages in the four time periods shows some interesting patterns. The areas labeled urban/agriculture might just as easily be called "developed". The lack of any acreage in this classification on the pre 1900 map is deceiving in that there was considerable farming in the valley (particularly grains) before 1900. Unfortunately, there is no region wide map that shows this use pattern. At best we have county totals of acres farmed in 1900 but no maps showing just where these farms

were located. Therefore, it should be assumed that some of the areas shown as grassland and some as riparian land in 1900 were, in fact, already developed.

Table 6 – Regional Land Cover Changes

LOWER REGION	1900	1945	1960	PRESENT
LAND COVER	**acres**	**acres**	**acres**	**acres**
Urban\agriculture	0	2162434	3341606	4209018
riparian	408662	96154	39290	15990
wetlands	954985	464990	289084	5301
aquatic	171408	88364	38728	35739
grassland	2289580	1278835	922770	1166693
Valley/foothill hardwood	9497	9415	8761	17930
alkali desert scrub	1755723	1545084	1120461	400096
chaparral	3136	3134	2960	3907
other floodplain habitat	266195	210778	95526	0
TOTAL	**5859186**	**5859188**	**5859186**	**5854674**

MIDDLE REGION	1900	1945	1960	PRESENT
LAND COVER	**acres**	**acres**	**acres**	**acres**
Urban\agriculture	0	2024095	2374835	2700663
riparian	129252	79769	60032	20951
wetlands	394946	139030	91066	23893
aquatic	24387	22363	20820	118166
grassland	2907682	1505806	1342280	1352075
Valley/foothill hardwood	222110	173498	163488	106195
alkali desert scrub	0	0	0	31103
chaparral	333	333	333	6259
other floodplain habitat	681391	415207	307299	0
TOTAL	**4360101**	**4360101**	**4360153**	**4359305**

UPPER REGION	1900	1945	1960	PRESENT
LAND COVER	**acres**	**acres**	**acres**	**acres**
Urban\agriculture	0	2159929	2452728	2780581
riparian	483670	193067	147106	95645
wetlands	690834	189887	164495	104066
aquatic	45372	31247	30078	107778
grassland	1888221	1161408	1018641	679534
Valley/foothill hardwood	933507	690402	633578	728642
alkali desert scrub	0	0	0	0
chaparral	0	0	0	1088
other floodplain habitat	476551	92216	71530	0
TOTAL	**4518155**	**4518156**	**4518156**	**4497334**

As one would expect, the tables and figures show increases in developed land over the century at the expense of natural habits. The increase in grassland from 1960 to the present in two of the regions is partially explained by the differences in data sources. The

1960 map was primarily constructed from DWR field surveys and the data for the 1995 map was taken from satellite and aerial imagery (GAP data). Human judgment and different criteria for defining hardwoods, grassland and scrub could account for some of the differences in mapped patterns. Another explanation is the fact that the 1995 GAP analysis did not include a classification called “other floodplain habitat” and the lands so classified in previous maps is shown as grassland in the 2000 (present) map. Also, the loss of riparian and wetland habitats is not unexpected and reflects changes documented in Frayer et.al and Thompson.

Table 6 and figures 8, 9, and 10 show similar patterns for each of the three sub-regions of the valley. The transition of alkali scrub to grassland and agriculture is particularly noteworthy in the San Joaquin Valley from 1960 to the present. Increases in aquatic habitat in the central and northern sub-regions may be due to the completion of the California Water Project.

Figure 6 – Valleywide Land Cover Changes

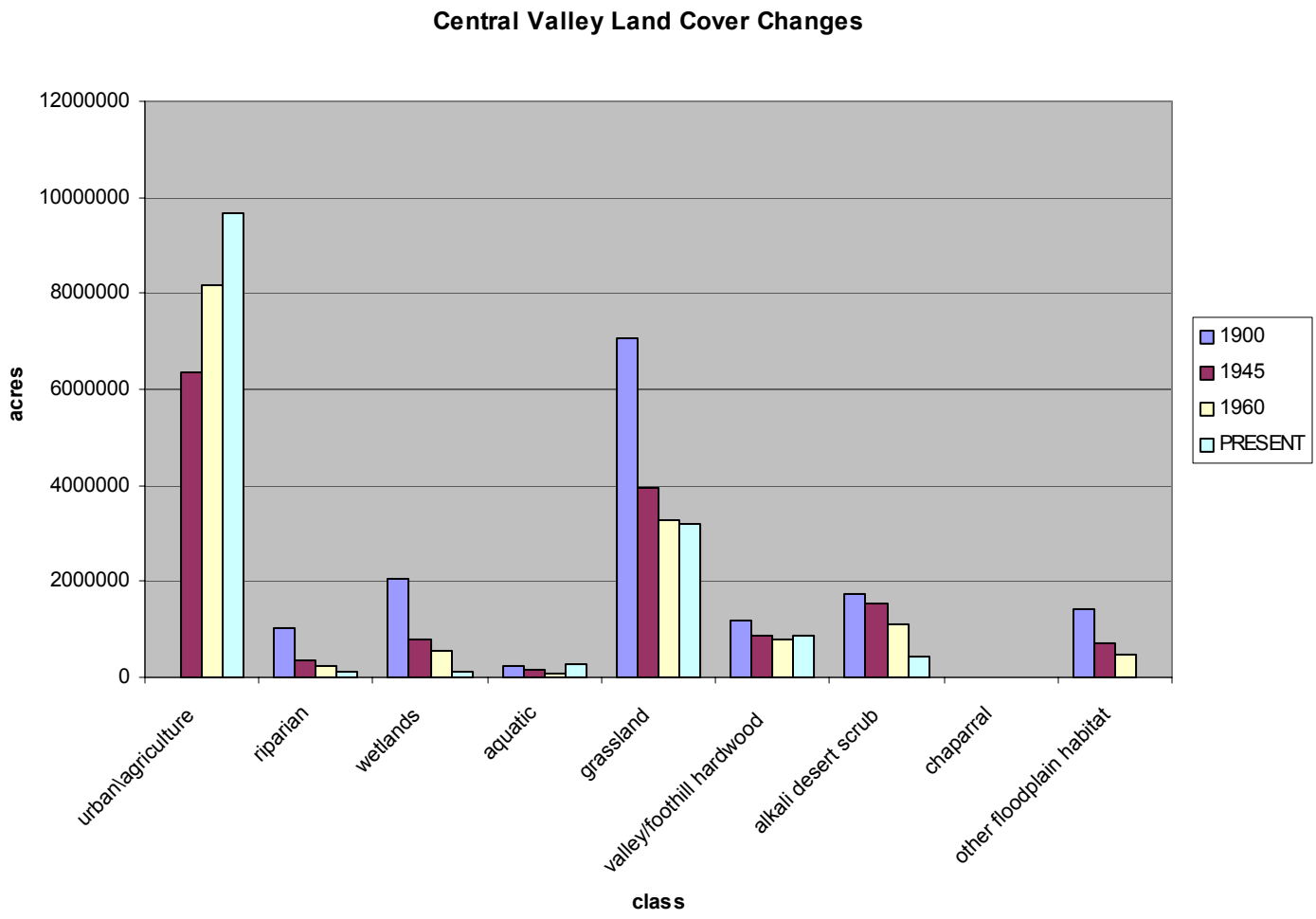


Figure 7 – Central Valley Land Cover Zones

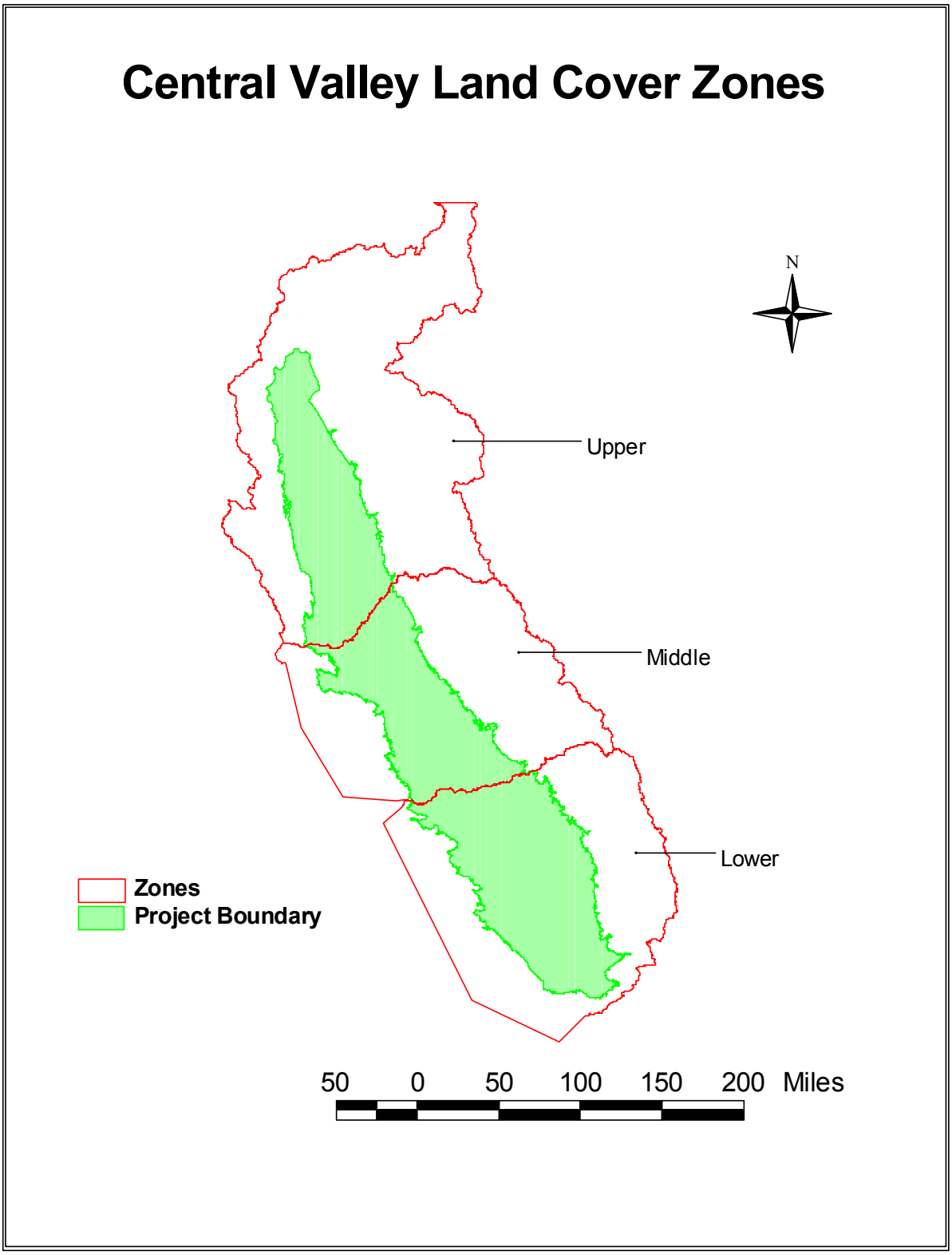


Figure 8 – Lower Region Land Cover Changes

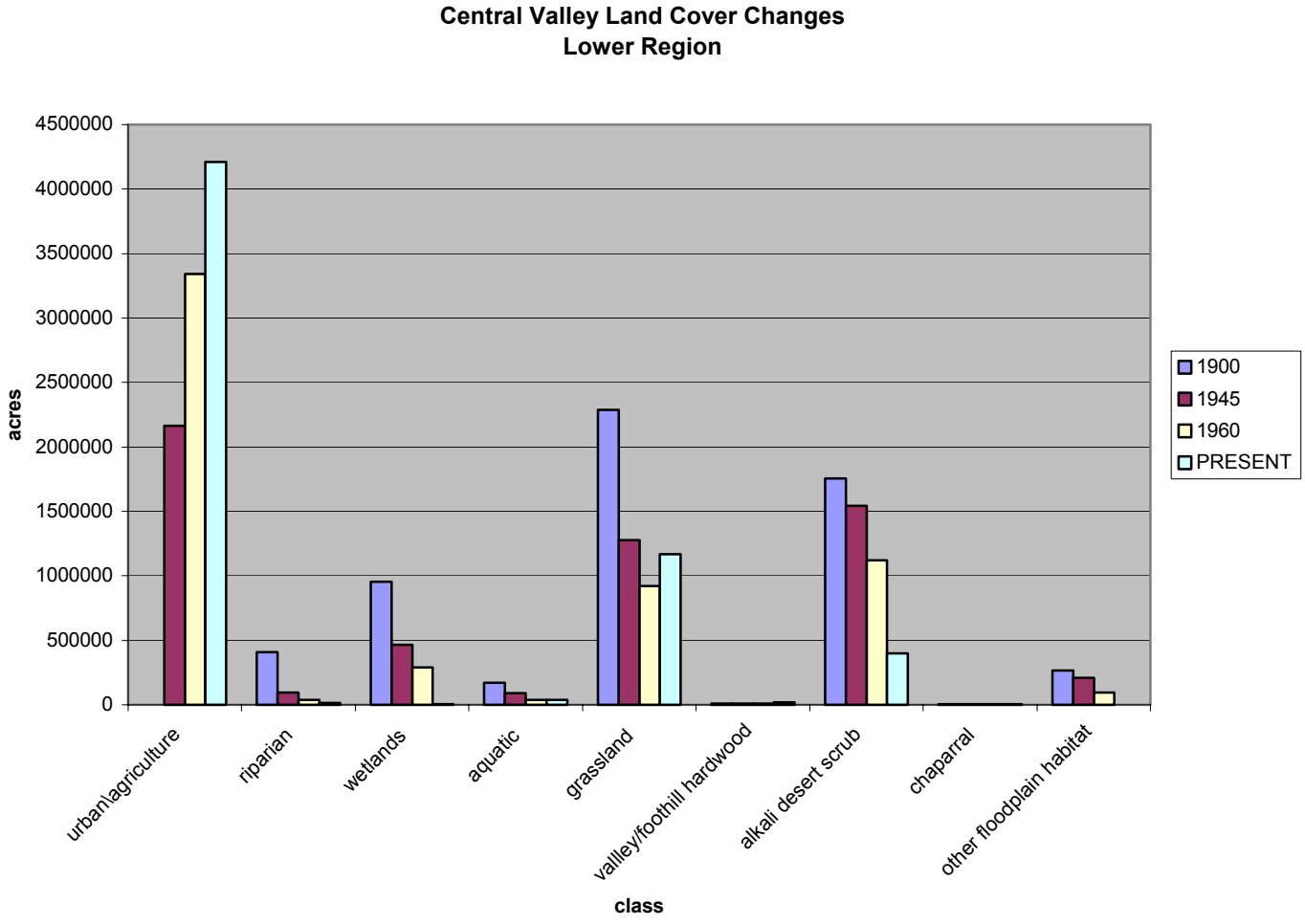


Figure 4 – Middle Region Land Cover Changes

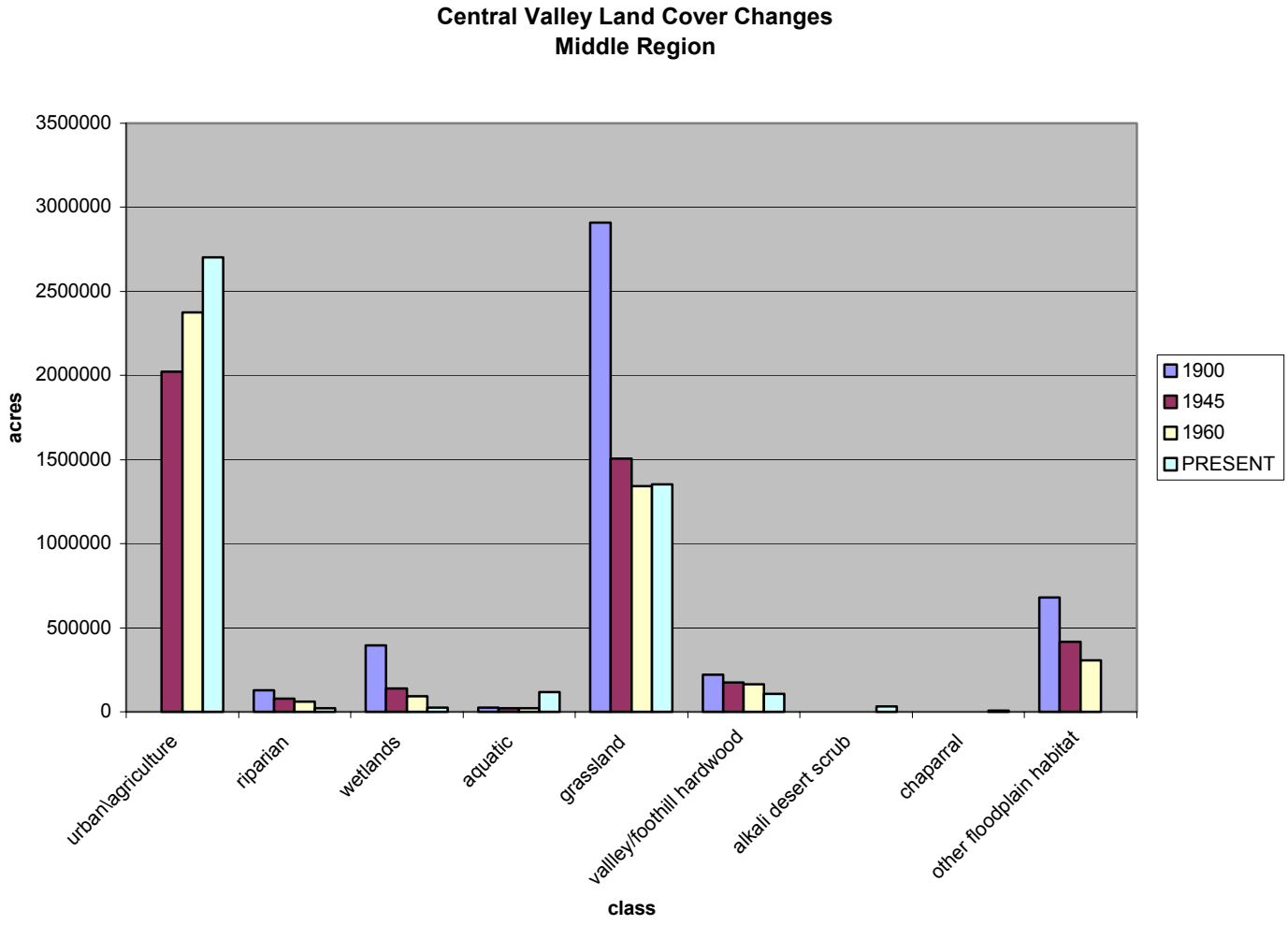
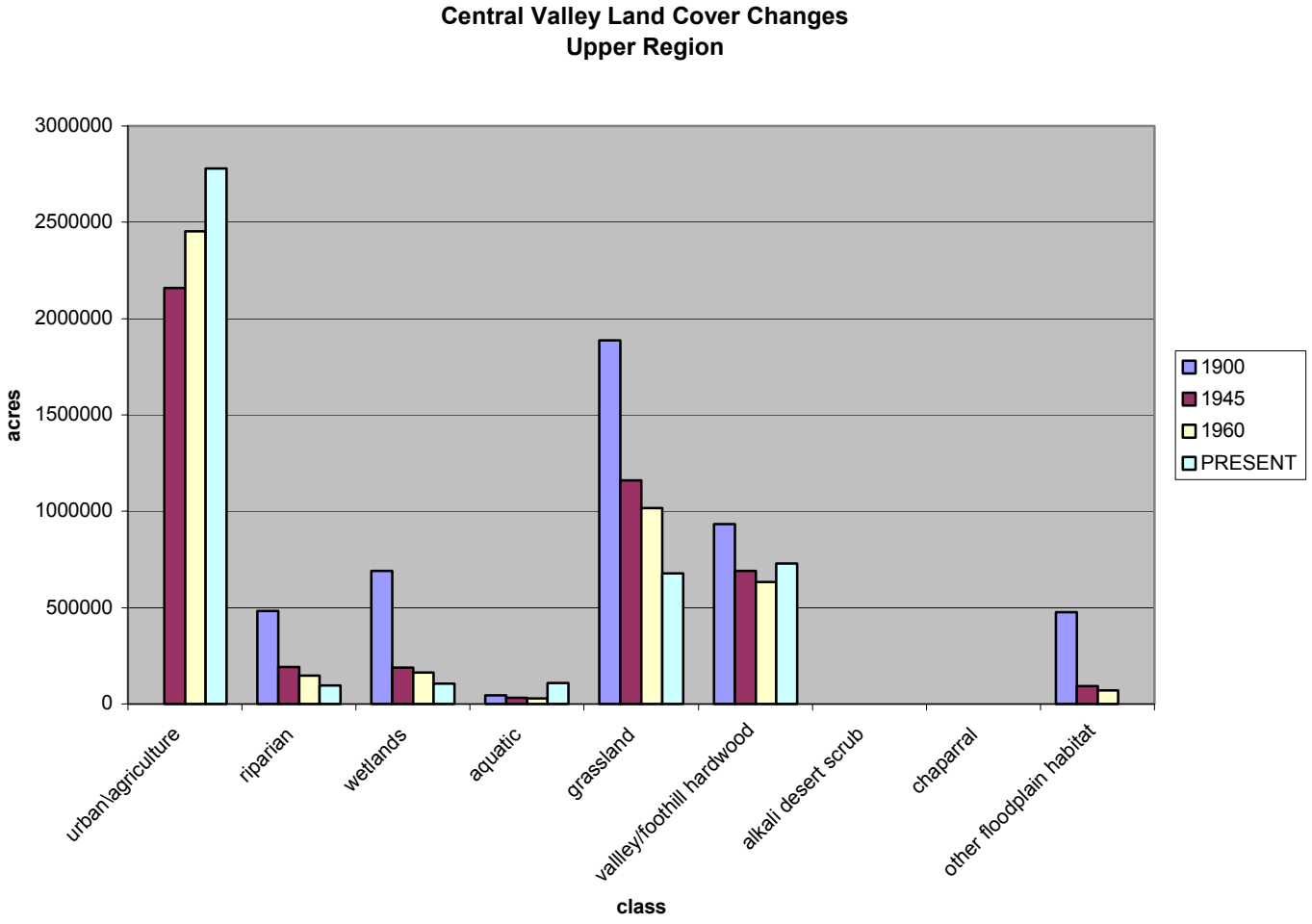


Figure 5 - Figure 8 – Upper Region Land Cover Changes



CONCLUSIONS

California's Central Valley is one of the most modified rural environments in the World. This effort to measure the qualitative vegetation changes has been both instructive and frustrating. It has been instructive to learn how much historical cartographic information are known and available to researchers but frustrating in learning what information is not known (such as the true amount of native grassland that was existent in 1900).

Future work on this project, if funded, should include creation of a user-friendly web portal into the project resources, start of an outreach effort to let agencies and others know of its existence and addition of yet more basic information with which to build the database. Specifically, the latter task includes the following:

- Improve *Historic Base Map* (1900) using more local expertise and historic accounts
- Develop Web/ArcView interface for project querying
- Add a generalized soils layer of the project area
- Scan, register and incorporate old air photos from the 1930's and 40's.

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Appendix A. Vegetation Habitat Types

Riparian – Riparian habitats in the valley are associated with low velocity waterways. They include freshwater bodies, watercourses, estuaries, and surface emergent aquifers. They generally have deep alluvial soils and a high water table. The dominant canopy species include California Sycamore (Platanus racemosa), Valley Oak (Quercus lobata), Fremont Cottonwood (Populus fremontii), White Alder (Alnus rhombifolia), Oregon Ash (Fraxinus latifolia), and numerous species of Willows (Salix spp.). The lower layers of vegetation include California Box Elder (Acer negunde subsp. californicum), Coyotebrush (Baccharis pilularis ssp. consanguinea), Blackberries (Rubus spp.), Sand Wild Rose (Rosa californica), and various annual and perennial herbaceous species. California Grape (Vitus califonica), Poison Oak (Toxicodendron diversilobum), and Dutchman's Pipe (Aristolochia californica) are the resident vine species that inhabit the riparian zone.

Wetland (perennial) – Also considered Freshwater Marsh. Wetlands are among the most productive wildlife habitats in California. They occur on virtually all exposures and slopes provided the depression or basin is periodically flooded. Characteristic species include various species of Cattails (Typha spp.), Bullrushes or Tules (Scirpus spp.), Rushes (Juncus spp.), and Sedges (Carex spp.).

Aquatic – Major water bodies within the study area (lakes, reservoirs, and estuaries like the Sacramento-San Joaquin Delta) are categorized as aquatic.

Grassland – Grasslands include grassy areas composed of annual plant species; they were originally composed of various perennial bunch grasses. Agricultural crops and grazing has caused the replacement of natives in many areas with introduced annual grasses. In spring and summer, large areas of grassland habitat are covered with annual herbaceous wildflower species.

Valley/Foothill Hardwoods – This vegetation type is dominated by oaks such as Valley Oak (Quercus lobata), Blue Oak (Quercus douglasii), and Interior Live Oak (Quercus wislizenii). Other trees present include Foothill Pine (Pinus sabiniana) and California Buckeye (Aesculus californica). Understory plants are species that also occur in Grasslands and Chaparral.

Alkali Desert Scrub – In the southern Central Valley, Alkali Desert Scrub borders on Grassland and can overlap. Characteristic species include Iodine Bush (Allenrolfea occidentalis), Shrubby Seablite (Suaeda fruticosa), Alkali Heath (Frankenia grandifloia), Seashore Saltgrass (Distichilis spicata), Alkali goldenbush (Haplopappus acradenius ssp. bracteosus), California Stink-weed (Wislizenia californica), Alkali Goldfield (Lasthenia chrysantha), California Alkali Grass (Puccinellia simplex), Spiney Saltbush (Atriplex spinifera), Leafcover Saltbush (Atriplex phyllostegia), Recurved Larkspur (Delphinium recurvatum), and Common Spikeweed (Hemizonia pungens).

Chaparral – Chaparral is characterized as being very hot and dry and is represented by a rich variety of "hard" woody shrubs. The most common plants that make up the chaparral community are Chamise (Adenostoma fasciculatum), California Holly or Toyon

(Heteromeles arbutifolia), Holly-leaf Cherry (Prunus ilicifolia), Mountain Mahogany (Cercocarpus betuloides), Red Berry (Rhamnus crocea), and various species of Manzanita (Arctostaphylos spp.) and California Lilac (Ceanothus spp.). Scrub Oak (Quercus dumosa), and Poison Oak (Toxicodendron diversilobum) are also present in the chaparral zone.

Other Floodplain Habitat – Used to denote areas that are a mixture of wetlands, grasslands, and riparian forests that were never differentiated on historic maps.

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