

# SOLANO COUNTY AG TOUR

# Soil and Water: Roots of our Solano County Ag Economy

April 30, 2019



A Special Meeting of the  
**SOLANO COUNTY BOARD OF SUPERVISORS**

Soils Map, Sacramento Valley, California.  
1913. Source: U.S. Department of Agriculture,  
Field Operations, Bureau of Soils.





# WELCOME TO THE SOLANO COUNTY AG TOUR

SOIL AND WATER: ROOTS OF OUR SOLANO COUNTY AG ECONOMY

APRIL 30, 2019

PRESENTED BY THE SOLANO COUNTY AGRICULTURAL ADVISORY COMMITTEE

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# SOLANO COUNTY AG TOUR

## SOIL AND WATER: ROOTS OF OUR SOLANO COUNTY AG ECONOMY

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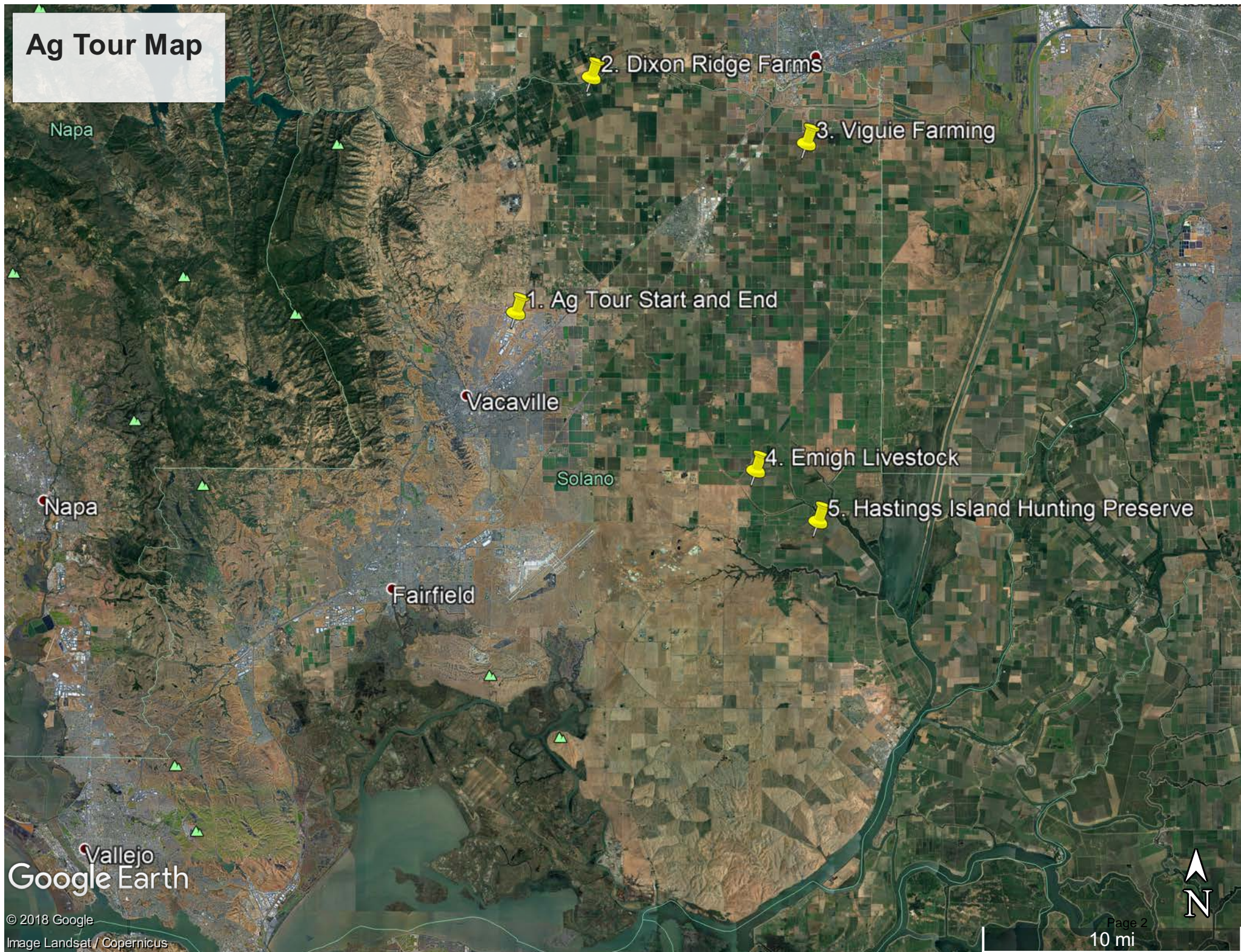
**SOLANO COUNTY AG ADVISORY COMMITTEE SPRING AG TOUR**  
**SOIL AND WATER: ROOTS OF OUR SOLANO COUNTY AG ECONOMY**  
**TUESDAY, APRIL 30, 2019**

**AGENDA:**

<b>TIME</b>	<b>LOCATION AND TOPICS</b>
8:00 AM	Convene at USDA / SID / SCWA building, 810 Vaca Valley Parkway, Vacaville
8:20 AM	Pre-departure discussion and overview of tour
8:30 AM	Bus departs <i>On-the-road topics:</i> <i>A soil geomorphological view of the landscape and land uses.</i> <i>A connected watershed, top to bottom.</i>
9:00 AM	Dixon Ridge Farms, Putah Creek Road, Winters <i>Soil and water dynamics near Putah Creek; Russ Lester</i> <i>Central Valley groundwater dynamics and groundwater recharge; Thomas Harter, UCCE Specialist.</i>
9:50 AM	On-the-road topic <i>Water delivery through Solano Irrigation District (SID) system and changes in water demand; Cary Keaton, General Manager, SID.</i>
10:20 AM	Arrive Vigie Farming, Dixon <i>Soil and water dynamics in the middle ground and diversified farming perspectives on soil and water in Solano County; David Vigie, Vigie Farming.</i>
11:35 AM	Arrive Emigh Livestock irrigated pastures, Brown Road <i>Soil and water dynamics near the basin and livestock producer perspectives on soil and water in Solano County; Ryan Mahoney, Emigh Livestock.</i> <i>Ground water policy and land use changes in Solano County; Roberta Goulart and Misty Kaltreider, Solano County.</i>
12:20 PM	On-the-road topic <i>Cache Slough Land Evaluation and Site Assessment (LESA); Wendy Rash, USDA-NRCS District Conservationist.</i>
12:30 PM	Arrive at Hastings Island Hunting Preserve for Lunch and Discussion <i>Current and potential impacts of water and land use policies on north Delta region and agriculture, Melinda Terry, North Delta Water Agency.</i> <i>Connections of policies and issues across the County.</i>
2:00 PM	Bus departs for Vacaville



# Ag Tour Map





# Welcome to the 2019 Ag Tour

There is a long and vibrant history of agriculture in Solano County largely due to the fertile and deep soils that have formed in the valleys over several millennia, and plentiful surface water and groundwater resources. The development of these resources into Solano County's agricultural roots started nearly two centuries ago with the Rancho Los Puntos (Vaca and Peña) and Rancho Rio de los Puntos (Wolfskill) Mexican land grants. It was then the hard work and ingenuity of several generations of farmers and ranchers, as well as state programs (reclamation districts), federal programs (Monticello Dam), and local irrigation districts that continued to develop the vitality of agriculture in the County.

The focus of this 2019 Ag Tour is the status of water and soil resources and their implications on agricultural sustainability, primarily in the region of Solano County on the extensive alluvial soils along Putah Creek and the much smaller Ulatas Creek and Alamo Creek. The immediate pressures on agriculture are elevated and abundant. Land use change is converting agricultural land to urban and environmental uses; demand for high-quality water is becoming more intense, diverse and regulated; and conflicts are increasing as urban and suburban congestion and interests spread into the rural, agricultural domain. The continued vitality of agriculture in Solano County depends on the conservation of water, farmland, and soil, the roots of our agricultural economy, but also on other pillars that enable farm and ranch enterprises to succeed.

On this Ag Tour, we will follow a transect from the gently rolling hills between Vacaville and Winters, across the Dixon Ridge, and into the basin region in the eastern half of Solano County. As we move across this landscape, the sometimes hidden physical attributes and interface of water and soil dynamics will dramatically change, defining agricultural uses (crop choices), and affecting agricultural practices. The agricultural landscape is also determined by other significant factors such as crop market prices and infrastructure for supporting and processing specific crops. We'll hear perspectives from farmers, ranchers, experts and elected leaders on the intertwined qualities and issues of water and soil, and policies that affect the long-term sustainability of the interconnected agricultural industry and natural resource conservation up and down the watershed.

--Solano County Ag Advisory Committee



## **SOIL LANDSCAPES OF NORTHEASTERN SOLANO COUNTY**

**BEING AN AGRICULTURAL PERAMBULATION OF THE RICH AND PRODUCTIVE LANDS OF THE  
VACA VALLEY—ENGLISH HILLS—SWEENEY AND PUTAH CREEK FANS—DIXON RIDGE—THE  
SACRAMENTO VALLEY/PIEDMONT PLAIN AND BASIN—THE SACRAMENTO RIVER BASIN AND  
FLOOD PLAIN—CACHE SLOUGH—HASTINGS ISLAND**

DAVID B. KELLEY  
KELLEY & ASSOCIATES ENVIRONMENTAL SCIENCES, INC.  
WINTERS, CA

### **Soil Landscapes**

The study and field examination of soils of any region are two-part studies in the earth history of that region, with different time scales. The geologic (or *pedologic*) history—How did those soils form? How old are they? What are their capabilities?—is perhaps the first part, or, really, the framework of these histories. The cultural history of the region's land uses by humans and the origins of agricultural and pastoral utilization is the second part (generally, the time scale for this second part is shorter than for the first part, dating back only to the time of the first people to inhabit these lands). On this field trip, we will be able to traverse a diverse landscape with origins of ancient to modern timescales, and try to imagine a little bit about how the pedologic (soil) landscapes have directed and defined the development of the cultural landscapes. The framework of the soil landscape's history is tied together, especially in modern times, by waterways and conveyances, roadways and stream crossings, energy delivery systems and foraging zones, and cultural adaptations for land use and inhabitation. What we will emphasize in the landscapes we visit today are the peculiarities (and blessings) of these fertile, arable lands, and the recognition our human cultures have come to with regard to the capabilities and productivity of these lands and their climate. At the end of the day, we want you to have acquired a better understanding of these segments of our home landscape, and some of the cultural frameworks that tie them together.

### **The Lower Sacramento Valley Landscape**

The Sacramento River is the defining stream of the region. There is no hiding the complexity of the landscapes one encounters in the region where the lower Sacramento River courses south and west toward its confluence with the San Joaquin River flowing from the south into the largest remnant tidal marsh on the West Coast, here on the

northwestern edge of the Sacramento-San Joaquin Delta, arguably the largest inland delta in the world. The complexity of the landscapes to be observed from Vacaville where the tour originates and those visible on the portion of the Putah Creek fan that we will traverse may be subtle in places, in part because much of the almost invisible variability is expressed as moderate surface features that belie the underground complexities of the Solano County soil landscape. But, the complexity is robust. The following discussion provides some hints at these complexities of this sometimes arid, sometimes watery region.

The City of Sacramento is situated on stream terraces and fans near the confluence of the Sacramento and American Rivers, which for the most part are streams of the Sierra Nevada rising to the east and north of the Sacramento Valley. The Sacramento Valley to the north and, to the south, the San Joaquin Valley, whose streams also originate in the Sierra but south of the Sacramento's watersheds, conjoin just south of the City of Sacramento, combining to form the Great Central Valley of California, a region of unparalleled agricultural productivity and many amiable Californians—including cattle, sheep, citizens, and politicians. Vacaville, Fairfield, and Vallejo, the major cities of Solano County, are certainly cities of the Sacramento River basin and its associated landforms, and they are built, for the most part, on sediments that have been deposited by streams of the Sacramento Valley.

In the past few years leading up to 2017, California's normally dry climate held sway, *in extremis*. Since then, the effects of what many consider to be California's epic drought have been somewhat attenuated by fall and winter and spring rains, marking a period of almost normal adequacy. (As an example of these extremes, some places recorded no rainfall in January 2015, traditionally the middle month of our Mediterranean climate's rainy season, but 2017-19 brought record rainfall totals in the same seasonal timeframe.) Those of us who live in the region have experienced several recent "pineapple express" events, when moisture from the central and north Pacific is lifted over or through the Coast Range and dumped on our cities and rangelands and farms, but, most important, on our Sierra. Good weather in California prior to 2017 had come to be defined as rainy days with prospects of more to come. Sometimes one can only take so many sunny, 60-degree days in the wintertime. Nowadays, we fickle lovers of rain are anxious for some weekends of sun and dry.



**The Excursion.** On our field excursion, we shall have a chance to examine some of the complexities of the soil landscapes of the region. On our bus trip, we leave the Vaca Valley (in the watershed of Ulatis and Alamo Creeks) and head north skirting the edge of the English Hills uplands and traverse the old stabilized alluvial fan segments of Putah Creek, where we might see upland soils of ancient and gravelly remnant alluvial fans that reflect another set of climatic conditions (not to mention river hydraulics, sea level differences, and cultural influences) not obvious now. As we approach Putah Creek and our first stop (Dixon Ridge Farms) we shall observe soils that were, figuratively speaking, in terms of pedologic time, laid down yesterday (Dixon Ridge is so-named because its “ridge” comprises sediments laid down on top of the older incised and ancient fans that preceded it, and it sits somewhat topographically higher than some of the incised portions of the older fans). Then we shall move down the fan to visit soils that vary from sandy loams (well-drained soils with a sand component) of the upper fan to down-fan clays of the distal fan and into the basin soils of the island country at Hastings Island, on the edge of the Delta. In the course of this traverse, we will see soils of great age (perhaps the Pleistocene epoch—100,000 years?) alongside young soils of the Holocene epoch (less than 15,000 – 20,000 years old). The ages of these soils have a great deal to do with their fertility and, more important, their drainage capabilities (and therefore farmability), which are associated with soil characteristics that take longer to form.

### **Hills and Fans of Solano County**

Most of the so-called annual grasslands of California might be better characterized as prairies—they support many forbs and other dicots (broad-leaved plants), remnant bunchgrasses, and many native species, as well as broadleaf and grass weeds (most likely a big part of the forage and grazing base), many of which are invasive species. They are dominated, for part of the year, by annual introduced grasses that are native to Mediterranean countries and that found a sound welcome here on the California prairies. In some areas, the natives have been all but eliminated, though they proliferate in the vernal pools, small depressional wetlands associated with restricted internal drainage of the soil profile, which are productive refugia for native species of plants and animals amid a sea of introduced annual grasses and forbs. These endorheic (not connected or flowing to rivers and the ocean) wetlands and some areas of ground that have not been cultivated provide classic study sites for native populations that are somewhat insular and somewhat

at risk. These vernal pool ecosystems, which may be characterized by their unique vegetation and faunal displays, may persist as ecological features for thousands of years, and their endemic plants may have been associated with these pools for thousands of generations.

Vernal pools and swales in the Allendale and Jepson Prairie areas, and other short-term wetlands of the prairie ecosystems, are associated with restricted drainage features of the clayey soil profiles—specifically, clay lenses that don't allow ponded surface waters to permeate the subsoil. The climate—winter rain and summer dry—allows the expression of vegetation types in landscape positions and conditions that reflect the truly harsh ecological cycles the pools undergo. The plants and the critters that have evolved in these unique systems are generally rare and passingly vulnerable to changing conditions. The pools and their biota are singularly adapted to the effects of grazing animals—sheep, cattle, and horses in contemporary California, and presumably elk and other grazers in pre-contact California—and other grassland processes such as wind erosion and deposition of aeolian sediments, fires, periods of water sufficiency and of drought, predation and herbivory, and other insults.

Allendale and other areas on the San Ysidro soil series occupy a fan terrace and some structural hills (underlain by bedrock) that have been shaped by streams and outwashes and influenced by watershed dynamics and sea level changes over the last few hundred thousand years. These systems lie north of the fringes of the Suisun Marsh, an inland marsh feature of the large inland Sacramento-San Joaquin Delta. We will be able to discuss the ecosystem dynamics of this wonderful complex of earth, air, fire, and water cohorts when we have some field time at the various stops.

Where we visit Dixon Ridge Farms and Viguie Farming in the upper and central parts of the Putah Creek fan and Dixon Ridge, the soils are sandy loams to clay loams and of prime capability for the tree and field crops grown there. In the vicinity of the Emigh Ranch and then on the way to Hastings Island, we may encounter old stabilized fan terraces, and, in some of the low spots in the region, the fringelands of the Suisun Marsh and the Delta, where one can see extensive clay soils that reflect the basin nature of the area, wet organic soils, and high-productivity irrigated pasture. Throughout the region, we will notice the green annual grasslands that color the hills and plains, and provide grazing for



thousands of hoofed animals. In November, those hills were gray and brown and crackly dry, and, in some cases, on fire.

### **Perspectives**

From a prehistoric perspective, there is another important thing to recognize about this complex landscape, about the fans and the hills and the sloughs: it has not always been the way it is now. In many ways, it is a classic California landscape that greens up brilliantly in the spring and browns down to gold in the summer and fall. The Putah Creek fan (and its component Dixon Ridge) is fan-shaped and defined by its major stream, Putah Creek (on the border of Yolo and Solano Counties), and smaller creeks draining into Putah Creek. All these creeks intercept and carry water and sediment in their secondary and primary channels; there are deep sediment accumulations (reflected by deep and delightful agricultural soils) flanking them. The fan is sloped from west to east (“tilted”) and has discrete edges. On the other hand, the landscape has some oddities, or maybe superlatives. The Putah Creek Fan coalesces with its sister, the Cache Creek Fan (to the north), to form what is arguably one of the largest coalesced alluvial fans in the country, certainly in the Great Central Valley of California. The streams of northeastern Solano County don’t make their way into the Sacramento River channel—that mother stream has massive and robust levees that turn the streams aside and force them to yazoo their way into the basin-mingling waters of the Sacramento-San Joaquin Delta. Thus, the distal, eastern edge of the fan is not so much truncated by the Sacramento (at least in its current form), but drowned by its sediment deposits, and Putah and Alamo and Ulatis Creeks’ waters are drowned somewhere in the spreading fringes of the Sacramento (in the large and remarkable Delta). The lowest landscape position on the tour may be characterized as part of a trough that more-or-less parallels the Sacramento, running along the Sacramento’s western levees and marked by salty undrained basin soils and moribund wetlands, fading in to the basin that is the Sacramento-San Joaquin Delta. And there are older fans and older landscapes here, or at least memories of them, that we see remnants of but that no longer exist.

Imagine a landscape where the Sacramento River, its base level reflecting sea level, runs in a channel that is from 100 to 300 feet lower than it is now. We don’t need to go too far back in time to find that possibility: that was the situation at the end of the Pleistocene and the beginning of the Holocene (about 20,000 years ago), before the catastrophic,

cataclysmic global warming of the late Pleistocene returned glacial waters to the sea. Imagine San Francisco's gap in the Coast Range—we call it the Golden Gate today—as a river valley 200 to 400 feet lower than sea level today, with the comingled waters of the Sacramento and San Joaquin Rivers coursing through the valley and entering the sea a mile or more west, toward Japan, from the Golden Gate Bridge. If we encountered the streams in those days, what would the landscape look like? We can suggest that the creeks may have had their own canyons, cut through an ancient, massive ancestral (pre-Holocene) alluvial fan, and completely different gradient dynamics—fast streams, carrying more water and more (and larger) sediment, doing more work on the landscape, maybe breaching the broad Sacramento River levees, moving through an alluvial plain that looks much different from the one we see now. Further, imagine that this was the landscape that the first people to invade this continent encountered. We can ask where they might have camped twelve to fifteen to eighteen thousand years ago, what fish they might have eaten, what critters they may have encountered, what their trade routes and seasonal migration patterns might have been. Not only would the flora and fauna have been different (and maybe terrifying), but the ground that lay beneath their hide-covered feet and their villages and campsites and hunting grounds would have been covered up by successive sediment inundations as the fans and the valley basin floors built up as sea level rose.

### **The Soil Landscape of Solano County**

This is the framework for our field day. We will see and discuss some pieces of this new landscape (Holocene-new), as well as remnants of an older, maybe more unfathomable landscape. (If we can perceive the differences in the landscape that existed ten thousand years ago, can we do the same for a million-year-old landscape? A ten million-year-old landscape?) We can discuss our way through our field trip, take a look at the soils and the cultural uses of these soils along the way, and sometimes feel and taste the landscape. We have designed the field day to introduce the fans and terraces and streams and basins as organic, dynamic, and intriguing landscapes, even to folks who know them already. We hope that participants will see this landscape differently today from the way they might have seen it yesterday.

**—David B. Kelley and Morgan Doran**

# 2019 Solano County Ag Tour Speakers

## Russ Lester



Russ Lester is co-owner of Dixon Ridge Farms and a fourth generation California farmer. Dixon Ridge Farms grows, buys and processes California organic walnuts. Russ began farming organically in 1989 and has helped shape many organic farming concepts and practices for orchards. An advocate for farmland protection, Russ served on the Board of Directors for Solano Land Trust and is the current Chair of the Solano County Agricultural Advisory Committee. He has been a featured speaker at national conferences on energy, farmland protection and organic agriculture. In addition, Russ is past president of the Winters Joint Unified School District. He attended the University of California at Davis and is a graduate of the California Agricultural Leadership Program.

- Russ Lester

"Farming is in my roots.

I was born and raised in the Valley of the Hearts Delight, or as most people now refer to it: the Silicon Valley. My dad, grandfather and many before them were all farmers, and I grew up working in their prune orchards. The prunes were conventionally grown, so that meant applying fertilizers, herbicides and pesticides. It wasn't until my chemistry and botany classes in college, though, that I started realizing the potential effects of all these chemicals.

After college, I decided to follow in my father's footsteps and farm. In 1979, my wife and I bought a 68-acre run down almond orchard in Winters, California, and set to work getting the orchard back into shape.

Slowly, I began planting walnut trees, but the young trees left me with little revenue. With tight finances, I started working with pest control advisors to find a way to use fewer pesticides and herbicides. We began employing the new idea of Integrated Pest Management, reducing the chemicals used in our orchard, and were pleasantly surprised to see that it worked!

It was a tragic wake-up call that helped me decide to take the leap and transition our farm to organic.

In the late 80s, doctors discovered that my dad had Non-Hodgkin's Lymphoma. Around the same time, we learned of a study linking this type of lymphoma to herbicides used in farming. Although research couldn't directly link my dad's cancer to the chemicals used in his prune orchards, watching his disease progress made me reconsider even the few pesticides that we still used.

My wife and I decided, for our young family's health, to take the next step. My father's death in 1989 also marked the end of our use of conventional chemicals.

Not many farmers were going organic at that time, and I would be lying if I didn't admit that the journey was frustrating and challenging at times. With the help of forward-thinking researchers, entomologists and organizations, we were able to develop a whole-systems approach to our sustainable practices for Dixon Ridge Farms that we continue to improve upon today.

In our walnut orchards, we keep the soil fertile with an annual no-till cover crop and composted manure. The cover crop and hedgerows attract beneficial insects and wildlife. Not tilling reduces (or eliminates) soil erosion and run-off, maintains earthworm habitat, retains soil moisture and reduces global warming pollution. A new overhead sprinkler system allows for our organic farming practices while delivering the even and efficient water application our trees need.

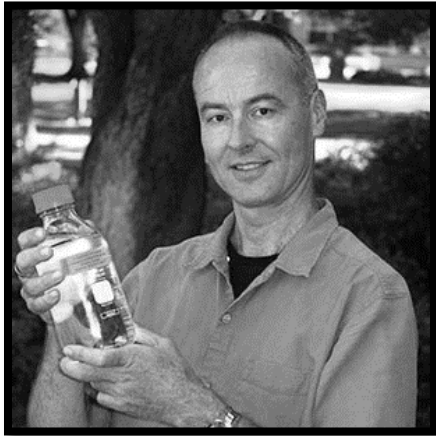
Some of our most exciting projects go far beyond the orchard. Organic walnut processing is better for the earth – we don't use chemical fumigants or bleach to prepare walnuts for sale – but it is energy intensive. We wanted to make our processing just as sustainable as our growing, and we started with the easy choices of using recycled materials in our packaging and putting solar panels on our buildings.

Then we took on the bigger (and more fun) challenge of reducing our energy use. With millions of pounds of walnuts processed each year, you can imagine the huge piles of shells we are left with. We're now turning those shells into electricity, heat, and gas, and using this energy to dry and process our walnuts. We are saving energy, cutting our costs and truly trying to sustain our work and sustain the land.

Every year, we are learning more and improving on the whole-systems approach we started over 30 years ago. After all, sustainability and farming certainly are not stagnant."



# Thomas Harter



Thomas Harter is a Professor and Cooperative Extension Specialist in the Department of Land, Air and Water Resources at UC Davis and holds the Robert M. Hagan Endowed Chair in Water Management and Policy. His research interests include flow and transport processes in groundwater and in the vadose (shallow and unsaturated) soil zone; statistical analysis and modeling of such processes in heterogeneous porous systems; numerical modeling; sustainable groundwater management; assessment and remediation of ground water contamination; nonpoint source pollution of ground water; and geostatistics.

## Degrees:

B.S. Physical Geography, Hydrology, Physics, Botany - Universitat Freiburg, Germany

M.S. Physical Geography/Hydrogeology, Geology and Soil Science - Universitat Freiburg, Germany

Ph.D. Hydrology, Applied Mathematics - University of Arizona

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Groundwater is an invisible resource and often misunderstood in how it works. The presentation provides an introduction to groundwater resources in Solano County. This will include an overview of basic concepts of groundwater occurrence and aquifers, understanding groundwater flow and groundwater storage, groundwater recharge, pumping, and groundwater discharging to streams. We will discuss water balance as an important tool to understand groundwater resources in a management context. The presentation will also provide some background on groundwater quality and groundwater contamination. We will touch on the basic tools that hydrogeologists and groundwater scientists use to measure, monitor, and assess groundwater resources in support of water management planning and decision making.

# Cary Keaton



Cary Keaton has been the General Manager of the Solano Irrigation District (SID or, District) since 2012. Cary started his career as a Civil Engineering Consultant in San Jose CA focused mainly on transportation improvements throughout Santa Clara and Alameda Counties. Cary transitioned to local government in 2000 based on a desire to contribute and diversify his interests. Mainly, before SID, Cary worked for the City of Lathrop in San Joaquin County first as the Public Works Director and later as the City Manager.

Working for a full-service City was a great training ground for Cary because most growth-oriented cities are limited by the availability of drinking water and wastewater treatment capacity.

Cary oversees a diverse District as it is one of a handful of Special Districts operating Agricultural and Municipal and Industrial (M&I) water systems in the State. The District receives 141,000 acre feet of water each year from the Solano Project each year. The Solano Project was conceptualized in the early 1940's and came on-line delivering its first water in 1959.

The District operates the Solano Project, which delivers bulk Lake Berryessa water to Vacaville, Fairfield, Suisun City, Benicia and Vallejo. The District also delivers bulk Ag water to itself and Maine Prairie Water District. Also, the District owns and operates the hydroelectric power plant at the base of Monticello Dam which has a generation capacity of about 11.5 MW. SID has 89 employees and operates on a \$10 million annual budget.

The District also partners with the City of Suisun City by forming the Suisun-Solano Water Authority (SSWA). SSWA has a water treatment plant with a treatment capacity of about 10 million gallon per day and serves a population upwards of about 30,000. SSWA's annual budget is about \$6 million. SSWA's water treatment plant is undergoing about a \$20 million upgrade.

Aside from SSWA, the District operates another sixteen (16) M&I water systems which includes two (2) small water treatment plants in rural areas of the county. Lastly, under contract, the District operates the Rural North Vacaville Water District's facilities which is a groundwater system but, no water treatment plants.

Solano Irrigation District is an independent Special District, a local government agency, formed in 1948 for the sole purpose of spearheading the Solano Project. The Solano County Water Conservation District was formed in 1952 for the purpose of setting up partnerships with the local Cities and funding the Solano Project. The District's five-member Board of Directors is elected by registered voters within the boundaries of the district.

## **SID Mission**

Solano Irrigation District's mission is to provide safe and reliable water to our farms, families, and businesses. As stewards of our precious local water resources, we are committed to responsible environmental and fiscal management in order to protect and ensure those resources into the future.

## **SID Vision**

The Solano Irrigation District will be an organization that:

- Fosters a positive and long term relationship with municipal, residential and industrial stakeholders within our place of use while emphasizing the needs of our agricultural roots.
- Researches and develops alternative income sources to maintain the lowest possible water rates for our District constituency.
- Develops a proactive and innovative approach to expand, maintain, and rehabilitate water delivery systems.
- Provides transparency and accountability to all District stakeholders and partnerships.
- Treats employees with respect, integrity, and dignity while providing a safe, progressive growth orientated work environment.
- Will be a responsible steward and guardian of our County's natural and fiscal resources.

## David Viguie



David is the owner of Viguie Farming, which is partnered with Dustin Timothy in farming 5,000 acres in the Dixon-Davis area, almost entirely south of Putah Creek. Together they oversee a highly diverse farming operation, growing at least ten types of field and orchard crops, primarily focused on processing tomatoes. Their farming operations are entirely dependent on ground water for irrigation, as they are outside any irrigation district boundaries.

David grew up in San Francisco and attended UC Davis, graduating in 1980. As he finished school in his mid-twenties, he came to Solano County to work on a farm. In 1990, working with Dustin's father, Ron Timothy, David started his own farming operation working in the Tremont Road area.

Since 2000 David has been a member of the Dixon Resource Conservation District (RCD) Board of Directors and currently serves as its president.



# Ryan Mahoney



Ryan is a fifth-generation sheep and cattle rancher who is the operations manager for Emigh Livestock, based in Rio Vista. Emigh Livestock is a diverse livestock enterprise with breeding ewes, breeding beef cows, and they finish or feed lambs to prepare them for sufficient carcass quality and size before harvest. Ryan prides the Emigh Livestock operation on prioritizing the animals first and always improving the operation through practical technologies, multi-species grazing practices, and a long tradition of common sense in livestock handling principles.

## - Ryan Mahoney

“My greatest satisfaction from raising and feeding sheep comes when I go to the store or restaurant, see eye-appealing lamb in the case or tasty lamb served to customers and know that I had a hand in bringing that to the consumer. That’s a darn good feeling.”

At Emigh Livestock, mature ewes, yearling ewes and lambs are run on grass year-round, thanks to irrigated pastures and California’s mild temperatures. The irrigated land can carry 1,000 lambs on 160 acres, but Emigh Livestock prefers to run its sheep in smaller bunches of 400, simply because “they do better.”

Ewes are lambled in the fall, with lambs weaned in May weighing 90 to 100 pounds. The lambs then go on irrigated clover. The sheep take full advantage of every bit of edible vegetation, including nutritious native plants like filaree and burclover.

Ryan, who joined the family business after graduating from St. Mary’s College of California in 2006, says one member of the sixth generation of the family is already learning the ropes at age six. Ryan and his wife Kelli have three children: McKayla, 9; Emily, 7; and Connor, 4. His young daughter McKayla worked on the farm with him one summer, earning \$1 an hour. She saved up \$60 – “and got her share of Frosties along the way.

“It’s quite unusual in California to have five generations of sheep ranching to one’s history, and it makes you feel good that the next generation is interested in the business. We’re a family business, with four generations – my grandpa, mom, me and now my kids – involved right now.”

# Roberta Goulart and Misty Kaltreider



Roberta and Misty are with the Solano County Department of Resource Management and will provide background information on two of the more significant water-related policy issues affecting the agricultural community in Solano County.

Misty will cover developing issues in Solano County around the Sustainable Groundwater Management Act (SGMA), including the formation of the Groundwater Sustainability Agency (GSA), and the process to develop the Groundwater Sustainability Plan (GSP).

Roberta will give an overview of State work in the Yolo Bypass and Cache Slough relative to flood and ecosystem restoration projects. This includes the creation and of a 15-member local/State/Federal Partnership to determine how all agencies could potentially work together in a way that is proactive of agriculture on the landscape; the State's EcoRestore program and its mandate to satisfy Biological Opinions to mitigate the State and Federal Water Projects, and what this means for Solano County; a brief background of EcoRestore projects and other projects, including Prospect Island, Lookout Slough and the potential Little Egbert Projects; and describe what Solano County is doing to protect agriculture in the face of significant changes to the landscape, through General Plan amendments as well as other efforts to add flexibility in Ag mitigation efforts.

# Wendy Rash



Wendy has been a Soil Conservationist with the USDA – Natural Resources Conservation Service (NRCS) since 2003, first in El Dorado County, then in Yolo County and now in Solano County. Wendy is also the District Conservationist for the NRCS offices in Solano and Napa counties. Wendy’s work focuses on the implementation of farming and ranching practices that conserve natural resources and enhance farm and ranch viability. She works closely with the Solano Resource Conservation District and the Dixon Resource Conservation District, both of which are sister agencies to the USDA-NRCS office.

In 2016-17, Wendy led the effort to establish the Cache Slough Land Evaluation and Site Assessment (LESA) model, the first such model in Solano County.

The Cache Slough Complex watershed lies in the northwest quadrant of the Sacramento-San Joaquin Delta in California. The Delta embodies the competing values of water use for agriculture, for wildlife habitat, and for urban development. Because of its lack of urban development, the Cache Slough Complex is the focus of competition for land between and among flood protection, ecosystem restoration, and agricultural land uses. Agricultural activities currently dominate land use in the Cache Slough Complex, and the value of the land for agriculture has not been well understood, nor is it adequately reflected by Prime Farmland or similar designations.

Land Evaluation and Site Assessment (LESA) is a “numeric rating system for scoring sites to help in formulating policy or making land-use decisions.” (LESA Guidebook, 1996). These systems were first developed in the 1980’s by the Natural Resources Conservation Service in order to bring agricultural values into land-planning processes and have been used in localities across the United States. The factors that make up the LESA system are developed by local stakeholders to measure suitability of different parcels for agricultural use in a specific geographic area. A Land Evaluation and Site Assessment (LESA) system was developed for the Cache Slough region in 2017 to better inform County and State land use planning processes that have a great potential to impact agriculture in the region.

The Cache Slough Complex LESA was developed in a stakeholder-driven process with guidance from local experts, and Geographic Information Systems (GIS) tool development was integrated into the project design from inception. The project resulted in a GIS tool to objectively evaluate projects in the region that convert agricultural lands to other uses, a clear understanding of the value of agriculture to the local economy and agricultural system, and a way to inform ecosystem restoration and flood planning efforts currently underway.

There is potential to create a LESA system for the rest of Solano County, which could bring some unity to planning processes among the entities that have land-use authority and could inform a unified agricultural land mitigation policy across the county. This system could be designed with sensitivity to values that stakeholders may have in different agricultural regions of the county. It could also incorporate tools for evaluating agricultural land conversion that are already used by LAFCO.

# Melinda Terry



Since 2008, Melinda Terry has served as the Manager for the North Delta Water Agency (NDWA) and Executive Director of the California Central Valley Flood Control Association (CCVFCA). Formed by a special act of the Legislature in 1973, the NDWA encompasses 300,000 acres of the legal Delta including portions of Sacramento, Yolo, Solano, and San Joaquin Counties. CCVFCA was established in 1926 to promote the common interests of local flood control district in maintaining effective flood management systems in California's Central Valley for the protection of life, property, and the environment.

Prior to her current position she served as: Deputy Secretary for Legislation for the CA Resources Agency in Governor Arnold Schwarzenegger's Administration; Vice President of Government Affairs for the CA Forestry Association; and as Legislative Director for Assemblyman Trice Harvey (R-Bakersfield).

In 1981, DWR and NDWA executed a Contract for the Assurance of a Dependable Water Supply of Suitable Quality (1981 Contract). The 1981 Contract is a guarantee by the State of California to operate the SWP to meet specified water quality criteria while providing enough water to satisfy all reasonable and beneficial uses of water within NDWA's boundaries for agriculture, municipal, and industrial needs in perpetuity. In return, NDWA makes an annual payment to DWR.

CCVFCA membership includes over 75 reclamation, flood control, levee and drainage special districts, as well as cities and counties with flood control responsibilities along the Sacramento and San Joaquin Federal Project Levee System and non-project levees within the Sacramento-San Joaquin Delta.

Melinda brings a wealth of knowledge surrounding water and land use changes in the Delta region and will discuss the multitude of projects and plans in the Delta, especially those affecting agricultural land conversion for habitat restoration.



## David Kelley

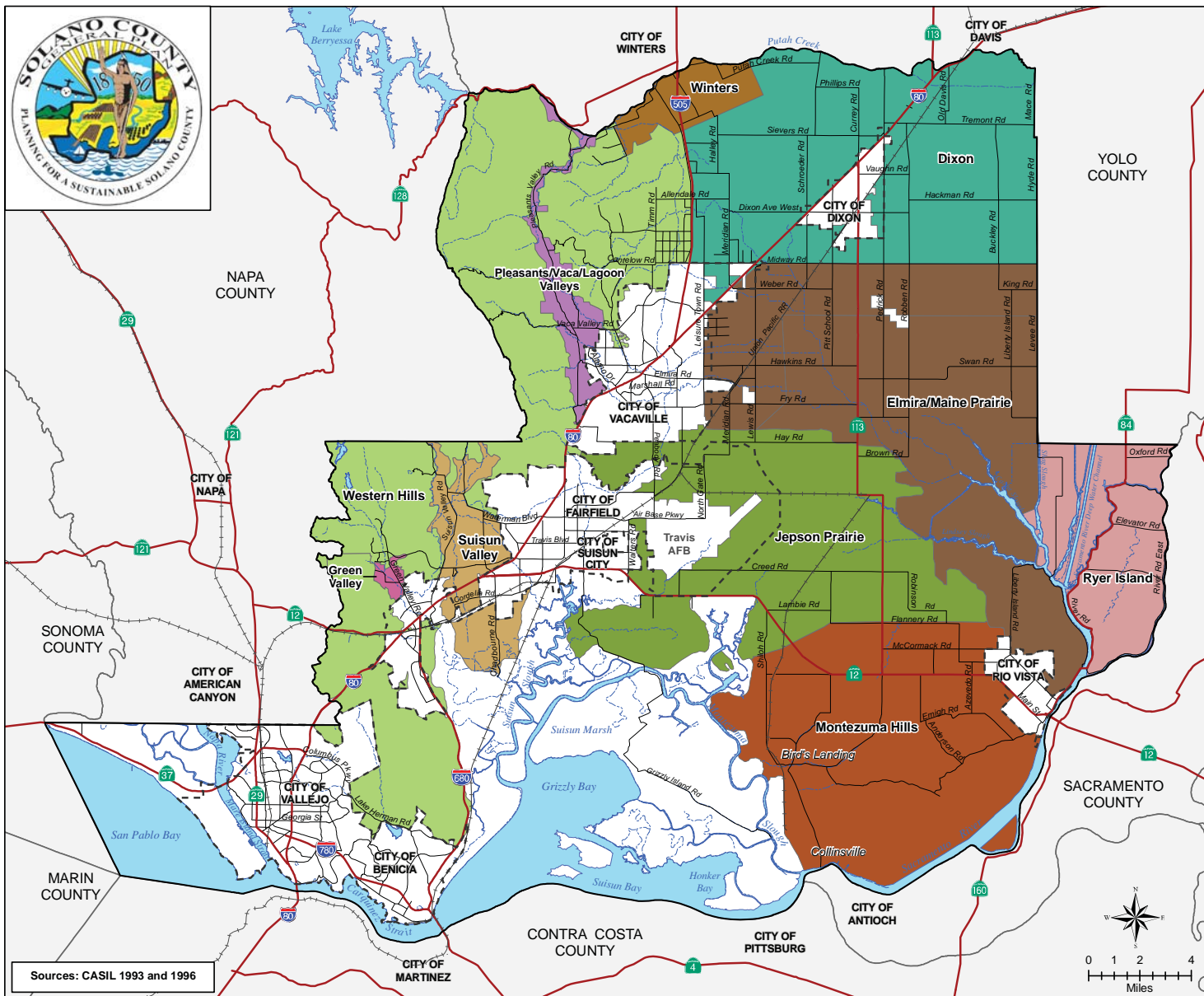


David Kelley has been a consultant on soil and plant science, rangeland ecology and management, land use and environmental resource issues, and arboricultural and agricultural matters for over 36 years. He is a registered professional soil scientist and a certified arborist. As president and founder (1981) of Kelley & Associates Environmental Sciences, Inc., a private consulting firm, and as president of Tuscan, Inc., a non-profit foundation formed (in 1991) to hold grazing land and wildland conservation easements and to manage and protect wildlands for educational and research purposes, he has had the opportunity to oversee the implementation and completion of many large agricultural and development projects and the development of agricultural and rangeland preserves in California. He has worked on many projects in the Great Central Valley, the Salinas and Napa Valleys, the California Coast, and the Sacramento-San Joaquin Delta and adjacent counties, on projects ranging from rangeland management issues and large-scale wildlife habitat restoration, to agricultural development and analyses of damages and claims on rangeland sites. His work has included agricultural development, wetlands, and rangeland projects in Peru, Mexico, Belize, Venezuela, Hong Kong, and other countries. He has taught plant physiology and rangeland ecology at the university level (the University of California-Davis and Humboldt State University), and frequently lectures at universities and colleges throughout the state. He teaches professional short courses on soils, ecology, and arboriculture on a regular basis.

## Morgan Doran



Since 2001 Morgan has been a Livestock & Natural Resources Advisor for UC Cooperative Extension covering Napa, Solano, Yolo and Sacramento counties. Much of his work in Cooperative Extension has focused on rangeland management and the use of livestock for specific vegetation management objectives in range and croplands. Other work includes invasive weed control, oak recruitment strategies, water quality, niche meat marketing, and grazing management systems. Morgan is the current director of UCCE Cooperative Extension Capitol Corridor, covering Solano, Yolo and Sacramento counties, and is an ex-officio member of the Solano County Ag Advisory Committee.



## Solano County General Plan

Figure AG-4

### Agricultural Regions

#### Legend

##### Agricultural Region

- Dixon Ridge
- Elmira/Maine Prairie
- Green Valley
- Jepson Prairie
- Montezuma Hills
- Pleasants/Vaca/Lagoon Valleys
- Ryer Island
- Suisun Valley
- Western Hills
- Winters

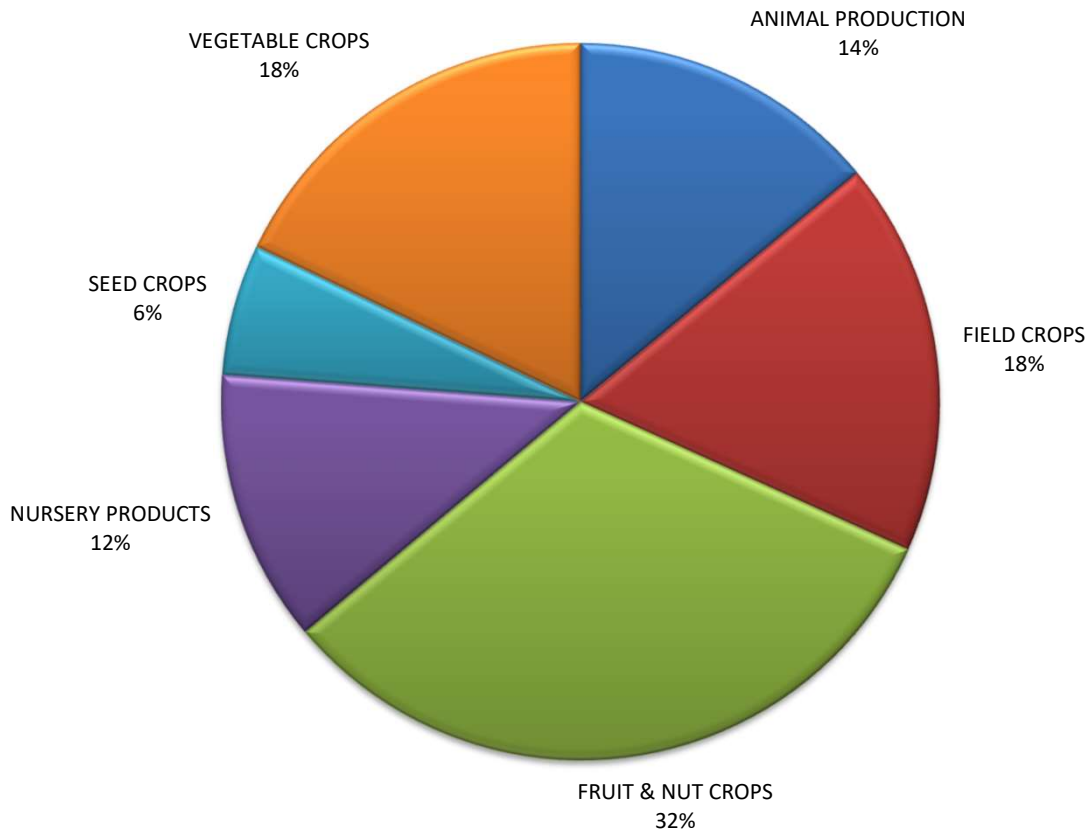
##### Basemap Layers

- Roadways
- Highways
- Railroads
- Streams and Creeks
- Major Water Features
- Municipal Service Areas
- Adjacent Counties

"Planning for a Sustainable Solano County"

X 06264476.04 040 8/22/08

# 2017 Value by Crop Group



## Value Summary

YEAR	ANIMAL PRODUCTION <sup>1</sup>	FIELD CROPS	FRUIT & NUT CROPS	NURSERY PRODUCTS	SEED CROPS	VEGETABLE CROPS	TOTAL	VALUE
2017	50,756,000	64,474,000	116,619,000	44,627,000	21,459,000	64,887,000	\$362,822,000	
2016	37,259,000	59,006,000	127,228,000	39,754,000	16,478,000	67,447,000	\$347,172,000	
2015	57,277,000	78,454,000	87,741,000	37,648,000	11,729,000	81,020,000	\$353,869,000	
2014	62,387,000	98,672,000	86,624,000	35,594,000	16,900,000	78,468,000	\$378,645,000	
2013	51,340,000	88,744,000	97,150,000	35,144,000	16,628,000	59,209,000	\$348,215,000	
2012	63,425,000	84,604,000	87,368,000	32,707,000	17,680,000	56,911,000	\$342,695,000	
2011	52,458,000	83,812,000	63,420,000	23,630,000	14,671,000	53,668,000	\$291,659,000	
2010	46,011,000	57,072,000	54,874,000	23,352,000	14,391,000	63,698,000	\$259,398,000	
2009	40,116,000	50,073,000	48,191,000	33,499,000	15,859,000	64,184,000	\$251,922,000	
2008	49,873,000	89,365,000	44,037,000	43,056,000	10,828,000	55,624,000	\$292,783,000	
2007	54,820,000	54,812,000	43,430,000	56,611,000	10,821,000	47,762,000	\$268,256,000	

<sup>1</sup>Includes livestock and poultry, livestock and poultry products, and apiary production.



\* Image sizes in chart are proportionate to 2017 Crop Value Amount

## Top Ten Million Dollar Commodities

CROP	2017 CROP VALUE	2017 CROP RANKING	2016 CROP RANKING
Walnuts	47,358,000	1	1
Nursery Products	44,627,000	2	2
Almonds	38,619,000	3	3
Tomatoes (Processing)	27,022,000	4	4
Alfalfa (Hay)	25,612,000	5	5
Cattle & Calves	25,113,000	6	9
Grapes (Wine)	20,369,000	7	6
Sunflower (Seed)	17,233,000	8	7
Wheat	7,261,000	9	10
Sheep & Lambs	6,032,000	10	8



## GRAND TOTAL OF ALL AGRICULTURAL PRODUCTS (US DOLLARS)

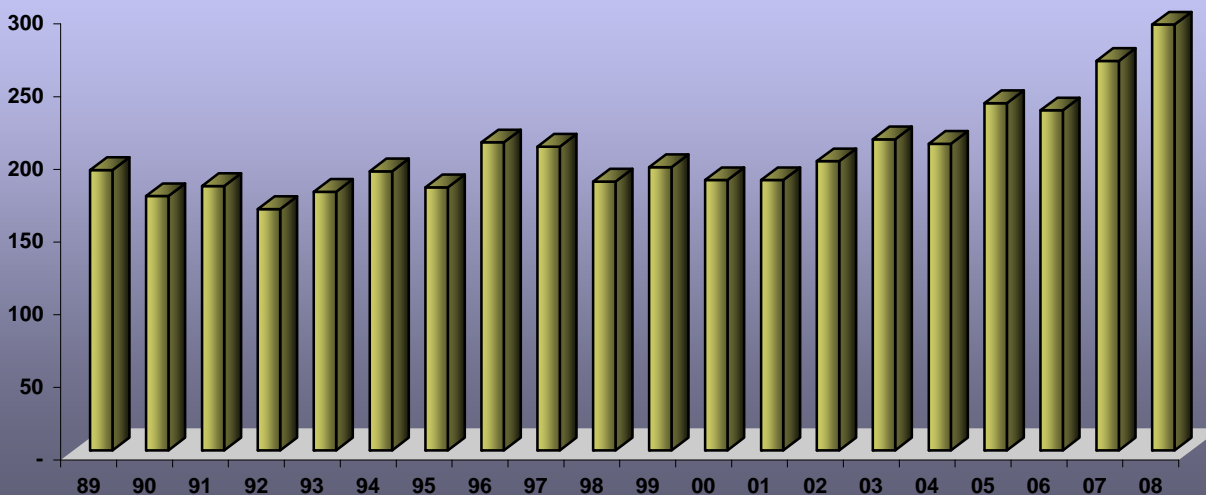
**2008            \$292,840,200**  
**2007            \$268,255,200**

### VALUE SUMMARY

YEAR	FIELD CROPS	NURSERY	FRUIT & NUT CROPS	SEED CROPS	VEGETABLE CROPS	ANIMAL PRODUCTION	YEAR TOTALS
1999	55,959,800	28,978,000	29,578,400	7,987,200	44,285,400	28,693,700	195,482,500
2000	47,493,400	35,044,700	29,801,800	5,075,100	33,893,900	34,265,500	185,574,400
2001	48,209,300	37,668,100	26,634,100	4,897,700	33,079,600	35,181,700	185,670,500
2002	47,901,800	38,781,200	25,974,800	5,739,700	37,155,000	43,933,000	199,485,500
2003	43,945,500	42,373,400	26,518,000	5,326,600	35,663,700	60,295,600	214,122,800
2004	50,423,200	43,645,000	*29,285,900	7,114,600	36,903,400	45,207,100	*211,229,900
2005	52,812,700	50,018,000	37,918,500	10,533,500	36,505,000	50,901,900	238,689,600
2006	46,945,500	47,856,000	39,964,300	9,987,600	40,899,400	47,852,200	233,505,000
2007	54,811,900	56,610,700	43,430,000	10,820,900	47,762,100	54,819,600	268,255,200
2008	89,365,400	43,056,300	44,036,600	10,827,900	55,623,500	49,930,500	292,840,200

\*Revised 2004 Figure

**Agricultural Production  
20-Year Comparison  
(Million US Dollars)**





**MILLION DOLLAR CROPS  
(US DOLLARS)**

**RANKING**

**2008                      2007**

NURSERY PRODUCTS	\$43,056,300.00	1	1
ALFALFA	42,889,900.00	2	2
TOMATOES, PROCESSING	29,850,600.00	3	3
CATTLE & CALVES	23,321,100.00	4	4
WALNUTS	19,948,100.00	5	5
MILK, MARKET	16,437,000.00	6	6
GRAPES, WINE	11,064,700.00	7	7
WHEAT, IRRIGATED	8,335,200.00	8	11
SUNFLOWER SEED, CERTIFIED	8,244,200.00	9	12
CORN, FIELD	8,081,600.00	10	9
SHEEP & LAMBS	6,781,100.00	11	10
SUDANGRASS	5,377,300.00	12	13
ALMONDS	5,175,700.00	13	8
RYEGRASS	4,689,300.00	14	16
PRUNES (DRIED PLUMS)	4,275,000.00	15	17
PASTURE, RANGELAND	3,374,200.00	16	15
WHEAT, DRYLAND	3,066,100.00	17	20
PASTURE, IRRIGATED	2,700,300.00	18	18
BEANS, EDIBLE DRY	2,219,400.00	19	-
HAY, GRAIN	2,078,100.00	20	-
SAFFLOWER, OIL	2,003,900.00	21	21
SUNFLOWER SEED, NON-CERTIFIED	1,044,000.00	22	22
BEANS, DRY SEED		-	19
BELL PEPPERS		-	14

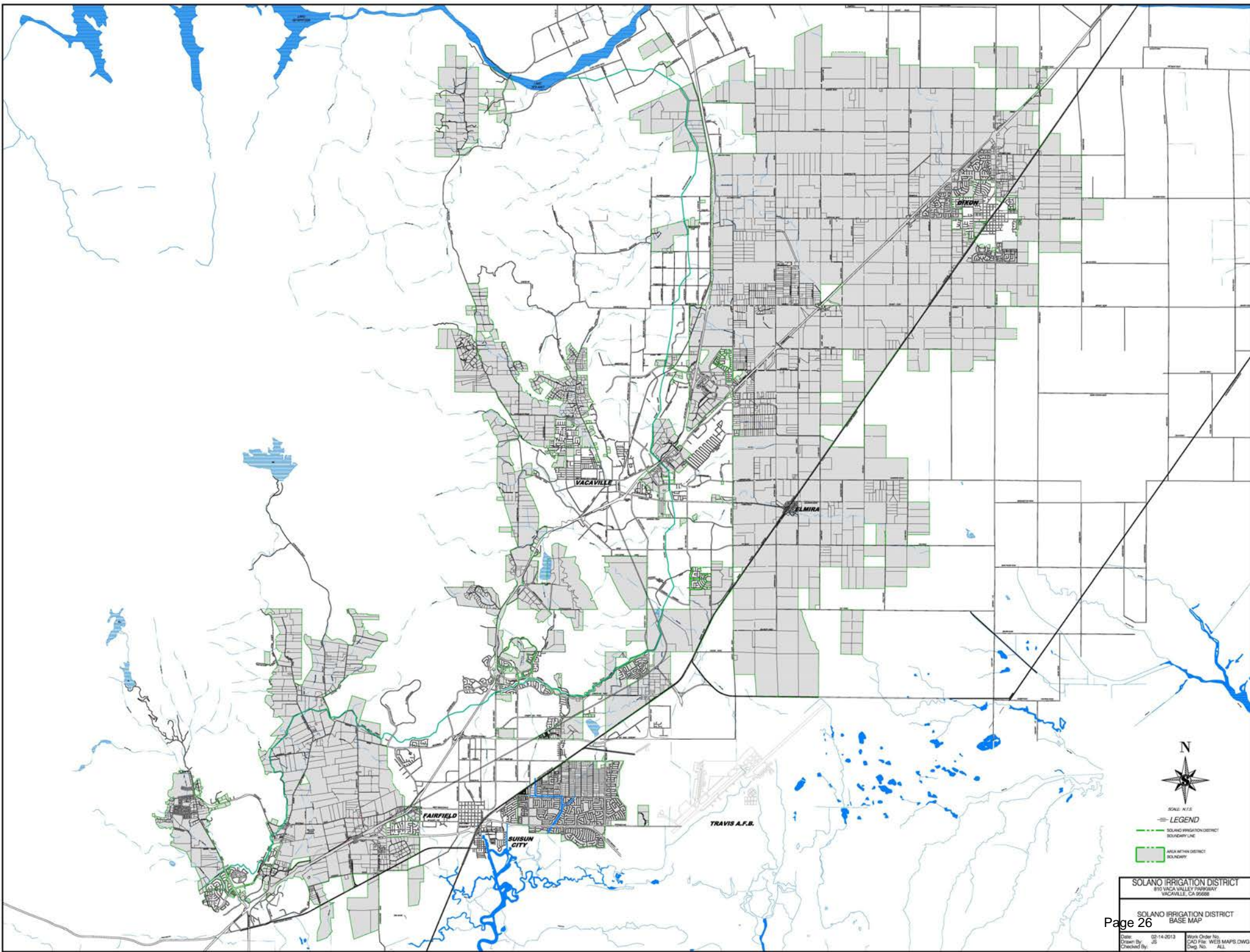
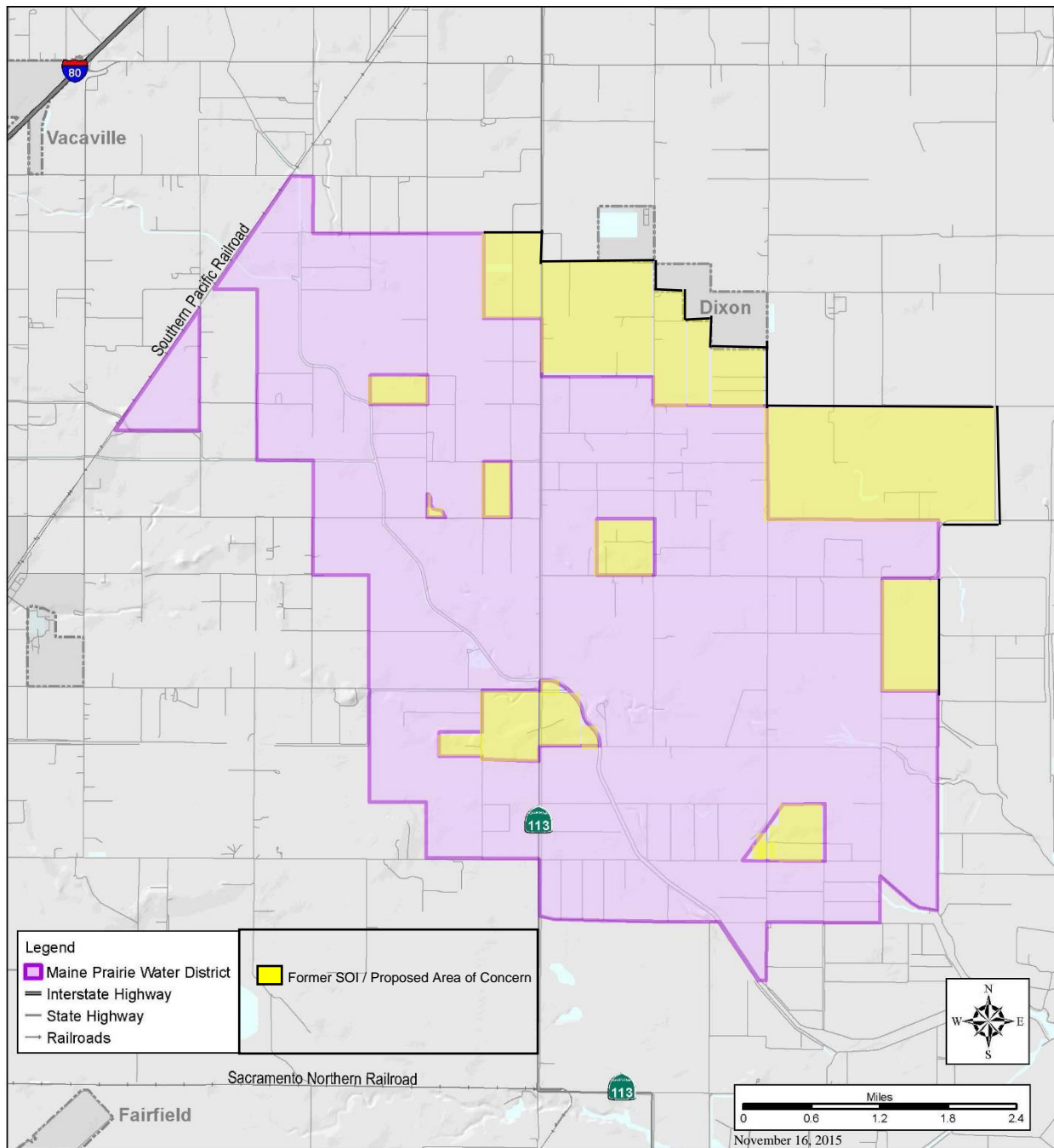


Exhibit: A

# Maine Prairie Water District



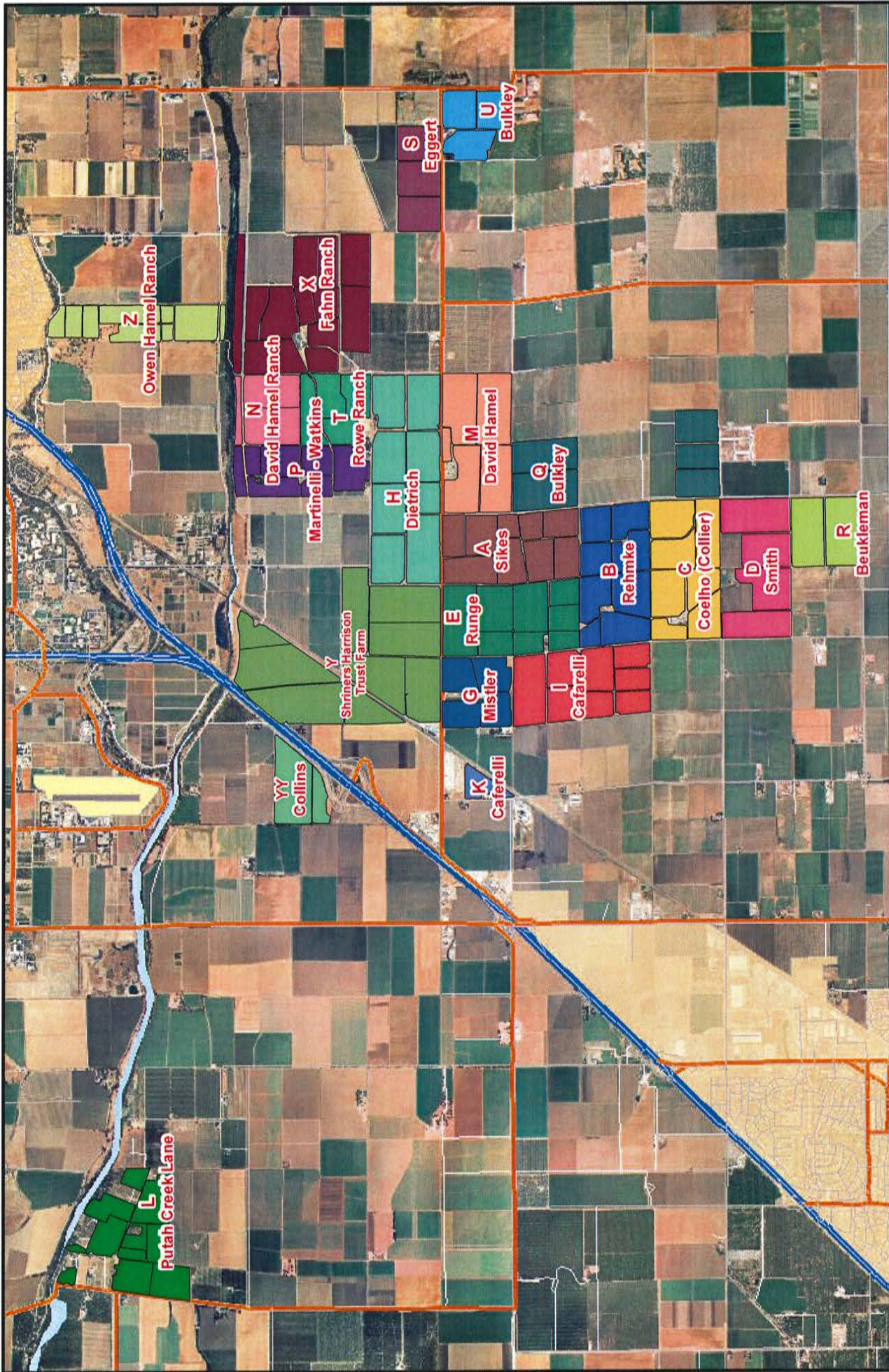
**Solano County GIS Services**  
Department of Information Technology  
675 Texas Street, Suite 3700  
Fairfield, CA 94533  
Phone: 707-784-6340  
Email: GISStaff@SolanoCounty.com  
PRJ\_1208, 01/29/15


*Disclaimer:*  
This map was made using Solano County GIS files with varying degrees of scale, accuracy, precision, currentness, and alignment and therefore cannot be used for situations requiring survey grade measurement or legal boundary determination. Solano County disclaims liability for any loss that may result from the use of this map. User acknowledges data limitations and accepts responsibility for map based judgments.












## Dustin Timothy & Viguie Farming

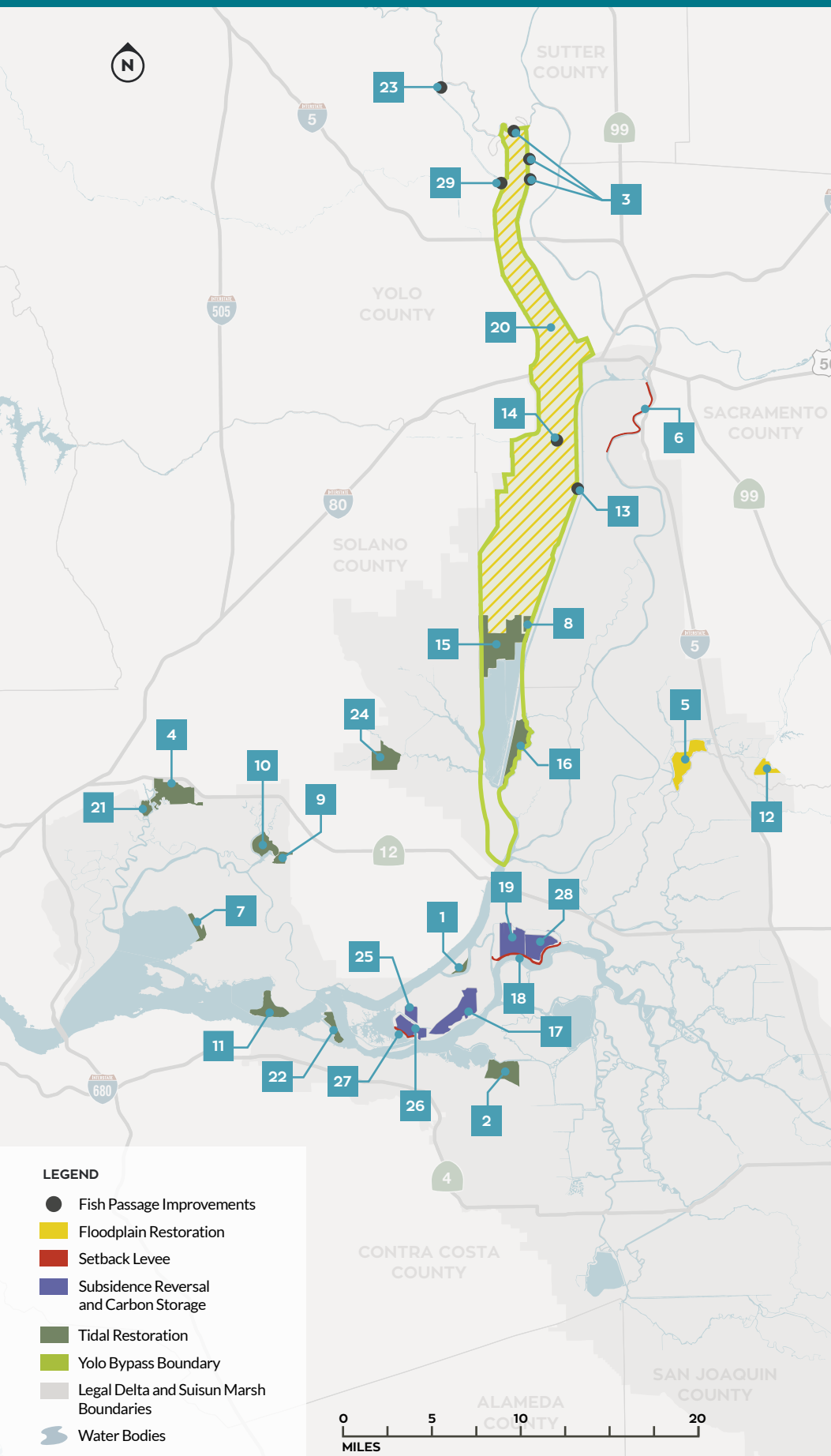


Overall	Mapping Services
2019	

Page 29



## CALIFORNIA ECO RESTORE PROJECTS



### 2018

(Construction Underway or Beginning in 2018)

1	Decker Island
2	Dutch Slough
3	Fremont Weir Adult Fish Passage Modification
4	Hill Slough
5	McCormack Williamson Tract
6	Southport Levee Improvement (2017)
7	Tule Red (2016)
8	Yolo Flyway Farms

### 2019+

(Target Construction Start Dates)

9	Arnold Slough
10	Bradmoor Island
11	Chippis Island
12	Grizzly Slough
13	Lisbon Weir
14	Lower Putah Creek Realignment
15	Lower Yolo Ranch
16	Prospect Island
17	Sherman Island: Whale's Belly Wetland
18	Twitchell Island: Levee
19	Twitchell Island: West End
20	Yolo Bypass Floodplain Restoration
21	Wings Landing
22	Winter Island

### COMPLETED

(Construction Completed)

23	Knights Landing Outfall Gate
24	Lindsey Slough
25	Sherman Island: Mayberry Farms
26	Sherman Island: Whale's Mouth
27	Sherman Island: Mayberry Slough
28	Twitchell Island: East End
29	Wallace Weir Fish Rescue Facility

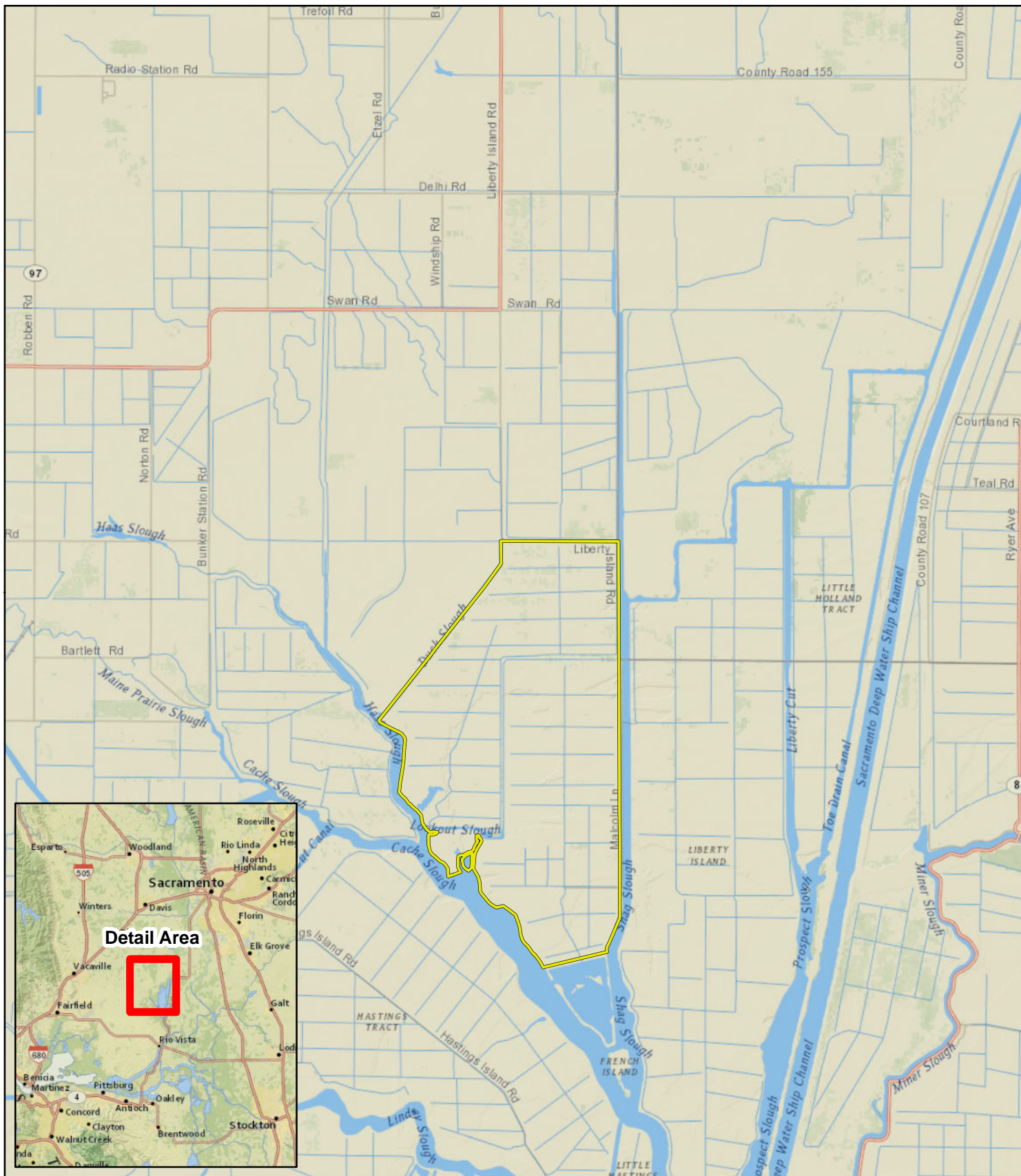


Figure 1. Project Location

## Lookout Slough Restoration Project



0 0.5 1 2  
Miles



**Ecosystem  
Investment  
Partners**

Prepared by:



Map Prepared Date: 12/13/2018  
Map Prepared By: pkobylarz  
Base Source: Esri - Nat. Geo.  
Data Source(s):

ENVIRONMENTAL CONSULTANTS



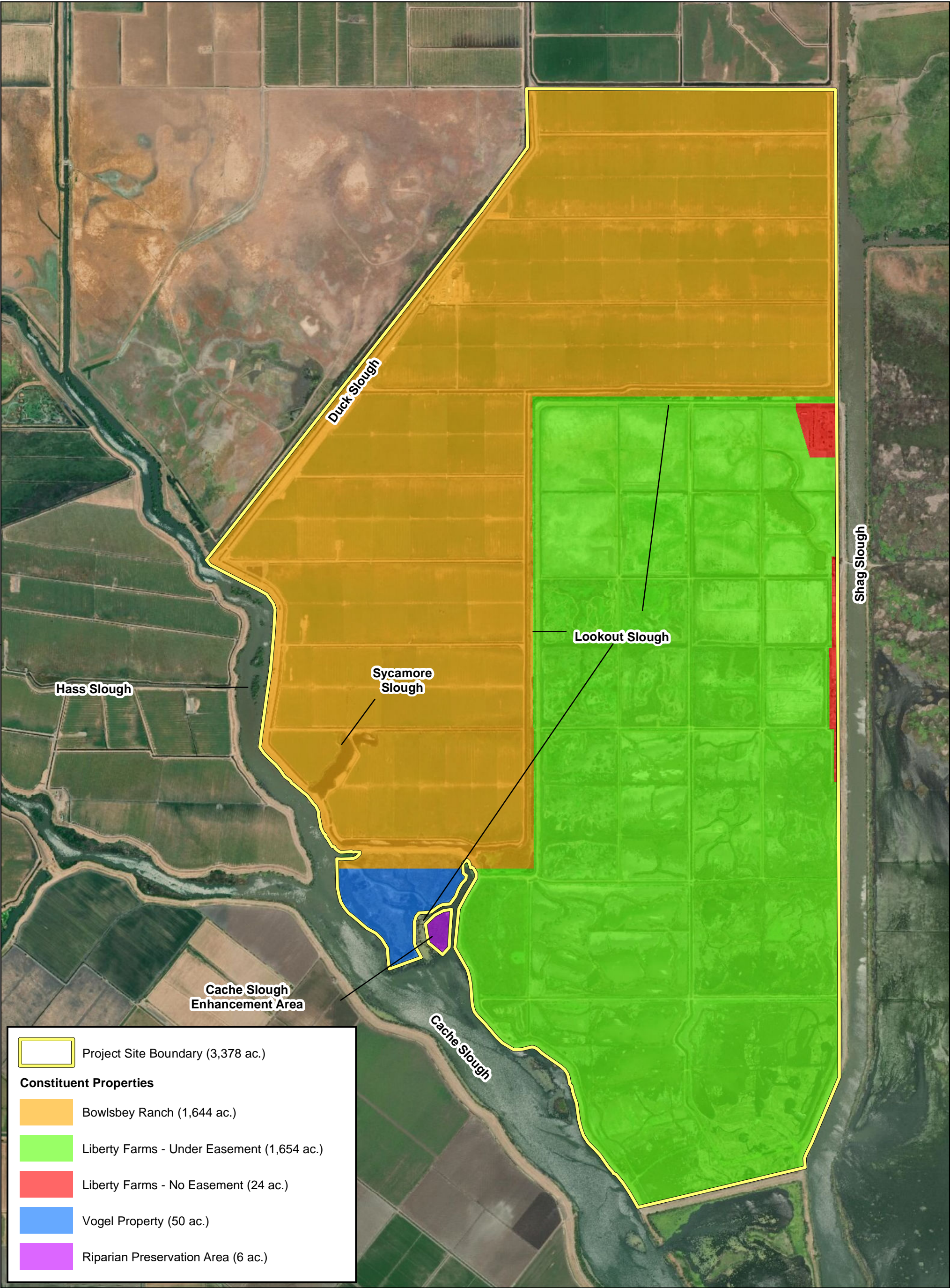
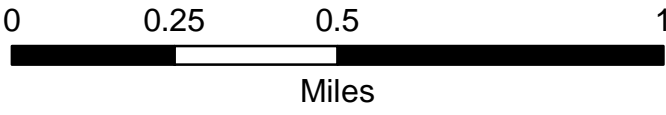


Figure 2. Project Area Overview

Lookout Slough Restoration Project



Ecosystem  
Investment  
Partners

Prepared by:



Map Prepared Date: 12/19/2018  
Map Prepared By: pkobylarz  
Base Source: Wood Rogers  
Base Date: 10/24/17  
Data Source(s): WRA



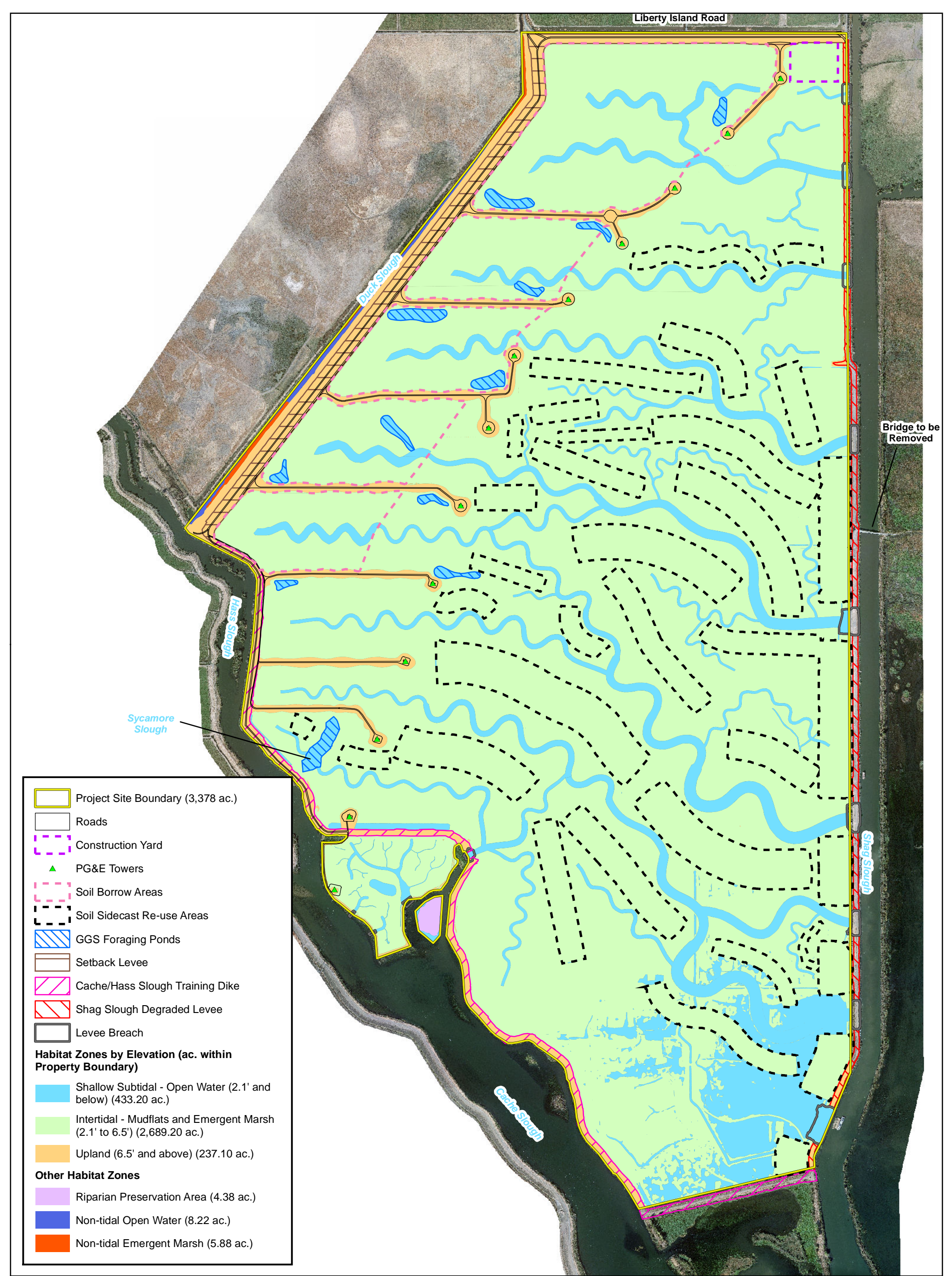
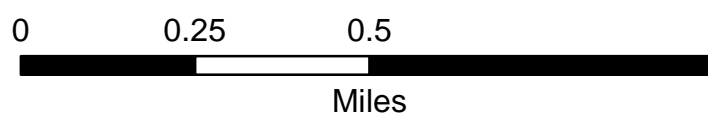


Figure 3. Overview of Proposed Project Concept

## Lookout Slough Restoration Project



Ecosystem  
Investment  
Partners

Prepared by:



Map Prepared Date: 2/25/2019  
Map Prepared By: pkobylarz  
Base Source: Wood Rogers  
Base Date: 10/24/17  
Data Source(s): WRA

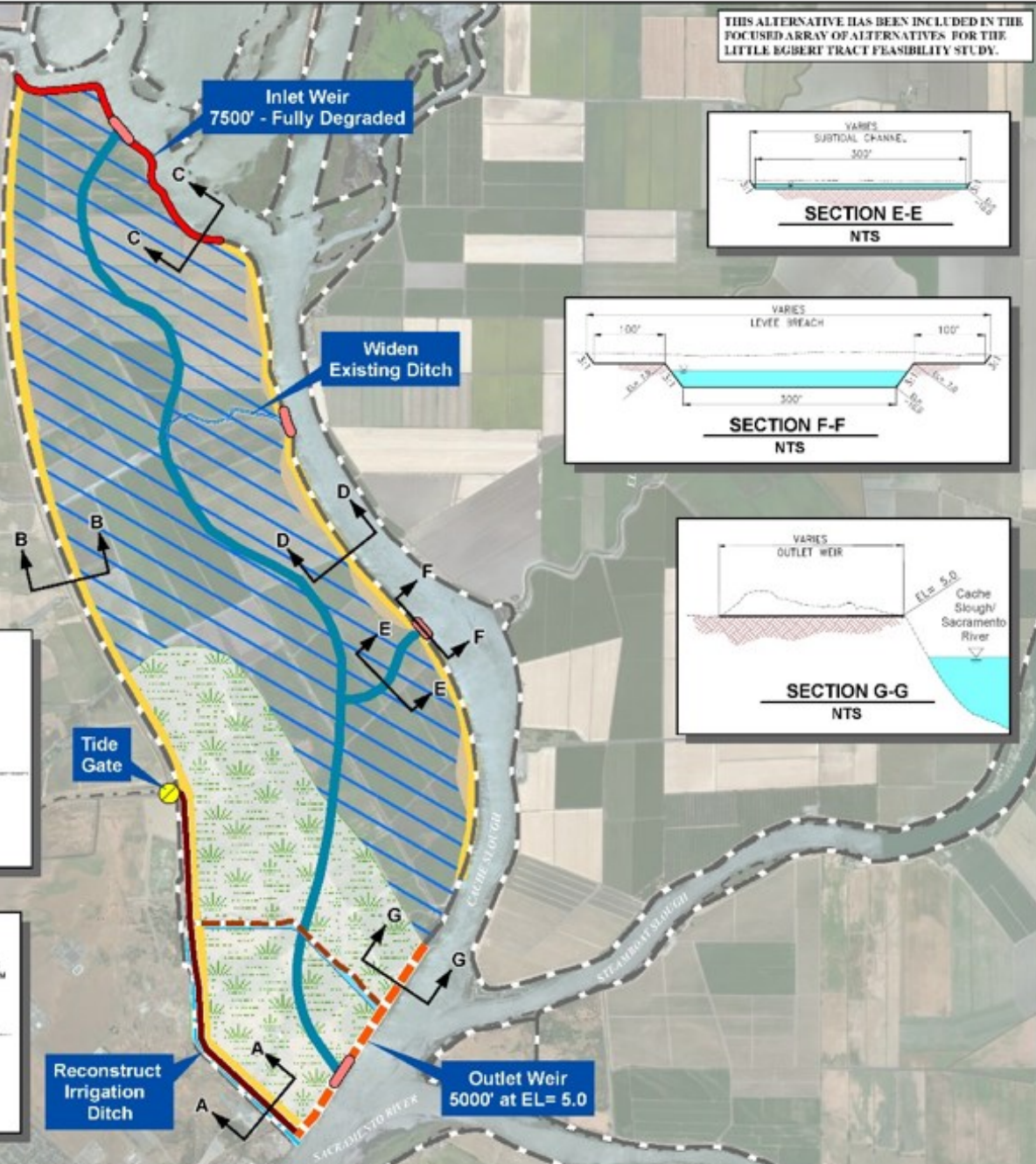
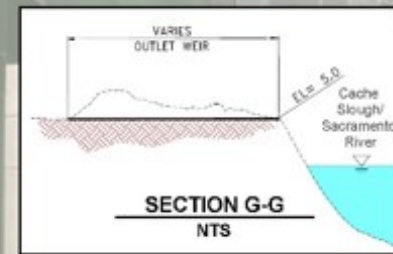
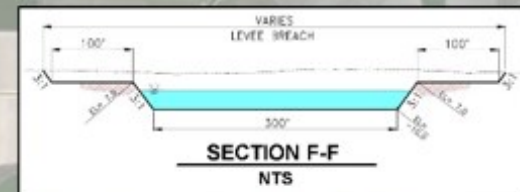
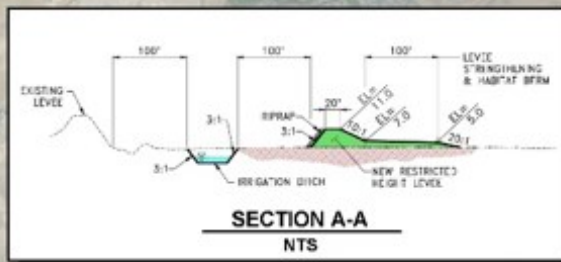
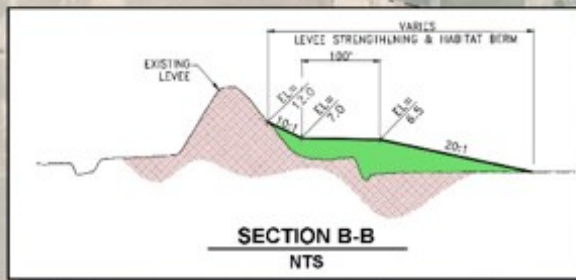
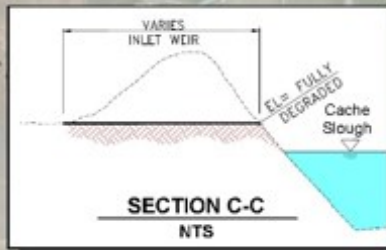
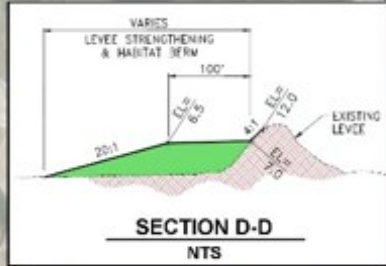


# Little Egbert Tract Feasibility Study

## ALTERNATIVE 3

Solano County, California  
June, 2018

THIS ALTERNATIVE HAS BEEN INCLUDED IN THE  
FOCUSED ARRAY OF ALTERNATIVES FOR THE  
LITTLE EGBERT TRACT FEASIBILITY STUDY.



- Tide Gate
- Inlet Weir
- Outlet Weir
- New Restricted Height Levee
- Degrade Agricultural Berm
- Levee Strengthening & Habitat Berm
- Irrigation Ditch
- Subtidal Channels
- Dredge Reuse/ Habitat
- Proposed Tidal Marsh Complex
- Subtidal Habitat
- Existing Ditch
- Existing Levee



**SAFCA**  
Sacramento Area Flood Control Agency



**WOOD RODGERS**





## Hastings Island Hunting Preserve

Established for the 1968-1969 hunting season, Hastings Island Hunting Preserve is a state licensed, Zone B, pheasant club located 70 miles east of San Francisco and 35 miles southwest of Sacramento. Nestled in California's Sacramento / San Joaquin Delta on Hastings Island, this private ranch contains an expansive 4,700 acres, with over 800 acres dedicated solely to prime upland bird cover. The balance of this family farming operation is occupied by Hastings Island Land Company, which provides a rich habitat of Delta irrigated alfalfa, corn, wheat and safflower.



Hastings Island is surrounded by river on all sides, providing you with a variety of hunting, fishing and outdoor recreational opportunities. There are activities to keep you and your family busy throughout the year. We have dog training, fishing, trapshooting, camping and picnicking available to our members and their families. During the spring and summer, several local dog clubs host field events.

Our personable, seasoned staff is dedicated to ensuring your success as well as your safety. We offer Hunter Safety Courses, as well as orientation classes to familiarize new members with the Club, our employees and our rules and regulations. We encourage family participation by offering safety classes and activities that support our junior hunters. Please feel free to call for an appointment to meet us and tour our operation.



# Articles of Interest

Benefits of Farmland Conservation in California

<https://www.cdfa.ca.gov/oefi/climate/docs/Farmland-Conservation-in-California.pdf>

Economic Effects of Solano County Agriculture: Baseline Assessment and Cache Slough Case Study

<http://www.solanocounty.com/civicax/filebank/blobdload.aspx?blobid=27084>

The Solano Agricultural Futures Project

<https://aic.ucdavis.edu/solano/index.htm>

From Davis fields to Dixon plant, Campbell's product is local

<http://solanocountybusinessnews.blogspot.com/2009/10/from-davis-fields-to-dixon-plant.html>

New Dixon facility raises hopes for lamb industry

<https://www.davisenterprise.com/local-news/ag-environment/new-dixon-facility-raises-hopes-for-lamb-industry/>

Agricultural Land Loss and Conservation

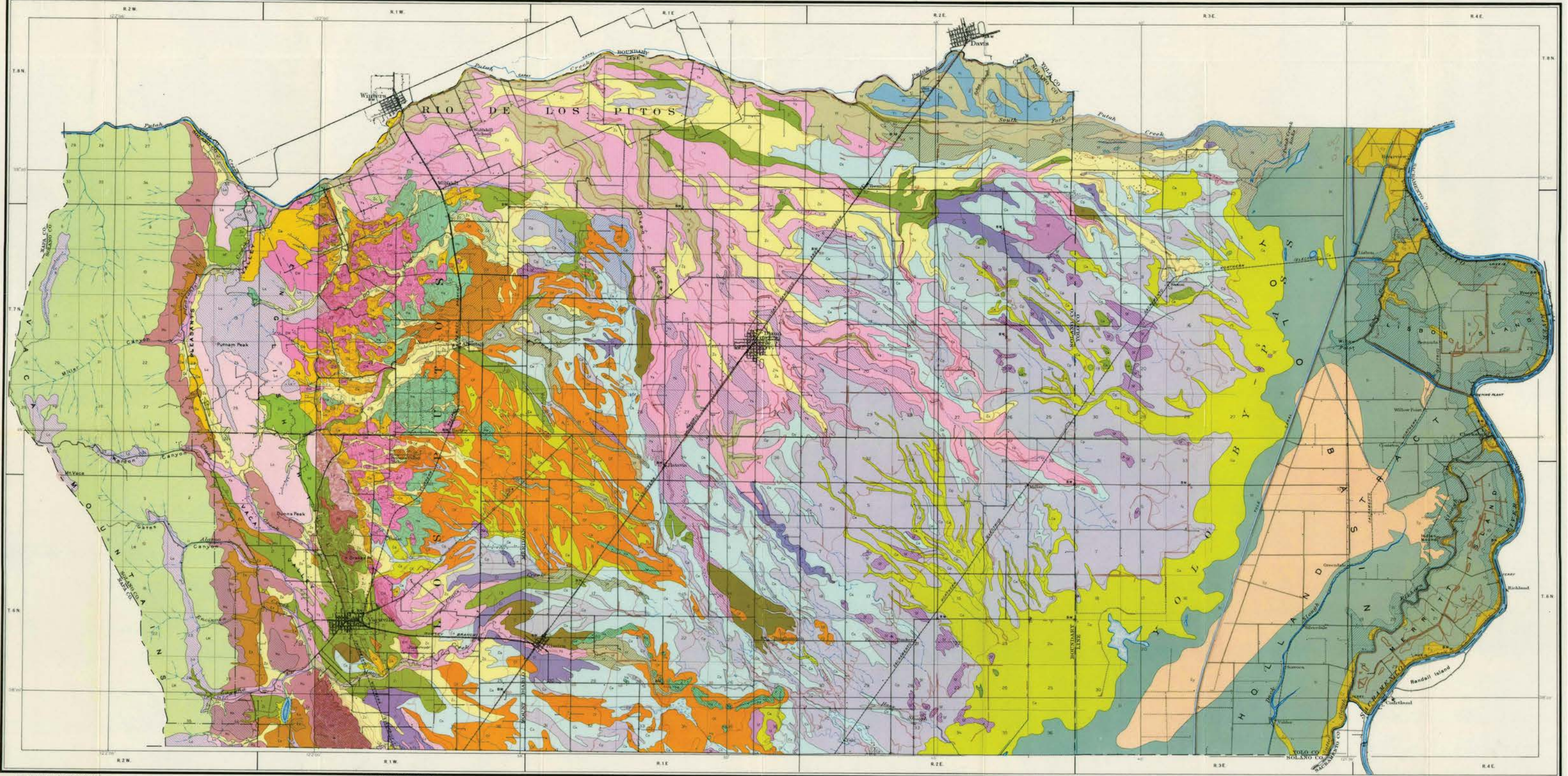
[https://www.cdfa.ca.gov/agvision/docs/Agricultural\\_Loss\\_and\\_Conservation.pdf](https://www.cdfa.ca.gov/agvision/docs/Agricultural_Loss_and_Conservation.pdf)



U. S. DEPARTMENT OF AGRICULTURE  
BUREAU OF CHEMISTRY AND SOILS  
HENRY G. KNIGHT, CHIEF  
A. D. MCGILL, CHIEF, SOIL INVESTIGATIONS  
CURTIS F. MARRUT, IN CHARGE SOIL SURVEY

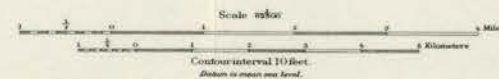
SOIL MAP  
DIXON AREA  
CALIFORNIA

UNIVERSITY OF CALIFORNIA  
AGRICULTURAL EXPERIMENT STATION  
C. B. HUTCHISON, DIRECTOR  
CHARLES F. SHAW, IN CHARGE SOIL SURVEY



Macy H. Lapham, Inspector, District 5.  
Soils surveyed by Stanley W. Cosby, University of California,  
in charge, and E. J. Carpenter, U. S. Department of Agriculture.

BASE MAP IN PART FROM  
U. S. GEOLOGICAL SURVEY SHEETS



Field Operations  
Bureau of Chemistry and Soil  
1931