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Teichert Shifler Project

Determination of Waters of the U.S.

Prepared by:

Adrian Juncosa, PhD

Prepared for:

Teichert Materials
3500 American River Drive
Sacramento, CA 95864

Report Date:

December 5, 2019

16173 Lancaster Place, Truckee, CA 96161 · Telephone: 530.412.1601 · E-mail: ajuncosa@ecosynthesis.com

Contents

Figures

Tables

Appendices

Summary

This report is a preliminary delineation and description of aquatic resources within the Teichert Shifler Project area, a study area of approximately 319 acres in Yolo County, California. It is being submitted with a request for an approved jurisdictional determination, which will be relied upon to determine acreage of impacts for Section 404 permitting, if any, and other environmental review.

Determinations at possible wetland areas were carried out according to the 1987 Corps of Engineers (Corps) Wetlands Delineation Manual and 2008 Regional Supplement for the Arid West Region, Version 2.0. No areas met all three mandatory wetland criteria under normal circumstances. Two contiguous irrigation canals occur, which are physically tributary to Cache Creek and thence to the Sacramento River.

The following areas of aquatic features were found within the study area:

Tributary Waters of the U.S.

Irrigation Canals	2.2046 acreas (5,625 lineal feet)

1 INTRODUCTION

1.1 Contact Information

Owner: Teichert Materials
3500 American River Drive
Sacramento, CA 95864

Contact: Barry Baba
Telephone: (916) 417-6778
E-mail: bbaba@teichert.com

Delineation: EcoSynthesis Scientific & Regulatory Services, Inc.
16173 Lancaster Place
Truckee, CA 96161

Contact: Adrian Juncosa
Telephone: (530) 412-1601
E-mail: ajuncosa@ecosynthesis.com

1.2 Site Information

Project name: Shifler Project

Corps Number:

APNs: portions of 025-430-001, 025-430-002, 025-120-032, 025-120-033

Study Area: 319 acres

Location: Study area is within an unsectioned portion of T. 10 N, R. 1 E

Latitude/longitude: center of site is at approximately 38.5806 N, -121.1830 W.

Address: County Road 94B, west of Woodland city limits

Study dates: Many dates in 2014-2018; data points studied on July 12 and November 13, 2019

Report date: December 5, 2019

Driving Directions from Downtown Sacramento:

Travel I-5 north to Woodland; exit at E. Main Street and go west (toward downtown Woodland).

At Road 98 (end of residential area), W. Main Street becomes State Highway 16; continue due west onto Road 22 (where Highway 16 veers slightly left).

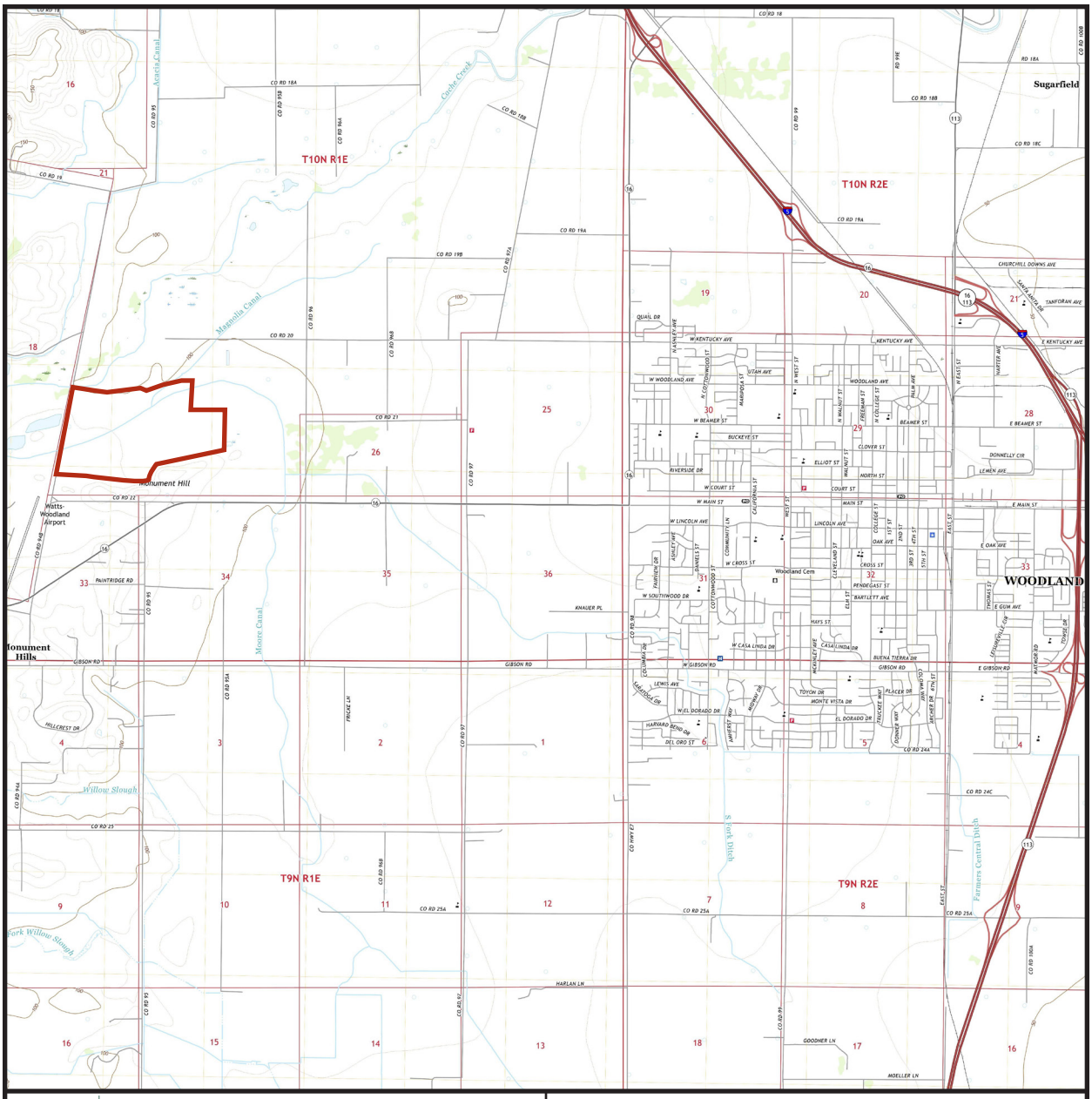
Road 22 ends at Road 94B; turn north (right) and continue about 0.25 mile to the Magnolia Canal maintenance road. The site is east of Road 94B, between Road 22 and Cache Creek.

If desired, the Woodland town center (ongoing road construction) can be avoided by staying on I-5 to the Highway 16 exit (next one north after E. Main Street); turn left at the end of the offramp and go south about 2.9 miles to Main St.; turn right and follow the directions above from "W. Main Street."

General Description

The Shifler Project study area is approximately 319 acres, at an elevation of approximately 100 to 112 feet above mean sea level.

Almost the entirety of the study area is and has long been actively farmed for a variety of annual or semi-annual crops including winter wheat, tomatoes, cucumbers, safflower, and others. Areas that are not farmed support mostly non-native annual brome grasslands and ruderal non-native annual forblands. A patch of irrigation-supported willows occurs at the southern site boundary, and oak trees occur along an unlined irrigation canal segment.



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Teichert Shifler Project
Determination of Waters of the U.S.

Figure 1. Location Map

Project site (approximate)

USGS 7.5-minute Woodland quadrangle

Scale: Approximately 1:65,760 (1"=5,480')

North

2 METHODS

2.1 Background Information

Preliminary wetland mapping was obtained from the US Fish and Wildlife Service National Wetlands Inventory (NWI) via the on-line Wetlands Mapper application (USFWS, 2019). Information on soils was obtained from the Web Soil Survey on-line application (NRCS, 2019). Climatic information was obtained from the Western Regional Climate Center (WRCC, 2019) and from the National Oceanic and Atmospheric Administration (NOAA, 2019).

Other wetland reporting was examined but not relied upon except to identify locations that merited field study.

2.2 Field Methods

Field work was carried out according to the 1987 Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory, 1987) and Regional Supplement for the Arid West Region, Version 2.0 (ERDC, 2008).

The present study was informed by several previous visits to the site in different seasons in 2014 through 2018, specifically including the study of 19 soil pits that were excavated to depths varying from 5 to 14 feet to provide information related to the feasibility of post-mining reclamation. Notably, no redoximorphic features or hydric soils were observed in any near-surface strata in any of these pits.

Wetland determination data points were studied on July 12 and November 13, 2019. In two areas with codominance by hydrophytic species (one being an apparent irrigation tailwater detention basin; the other being subject to leakage from an adjacent property), I studied data points at the wettest feasible spots. Not finding wetland criteria to be met at the data points, no further "outside" data points were studied. See Section 3.2 for further discussion.

Specific field methods that were applied to the determination of each of the criteria within the study area are described below.

2.2.1 VEGETATION

Plant species were identified on sight or with reference to keys and nomenclature of The Jepson Manual, 2nd edition (Baldwin et al., 2012). The generic names of many plants that are on the national wetland plant list are different from the ones that are found in The Jepson Manual, 2nd Edition, and the Flora of North America North of Mexico (which references do not always agree with one another either). Scientific names provided in this report include synonymy in such cases.

Determinations of plant cover were visual estimates, aided where necessary by cover percentage diagrams originally provided in Forest Service (2001) and also distributed by other entities.

Wetland indicator status assignments were made according to current National Wetland Plant List (Lichvar, 2016). This delineation report uses the standard abbreviations as defined below:

OBL obligate (almost always found within wetlands)

FACW facultative-wetland (generally, but not always, found within wetlands)

FAC facultative (found equally within and outside wetlands)

FACU facultative-upland (generally not, but may be, found within wetlands)

UPL upland (rarely found within wetlands)

2.2.2 SOILS

In addition to the soil profiles studied for other purposes (see Section 2.2, first paragraph under Field Methods), wetland determination soils test pits were excavated by hand tools to depths of 12-20 inches. Determination of the presence or absence of hydric soils field indicators was made on the basis of Field Indicators of Hydric Soils in the United States (NRCS, 2017; Version 8.1) and the Arid West Regional Supplement (ERDC, 2008). Due to updates in the names and numbers of hydric soils indicators, there are minor discrepancies between the indicators in NRCS (2017) and those listed on the Arid West data form, but in no case did this impair the hydric soils determination.

2.2.3 HYDROLOGY

Determinations of wetland hydrology or absence thereof were made by means of field indicators described in the Regional Supplement (ERDC, 2008). The areas where wetland data points were studied included two areas that are subject to non-normal hydrology. These are discussed in detail in Results.

2.2.4 BOUNDARIES

The limits of delineated waters of the U.S. were determined at the apparent ordinary high water mark (OHWM) as described in Lichvar and McColley (2008) and documented in OHWM data sheets in Appendix C.

2.2.5 SURVEY AND MAPPING TECHNOLOGY

Boundaries and data point locations were surveyed with a Trimble GeoXH 6000 GNSS ("GPS") unit. The resulting data were then differentially post-processed using publicly available base station data. Given the open terrain (generally without woody overstory), satellite reception was excellent and the post-processed points were overwhelmingly determined by the Trimble Pathfinder Office software to be within the 15-30 cm accuracy range. Field work was exported in California State Plan zone 2, US survey feet, and reprojected to WGS 1984 for the contents of this report and digital submittals.

3 RESULTS

This section includes information on the site's environmental setting and specific information on each of the mandatory wetland criteria (vegetation, soils, and hydrology) and observations at the data points, followed by a description of the wetlands and other waters of the U.S. that were delineated.

The NWI mapping from Wetlands Mapper is provided in Figure 2 (page 8). NRCS soil survey mapping is shown in Figure 3 (page 11). The aquatic resources mapping is provided on a single map sheet (inside back cover). A list of plant species relevant to the determination of wetlands and other waters is provided in Table 1, and acreages of delineated features are summarized in Table 2. Additional results are found in the appendices as follows:

Appendix A: photographs of waters and selected data point features (specifically soils)

Appendix B: wetland determination data forms

Appendix C: OHWM data forms.

3.1 Wetland Criteria

3.1.1 VEGETATION

As summarized in Section 1.2, the site is farmland, with frequently changing composition of economically important row crops including winter wheat, sunflower seeds, canola, safflower, cucumbers, and tomatoes. Occasional weeds (e.g., radish, *Raphanus sativus,* or other Brassicaceae) occur within the production fields. Vegetation in the fringes of the site, mostly to the south, is mostly non-native annual brome grassland with some non-native forbs. The northern edge of the site supports a variety of UPL and FACU Mediterranean grasses and non-native forbs including milk thistle (*Silybum marianum*), Italian thistle (*Carduus pycnocephala*), yellow star-thistle (*Centaurea solstitialis*), tall whitetop (*Lepidium latifolium*), unicorn-plant (*Proboscidea louisianica*), horseweed (*Erigeron [Conyza] canadensis*), and curly dock (*Rumex crispus*). Vegetation at areas studied by means of three-parameter wetland determination data points is described on the data sheets (Appendix B) and in Section 3.2, which discusses the reasons for non-wetland determinations; plant species observed at data points are listed in Table 1.

Table 1. Plant species that were observed at and near wetland determination data points. Nomenclature follows Baldwin et al. (2012). Wetland indicator status is from Lichvar et al. (2016).

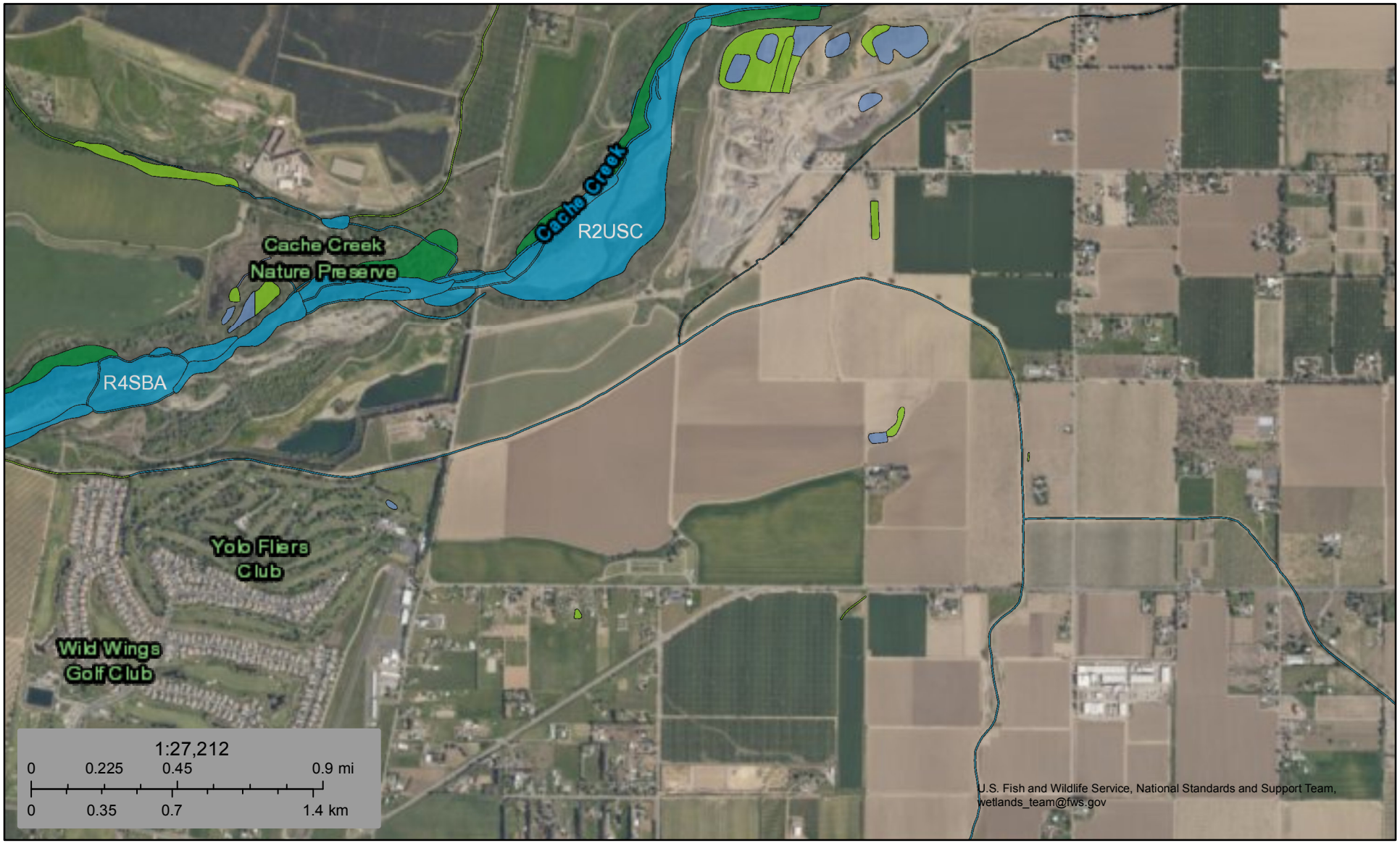
Scientific Name	Common Name	Wetland Status
Abutilon theophrasti	velvetleaf	UPL
Amaranthus blitoides/retroflexus	amaranthus	FACU (both)
Baccharis salicifolia	mulefat	FAC
Bromus diandrus	ripgut brome	UPL
Bromus hordeaceus	soft brome	FACU
Carduus pycnocephala	Italian thistle	UPL
Centaurea solstitialis	yellow star-thistle	UPL

Table 1 (continued)

Scientific Name	Common Name	Wetland Status
Convolvulus arvensis	bindweed	UPL
Cynodon dactylon	Bermuda grass	FACU
Cyperus eragrostis	umbrella sedge	FACW
Festuca (Lolium) perenne	Italian rye-grass	FAC
Hordeum marinum	Mediterranean barley	FAC
Juncus bufonius	toad rush	FACW
Lepidium latifolium	tall whitetop	FAC
Malva neglecta	common mallow	UPL
Polypogon monspeliensis	rabbit's-foot grass	FACW
Populus fremontii (=deltoides in Arid West list)	Fremont's cottonwood	FAC
Quercus wislizenii	interior live oak	UPL
Rumex crispus	curly dock	FAC
Rumex dentatus	toothed dock	FACW
Salix gooddingii	Goodding's willow	FACW
Salsola tragus	Russian thistle; tumbleweed	FACU
Typha angustifolia	narrow-leaved cattail	OBL
Xanthium strumarium	cocklebur	FAC

U.S. Fish and Wildlife Service
National Wetlands Inventory

Figure 2. Teichert Shifler Project NWI Map



December 7, 2019

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

3.1.2 SOILS

Results from Soil Survey

The following soil types occupy the wetland study area (with map symbol in Figure 3 and acreage):

Brentwood silty clay loam, 0 to 2 percent slopes (BrA; 2.6 acres)

Loamy alluvial land (Lm; 17.9 acres)

Riverwash (Rh; 0.3 acres)

Sehorn-Balcom complex, 2 to 15 percent slopes (SmD; 4.1 acres)

Sehorn-Balcom complex, 30 to 50 percent slopes (SmF2; 1.5 acres)

Yolo loam, 2 to 5 percent slopes (Ya; 292.9 acres)

Brentwood silty clay loam occupies a very small area (2.6 acres) in the northeastern corner of the site. Brentwood soils are very fine textured alluvial soils which nevertheless have moderately high permeability and a depth to water table of more than 80 inches. The entire area of Brentwood soils within the site is cultivated cropland.

Loamy alluvial land (not a soil series) is present in 17.9 acres of northern part of the site, generally near Cache Creek but located on a terrace high above the present creek channel. This soil map unit occurs on toeslopes and floodplains and consists of mostly coarse textured stratified soils (sand to gravelly loam) with high permeability.

Riverwash is also not a soil series. This map unit occurs in tiny areas (total of 0.3 acre) adjacent to the Cache Creek active stream channel and may be subject to frequent flooding. Soils in this map unit are gravelly sand to sandy loam, with high to very high permeability. Based on topography, it appears that the NRCS mapping may be a few feet off: the topographic break between the silty alluvial terrace and the active creek channel below is located at or outside the site boundary, not 10-20 feet within it, as suggested by the soils map.

Sehorn-Balcom complex comprises the hillslopes just extending within the southern boundary of the site, occupying a total of 5.6 acres. Both of the constituent series are soils (residuum) weathered in place from calcareous sandstone and shale. Sehorn soil is clay, with a thick strongly structured B horizon with slickensides (Sehorn is a vertisol.) Permeability is moderately low to moderately high. Balcom series soils are alkaline clay loam soils, weathered from soft calcareous shale and sandstone, with very low to low permeability.

Yolo loam soils occupy the vast majority of the study area. They are Mollic Xerofluvents occurring on alluvial fans and floodplains, with a very uniform soil profile throughout, in both texture and color. Close inspection is necessary even to find the boundary between the A and C horizon silt loams. Notwithstanding the fine texture of Yolo loam, it has moderately high to high permeability, and roots penetrate easily and quickly to great depths. During the previous soil study for the evaluation of reclamation feasibility, living roots of winter wheat plants only a month or so old were found at depths of five feet below the surface. No redoximorphic features were found, even at depths exceeding ten feet.

Hydric Soils List

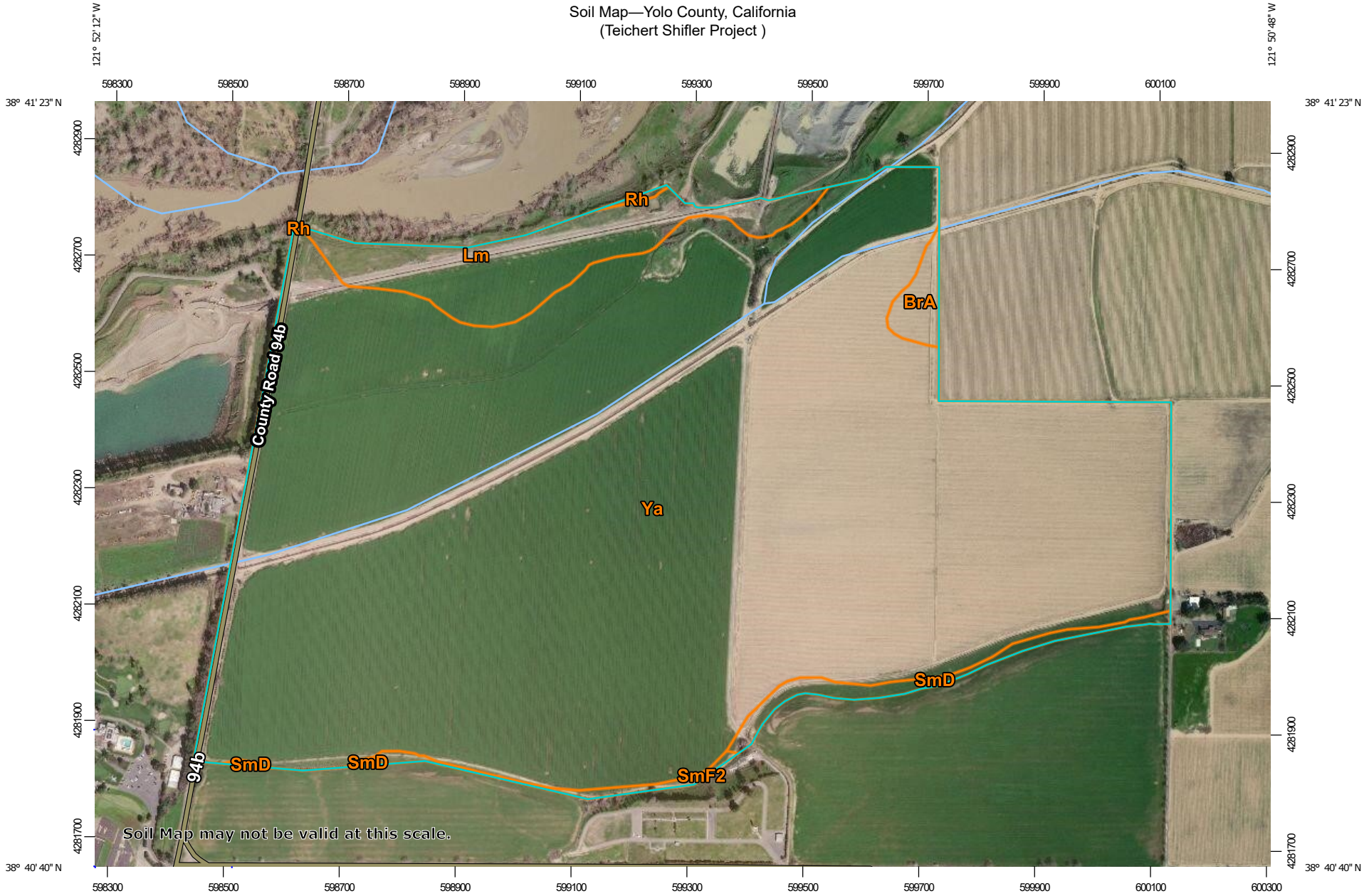
A small portion of Loamy alluvial land (4 percent), and nearly all of Riverwash (85 percent), is listed as hydric in Yolo County. Sycamore series, which is basically a mottled variant of Yolo loam, is a hydric soil, but apparently does not occur within Yolo loam map units in Yolo County (though Sycamore silty loam itself occurs in the county).

Field Observations

Hydric soils determinations were made in the field in accordance with NRCS (2017).

In short, none of the putative wetland study areas failed to exhibit any field indicators of hydric soils such as high organic content, depleted matrix, or redoximorphic features. I specifically examined soils as close as possible to some data point locations that had previously been studied, where redoximorphic features were recorded. No such features were found in 2018 or 2019 (see photos in Appendix A). Soils were silt loams which nevertheless drain relatively well internally. Soil colors were almost always 10YR to 2.5Y 3/2. No limiting layers were observed.

Soil Map—Yolo County, California
(Teichert Shifler Project)



Map Scale: 1:9,280 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 450 900 1800 2700

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

Teichert Shifler Determination of Waters
Figure 3. Soils Map

See text for identification and description of soil map unit codes.

3.1.3 HYDROLOGY

The study site is in hydrologic unit 18020110 (Lower Cache Creek).

Precipitation data from the Woodland 1 WNW station (049781) is representative of the study site to provide climatic context and has the advantage of both a long term historic record and easy availability of recent monthly data. It is located about 3.5 miles east of the study site.

Wetland determination data points were studied in July and November 2019, after the end of the rainy season, so I obtained NOAA data for precipitation from October 1, 2018, to September 30, 2019, and compared that with the long term historical average annual precipition.

Precipitation for the 2018-2019 water year totaled 34.33 inches (NOAA, 2019), nearly twice the long-term average annual rainfall of 18.50 inches (110 year record; WRCC, 2019). Accordingly, any sites that failed to meet any of the three mandatory wetland criteria during the 2019 study year can certainly be determined not to be wetland under normal circumstances.

Run-on from off site occurs in two places: the water conducted by the two irrigation canals, and leakage from an irrigation works located a few feet south of the southern site boundary (see Section 3.2 for further discussion).

Nearby and Downstream Waters

The nearest blue line water body on the USGS map is Cache Creek, which at its closest point extends to within a few feet of the northern site boundary. (The extent of Riverwash soil map unit, which is within or not far outside the OHWM of Cache Creek, is probably incorrectly mapped as extending within the site; in reality these active alluvial soils end below the topographic discontinuity from the terrace upon with the nearby sediment/infiltration basin is located.)

Moore Canal (IC-1) conveys water from Cache Creek (source point approximately 1.94 air miles west of the site boundary), flows eastward through the site, and ultimately discharges into Willow Slough, which is tributary to the Sacramento River, a navigable water of the U.S. Magnolia Canal is hydrologically contiguous with Moore Canal, albeit separated by a large irrigation control gate, and though it flows eastward also, it appears to be blind-ending, without a confluence with any other tributary of the Sacramento River. Strictly speaking, since the gradient of the invert is in the opposite direction, any potential for it to be tributary to a water of the U.S. is questionable; it is more accurately regarded as being an isolated water (if any at all). However, in the present report, it is tentatively included in the table of jurisdictional irrigation canals.

3.2 Discussion of Wetland Determination Data Points

Photographs that are pertinent to wetland determination are included in Appendix A. Data forms for the wetland determination data points that were studied are included in Appendix B.

The majority of the study site is prime farmland, used continuously and entirely for agricultural production, entailing grading, tilling, and irrigation which are standard agricultural practices that alter soils and hydrology. The normal vegetation that is present is non-wetland annual row crops. For a previous study, soils within the cropped area were studied by means of 19 deep soils test pits scattered throughout the farmed area. At none of these points was any field indicator of hydric soils observed. Therefore, since neither hydrophytic vegetation, nor hydric soils, nor wetland hydrology under normal circumstances are present, no wetlands occur within the agricultural area.

Three-parameter wetland determination data points were studied at eight locations (see Figure 4, Aquatic Resources Delineation Map). Five of these were in an area affected by run-on from an irrigation system leak just off site, and the remaining points were located in or near two sediment/ infiltration basins near the northern site boundary. All of these non-wetland determinations are discussed below.

Area Affected by Irrigation Leakage

The setting of this area is shown in Photo 1 (Appendix A). Photo 2, Water leaks abundantly from irrigation works immediately outside the southern site boundary (Photo 2), supporting lush cattails (*Typha angustifolia*) on top of the hillside (Photo 3), then flowing under the fence and into the study site (Photo 4). This is the irrigation supply for the cemetery (marked on the USGS map as Monument Hill), so it is understandable that it would run frequently at all times that the turf would be under water stress. Though frequent, this irrigation leakage is intermittent; it (and the surface water downslope, within the site) is absent for long periods, during which the wetland vegetation it supports dries out and dies, and is replaced by an upland understory (DP-5). When the irrigation system is turned on, however, the flow is substantial (Photo 5) and attains the toe of the slope (Photo 6), where it infiltrates in the moderately permeable Yolo loam soils. In order to keep the farm perimeter road dry, a ditch is usually excavated at the toe of the slope (DP-4), which terminates in both directions, not far from the point where the irrigation leakage arrives at the toe of the slope. Observation of soils within a few feet of the surface water that was present on July 12, 2019 showed that no redoximorphic features or other hydric soils indicators were present on that date (Photo 4). Even under the ponded water, color difference between matrix and redox depletions was only between 2.5YR 3/2 and 2.5YR 3/1 (Photo 7; contrast is defined as "faint", insufficient to constitute a hydric soils indicator). Soils under the willows on the hillslope (DP-5) also lacked hydric field indicators. In both the herbaceous and the woody shrub layer, decidedly upland species (e.g., interior live oak, *Quercus wislizenii*) are mixed in with a FACW willow (*Salix gooddingii*), and no indicators of wetland hydrology are present either.

This combination of circumstances supports a conclusion that the hydrophytic species and intermittently inundated or moist soils are supported only and entirely by the non-normal circumstance of intermittent abundant leakage from off-site irrigation facilities.

Sediment/Infiltration Basins

Two excavated basins are present in the northern part of the site (Photos 9, 10). These receive irrigation tailwater collected in row-end ditches and perhaps also rain runoff, although the permeability of Yolo loam is 4.5623 micrometers/second (0.647 inches/hour; NRCS, 2019), which means that only intense rainfall is likely to produce any runoff at all, and even under this circumstance, it would infiltrate into the basin floor within a short period of time. Even during the exceptional water year from October 1, 2018, to September 30, 2019, rainfall for an entire 24-hour period only exceeded two inches on five occasions. In many visits, I have never seen water or seemingly saturated soil in either basins except during active irrigation. Presence of sediment on plant debris at DP-8 (not within a basin) certainly indicates that depressions do fill with water at times, but not for long (as indicated by absence of hydric soils indicators). In July, living vegetation extending right to the basin floor at DP-1 was strongly dominated by UPL species (in other words, there was no OHWM above the basin floor indicated by physical markers or change in vegetation).

Another shallow depression appears also to have been created by limited excavation, whether for sediment removal purposes or merely to allow water to drain off the adjoining dirt road. It is represented by DP-6, with sparse hydrophytic vegetation, decidedly non-hydric soils, and no hydrology indicator other than surface cracks.

3.3 Types of Waters Observed

Waters of the U.S. observed on the Shifler site are listed in Table 2, with the applicable FGDC (2013) categories of wetlands and deepwater habitats of the U.S. Both are irrigation canals which flow only when water is pumped or diverted into them. IC-1 (Moore Canal) is tributary to Willow Slough and the Sacramento River. IC-2 (Magnolia Canal) ends blindly before any confluence with any tributary. OHWM data sheets are included in Appendix C.

Table 2. Summary of waters (irrigation canals) delineated at the Shifler site.

DESCRIPTION	MAP IDENTIFIER	AREA (acres)	LENGTH (feet)	FGDC (COWARDIN) CATEGORY AND DOMINANT SUBSTRATE
Riverine				
Intermittent	IC-1	2.0423	4,490	Riverine intermittent streambed, concrete bed
Intermittent	IC-2	0.1623	1,135	Riverine intermittent streambed, soil bed
Total:	**Irrigation Canals**	**2.2046 acres**	**5,625 feet**	**Riverine intermittent streambed**

3.4 Commerce and Recreation

The site described in this report is prime farmland whose production, which is enhanced by the irrigation canals, is potentially part of interstate commerce. The site is private land with no known recreational use.

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Appendix A:

Photographs

Photo 1. Setting of DP-2 through DP-5 at southern site boundary. Fence is at boundary; shed and tank are off site. Willow area is represented by DP-5; points DP-2 through -4 are behind vegetation at right edge of photo. Tall dead gray stems in center left foreground are *Typha* surrounded by live upland grasses (*Avena* and *Bromus diandrus*), which cannot survive prolonged saturation. Leakage discharge obviously used to go there, but now flows further behind (as seen from this viewpoint).

Photo 2. View through boundary fence to leaking irrigation works 10-20 feet away. Water spray is clearly visible. Corner of the tank in upper right corner of photo is the same tank that is seen behind the fence in Photo 1.

Photo 3. Abundant *Typha* off site, at top of hillside, supported by leakage from irrigation.

Photo 4. Leakage flow entering site under property boundary fence.

Photo 5. Ripples in flow down hillslope demonstrates that it's not just a small amount of seepage, instead, it's a substantial continuous flow whenever the off-site irrigation system is turned on.

Photo 6. Leakage flow ponded at the toe of slope, on April 24, 2018. Grass is *Cynodon dactylon* (FACU). If surface water such as this had been present throughout the winter, vegetation would be dominated by FAC or wetter species. Instead, this is fresh leakage flow, with the irrigation system just having been activated as the weather warms up. DP-2 is located within a few feet of the standing water visible here.

Photo 7. Saturated ped from soils under standing water near DP-2, showing faint redox contrast (2.5YR 3/2 vs. 3/1). Soil was drier below about 10″ than it was at the surface. Both of these circumstances are consistent with the saturation having been present only for a short period of time. As indicated by previous photos, this hydrology is not a normal circumstance.

Photo 8. Soil from test pit at DP-2, with no redoximorphic features at all (100 percent 2.5YR 3/2).

Photo 9. Setting of DP-1, in infiltration basin that had recently partially filled from irrigation tailwater (July). Inflow is behind photographer; there is no outflow other than infiltration into the basin floor. Though the soil surface is only a few inches above the water level, no water table or saturation was encountered in the test pit to its maximum depth of 20 inches. This feature is constructed on dry land and its hydrology (standing water) is artificial (derived from pumped and diverted irrigation flow). I have visited this feature multiple times in winter months and it is never ponded or even moist at those times, because there's no irrigation flow.

Photo 10. Inflow to infiltration basin. Shovel is in the same location as in Photo 9. Vegetation on berm includes *Lepidium latifolium* (FAC) but is dominated by UPL species.

Photo 11. Moore Canal (feature IC-1), near the cross section OHWM-2. Canal is quite uniform throughout its length within the site: sideslopes are 1.5:1 to 2:1, and the canal is concrete lined nearly up to the maximum flow level. A slightly incised OHWM can be discerned in the soil just above the concrete, and, as seen in the photo, occasional plants of *Leptochloa (Diplachne) fusca* var. *uninervia* (Mexican sprangletop, FACW) grow exactly at that point, but not higher. Canal is flowing almost to maximum capacity, which is consistent with presence of irrigation tailwater in the basin shown in Photos 9-10 (taken on the same date).

Photo 12. Magnolia Canal. Like Moore Canal, there is no floodplain or even a low terrace; flow is confined to the excavated channel under all possible conditions. This much smaller irrigation canal is unlined and supports FACU and UPL vegetation on its banks (*Quercus lobata, Brassica, Bromus diandrus, Carduus pycnocephala, Cynodon, Silybum, Sorghum*).

Appendix B:

Wetland Determination Data Forms

Data forms are in a separate electronic folder to prevent Acrobat from automatically changing entries in fields of the same name in different data forms.

Appendix C:

OHWM Data Forms

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Teichert Shiffer
Project Number:
Stream: Moore Canal IC-1
Investigator(s): Adrian Juncosa

Date: 7/12/19 **Time:** 1314
~~**Town:**~~ Yolo Co. **State:** CA
Photo begin file#: IMG-4036 **Photo end file#:**

Y ☑ / N ☐ Do normal circumstances exist on the site?

Y ☑ / N ☐ Is the site significantly disturbed?

Location Details: E of Co. Rd. 94B

Projection: n, a, (lat/long) **Datum:** WGS 84
Coordinates: 38.68439 -121.86134

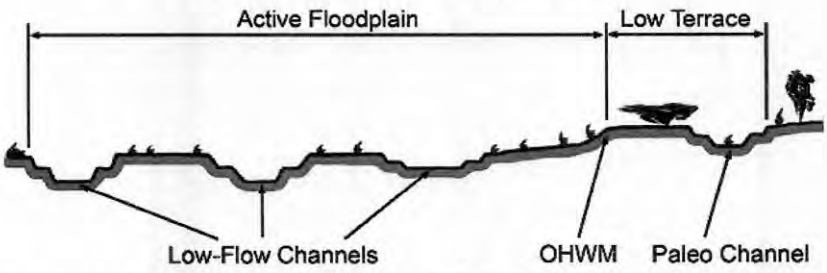
Potential anthropogenic influences on the channel system:
It is an excavated, concrete lined irrigation canal.

Brief site description:
Agriculture

Checklist of resources (if available): Included in report.

- ☑ Aerial photography ESRI
  Dates:
- ☑ Topographic maps USGS
- ☐ Geologic maps
- ☐ Vegetation maps
- ☑ Soils maps Web Soil Survey
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☑ Global positioning system (GPS)
- ☐ Other studies
- ☐ Stream gage data
  Gage number:
  Period of record:
  - ☐ History of recent effective discharges
  - ☐ Results of flood frequency analysis
  - ☐ Most recent shift-adjusted rating
  - ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

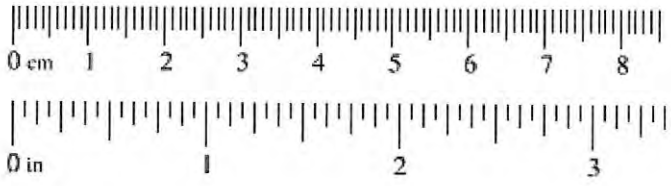


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section. n a
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ☐ Mapping on aerial photograph
   - ☐ Digitized on computer
   - ☑ GPS
   - ☐ Other:

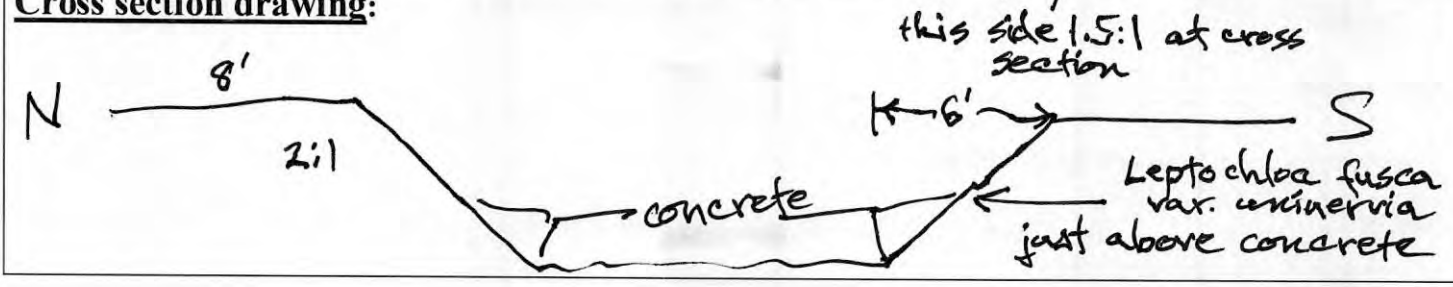
Wentworth Size Classes

Inches (in)	Millimeters (mm)	Wentworth size class	
10.08	256	Boulder	
2.56	64	Cobble	Gravel
0.157	4	Pebble	
0.079	2.00	Granule	
0.039	1.00	Very coarse sand	
0.020	0.50	Coarse sand	
1/2 0.0098	0.25	Medium sand	Sand
1/4 0.005	0.125	Fine sand	
1/8 0.0025	0.0625	Very fine sand	
1/16 0.0012	0.031	Coarse silt	
1/32 0.00061	0.0156	Medium silt	Silt
1/64 0.00031	0.0078	Fine silt	
1/128 0.00015	0.0039	Very fine silt	
		Clay	Mud



Project ID: Teichert Shifler **Cross section ID:** OHWM-2 **Date:** 7/12/19 **Time:**

Cross section drawing:



OHWM

GPS point: 38.68439 -121.86134

Indicators:

- ☐ Change in average sediment texture
- ☑ Change in vegetation species
- ☐ Change in vegetation cover
- ☐ Break in bank slope
- ☑ Other: line impressed in soil just above concrete
- ☐ Other: _____

Comments:

Floodplain unit: ☑ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: 38.68439 -121.86134

Characteristics of the floodplain unit:

Average sediment texture: n.a. (concrete)

Total veg cover: 0 % Tree: 0 % Shrub: 0 % Herb: 0 %

Community successional stage:

- ☑ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☑ Presence of bed and bank constructed
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

No floodplain - water is 100% irrigation supply which cannot rise above top of excavated bank.

Project ID: **Cross section ID:** **Date:** **Time:**

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____ % Tree: _____% Shrub: _____% Herb: _____%

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____ % Tree: _____% Shrub: _____% Herb: _____%

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Teichert Shifler
Project Number:
Stream: Magnolia Canal IC-2
Investigator(s): Adrian Juncosa

Date: 7/12/19 **Time:** 11:40
Town: Yolo Co **State:** CA
Photo begin file#: IMG 4022 **Photo end file#:**

Y ☑ / N ☐ Do normal circumstances exist on the site?

Y ☑ / N ☐ Is the site significantly disturbed?

Location Details: E of Co. Rd, 94B

Projection: n.a. **Datum:** WGS84
Coordinates: 38.68709 N -121.85705 W

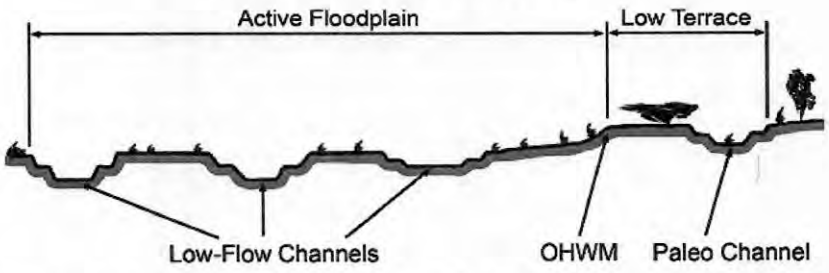
Potential anthropogenic influences on the channel system:
It is an excavated irrigation canal.

Brief site description:
Agricultural.

Checklist of resources (if available): Included in report.

- ☑ Aerial photography Google Earth
  Dates: ESRI
- ☑ Topographic maps USGS Woodland
- ☐ Geologic maps
- ☐ Vegetation maps
- ☑ Soils maps NRCS
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☑ Global positioning system (GPS)
- ☐ Other studies
- ☐ Stream gage data
  Gage number:
  Period of record:
- ☐ History of recent effective discharges
- ☐ Results of flood frequency analysis
- ☐ Most recent shift-adjusted rating
- ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

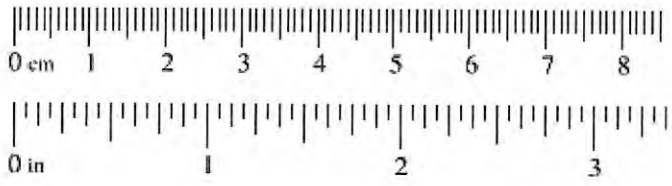


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ☐ Mapping on aerial photograph
   - ☑ GPS
   - ☐ Digitized on computer
   - ☐ Other:

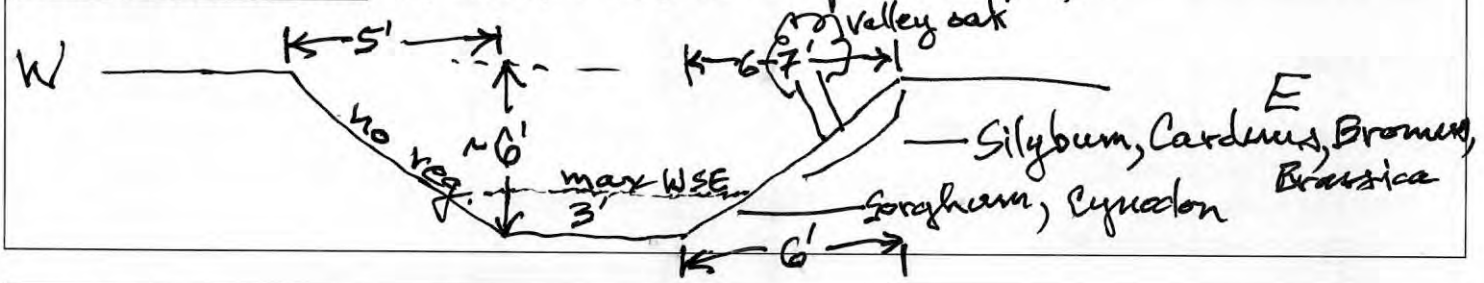
Wentworth Size Classes

Inches (in)	Millimeters (mm)	Wentworth size class	
10.08	256	Boulder	
		Cobble	Gravel
2.56	64	Pebble	
0.157	4	Granule	
0.079	2.00	Very coarse sand	
0.039	1.00	Coarse sand	
0.020	0.50	Medium sand	Sand
1/2 0.0098	0.25	Fine sand	
1/4 0.005	0.125	Very fine sand	
1/8 0.0025	0.0625	Coarse silt	
1/16 0.0012	0.031	Medium silt	
1/32 0.00061	0.0156	Fine silt	Silt
1/64 0.00031	0.0078	Very fine silt	
1/128 0.00015	0.0039	Clay	Mud



Project ID: Teichert Shifter **Cross section ID:** OHWM-1 **Date:** 7/12/19 **Time:**

Cross section drawing: at OHWM-1 line on map and in GIS files



OHWM

GPS point: 38.68709 -121.85705

Indicators:

- ☐ Change in average sediment texture
- ☑ Change in vegetation species
- ☑ Change in vegetation cover
- ☐ Break in bank slope
- ☑ Other: impressed line on bank
- ☐ Other: _____

Comments:

Created by irrigation flow; at least 3-4' below top of bank, width varies by bank angle.

Floodplain unit: ☑ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

No floodplain, flow is never above canal top of bank.

GPS point: 38.68709 -121.85705

Characteristics of the floodplain unit:

Average sediment texture: SiC

Total veg cover: 0 % Tree: 0 % Shrub: 0 % Herb: 0 %

Community successional stage:

- ☑ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☑ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Project ID: **Cross section ID:** **Date:** **Time:**

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____ % Tree: _____% Shrub: _____% Herb: _____%

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____ % Tree: _____% Shrub: _____% Herb: _____%

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Contact Information for this project

Adrian Juncosa
EcoSynthesis Scientific & Regulatory Services, Inc.
16173 Lancaster Place
Truckee, CA 96161

Telephone: (530) 412-1601
E-mail: ajuncosa@ecosynthesis.com

Legend

- Reference Corners
- Data Points
- Ordinary High Water Mark (OHWM)
- 10ft Contour Interval
- 2ft Contour Interval
- Irrigation Ditch
- Project Boundary: 319 Acres

Acreage Table

Waters of the U.S.	
Irrigation Canal	
IC-1	2.0423
IC-2	0.1623
Total	2.2046

Total Waters: 2.2046 Acres
Total Study Area: 319 Acres

Notes

Map Projection: WGS 1984

Aerial Photography Provided by ESRI Basemaps & Affiliates (Yolo County: April 13, 2018)

Topography Provided by Point Co. (April 30, 2010)

N

0 200 400 Feet

1 inch = 200 feet

Teichert Materials: Shifler Project
Fig. 4. Aquatic Resources Delineation Map

December 05, 2019

EcoSynthesis SCIENTIFIC & REGULATORY SERVICES INC

TEICHERT MATERIALS

12/5/2019 SHF_AquaticResourcesDelineation_ES_201912.mxd