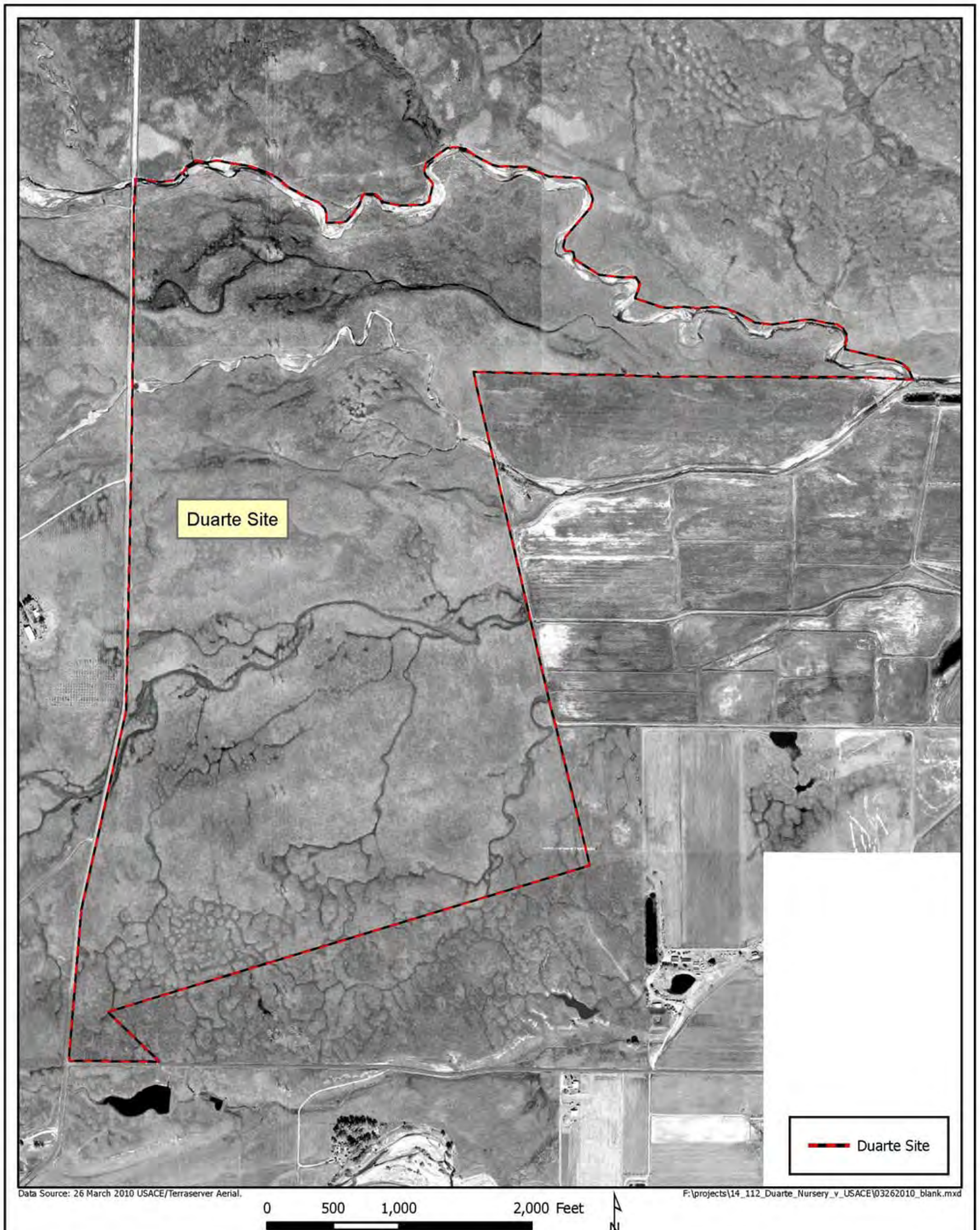


Figure V-24. 26 March 2010 Aerial.

The “North State” delineation (Figure V-25) shows their interpretation of the distribution of 35.9 acres of waters/wetlands on the Duarte Site in 1994 (North State, 1994). This delineation was verified by the U.S Army Corps of Engineers October 26, 1994, (Bates # USA-NSR-00130-00131 and USA-NSR-00147-00148).

The “NorthStar” delineation (Figure V-26) shows NorthStar staff’s interpretation of the distribution of 24 acres of waters/wetlands on the Duarte Site in 2012. It appears as though the overall boundaries of this delineation were adjusted between its initial issuance in early 2012. This adjustment was apparently to compensate for conveyance of the northern portion of the Duarte holdings to other owners. Neither version of the 2012 NorthStar delineation was verified by the U.S. Army Corps.

A map showing the “Northstar” delineation in presented (Figure V-26). It shows Northstar staff’s interpretation of the distribution of approximately 24 acres of waters/wetlands on the Duarte site in 2012 (See Northstar Delineation report – Table 1). It appears as though the overall boundaries of this delineation were adjusted between its initial issuance in early 2012 and July, 2012. This adjustment was apparently to compensate for conveyance of the northern portion of the Duarte holdings to other owners. Neither version of the 2012 Northstar delineation was verified by the U.S. Army Corps of Engineers.

It is important to note the following:

a. The DOJ Expert Team does not have a property deed and legal description of the Duarte Site,

b. Table 1 in the Northstar delineation reports 24.59 acres of waters/wetlands.

The DOJ Expert Team’s Figure V-26 of the Northstar delineation shows 24.0 acres of waters/wetlands. Our interpretation of the discrepancy between the Northstar Table 1 (24.59 acre) estimate of the area of waters/wetlands and the Figure V-26 estimate of 24.0 acres is likely focused along the main channel system of Coyote Creek and the north Duarte Site property boundary. On this reach of the Coyote Creek system (ie. the north Duarte Site property boundary) Northstar’s mapped waters/wetland polygons transgresses the DOJ estimates of the exact location of the north Duarte property line.

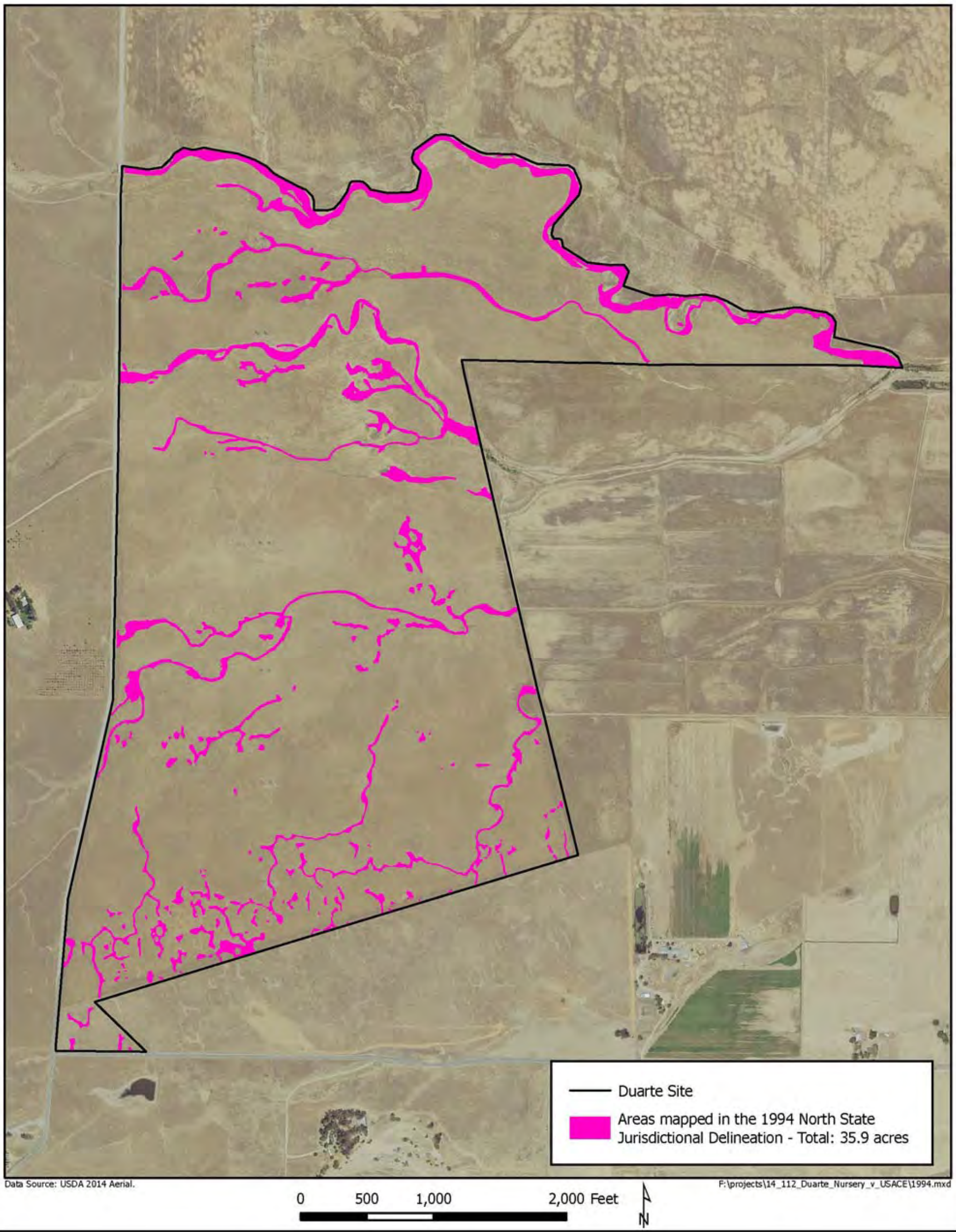


Figure V-25. 1994 North State Resources Jurisdictional Delineation.

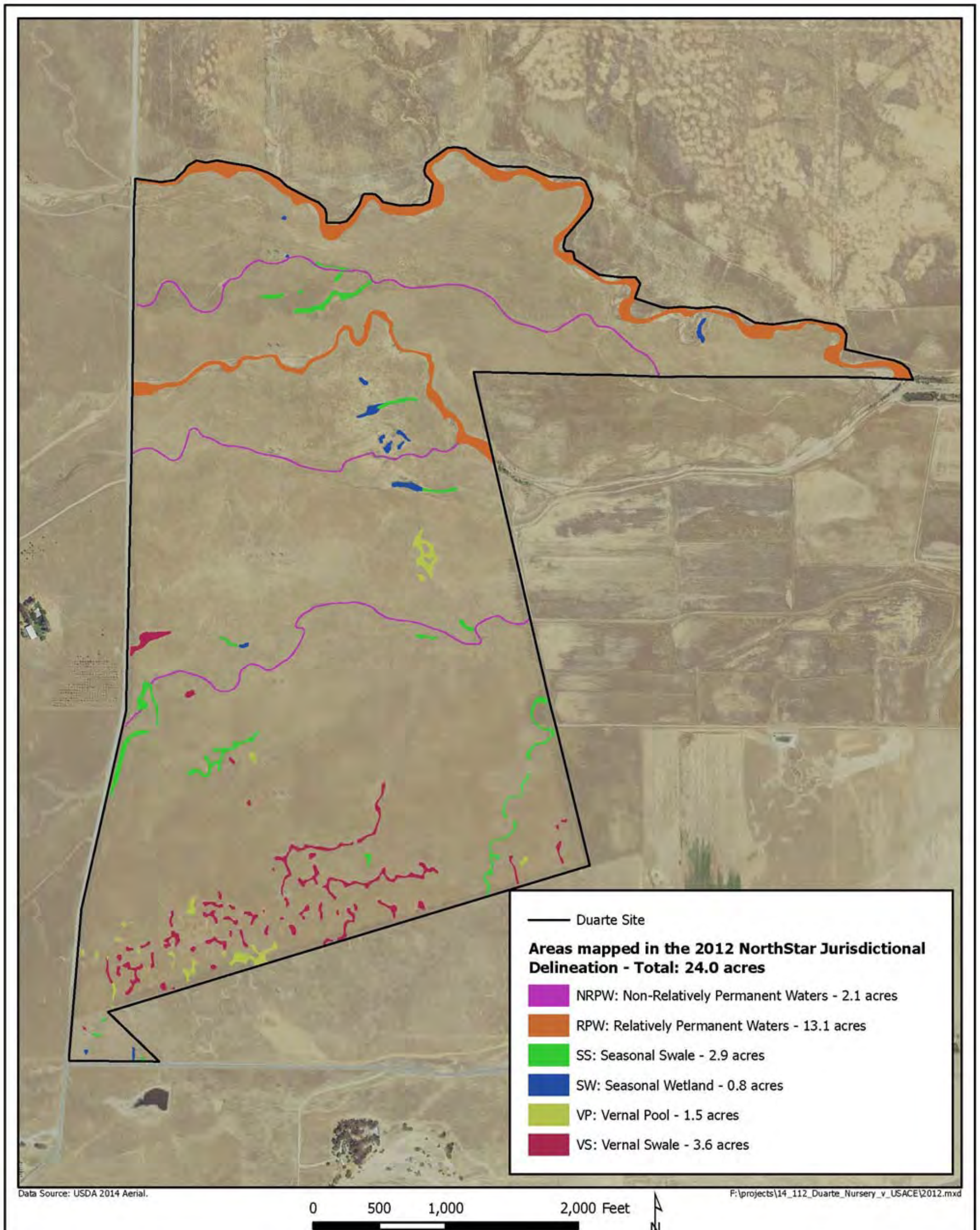


Figure V-26. 2012 NorthStar Environmental Jurisdictional Delineation.

The differences between the 1994 North State and 2012 NorthStar delineations are summarized in Figure V-27, the DOJ Expert Team's field and office peer review of waters/wetlands delineations developed by both North State and NorthStar show the following:

(1). Map scales used in both the 1994 and 2012 delineations are not well suited to accurately depict the extent or complexity of the network of connections among depression/swale complexes and the headwardmost extent of bed and bank riverine features on the Duarte Site.

(2). Inconsistent terminology used to name common features in the landscape such as active channels, stream terraces, vernal depressions and swales, bed and bank features, etc.

(3). Especially for the 2012 NorthStar delineation effort, the range of dates on the delineation data sheets show that they were completed approximately 6 days between April 17-23, 2013. (Bates range USA-NOSTR 00387-00646. It is our opinion that for a land parcel that is the size and complexity of the Duarte Site, a great deal more effort would be necessary to accurately delineate all waters/wetland features and document hydrologic connecting in. In addition, January/winter season timing for sampling of plant communities is not optimal because important plant indicator species would be senescent.

(4). The OHW mark in Coyote Creek and in smaller riverine features that occur on the Duarte Site was consistently under mapped (in width) or missed entirely. This was especially true in the smaller scale reaches of the dendritic channel systems that occur on steepening slopes at the transition from upper terrace depression/swale complexes to lower terrace surfaces on the Duarte Site. These consistent errors had a significant impact on the accuracy of the estimate of the total area of Type 3 Waters of the U.S. ("Other Waters" as defined at 33 CFR 328.3(a)(3)) on the Duarte Site.

(5). Many swale features that meet the hydrologic, hydric soil, and hydrophytic vegetation parameters as articulated in the 1987 Corps Delineation Manual (Environmental Laboratory, 1987) and Arid West Supplement were either not mapped (missed), under mapped (in terms of their overall size), or not accurately mapped with respect to their connections to upstream and downstream waters/wetland features. In fact, our field observations of conditions at the Duarte Site show that within the main Coyote Creek system and within the 9 to 10 watersheds that occur on the Duarte Site, most of the depression, swale, and riverine features are wetlands *per se* and are connected to one another and/or adjacent (bordering, neighboring, or contiguous) to the main channel system of Coyote Creek. On the Duarte Site, "isolated" depressional and swale features that meet the wetland hydrology, hydric soil, and hydrophytic vegetation parameters as articulated in the 1987 Corps Delineation Manual (Environmental Laboratory, 1987) and the Arid West Supplement are rare. An example of a rare isolated depressional feature is located at latitude 40.084189N and longitude: -122.26264W on the Duarte Site.

2. *Summaries of Reference Site Conditions (and by Inference, Duarte Site Conditions Prior To Late Fall of 2012): Plot by Plot Field Observations at Reference Areas*

The information included in Appendix B of this Expert Report consists of plot by plot descriptions of CCCA reference site conditions. These data were relied upon by the DOJ Expert Team to reconstruct conditions on the Duarte Site prior to Late Fall of 2012. The information is based on our field observations and measurements in both the Coyote Creek Area 13 and Agricultural Area Reference sites. The Arid West Supplement (U.S. Army Corps of Engineers, 2008) data sheets that are included in Appendix A of this Expert Report are part of this information base. As introduced in the summary of the hydrologic study results presented in this report, in the CCCA, our goal was to select sample plot locations that were representative of overall conditions of vernal depression/swale complexes and their associated stream reaches.

Each plot that was examined for wetland vegetation is described below with the plot name, determination as to whether the hydrophytic vegetation parameter had been met, and a summary of the plot. Some common items to the plot summaries are:

(a) For the abbreviation 'spp.' this is used to indicate more than one species, and used as Genus A spp. when it was uncertain as to whether there was one or more species of Genus A in the plot and/or the identity of the individual species was not determined. In these cases where there may be several species with slightly different wetland indicators then the indicator value is selected that has the is the highest probability of being found in upland conditions, e.g. if Genus A has three different species one is an obligate, one a FACW, and one a FAC, then if the species were not identified then Genus A spp. is given the wetland indicator of FAC.

(b All plots were in the herbaceous stratum.

(c) The abbreviation 'ssp.' refers to subspecies.

(d) The abbreviation 'var.' refers to variety.

(e) The taxon *Eleocharis palustris* was recorded in the field and is used in the plot descriptions, and is very similar to another species *E. macrostachya*. Distinction between the two species is difficult because they are separated on fine morphological features that may not be well developed in the field and characteristics of the flower and fruit which are often unavailable. *Eleocharis palustris* is the wider ranging species with a circumboreal distribution. Both species have been identified as occurring in the Central Valley of California. Cranfill (1993) included *E. palustris* within *E. macrostachya*; whereas Smith (2012) and Smith et al. (2002) segregated *E. palustris* and *E. macrostachya*. Due to the limited time in the field and the lack of reproductive structures on most occurrences, it was decided to use the wider ranging *E. palustris* as the taxon for identification. Both species occupy the same wetland habitat and both are wetland obligate species.

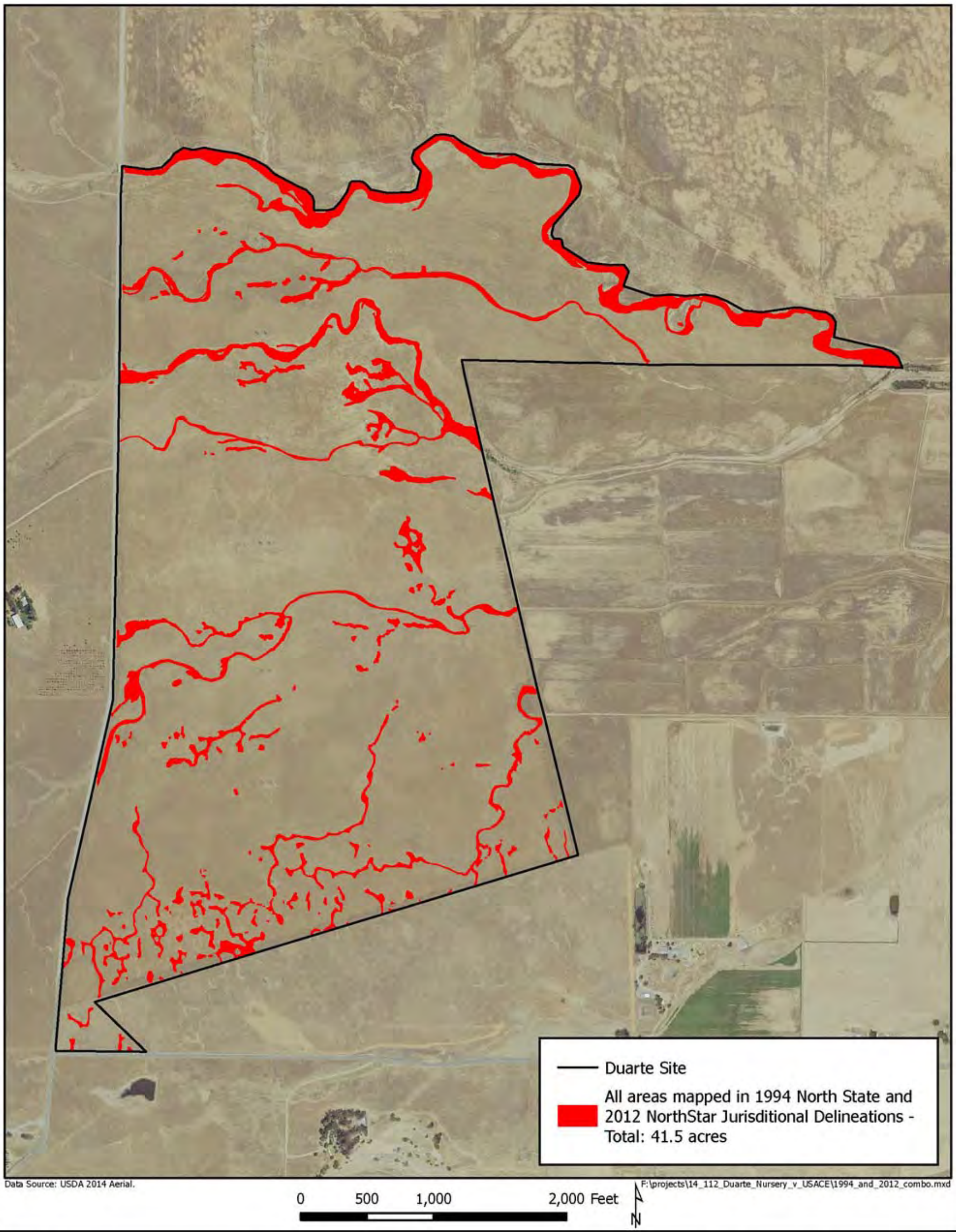
(f) Abbreviations for the wetland indicator status of plants used in this report are listed in Table V-7.

Table V-7. Abbreviations for the wetland indicator status of plants.

Plant Indicator Status Categories		
Indicator Abbreviation	**Indicator Category for a taxon**	**Probability (p) that the plant taxon occurs in a wetland.**
OBL	Obligate	Almost always (p > 99%)
FACW	Facultative Wetland	Usually (p > 67% to 99%)
FAC	Facultative	Similar likelihood to occur in wetland and upland (p = 33% to 67%)
FACU	Facultative Upland	Sometimes occur in wetlands (p = 1% to < 33%)
UPL	Upland	Rarely occur in wetlands (p < 1%)

a. Descriptions of categories presented here in abbreviated format as taken from Corps of Engineers Wetland Delineation Manual (1987: Table 1)

To summarize, information presented in Appendix B shows that in each of the reference area sampling locations, the DOJ Expert Team observed:



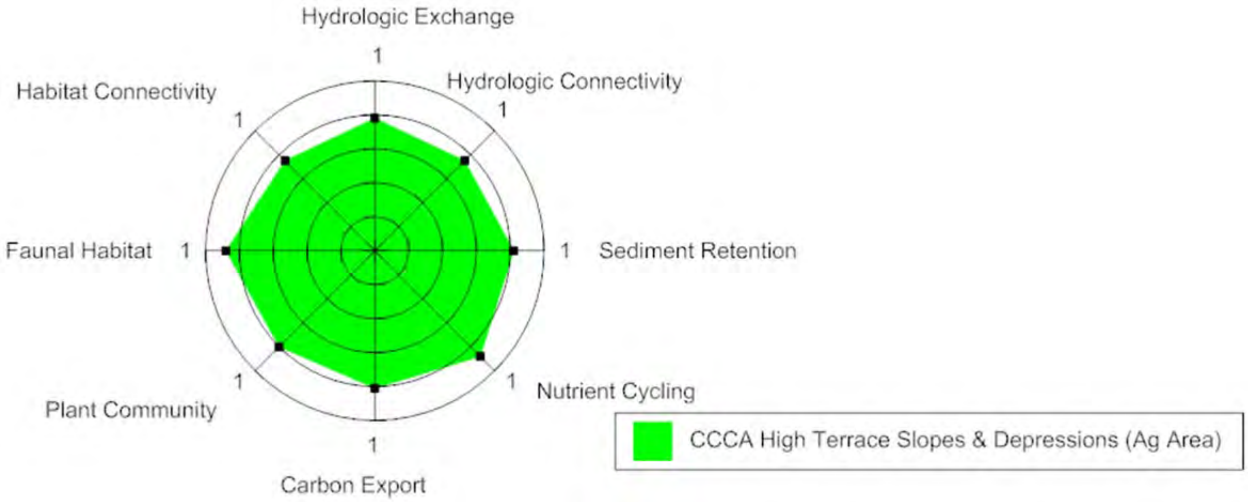
V-27. All areas mapped in the 1994 North State Resources and 2012 NorthStar Environmental Jurisdictional Delineations.

3. HGM Analyses of the Functioning of Reference Water/Wetland Ecosystems (and by Inference, the Functioning of the Duarte Site Prior to Late Fall of 2012).

Figures 28 through 30 summarize the DOJ Expert Team's assessment of the functioning of reference site (and by inference, Duarte Site) stream, depressional wetlands and slope (swales) wetland ecosystems prior to the fall of 2012 tillage activities. For the purposes of this functional assessment, classes of waters/wetlands assessed by the DOJ Expert Team were considered (massed) as similarly situated landscape units. Appendix D consists of our variable index scoring sheets for both pre December 2012 and post December 2012 conditions. As discussed in the Methods section of this Expert Report, the DOJ Expert Team used an HGM functional assessment approach that was written specifically to address the functioning of low order riverine, slope and depressional waters/wetlands situated on Pliocene and/or Pleistocene sandstone, shale and gravel deposits in the North Central Valley of California (Lee et al., 2015, In prep).

In figures 28 through 30, the suite of ecosystem hydrologic, biogeochemical, plant community, and faunal support/habitat functions performed by depression, swale and stream ecosystems is arrayed around the circular plot. Consistent with standard HGM methodologies, a functional capacity index score of one ("1.0") represents the "reference standard" condition or the best possible score for a particular function. Conversely, a zero ("0.0") is the lowest (most degraded) functional score. As would be expected for depressional, swale, and small stream systems in the CCCA Reference Area 13 and Agricultural Area and on the Duarte Site prior to December 2012 tillage activities, the functional index scores are relatively high (i.e. Generally ranging from 0.75 to 1.0) for most ecosystem functions. This is because the CCCA Reference Areas and the Duarte Site prior to Late Fall of 2012 tillage operations were not significantly perturbed. For example, they were lightly to moderately grazed, not historically tilled or shallow tilled (ie. CCCA Agricultural Reference Area), not recently burned, not fragmented, etc. Plant community functions in the reference areas and on the Duarte Site prior to Late Fall of 2012 were relatively low, due to the existence of non-native weed species that are ubiquitous as members of plant associations throughout the grasslands of California (Minnich, 2008).

The import of the functional assessment summarized in Figures 28 through 30 is that, considered as connected and similarly situated landscape units, the depressional, swale, and stream ecosystems that occurred on the Duarte Site prior to Late Fall of 2012 performed the suite of ecosystem functions of which they were capable to a relatively high degree. Taken as highly functioning and connected landscape units in the headwardmost reaches of the Coyote Creek ecosystem, they made significant contributions to maintenance of the physical, chemical, and biological integrity of the downstream reaches Coyote/Oat Creek system and thus to the traditional navigable waters of the Sacramento River.



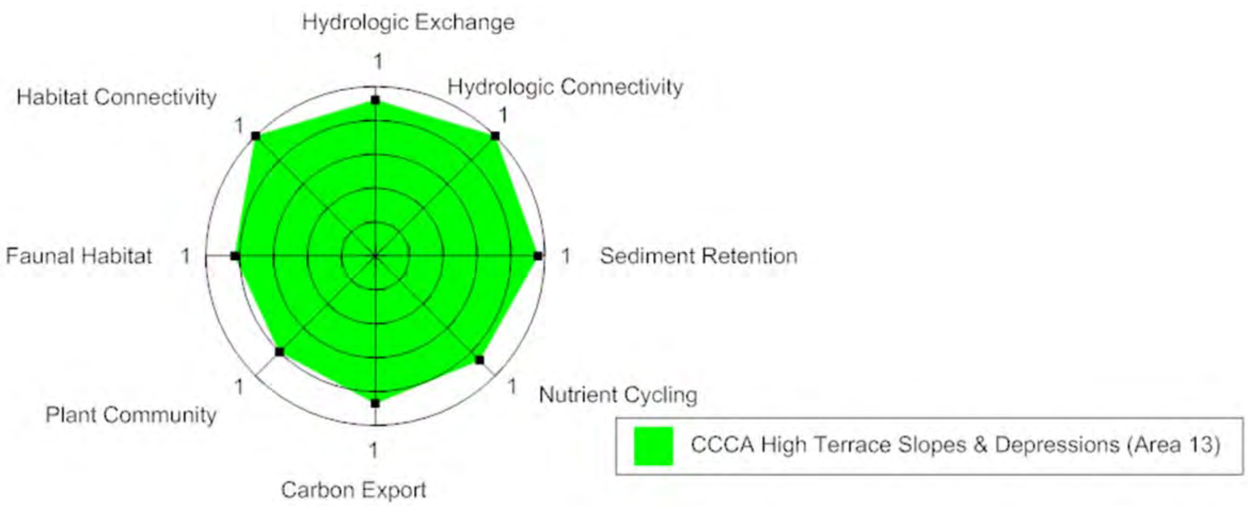
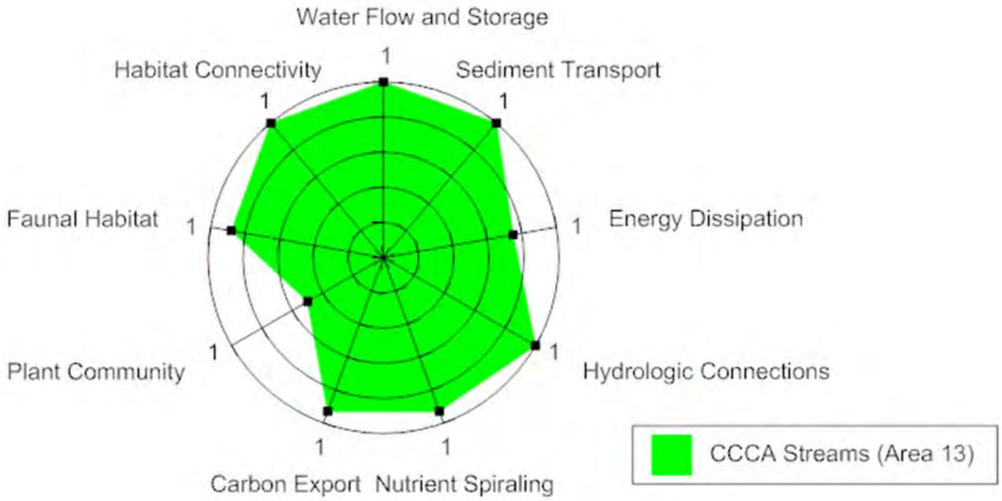


Figure V-28. Polar plots of the suite of Hydrogeomorphic wetland functions for the CCCA Area 13 and Ag Area high terrace slopes and depressions.



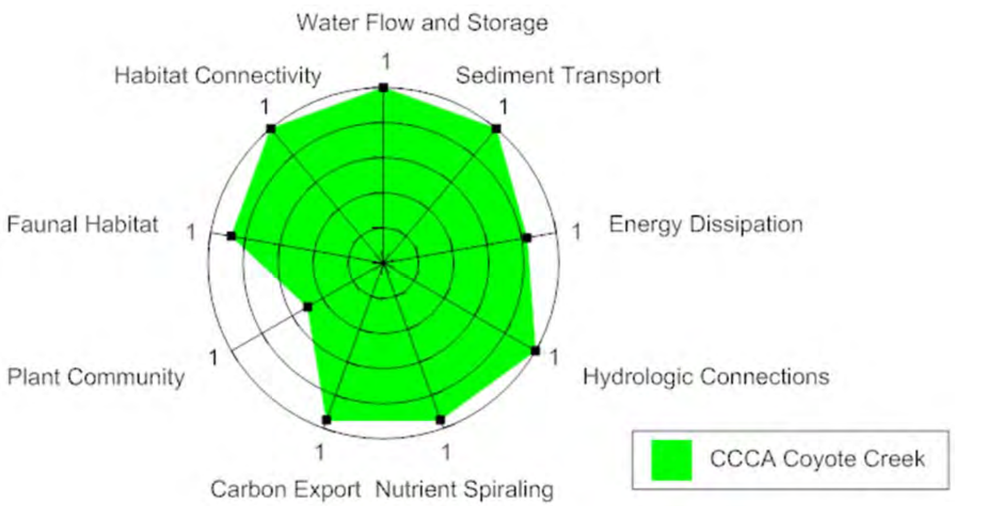
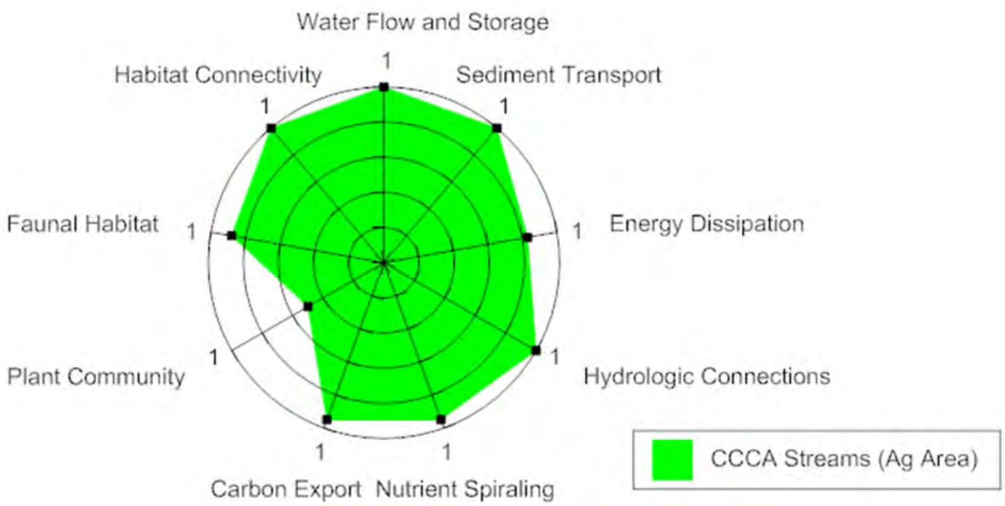


Figure V-29. Polar plots of the suite of hydrogeomorphic wetland functions for CCCA streams in Area 13 and Ag Area.



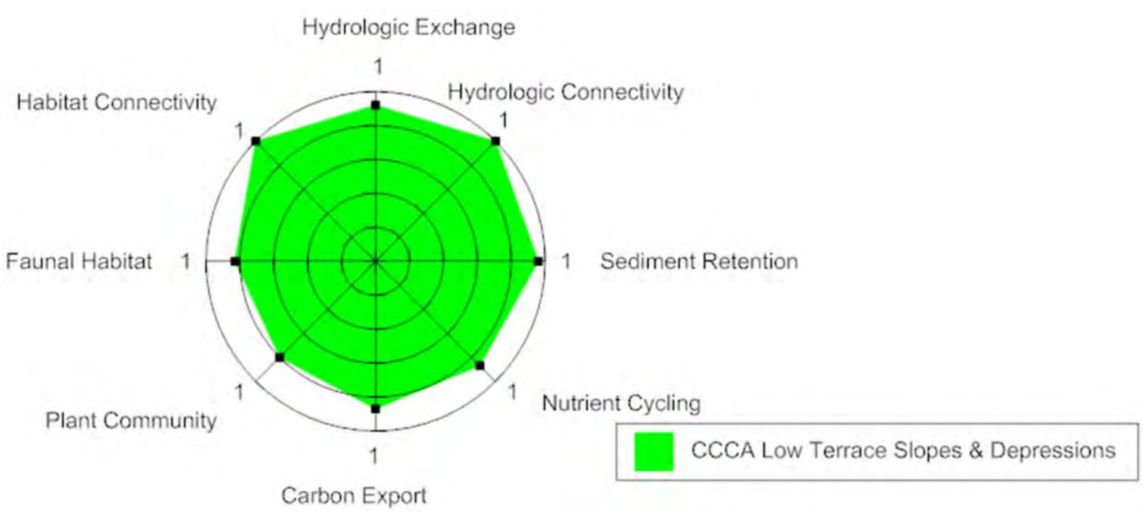


Figure V-30. Polar plots of the suite of Hydrogeomorphic waters/wetland functions at Coyote Creek and low terrace slopes and depressions on the Duarte Site prior to the 2012 disturbance.

G. Intact Hydrology:

The DOJ Expert Team's work in Reference Areas (and by inference Duarte Site conditions prior to late Fall, 2012) shows intact hydrologic structure and functioning within the depression/swale complexes and down gradient via surface and shallow sub-surface flows to the small streams that flow generally south from Area 13 and west and south from the Agricultural Area. The intact hydrologic structure and functioning observed by the DOJ Expert Team at CCCA Reference Areas (and by inference, at the Duarte Site) also included hydrologic processes such as surface and shallow subsurface water storage and exchange (local scale) and landscape scale hydrologic connections among all elements of the depression/swale complexes and to down gradient streams. The landscape scale connections depend upon the existence and operation of surface and shallow subsurface water flows that occur at or above the soil surface and/or above slowly permeable soil layers.

H. Intact Microtopography

The DOJ Expert Team work in Reference Areas (and by inference Duarte Site conditions prior to late Fall, 2012) shows intact and complex microtopographic structure within depression and swale complexes and down gradient to associated streams (Figure V-31). In reference conditions and given past land use history this microtopography occurs on a gradient of response from:

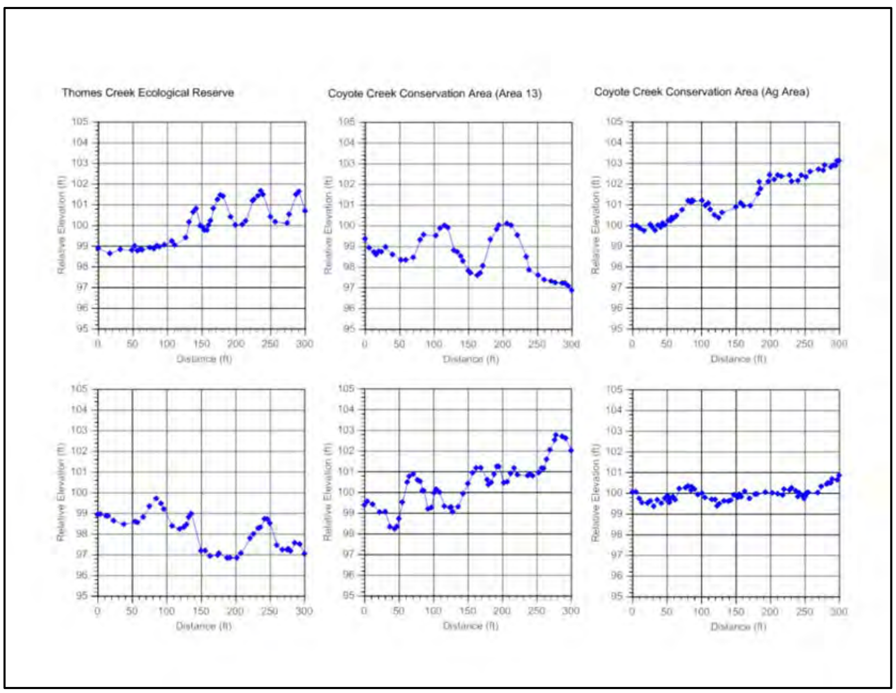


Figure V-31. Comparison of microtopographic features at the reference locations: Thomes Ecological Reserve, CCCA Area 13, and CCCA Ag Area.

(a) Thomes Ecological Reserve (not grazed, not recently burned, never tilled), to

(b) CCCA Area 13 (grazed, never tilled), and then to

(c) CCCA Agricultural Area (grazed, tilled in the relatively recent past).

Intact microtopography includes conditions at the inlets and outlets of vernal depressions and swales that allow water to flow over and through (shallow subsurface) the relatively smooth and often nearly level depression and swale bottom transitions that occur within the headwardmost reaches of stream channel systems, and then down gradient into the streams themselves.

I. Intact Soils

The DOJ Expert Team work in Reference areas (and by inference Duarte Site Conditions prior to late Fall, 2012) show that it took a great deal of time (geologic time) to develop the soil structure and morphology associated with the presence of one to several slowly permeable layers within the upper parts of modal soils on reference sites (and by inference, at the Duarte Site prior to Late Fall of 2012). These slowly permeable layers include Bt horizons, surface hardened (or very hardened) layers, and 2Bt extremely hard to indurated layers. It is important to note that soils on reference sites were relatively intact and not detached or perturbed by tillage or other mechanical means. In our opinion, moderate to light grazing by domestic livestock does not cause massive erosion. Consequently, even in grazed conditions, reference area soils were not subject to significant massive erosion. This is because soil profiles in reference conditions are bound by their intact physical structure and intact fine root biomass of native plants.

J. Intact Biogeochemical Processes

The DOJ Expert Team work in Reference Areas (and by inference Duarte Site conditions prior to late Fall, 2012) shows that biogeochemical processes that occur at the soil/water/plant root/microbe interface also took a great deal of time (geologic time) to develop. In reference landscapes, these processes are dependent upon intact soil and plant community conditions, and seasonal, cyclic shifts in oxidation/reduction conditions within vernal depressions and swales. These seasonal and cyclic shifts in oxidation/reduction conditions are dependent upon the presence of water (a) at the soil surface, (b) ponded above the soil surface, or (c) stored in shallow subsurface soil layers that exist above slowly permeable soil layers. Reference condition biogeochemical processes are intermittent and cannot occur if water within the vernal depression/swale complexes and down gradient streams is not present, is shunted to different positions within soil profiles, or is retained, detained or conveyed out of synchrony with intermittent flows that occur during and immediately after storm events (Figure III-13 and III-14).

K. Intact Plant Community Structure and Functioning

The DOJ Expert Team work in Reference Area (and by inference, the Duarte Site prior to late Fall, 2012) shows that plant communities are dominated by native species and few invasive, non-native weeds. It is important to note that the plant communities that dominate reference area (and by inference, the Duarte Site prior to Late Fall of 2012) depressions, swales and streams are very old (i.e. > 100's of years). Like many mediterranean plant communities worldwide, they have evolved within a landscape that is geologically old, relatively nutrient poor, and infrequently disturbed (Hopper, 2009). In this context, the horizontal and vertical spatial structuring, species composition and diversity, productivity, and reproduction patterns of dominant reference area plant communities is complex and highly integrated with the physical environments in which they occur.

L. Intact Faunal Support/Habitat Conditions

The DOJ Expert Team work in Reference Areas shows that faunal support/habitat conditions in reference areas (and by inference, the Duarte Site prior to late Fall, 2012) exhibited well developed vertical and horizontal structure and were not spatially or hydrologically fragmented. For example, within reference area depression/swale complexes and in associated streams, the structure of faunal habitats exhibited intact hydrologic processes and connections, intact plant communities dominated by native species, and large habitat patches that were well connected and interspersed with adjacent habitat patches and faunal habitats within surrounding landscapes. This type of local scale and landscape scale structure provides a high diversity of faunal habitats for a range of resident and nonresident faunal species such as fairy shrimp, migratory perching (passerine) birds, resident and migratory hawks and owls (raptors), several classes of waterfowl, and mammals with small, medium, and large home ranges.

Tehama County has three branchiopods that may be found in vernal swale or depressions: *Branchinecta lynchi* (vernal pool fairy shrimp; Federal Threatened), *Lepidurus packardi* (tadpole shrimp; Federal Endangered), and *Linderiella occidentalis* (California linderiella; no Federal or State listing). Although *L. occidentalis* is not federally listed, it is tracked by California Natural Diversity Database (CNDDB, California Department of Fish and Wildlife 2015) because its habitat (depressions and some swales) is imperiled in the State of California (U.S. Fish and Wildlife Service 2005). Eriksen and Belk (1999) provide a thorough introduction and summary to the branchiopods of California. Conducting a search of the California Diversity Database for these species in Tehama County found 21 records for *L. packardi*, 20 records for B. lynchi, and 10 records for *L. occidentalis*. Further analysis found several records of these species in depression and swale habitats in the immediate area of the Duarte Site. *Lepidurus packardi* was observed in 11 seasonal wetlands during dry season sampling in the area around Coyote Creek, and vicinity of Ohm Road and Dusty Way (CNDDB, *L. packardi* occurrence no. 175). *Branchinecta lynchi* was found southeast of the corner of Paskenta Road and Ohm Road in two pools (CNDDB, *B. lynchi* occurrence no. 133), and near Rawson Road and Vista Way in four pools (CNDDB, *B. lynchi* occurrence no. 628). *Linderiella occidentalis* was found in the vicinity of Ohm Road and Dusty Way in an unknown number of pools in pool/swale complexes (CNDDB, *L. occidentalis* occurrence no. 135). The occurrences of these three species in the immediate vicinity of Ohm Road and Dusty Way are compelling evidence that it is very likely that one or more of these species could be found on the Duarte Site, which had suitable habitat for all three species at least prior to the tillage operations in late 2012.

M. DOJ Expert Team Delineation

On the Duarte Site of waters of the U.S. including wetlands on December 2, 2008, the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers (Corps) issued guidance to EPA regions and U.S. Army Corps of Engineers districts implementing the Supreme Court's decision in the consolidated cases Rapanos v. United States and Carabell v. United States (the “Rapanos” decision). The “Rapanos” guidance addressed jurisdiction over waters of the United States under the Clean Water Act. This draft guidance clarified how the EPA and the Corps will identify waters protected by the Clean Water Act and implement the Supreme Court’s decisions concerning the extent of waters covered by the Act. Guidance Table 3 (Table V-8) is taken directly from the December, 2008 Guidance and provides a summary of its key points. In practice, the Guidance set out two tests that are commonly referred to by the names of the Supreme Court Justices (“Scalia” and “Kennedy” tests) who articulated them. With particular respect to the Scalia (or plurality) test, the issue is whether the waters/wetland feature at issue can be shown to be physically connected to a traditional navigable water (TNW) via surface and/or shallow subsurface flows. With respect to the Kennedy or “significant nexus” test, Kennedy wrote:

> *“In Solid Waste Agency of Northern Cook County v. Army Corps of Engineers, 531 U.S. 159 (2001) (SWANCC), the Court held, under the circumstances presented there, that to constitute ‘navigable waters’ under the Act, a water or wetland must possess a ‘significant nexus’ to waters that are or were navigable in fact or that could reasonably be so made.”*

Thus, the guidance offers that:

> *“Waters have the requisite significant nexus if they, either alone or in combination with similarly situated waters in the region, significantly affect the chemical, physical, or biological integrity of traditional navigable waters or interstate waters.”*

The following table reproduced from the U.S. EPA and Corps guidance document.

(a) Our observations of field conditions on the Duarte Site;

(b) Our peer review of the 1994 (North State) and 2012 (NorthStar) delineations;

(c) Guidance concerning the atypical approach articulated in the 1987 Corps Delineation Manual (Environmental Laboratory, 1987);

(d) Reference site data including the results of our hydrologic studies in the CCCA and downstream to the Sacramento River; and

(e) Current regulatory guidance.

Figure V-32 presents the DOJ Expert Team's synthesis of the direction of water flows (flow vectors) into, through, and out of the Duarte Site prior to tillage activities in November and December of 2012. The flow vectors were developed using a combination of map and aerial photo interpretations, consideration of the existing 1994 and 2012 delineations, synthesis of reference data, and field observations of Duarte Site conditions during the interval March 31 to April 10, 2015. We combined the information presented in Figures V-25 and V-26 with the following:

The DOJ Expert Team then worked to refine the 1994 and 2012 delineations of waters of the U.S. (Figures V-25 and V-26) with the goal of identifying and including waters/wetlands that occurred on the Duarte Site *prior to late Fall 2012 tillage activities*. Figure V-33 presents the DOJ Expert Team's synthesis and delineation of the geographic extent of waters of the U.S., including wetlands on the Duarte Site. It shows a total of 43.9 acres of waters of the U.S., including wetlands that occur on the Duarte Site. Figure V-33 also shows that a total of 51,892 linear feet (10.02 miles) of stream channels that include the main channel of Coyote Creek and the ten tributary stream channel systems that form the headwardmost extent of the Coyote Creek ecosystem on the Duarte Site. In the inset table on Figure V-33, the lengths of stream channel reaches are reported individually and then summed. In developing our delineation, the DOJ Expert Team added approximately 0.5 acres of wetland sloughs that were located on the Holocene floodplain of Coyote Creek and either below OHW and hydrologically connected, abutting or "adjacent" (bordering, neighboring and contiguous) to Coyote Creek. We also added 1.9 acres of area below OHW in the Coyote Creek system that was not mapped in either 1994 or 2012. These areas are part of the main Coyote Creek system and thus part of "Tributaries" as defined at 33 CFR 328.3 (a) (5). In the field and with the help of reference data, we also documented the hydrologic connections among depressions, swales and streams shown in Figure V-32. Consistent with standard delineation practices and current guidance, we consider the depression and swale wetland complexes shown in Figure V-33 and their associated ten stream systems to be unified and connected parts of the tree-like dendritic structure of the, Coyote Creek/Oat Creek stream channel network. Coyote Creek and the network of the Duarte Site streams and wetland depressions and swales are tributaries that flow directly to the traditional navigable waters of the Sacramento River.

1. Significant Nexus Determination

Approved U.S. Army Corps Jurisdictional Determination Form (Appendix B in U.S. Army Corps of Engineers Jurisdictional Determination Form Instructional Guidebook) provides the following set of questions to support a determination of whether or not there is a significant nexus between waters/wetlands and traditional navigable waters. We have applied these questions to the Duarte Site waters/wetlands ecosystems shown in Figure V-33. Our answers and substantiating data locations in this Expert Report are given for each question.

Table V-8. Table 3 from the Summary of key points from December 2, 2008 Guidance issued by the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers implementing the Supreme Court's decision in the consolidated cases Rapanos v. United States and Carabell v. United States.

The agencies will assert jurisdiction over the following waters
• Traditional navigable waters • Wetlands adjacent to traditional navigable waters • Non-navigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally (*e.g.*, typically three months) • Wetlands that directly abut such tributaries
The agencies will decide jurisdiction over the following waters based on a fact-specific analysis to determine whether they have a significant nexus with a traditional navigable water:
• Non-navigable tributaries that are not relatively permanent • Wetlands adjacent to non-navigable tributaries that are not relatively permanent • Wetlands adjacent to but that do not directly abut a relatively permanent non-navigable tributary
The agencies generally will not assert jurisdiction over the following features :
• Swales or erosional features (*e.g.*, gullies, small washes characterized by low volume, infrequent, or short duration flow) • Ditches (including roadside ditches) excavated wholly in and draining only uplands and that do not carry a relatively permanent flow of water
The agencies will apply the significant nexus standard as follows:
• A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by all wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical and biological integrity of downstream traditional navigable waters • Significant nexus includes consideration of hydrologic and ecologic factors

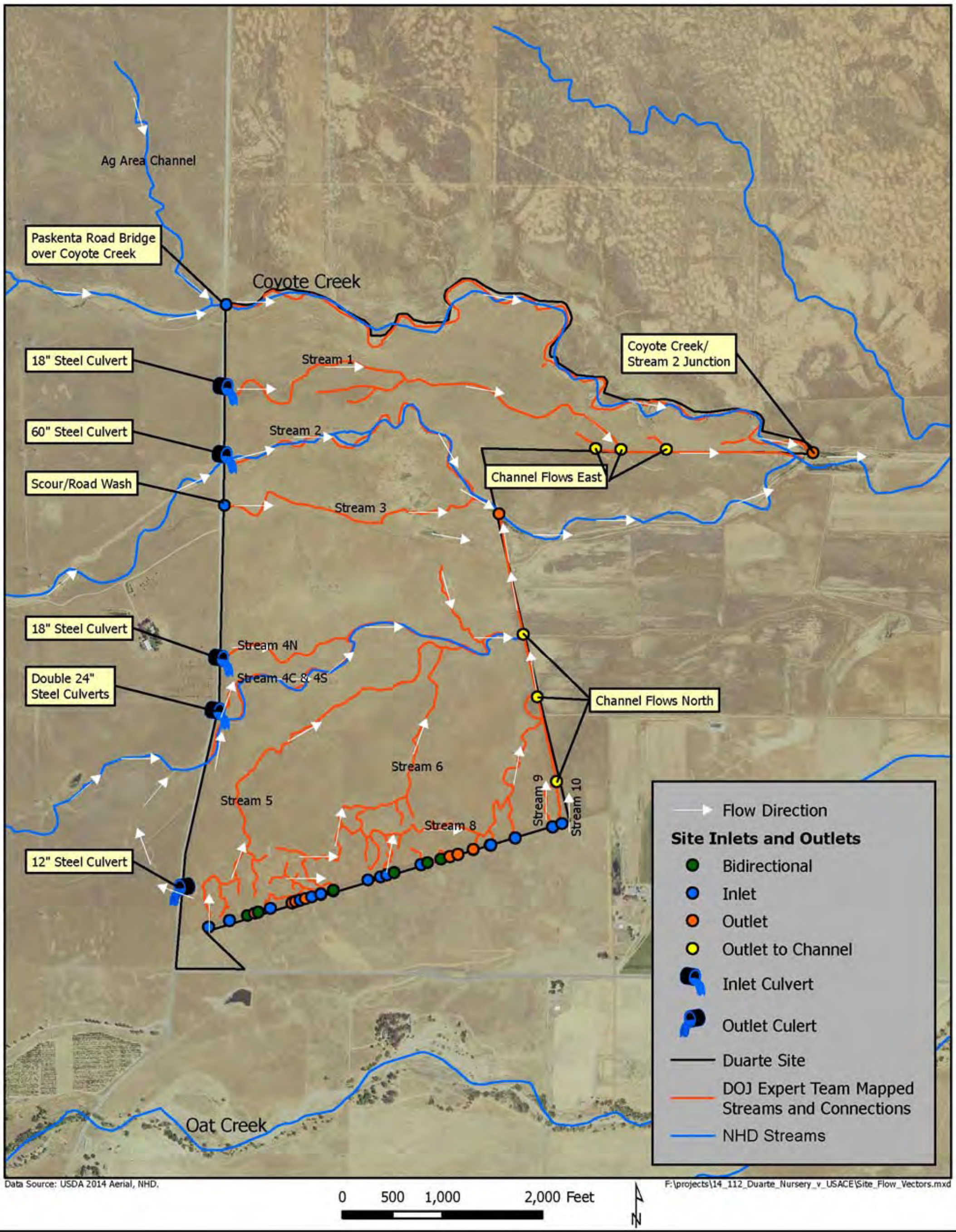


Figure V-32. Existing flow systems with approximate flow directions.

Question 1. *Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?*

Response 1: In this Expert Report, Yes – see (a) hydrology study results summary including supporting water level recorder data and (b) chemical hydrology study results.

Question 2. *Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?*

Response 2: Yes – we have documented the presence of or directly observed the following:

Documented via literature and US Fish and Wildlife Service Listings. Direct observation of fishing and catch. Listed salmon and Steelhead (adults and juveniles)

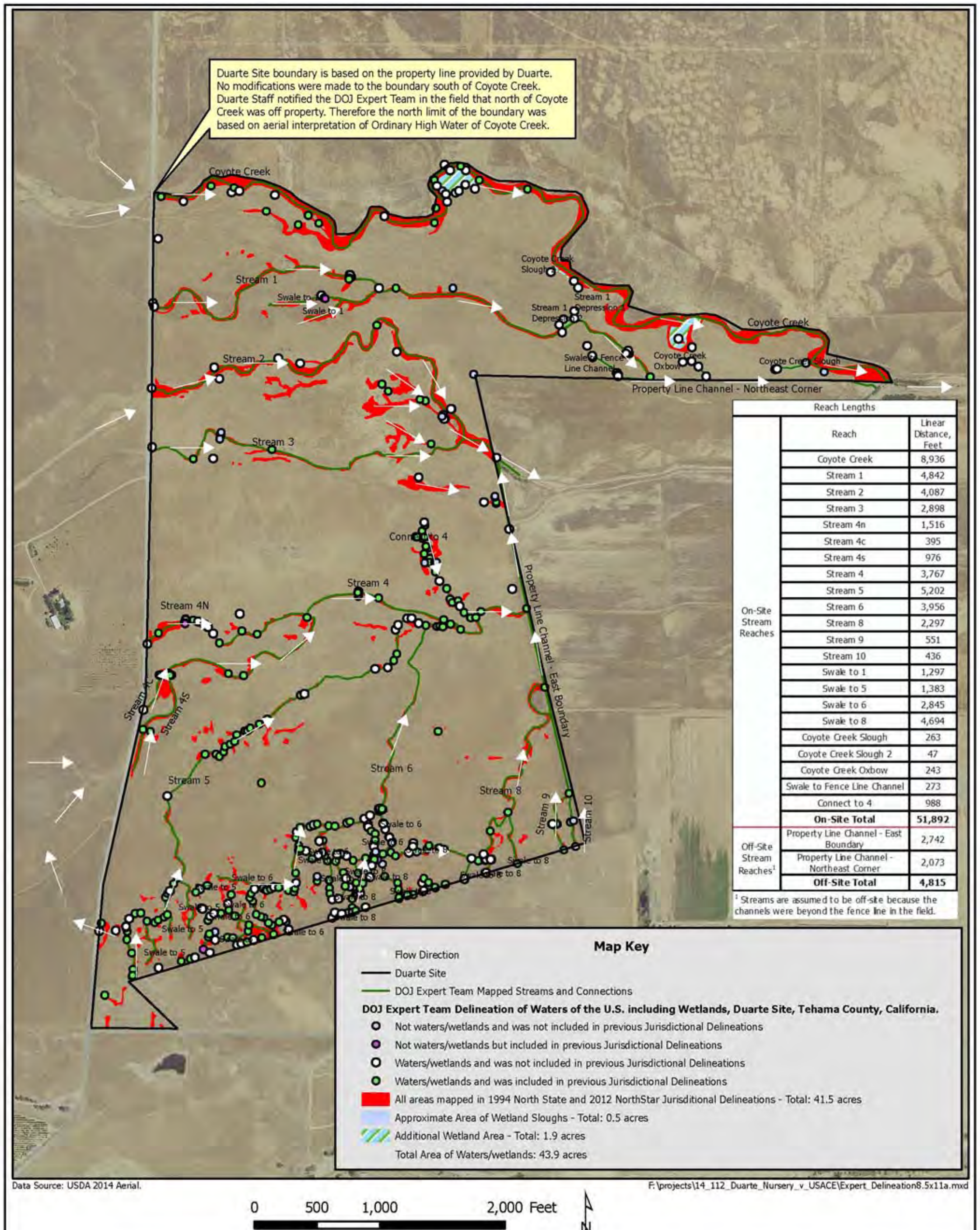
Directly observed in the CCCA and in downstream reaches of the Coyote Creek/Oat Creek System and in the Sacramento River National Wildlife Refuge in the vicinity of the Oat Creek Junction With the Sacramento River:

Black Bear
Mountain Lion (Tracks)
Rattlesnakes
Coyotes
Catfish
Crappie
Several classes of macroinvertebrates,
Several classes of avifauna including harriers, burrowing owls, red tail hawks, migratory waterfowl (i.e., Canada Geese; Mallards), migratory passerines, turkeys, vultures

Question 3. *Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?*

Response 3: Yes – see (a) soils descriptions and associated discussions of soil organic carbon and (b) results of the chemical hydrology study.

Question 4 *Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?*



Reach Lengths

	Reach	Linear Distance, Feet
On-Site Stream Reaches	Coyote Creek	8,936
	Stream 1	4,842
	Stream 2	4,087
	Stream 3	2,898
	Stream 4n	1,516
	Stream 4c	395
	Stream 4s	976
	Stream 4	3,767
	Stream 5	5,202
	Stream 6	3,956
	Stream 8	2,297
	Stream 9	551
	Stream 10	436
	Swale to 1	1,297
	Swale to 5	1,383
	Swale to 6	2,845
	Swale to 8	4,694
	Coyote Creek Slough	263
	Coyote Creek Slough 2	47
	Coyote Creek Oxbow	243
	Swale to Fence Line Channel	273
	Connect to 4	988
	On-Site Total	**51,892**
Off-Site Stream Reaches[1]	Property Line Channel - East Boundary	2,742
	Property Line Channel - Northeast Corner	2,073
	Off-Site Total	**4,815**

[1] Streams are assumed to be off-site because the channels were beyond the fence line in the field.

Figure V-33a. Duarte Site: DOJ Expert Team Delineation of Waters of the U.S., including Wetlands, Duarte Site, Tehama County, California.

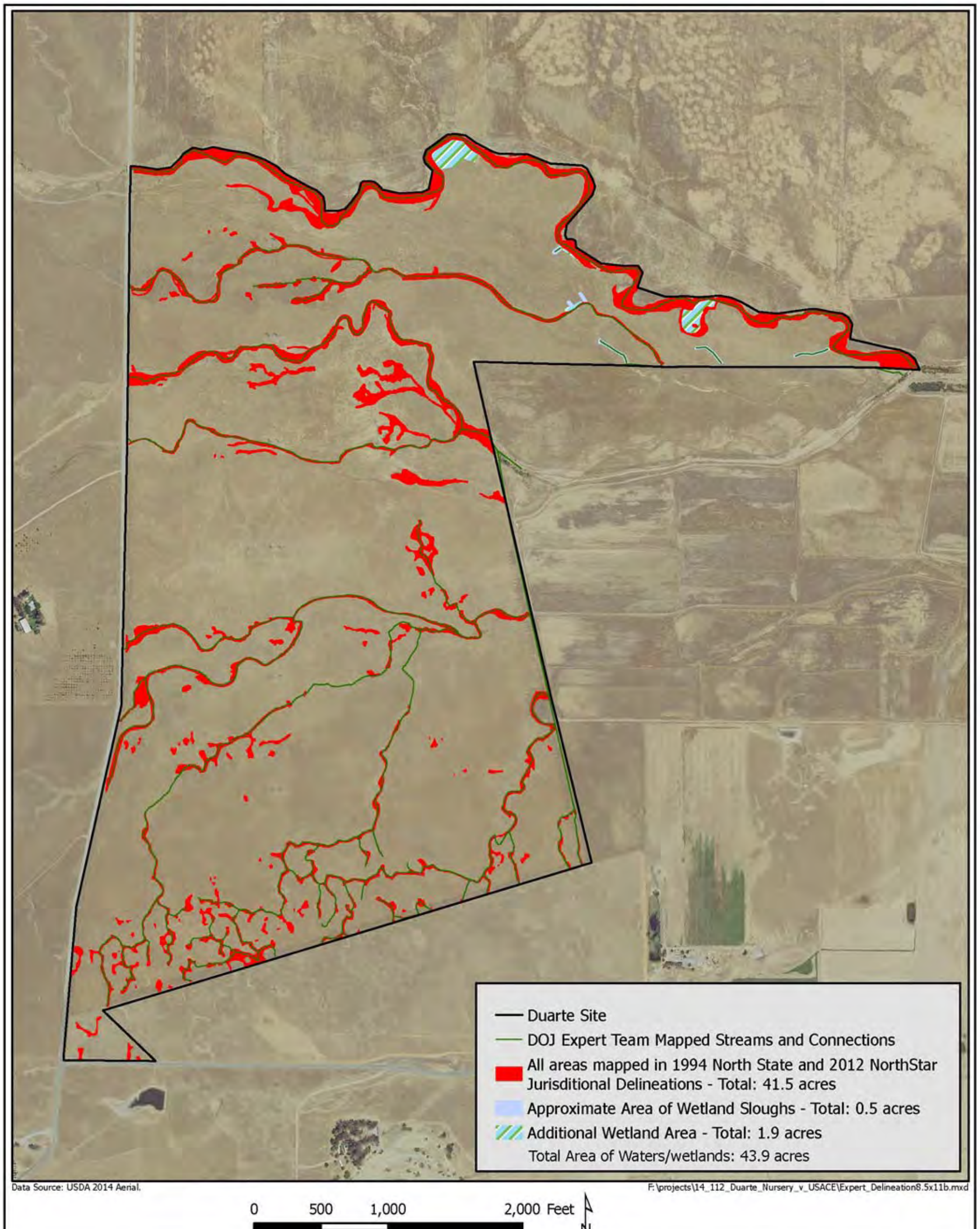


Figure V-33b. Duarte Site: DOJ Expert Team Delineation of Waters of the U.S., including Wetlands, Duarte Site, Tehama County, California.

Response 4: Yes – the Coyote Creek/Oat Creek system has the capacity to deliver water of high quality to the Sacramento River with timing, rate and volume of delivery that provides faunal species and humans with an important resource that sustains physical, chemical, and biological systems in the Sacramento River. Maintenance of this delivery system and high water quality in the Sacramento River ecosystem is also related to maintenance of navigation and commerce (i.e., recreation on the river and sport and commercial fishing).

Based upon on our field work including our hydrologic, chemical, soil, vegetation and faunal support/habitat studies in the Coyote Creel/Oat Creek ecosystems since October, 2012, our review of pertinent literature, the syntheses of data presented in this Expert Report, and our responses to the four questions immediately above in this section, the DOJ Expert Team's opinion is that there is significant nexus between the Coyote Creek/Oat Creek system and the traditional navigable waters of the Sacramento River.

N. Documentation and Assessment of Conditions and Impacts at the Duarte Site – Post Late Fall of 2012

1. Summary of Plot by Plot Field Observations at the Duarte Site

As with reference site plot by plot descriptions (Appendix B) the information included in Appendix C of this Expert Report consists of plot by plot descriptions of the DOJ Expert Team's documentation of Duarte Site conditions post Late Fall of 2012. The information is based on our inspection of background materials and on field observations and measurements on the Duarte Site During the interval March 31 – April 10, 2015. The Arid West data sheets that are included in Appendix A of this Expert Report are part of this information base.

As with CCCA Reference Areas, on the Duarte Site, our goal was to select sample plot locations that were representative of overall conditions of vernal depression/swale complexes and their associated stream reaches. We also focused on waters/wetland features that were omitted in previous delineations. Therefore, while we walked and drove the length of every stream system on the 450 acre Duarte Site and observed conditions in all depression/swale complexes, we could not sample every depression, swale, and stream feature. Therefore, we sampled a subset of the waters/wetland areas shown in Figure V-33. Our sample plot locations on the Duarte Site are given in Figure V-34. As shown in both figures we sampled all of the geomorphic surfaces on the Duarte Site.

Appendix C is organized to present information focused on our observations within the main channel system of Coyote Creek on the Duarte Site and within the depression - swale - stream systems that occur on the Duarte Site (identified as 1 through 10 plus Coyote Creek). As has already been discussed this Expert Report in the field, the "Stream 7" was problematic as it appeared to be bidirectional depending on the depth of water in the depressions and swales. Given our final analyses in the field and in developing this report, we recognize that this nearly level and complex area should be considered as part of the headwardmost reaches of the Stream 6 and 8 systems (Figure V-4). However, for the sake of maintaining organization of our field notes and discussions, we have retained designation of the "Stream 7."

2. Summary of Hydrologic Observations of Depressions, Swales, and Streams on the Duarte Site

Between March 31 and April 9, 2015 the Expert Team conducted studies on the Duarte Site. Characteristics of the site and overall study objectives have been described elsewhere in this Expert Report. The hydrologic portion of the study, in addition to observations of the wetland hydrologic indicators (described in the Methods section), included identification of all streams and connecting depressions and swales on the Duarte Site and their connectivity to Coyote Creek, measurements of cross-sections of depressions, swales, and stream complexes, and identification of impacts resulting from tillage. The Duarte Site is directly east of the CCCA across Paskenta Road. Some of the streams originate on the CCCA and flow on to the Duarte Site (Refer to Figure V-4 for stream map). Based on the DOJ Expert Team's on-site observations of the CCCA and Duarte Site areas, the two sites occupy the same landform, have similar hydrologic processes, and are similarly situated in the regional landscape.

Figure V-32 shows the location of all streams identified in the study and the direction of flow onto, through, and off the Site. All streams were traversed to verify connectivity of the depressions and swales to the streams and eventually to Coyote Creek. As part of the study Dr. Nutter conducted a walking survey of two streams with the GIS Specialist and noted conditions resulting from tillage impacts, the coordinates of the inlet and outlet of each depression to the connecting swales. The results of the surveys for Streams 5 and 6 are presented in Appendix C. It is evident from the surveys that most of the wetland depressions and swales in the two streams were tilled with furrow depths ranging from 0 to greater than 10 inches. An estimate of the average depth of furrows is about 5 to 7 inches. The depth of tillage is discussed in greater detail in the Soils section of this report. The entire length of both Streams 5 and 6 are jurisdictional wetlands as defined in the U.S. Army Corps of Engineers 1987 manual and the Arid West Supplement and evaluated using the Atypical Approach for altered wetlands.

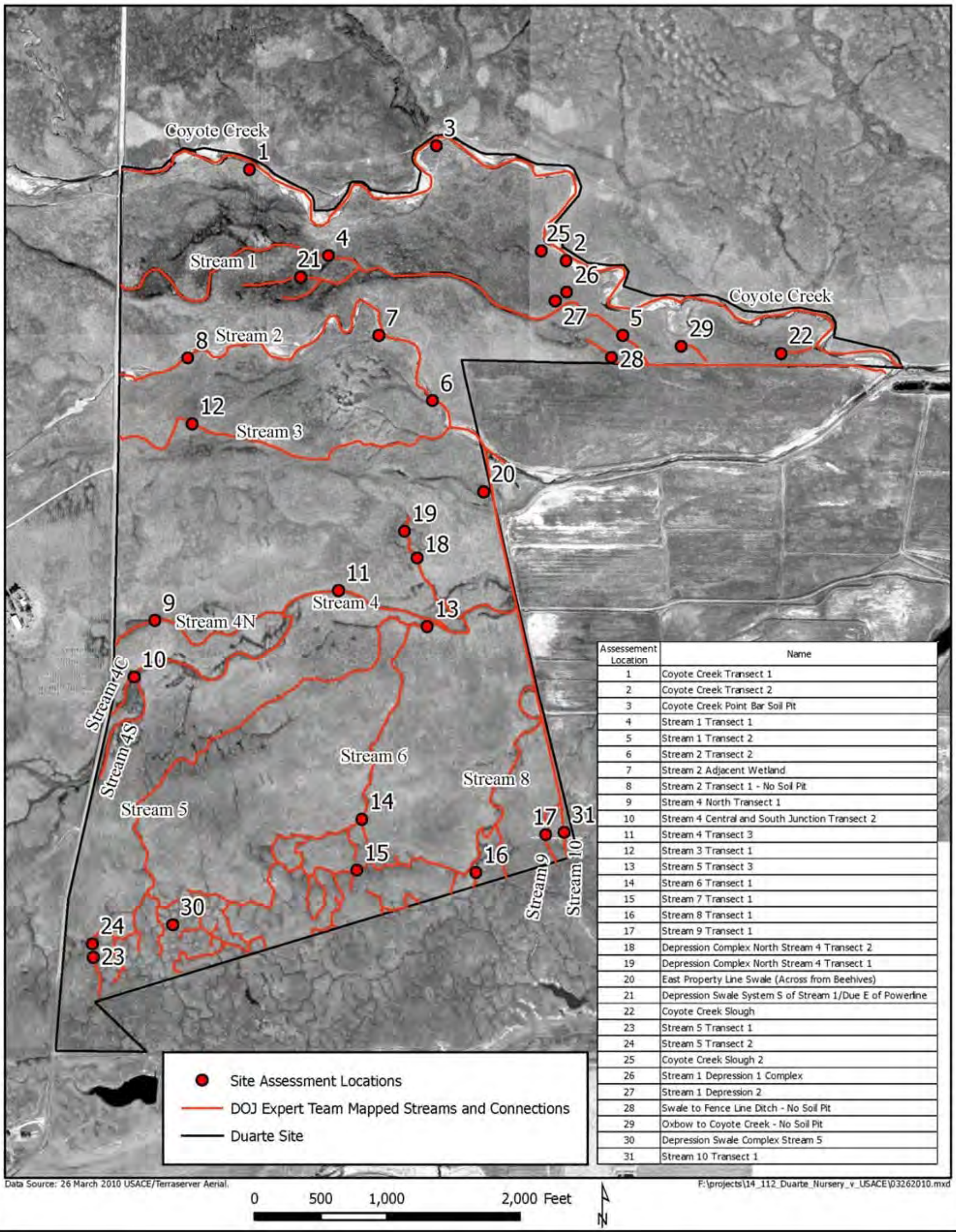


Figure V-34. Duarte Site assessment locations.

Most of the depression inlets and outlets to the swales were tilled, some in the same direction of flow, some at right angles to flow, and some offset from about 30 to 45 degrees. A schematic depicting how the tractor and ripper operation likely tilled through the depressions, swales, and streams is presented in V-35. This schematic also shows how the operation could have been done without impact to the depressions and swales by lifting the ripper shanks as a depression, swale, or stream was approached. Examples of the tillage operations in Stream 1 where the channel was tilled across and then in-line with the direction of flow. On the Duarte Site, changes in the geometry of depression to swale inlets and outlets usually result in fundamental changes in the size and functioning of these wetlands because there are changes in the patterns of water flow and circulation, and the extent of reach of ponded or saturated conditions. This type of hydrologic impact is shown in schematic in Figure 36. Deep tillage within the depression and swale interiors on the Duarte Site set up changes in patterns of water flow and circulation and soil water storage and the extent of reach of mapped waters/wetlands by changing the dominant water flow vector from lateral (surface and subsurface) to vertical. This impact is depicted in the schematic of Figure V-37.

The DOJ Expert Team also noted was the dragging or side-casting of soil clumps or linear blocks or slabs of soil from adjacent uplands into waters/wetlands at some locations. Also, as a result of undulating terrain, the depth of tillage/ripping will vary and may exceed the observed range of 7 to 14 inches. This type of impact is depicted in the schematics of Figures 38 and 39.

Furrow tops resulting from tillage raised the bottom elevation of the depressions and swales and lofted the soils causing a detachment of soil particles and changes in local site water balance characteristics. This is important, because:

a. Detached soil particles are readily transported in moving water, impacting biogeochemical (water quality) functions and the other riverine functions in the on-site streams, Coyote Creek, and the Sacramento River, and

b. Changes in site water balance characteristics fundamentally impacting assembly, growth and reproduction processes in very old and highly structured plant communities.

3. Summary of Sediment Characterization and Transport

We characterized grain-size distributions on 17 stream reaches on the Duarte Site (Figure V-40). Grain sizes were generally mixed, with substantial fine- and coarse-grained fractions. There are three general populations: streams with a relatively small fraction of fine-grained sediments (e.g., Coyote Creek, Transect 1), streams with a relatively moderate fraction of fine-grained sediments (e.g., Stream 3, Transect 1), and streams with a relatively large fraction of fine-grained sediments (e.g., Stream 9, Transect 1). In Coyote Creek, the bed-material sediments might all be mobile during high flows. In the other stream reaches, the coarsest bed-material sediments are likely immobile. These are lag deposits, having been part of the original alluvial fan deposits (Photo V-3) but being left behind as the fine-grained fractions of those original alluvial fan deposits have been slowly eroded (Photo V-4.).

The D_{10} was in the <2 mm size-class (i.e., represented as 1 mm in our analyses) on all 17 stream reaches characterized on the Duarte Site, comprising between 22% of the of the sediments counted at Coyote Creek, Transect 1 and 85% of the of the sediments counted at Stream 9, Transect 1 (Table V-9). The D_{10} would be expected to be transported even at very shallow flows on most of the 17 stream reaches, with transport expected at a median depth of 0.06 ft, and ranging from a depth of 0.02 ft at Stream 2, Transect 2 and 2.44 ft Stream 4, Transect 3 (Photo V-5). The latter was an outlier, which was a function of the extremely small slope along that reach (i.e., 0.0001, or 0.01%).

2. *Summary of Hydrologic Observations of Depressions, Swales, and Streams on the Duarte Site*

Between March 31 and April 9, 2015 the Expert Team conducted studies on the Duarte Site. Characteristics of the site and overall study objectives have been described elsewhere in this Expert Report. The hydrologic portion of the study, in addition to observations of the wetland hydrologic indicators (described in the Methods section), included identification of all streams and connecting depressions and swales on the Duarte Site and their connectivity to Coyote Creek, measurements of cross-sections of depressions, swales, and stream complexes, and identification of impacts resulting from tillage. The Duarte Site is directly east of the CCCA across Paskenta Road. Some of the streams originate on the CCCA and flow on to the Duarte Site (Refer to Figure V-4 for stream map). Based on the DOJ Expert Team's on-site observations of the CCCA and Duarte Site areas, the two sites occupy the same landform, have similar hydrologic processes, and are similarly situated in the regional landscape.

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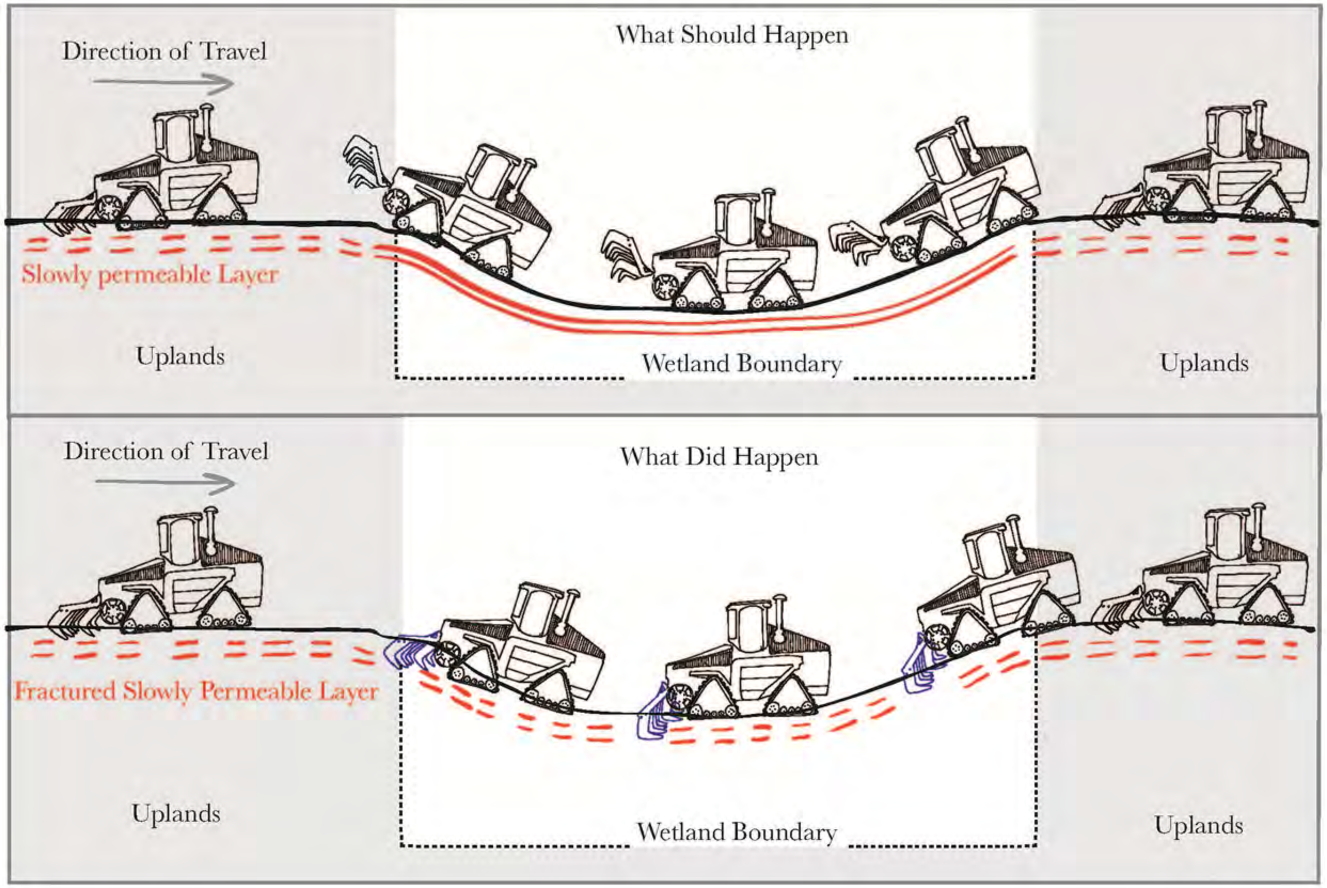
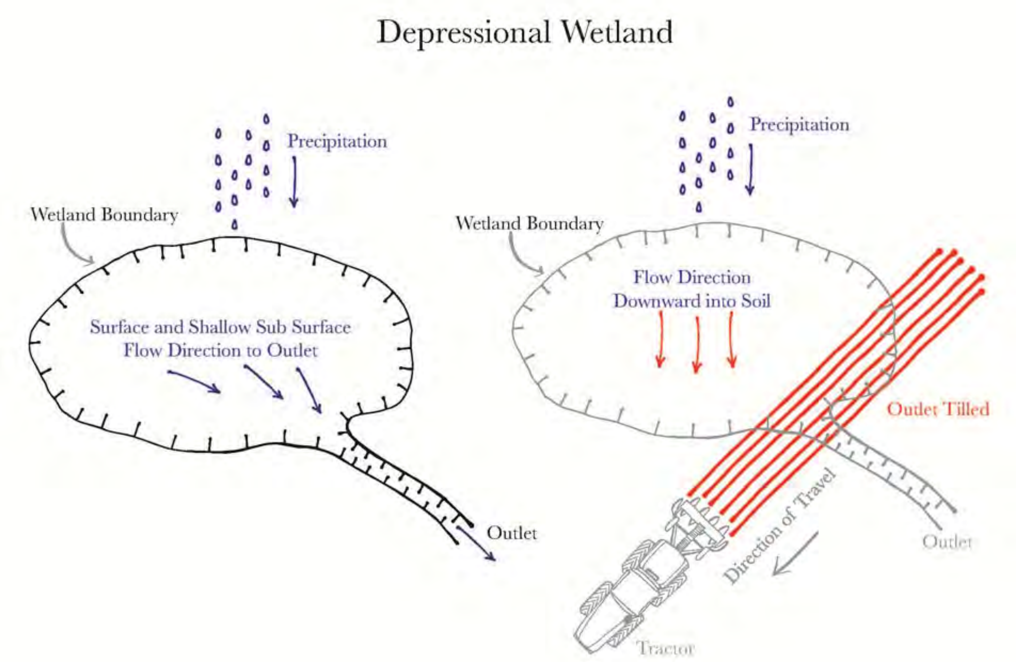


Figure V-35. Schematic of a tillage operation where the ripper is not raised when crossing the wetland leading to piercing and fracturing of the slowly permeable layers, mixing and redistribution of soils within wetlands, redistribution of upland soils into wetlands, redeposit of soils from lower soil horizons to the surface of tilled soils, and changes in the pattern of water flow and circulation. (Not to scale)



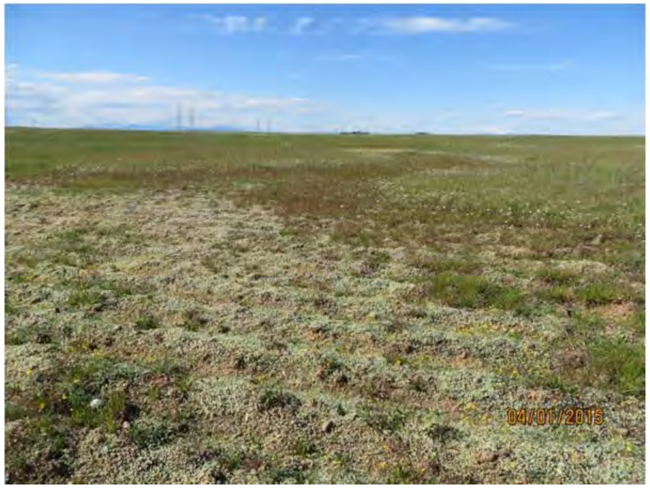


Figure 36. Schematic of tillage across depression outlet changing the patterns of flow and circulation of water from the wetland. (Not to scale)

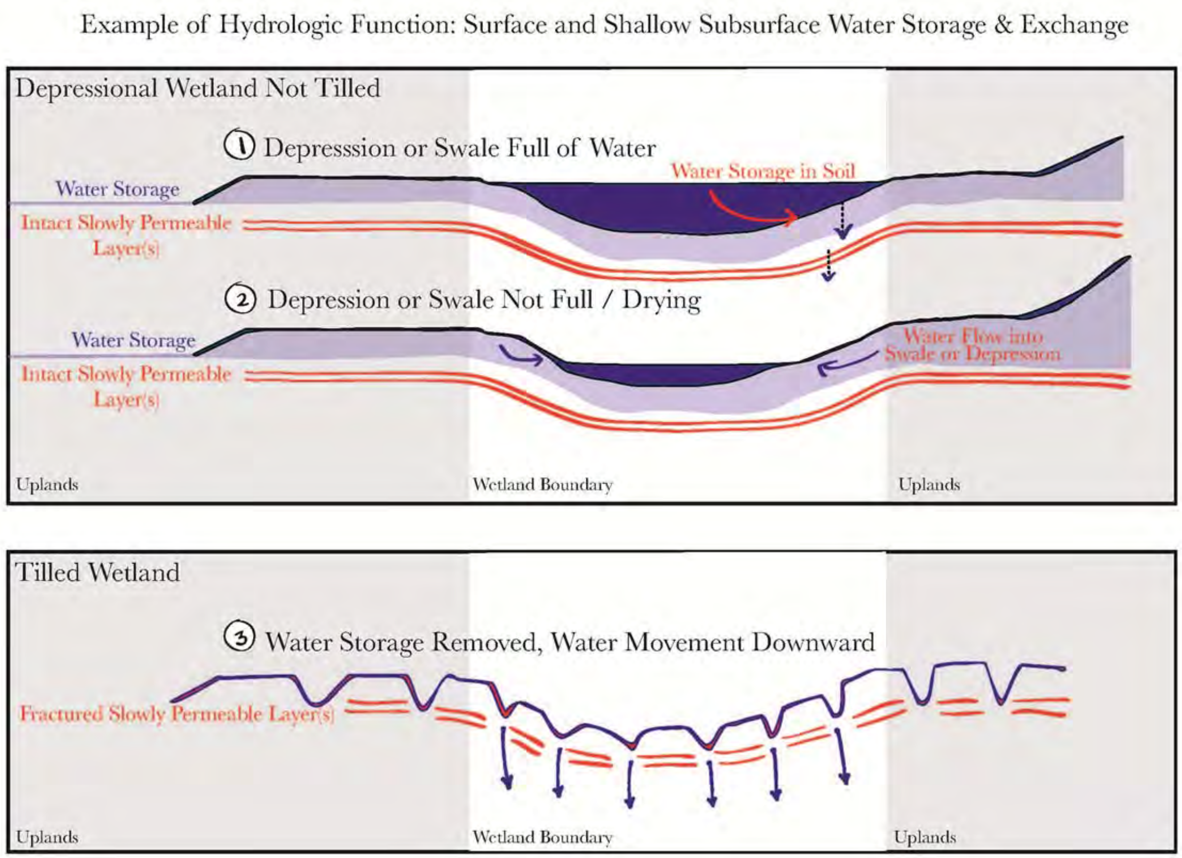


Figure 37. Schematic showing the impact of tillage across a depression or swale where the underlying slowly permeable soil layers are fractured. Water then moves downward in the soil profile rather than saturating surface soils, ponding on surface soils, or running off. The downward movement of water caused by tillage constitutes a significant change in the patterns of water flow and circulation within the depression or swale wetland. (Not to scale)

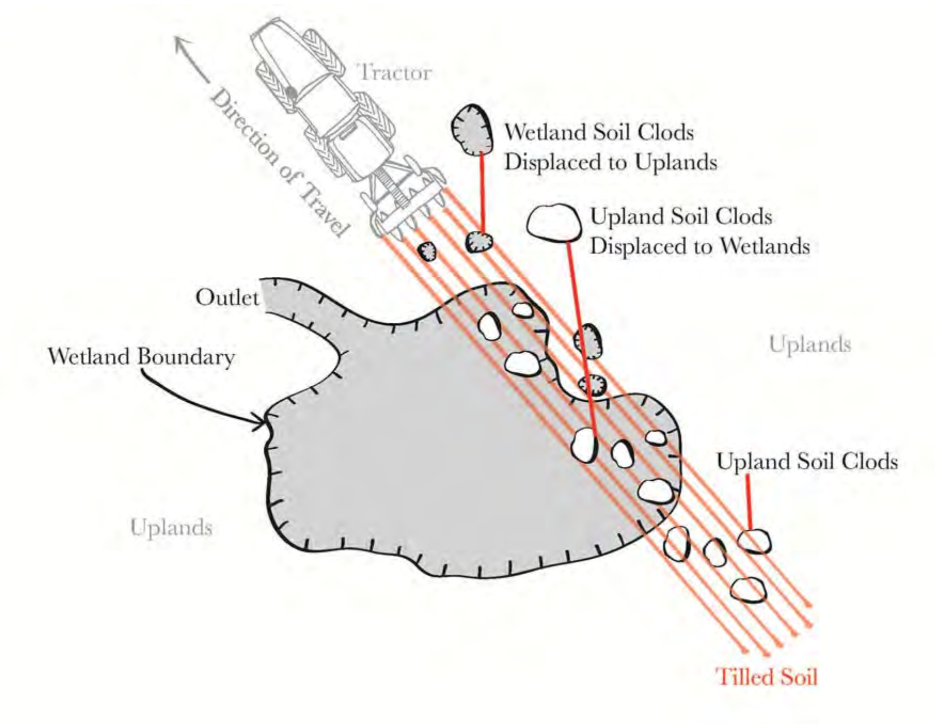


Figure V-38. Schematic of soil chunks or clods being dragged from the upland and deposited in the wetland. Upper photo shows deposition of upland soil in the wetland and lower photo shows upland soil chunks or clods that have been moved into wetlands. (Not to scale)

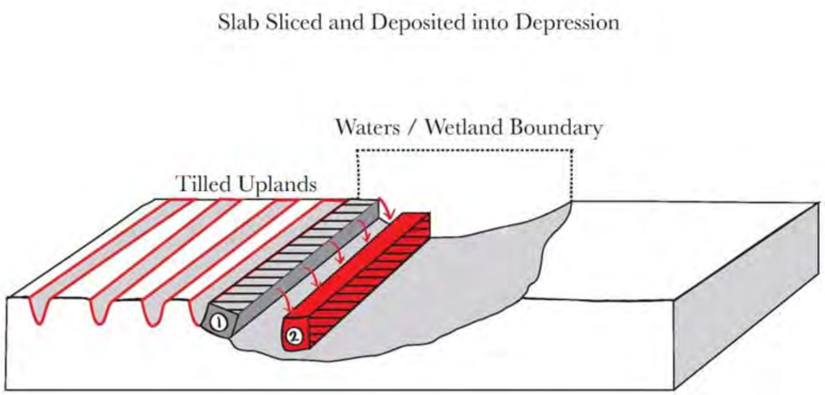


Figure V-39. Redistribution and deposition of soil slabs loosened by the tillage operation too close to the wetland edge. The upper photo shows tillage along the bank of the stream and lower photo shows the collapse of the loosened slab into the stream channel. (Not to scale)

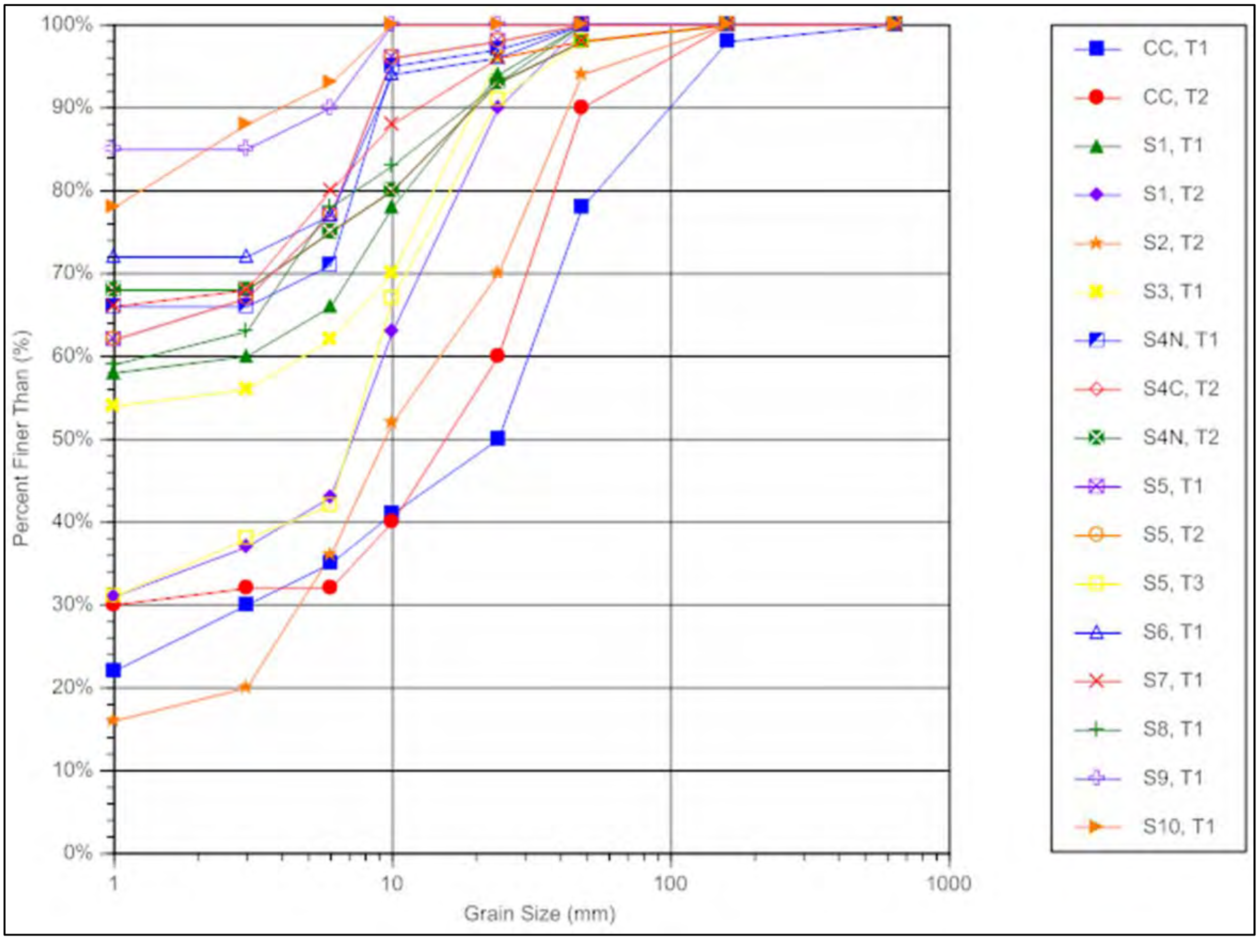


Figure V-40. Grain-size distributions from pebble counts on the Duarte Site.

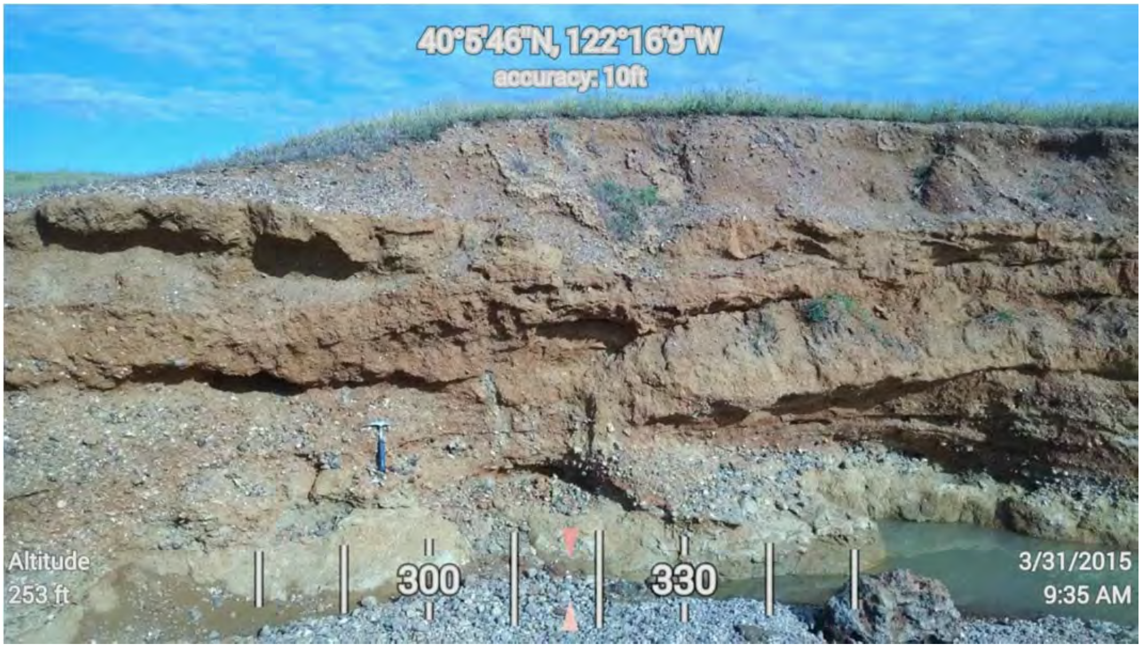


Photo V-3. Cut bank on Coyote Creek showing some of the original alluvial fan deposits, including the coarse-grained sediments that now form the coarse-grained lag deposits that are found in many of the stream reaches on the Duarte Site.

Photo V-4. The coarsest fraction of the exposed sediments are channel lag deposits, and are likely immobile in the small, low-slope channels that flow across the Duarte Site and ultimately into the Coyote Creek system.

Table V-9. The grain size of the D_{10}, the percent of the grains finer than the D_{10}, the measured slope, and the depth required to transport the D_{10} for each of the 17 stream reaches characterized on the Duarte Site.

Location	**D10 mm** Mm	**Percent Finer than D10** %	**Slope**	**Depth to Transport the D10** ft
Coyote Creek, Transect 1	1	22	0.0063	0.04
Coyote Creek, Transect 2	1	30	0.0027	0.09
Stream 1, Transect 1	1	58	0.0090	0.03
Stream 1, Transect 2	1	31	0.0005	0.49
Stream 2, Transect 1	1	27	0.0043	0.06
Stream 2, Transect 2	1	16	0.0113	0.02
Stream 3, Transect 1	1	54	0.0010	0.25
Stream 4N, Transect 1	1	66	0.0014	0.17
Stream 4C, Transect 2	1	68	0.0090	0.03
Stream 4S, Transect 2	1	68	0.0026	0.09
Stream 4, Transect 3	1	32	0.0001	2.44
Stream 5, Transect 1	1	62	0.0067	0.04
Stream 5, Transect 2	1	62	0.0097	0.03
Stream 5, Transect 3	1	31	0.0016	0.15
Stream 6, Transect 1	1	72	0.0108	0.02
Stream 7, Transect 1	1	66	0.0096	0.03
Stream 8, Transect 1	1	59	0.0061	0.04
Stream 9, Transect 1	1	85	0.0002	1.33
Stream 10, Transect 1	1	78	0.0041	0.06
			Median	0.06
			Minimum	0.02
			Maximum	2.44

Photo V-5. A veneer of fine-grained sediments overlying coarser-grained sediments in Coyote Creek. These fine-grained sediments would be expected to be transported even at extremely shallow flows.

4. Summary of Duarte Site Soil Characteristics, Mapped Soil Units, and Examined Soil Excavations at the Duarte Site

The soils/materials at all waters/wetlands sample locations on the Duarte Site were hydric either by meeting the definition of a hydric soil or by being below Ordinary High Water and within the Riverwash mapping unit. Additionally, the soils met one or more of the hydric soils indicators listed on the Arid West supplement data sheets. The most common indicator was redox depressions (F8). In some locations this indicator was used in swale/stream landforms. While not strictly depressions, many of these locations had the ability to pond water due to low gradients and/or the presence of subtle microtopograpic high features that could facilitate the ponding of water. All waters/wetlands sample locations had indicators of surface water present seasonally and the redox descriptions for this particular indicator were met at these locations. A schematic of a typical cross-section of soil horizons and the presence of slowly permeable layers important to the functioning of the depression and swale complexes that occur on the landscape is presented in Figure V-41.

Six different map units were mapped on the Duarte Site. One soil type mapped on the property has two phases. (USDA-NRCS, 2015). These map units include: (1) Arbuckle gravelly loam 0-2%, MLRA 17 (2) Arbuckle gravelly loam, clayey substratum 0-3% (phase) (3) Corning-Redding gravelly loams, 0-5%, (4) Perkins gravelly loam, 0-3%, MLRA 17, (5) Red Bluff gravelly loam, 0-3%, (6) Riverwash. The local and regional soils map for the Duarte Site are provided in Figures III-3 and V-42.

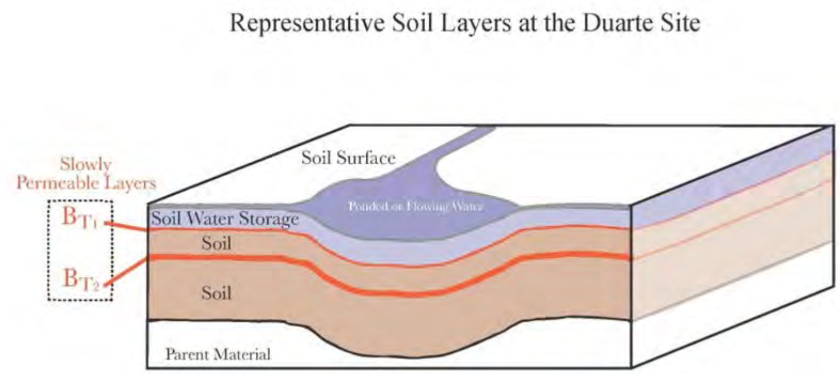


Figure V-41. A schematic of an example of the location of slowly permeable layers in the soil. The upper photo shows the fractured soil layer and the lower photo shows the presence of the layers along the bank of a stream. (Not to scale)

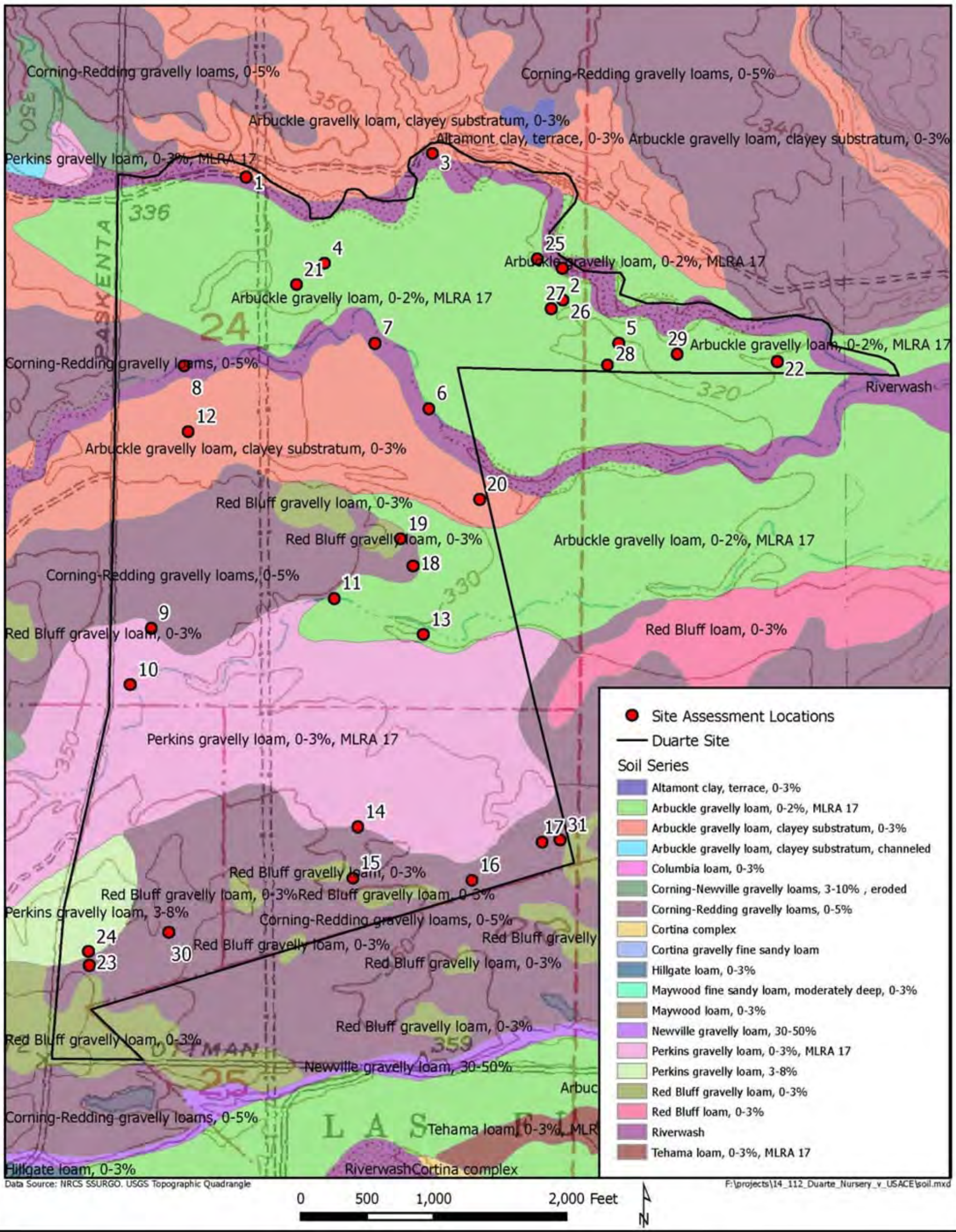


Figure V-42. Duarte Site soil map.

All soil series and the Riverwash map unit are found on the national and county hydric soils lists as a result of unnamed inclusions due to depressions and drainage ways, except for the two phases of the Arbuckle (gravelly loam, 0 – 2% MLRA 17 and the 0-3% clayey substratum) (USDA – NRCS, 2015).

The Arbuckle series consists of very deep, well drained soils on alluvial materials. Arbuckle soils are on low terraces, and have slopes of 0-3% on the Duarte Site. The mean annual precipitation is approximately 20 inches with the mean annual air temperature of about 61 degrees F. (USDA – NRCS, 2003). This phase of the Arbuckle series is not found on any hydric soils lists. The clayey substratum, channeled, phase of the Arbuckle is found on hydric soils lists due to the presence of unnamed hydric depressions, but this phase is not mapped on the Duarte Site.

The Corning-Redding map unit is a complex of Corning and Redding soils. The Redding series consists of moderately deep to duripan, well or moderately well drained soils formed in alluvium derived from mixed sources. These soils are on nearly level or dissected and undulating high terraces with 0-5% slopes on the Duarte Site. The average annual precipitation is approximately 22 inches with the mean annual air temperature of about 61 degrees F. (USDA – NRCS, 05/2006 revision). Both the Corning and Redding soils are found on the hydric soils lists due to the presence of unnamed hydric depressions.

The Corning series consists of very deep, well or moderately well drained soils formed in gravelly alluvium weathered from mixed rock sources. Corning soils are on high terraces with mound, intermound microrelief. Slopes are 0 to 30 percent. The mean annual precipitation is about 23 inches and the mean annual temperature is about 62 degrees F (01/2001 revision).

The Perkins series consists of very deep, well drained soils that formed in alluvium derived from mixed rock sources. Perkins soils are on terraces and have slopes of 0 to 30 percent. The mean annual precipitation is about 24 inches and the mean annual air temperature is about 62 degrees F The Perkins series is found on the hydric soils lists due to the presence of unnamed hydric depressions (USDA – NRCS, 08/2005 revision).

The Red Bluff series consists of very deep, well drained soils formed in old mixed alluvium. Red Bluff soils are on terraces and have 0 to 9 percent slopes. The mean annual precipitation is about 25 inches and the mean annual air temperature is about 62 degrees F. (USDA – NRCS, 6/86 revision).

The Riverwash map unit is described as generally consisting of extremely gravelly sand in the upper part (0-6 inches) and stratified gravelly sand to extremely gravelly course sand within drainage ways. On the Duarte Site these areas are made up of deposits of stratified sands and gravels overlain by a veneer of finer sediment in some locations (USDA – NRCS, 2015).

The NRCS map unit descriptions were generally confirmed in the field with the exception of the Arbuckle gravelly loam map unit(s). Although not on the hydric soils lists, the Arbuckle unit(s) had many unnamed hydric inclusions.

More specific descriptions of the soils at the following locations can be found in data sheets located in Appendix A.

5. *Summary of Vegetation Associations as Derived from Duarte Site Survey and Wetland Delineations*

The observable vegetation on the Duarte Site during the interval March 31-April 10, 2015 could be segregated into the following associations, with the characteristic species listed. These associations were derived from the observations, collections and determinations made on site. These cannot be interpreted to be complete due to the limited time in the field and the fact that all these associations sustained perturbation from the tillage event. The primary characteristic taxa, which are hypothesized to have been predominant prior to the tillage event, are listed.

Uplands – Slopes and Mounds

The upland areas are distributed throughout the site as mounds or other elevated (relative to immediately adjoining) portions of the landscape from which water will drain away. These sites support many species that do not tolerate saturate soils.

Primary Characteristic Taxa: *Avena* spp., *Erodium cicutarium*, *Bromus madritensis* ssp. *rubens*, *Bromus diandrus*, *Hordeum vulgare*, *Elymus caput-medusae*

Upper Terrace Depressions

This association is found predominantly at the southern end of the property in depressions that hold standing water during the winter.

Likely Primary Characteristic Taxa prior to Tillage: *Psilocarphus* spp., *Hordeum marinum* ssp. *gussoneanum*, *Navarretia* spp., *Eryngium castrense*, *Juncus uncialis*, *Juncus bufonius* var. *bufonius*.

Upper Terrace Swales

This association is found predominantly at the southern end of the property in swales that carry water during the winter. With repeated rains the soils in these swales may remain saturated and have shallow overland or sub-surface flow.

Likely Primary Characteristic Taxa prior to Tillage: *Psilocarphus* spp., *Hordeum marinum* ssp. *gussoneanum*, *Navarretia* spp., *Eryngium castrense*, *Pogogyne zizyphoroides*, *Gratiola ebracteata*.

Upper Terrace Flats

This association is found near the southwestern corner of the Duarte Site on the very thin soils with a shallow subsurface duripan. The thin nutrient poor soils saturate very quickly with each rain and support only shallow rooted annuals and perennial bryophytes.

Likely Primary Characteristic Taxa prior to Tillage: *Plantago elongata*, *Juncus uncialis*, *Vulpia* spp., bryophytes.

Lower Terrace Swales and Emergent Wetlands

This association is roughly defined and would like encompass two or three more narrowly defined associations; however, given the limited access and review time it is grouped as one. Being lower on the terrace allows subsurface flow and deeper soils to sustain perennials and deeper rooted annuals for extended seasonal growth.

Likely Primary Characteristic Taxa prior to Tillage: *Eleocharis palustris*, *Lolium perenne*, *Bromus hordeaceus*, *Eryngium castrense*, *Hordeum marinun* ssp. *Gussoneanum*

Upper Terrace Saddle Swales

This association occupies the swales and very low gradient stream channels, primarily in the local watersheds of Stream 3 and Stream 4. There is a compositional mix of species reflective of the intermediate position between the Upper Terrace Swales and the Lower Terrace Swales and Emergent Wetlands.

Likely Primary Characteristic Taxa prior to Tillage: *Lolium perenne*, *Triteleia hyacinthinia*, *Eleocharis palustris*, *Eryngium castrense*, *Hordeum marinum* ssp. *gussoneanum*.

Coyote Creek and Other Streams Adjacent Floodplain

This association is found on soils that are saturated frequently but drain rapidly due to high gravel and sand content. The taxa are susceptible to over-bank flooding and movement of the substrate in higher flows.

Likely Primary Characteristic Taxa prior to Tillage: *Plantago elongata*, *Bromus* spp., *Juncus uncialis*.

Stream Channels

The stream channels and interior portions of the banks of streams have variety of taxa depending upon the local geomorphology of the channel and numerous other hydrological, topographical, and pedological factors.

Observed Characteristic Taxa: *Salix* spp., *Eleocharis palustris*, *Mimulus* spp., *Plantago elongata*, *Juncus bufonius* var. *bufonius*, *Schoenoplectus* spp.,

6. Summary of Determinations for Hydrophytic Vegetation

Standard procedure in typical situations for evaluating hydrophytic vegetation requires that OBL, FACW, and FAC species be used to determine whether that hydrophytic vegetation parameter is met. For wetlands that have only a single stratum, the five dominant species may be scored in that stratum . The Duarte Site, having been subjected to tillage, is subject to analysis under the "Atypical Situation" clause (1987 Corps Manual, Methods, Section F, Atypical Situations, Paragraph 71a Unauthorized Activities). General approaches to problematic vegetation state that in problematic situations "...wetlands dominated by FACU, NI, NO, or unlisted species that are functioning as hydrophytes." then technical literature may be used to support a decision to treat specific FACU, NI, NO, species as hydrophytes (Arid West Supplement 2008: 94-95).

In the delineation work at the Duarte Site and in the process of assessing whether hydrophytic vegetation was present at each sampling location, four methods of computing the presence of hydrophytic vegetation were employed: (1) three dominants excluding FACU species; (2) three dominants including FACU species; (3) five dominants excluding FACU species; (4) five including FACU species. The computations excluded the two plots that were placed in uplands adjacent to the wetland.

Sites Meeting Hydrophytic Vegetation Parameter	**Three Dominants (28 Duarte Sites)**		**Five Dominants (28 Duarte Sites)**	
	FACU Included	FACU Excluded	FACU Included	FACU Excluded
Yes	28	21	28	20
NO	0	7	0	8

Inclusion of the FACU species results in all 28 sites classifying as having hydrophytic vegetation. Exclusion of the FACU species results in seven or eight sites not being classified as hydrophytic, for the three dominants and five dominants computation, respectively. Examination of the seven and eight wetlands that did not meet the hydrophytic wetland parameter revealed that this was because of the exclusion of four FACU taxa, (numbers in parentheses indicate number of times the species was excluded from a determination of the site as wetland by excluding it being a FACU): *Bromus hordeaceus* (7), *Hypochaeris radicata* (13), *Navarretia* spp. (1), and *Vulpia myuros* (1).

These FACU species are counted as hydrophytic vegetation in this delineation because of the atypical situation that occurred with tillage operations that left furrows across the site and through many wetlands. The wetlands that failed to meet hydrophytic vegetation criteria in the three dominant species and five dominant species criteria were scored for the species and number of times the inclusion of the FACU species affected the determination of hydrophytic vegetation (Table 2).

Taxon	FACU Taxon not included in hydrophytic vegetation	
	Three Dominant Species	Five Dominant Species
Bromus hordeaceus	1	6
Hypochaeris radicata	7	6
Navarretia spp.	1	0
Vulpia myuros	0	1

The rationale for inclusion of each species is as follows:

Bromus hordeaceus

This species was occupying the furrow tops and also found frequently in the Coyote Creek floodplain and Creek Adjacent Wetlands association. The more typical upland habitat of this species was provided by the tillage, with improved micro-habitat conditions for its growth. Hawkes et al. (2005) found that presence of *Bromus hordeaceus* and *Avena barbata* caused the composition of the mycorrhizal community to shift away from the mycorrhizal fungi found in native plant roots toward the non-mycorrhizal fungi associated with the non-native roots of *B. hordeaceus* and *A. barbata*.

Hypochaeris radicata

This species was occupying the furrow tops in high density and found widely across the site in the wetland areas, but in less density in the upland areas, likely due to strong competition from the upland species. The more typical moist upland habitat of this species was provided by the tillage with improved micro-habitat conditions for its growth. The tap root of *H. radicata* also would access the moisture captured in the bottoms of the furrows and allowed enhanced growth. Schoenfelder et al. (2010) found that *H. radicata* a more rapid uptake and utilization of nitrogen on Mt. St. Helens in Washington as compared to other native plants and thus may be more responsive to pulses of available nitrogen.

***Navarretia* spp.**

This genus has many species with varying wetland indicators from OBL to FACU. Due to time constraints and growth condition at the time of the survey not all specimens could be identified to species. As a conservative measure, for this report, the taxon *Navarretia* spp. was assigned the lower wetland status indicator of FACU. It was present in many depressions and swales and in only one sample plot was it at high enough cover to influence the determination of hydrophytic vegetation.

Vulpia myuros

This annual grass is a non-native species and has been found to suppress the growth of native perennial grasses and non-native grasses and forbs including a wetland species *Juncus bufonius* (Brown and Rice 2000). It is likely this species is suppressing the growth of other wetland species on the Duarte Site. In Tehama County, this species is often observed in wetlands with thin soils, and on the margins of wetlands. In only one sample plot did it have enough cover to influence the determination of hydrophytic vegetation.

7. Analyses of Tillage Impacts to Waters/Wetlands Area and Functioning

a. Estimates of Area Impacts to Waters/Wetlands

As explained in the "Methods" section of this Expert Report and in that portion of the "Results" section that presents the DOJ Expert Team's delineation of waters of the U.S., including wetlands (Figure V-33) we walked and/or drove down the length of Coyote Creek and each of the nine stream channel systems that occur on the Duarte Site. Via walking or driving, we also observed conditions in almost all of the depressional and swale waters/wetlands on the Duarte Site.

A December 12, 2012 Invoice #95353 (Bates stamp #00546) to Brad Munson of Modesto, California shows a charge of $22,500 for "Ripping" of what is called a 450 acre – Field 1 area. This invoice was provided to the DOJ Expert Team during the discovery phases of this case. Combining our observations of conditions in the field, analyses of historic and current air photos, and examination of the invoice from I-5 Rentals for rental of the equipment (Bates stamp # I5R000011-13), it is our professional judgement that virtually all of the waters/wetlands on the Duarte Site as delineated by the DOJ Expert Team were directly impacted by tillage operations. Specifically, there are exceptions that mainly had to do with proximity of waters/wetland features to Paskenta Road, deep ponded or saturated conditions, tractor turn-around areas near fence lines or other obstructions, and dangerously steep banks or abrupt transitions in local topography that would present a roll over risk for the tractor operator. Examples of some of these areas are as follows:

Coyote Creek – most of the low flow channel of Coyote Creek was not tilled, however several areas below the OHW mark and some areas immediately adjacent to the active channel bank were tilled.

***Stream 1* –** several deep and ponded swales that were tributaries Stream 1 were not tilled

Stream 2 and 3

a. No tillage at the headwardmost extent of the Stream 2 channel on the Duarte Site immediately east of its crossing with Paskenta Road. This area is immediately downstream of the culvert system that conveys flow in Stream 2 under Paskenta Road. It was ponded during the interval March 31 – April 10, 2015.

b. The junction area of Stream 2 and Stream 3 was not tilled for a short distance upstream in each of Streams 2 and 3.

c, Downstream and east of the junction area of Streams 2 and 3 and east to the Duarte Site property line was not tilled.

Stream 4 – Due east of the Paskenta Road culverts on two forks (North and Central Figure V-33) – no tillage.

Stream 5 – The north central reach that was associated with relatively steep banks and exhibited bed and bank features – no tillage

West of Stream 5 near the SW corner of the Duarte Site – there is a small depressional feature that flows west through a culvert that is installed under Paskenta Road – not tilled.

Stream 6 – One short reach located upstream from the junction of Stream - not tilled.

SW trapezoidal-shaped area south of the existing fence line – not tilled

In the discussion section, Figure V-47, the sum total area of these no tillage areas in streams, depressions, and swales is 947,308 ft^2 or 21.7 acres. Subtracting these no tillage areas from the total area of waters/wetlands delineated by the DOJ Expert Team on the Duarte Site yields a total area of tilled and directly impacted waters/wetlands = 964,709 ft^2 or 22.2 acres. It is our opinion that this 22.2-acre area is ***at least*** the amount of waters/wetlands area that was directly impacted by tillage operations on the Duarte Site. The following sections of this report detail the DOJ Expert Team's observations of the types of impacts to waters/wetland area and functioning that occurred on the Duarte Site.

b. Hydrology and Soil Impacts

1. Direct Impacts

Direct impacts to hydrology and soil structure and functioning in Duarte Site waters/wetlands occurred from the physical alteration of the soil surface and subsurface horizons via tillage. Specifically, tillage operations created a furrow top and bottom microtopography that resulted in the development of upland furrow tops within many of the Duarte Site waters/wetlands. This topographic change will also result in soil particle detachment which in turn leads to increased erosion and sediment deposition within on-site and in down-gradient waters/wetlands, including the traditional navigable waters of the Sacramento River. In the Central Valley of California and in the Sacramento River ecosystem, mobilization of sediment leads to significant decreases in water quality in downstream waters (van Rijn, 1993; Wood and Armitage, 1997). It also leads to large expenditures of public and private money to maintain navigability via dredging (http://www.spk.usace.army.mil/Media/NewsReleases/tabid/1034/Article/479338/corps-awards-66-million-contract-for-deep-water-channel-dredging.aspx).

The fracturing of surface and subsurface soil horizons on the Duarte Site has resulted and will continue to result in changes in the amount and timing of water entering the soil (infiltration), water moving through the soil (throughflow or percolation) and permeability (the rate which water can move through the soil). These changes lead to significant and discernable alterations in the rate of vertical and lateral water movement into, within, and out of waters/wetlands. Figure V-43 is a schematic of how the direction of water movement following tillage is changed by breaking any one or several of the slowly permeable layers in the soil. On the Duarte Site, tillage operations within, near, and through waters/wetlands also resulted in upland soil materials (i.e. clods or slabs) being dragged, cut off or spilled/tumbled, into waters/wetlands and thus accretion of the bottom elevation of waters/wetlands.

2. Indirect Impacts

Indirect impacts to hydrologic and soil resources at the Duarte Site occurred as a result of soil particle detachment. This detachment leads to transport and deposition of soil particles (the erosion process) within waters/wetlands and increased sedimentation in downgradient waters/wetlands that support native and non-native plant communities and faunal species, including federally listed salmonids. Additionally, changes in infiltration, percolation, and permeability of soils on the Duarte Site and in similarly situated waters/wetlands will alter the rate, timing, and volume of water delivered to both on-site and down-gradient waters/wetlands. Accompanying changes in the rate, timing and volume of water delivery is the fact that these changes will result in alterations to delivery timing and export mechanisms for organic carbon and other nutrients and compounds. Organic carbon and other nutrients and compounds form the energy/food base for several classes of faunal species that occur along the river continuum from the headwaters on the Duarte Site, through the Coyote/Oat Creek ecosystems and to the traditional navigable waters of the Sacramento River.

3. Cumulative Impacts

Cumulative impacts to waters/wetlands on the Duarte Site occurred and continue to occur as a result of the soil surface and subsurface alterations that change infiltration, percolation, and permeability. These changes trigger significant and discernable alterations in patterns of water flow and circulation at the landscape scale. Specifically, these changes include significant alterations of on-site and landscape scale water balance(s), and water residence and turnover time(s) within complexes of waters/wetlands and in down gradient reaches of associated riverine ecosystems. Additional impacts at the landscape scale include fragmentation and timing of hydrologic connectivity to other waters/wetlands and surrounding areas, fragmentation/alteration of waters/wetlands patch size and the mobilization of sediment and deposition down gradient. All of which will affect the timing and delivery of water and compounds to down-gradient waters/wetlands, including the Sacramento River.

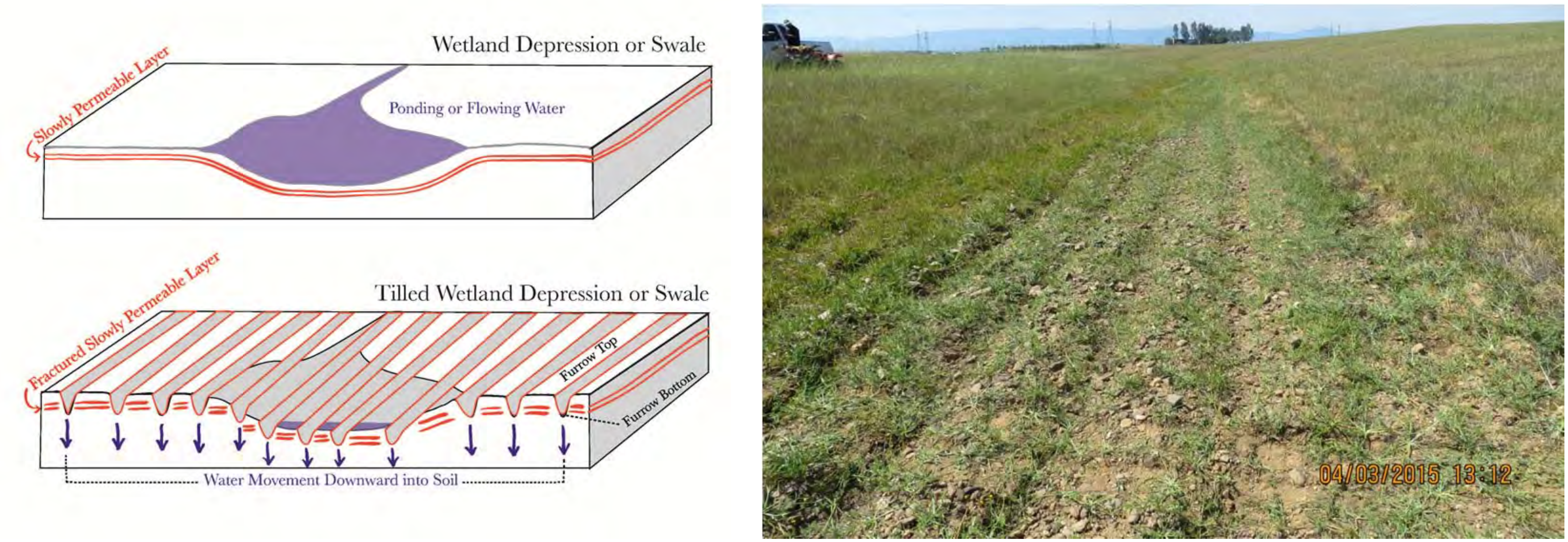


Figure V-43. Schematic of how predominate direction and timing of water movement is changed by tillage and associated piercing or fracturing of slowly permeable soil layers. (Not to scale)

4. Temporal Impacts

Temporal impacts have occurred and will continue to occur on the Duarte Site as a result of permanent impacts to the hydrologic, biogeochemical, plant community, and faunal support habitat ecosystem functioning, particularly impacting the length of time the waters/wetlands maintain characteristic ponding and soil saturation.

5. Impacts to Waters/Wetland Hydrologic Functions

Hydrologic functions are impacted and will continue to be permanently impacted due to alterations of water movement and timing of water storage in the ponds, depressions, and swales at the landscape scale. These alterations are brought about by changes in infiltration, percolation, and permeability across the landscape due to impacts to low permeability and/or restrictive soil layers. Hydrologic functions are dependent on an intact landscape system that includes the uplands as the uplands are a source of water to the waters/wetlands.

Biogeochemical functions will be impacted by the mobilization of sediment, and changes to oxidation-reduction (soil moisture) processes and environment. As a result there is a net change of organic C and N.

c. Vegetation Impacts

1. Overview

The plant associations that occur in the Duarte Site landscape evolved primarily to tolerate low levels of grazing from herbivores that were kept moving through the landscape by predators and climate. Predators kept herbivores moving so that no single area was a place for herbivores to stand for weeks and damage the soils with excessive hoof-printing, or by over-grazing the landscape. Climate also moved herbivores and other animals in and out of the landscape because as the rains subsided in the summer and herbivores and other animals would leave the local landscape and move to higher elevation habitats or down into the dense riparian zone that used to comprise the Sacramento River floodplain.

2. Direct, Indirect, Cumulative, and Temporal Impacts

The tillage operations at the Duarte Site were a severe soil disturbing action that fractured the various slowly permeable layers within the soil profile and mixed and lofted soil layers. Tillage operations also had fragmented and thus had direct, indirect, and cumulative impacts on the structure and functioning of very old assemblages of plants and on the hydrologic and soil components of habitats in which they existed. This fracturing, mixing, lofting, and fragmentation had immediate and permanent direct effects on the perennial plant species that had roots, rhizomes, bulbs, and tubers in the soil awaiting the next rains. These plant parts were immediately damaged, broken up, and pulled up on to furrow tops where they would desiccate and die, or they were buried much deeper than feasible for them to re-sprout and reach sunlight.

Tillage operations on the Duarte Site immediately and directly damaged the micro-biota in the soil. In vernal depression, swale, and stream ecosystems, knowledge of important species interactions, climatic effects, and events that influence plant and faunal species population dynamics are unknown or very poorly studied (Keeler-Wolf et al. 1998). However, Calderon et al. (2000) documented immediate changes in microbial activity in grassland soils following simulated tillage. With respect to indirect and cumulative impacts, we know that there are many species within many diverse groups of micro-organisms that occur in vernal depression, swale and small stream ecosystems. These micro-organisms perform or facilitate ecological functions on the landscape (e.g. *Nitrosomonas ferro-oxidans* mediating biogeochemical processes in anerobic soils) (Jeffrey 1987). Intact populations of micro-organisms have also been shown to maintain important symbiotic relationships with plants that facilitate plant uptake and use of vital nutrients such as nitrogen (Blosser, 2004).

For annual plant species, tillage operations completely turned over and mixed the seed bank and placed many seeds into positions and places on the tilled soil in which the seeds could not germinate, or if they did germinate, they could not survive in their new location. This mixing of the annual seed bank is a direct, indirect and cumulative impact. Following tillage operations, hydrologic conditions and associated soil oxidation/reduction conditions were changed in ways that no longer favored the native wetland plant species to germinate and grow. This type of impact constitutes a permanent temporal impact to the structural integrity and assembly mechanisms of the waters/wetland plant communities on the Duarte Site.

After tillage operations, the local ecosystem conditions for both wetland and upland plant species was completely churned up and changed. If these plant associations were compared to neighborhoods of people in a town, then the tillage could be compared to a tornado that blows in and completely uproots and rearranges the entire functioning community of neighborhoods. For example, after tillage operations and with the development of furrow tops and bottoms, a completely new micro-topography was brought into the depressions and swales. The furrow tops now serve as small mountains ranges (microtopographic high spots) that cross the swales and depressions in various directions. These furrow tops now provide conditions that are not conducive to growth and development of wetland plant species. They are “mini uplands.” For example, tillage operations set up site water balance and microtopographic conditions that allowed species such as *Hypochaeris radicata* to expand and proliferate across the tilled site. Prior to tillage operations and at our reference sites, this species comprised a small percentage of cover (estimated 1-5% at the Duarte Site), whereas after tillage it now occupies sites with canopy cover values ranging from 0-66%. The increases in canopy cover of *Hypochaeris radicata* are because the furrow tops provide the ideal site conditions for its growth. In between the furrow tops, furrow bottoms regularly provide conditions for some native wetland species; however, others may be severely hampered because the original wetland soil structure, water deliver mechanisms, water residence times, and overall site water balances have been completely altered. Two examples of perennial species that were severely set back due to tillage operations are *Eleocharis palustris* and *Eryngium castrense*. On tilled soils, these species were found at low cover values because of the damage to the perennial roots stocks and rhizomes. At many sample locations, there were places where the furrow bottoms had no growth of wetland plants due to algae that grew in ponded conditions, blocking light for potential germinating seedlings. As the *Hypochaeris radicata* grew well on the furrow tops it blocked light from the furrow bottoms and as water levels declined in the furrow bottoms, the algae became a mat blocking light to potential growth in the furrow bottoms.

The ridges and furrows also changed patterns of water flows in and out of depressions, down swales and into the down gradient stream channels. The specifics of how the furrow tops and bottoms affect the assembly, growth, and reproduction of vegetation at each site varies depending on the orientation of furrow top and bottom sequences in tilled areas. In some instances furrow top and bottom sequences retard flow. In other instances, furrow top and bottom sequences consolidate drainage and accelerate flows. In almost all cases, tillage changed soil conditions and patterns of water flow and circulation that enhanced the growth of facultative upland species such as *Hypochaeris radicata* and retarded growth of native wetland species.

As discussed elsewhere in the Expert Report, tillage operations brought about many changes in the patterns of flow and circulation of water on the Duarte Site and in the soil structure and nutrient cycling and other physical and biogeochemical processes associated with waters/wetlands on the site. These changes also brought about substantial changes in the plant associations that existed on the site prior to tillage. For example, after tillage there was an increase in non-native species such as *Hypochaeris radicata* and declines in both perennial and annual native species. The relative biodiversity and ecosystem stability of these wetlands was completely changed (Groves, 1998; Hautier et al., 2015). Comparison of the reference Area 13 plots in the depression and swale with the reference Agricultural Area plots for the depression and swale demonstrate that the tillage that occurred in the agricultural area, many years ago, still shows clear effects on the biodiversity of the depression and swale plant associations compared to reference Area 13 that has only had grazing. In addition to the direct impacts of tillage within waters/wetlands, the effect of dragging soils, from the adjacent uplands into the wetland swales and depressions also brings nutrients into the wetland system. Isbell et al. (2013) examined the effects of nutrient enrichment on biodiversity loss and changes in ecosystem productivity in grassland field experiments, and found that ecosystem productivity had the greatest declines over time in the plots that lost the most species. Depression and swale wetlands have strong and cyclical biogeochemical processes involving oxidation reduction reactions. These reactions can bring about changes in the physical and chemical functioning of the wetlands which affect the associated flora and fauna of the wetland. The effects of tillage are short term and long term as demonstrated with the comparison between the reference Area 13 and the Agricultural reference area depressions and swales. This change in biodiversity can have direct effects on ecosystem stability and has been shown by Hautier et al. (2015) examining data from 12 multi-year experiments that manipulated various drivers (environmental changes that are anthropogenically driven) that influence ecosystem productivity. Hautier et al. showed that the stability of ecosystem productivity is only changed by those drivers that alter biodiversity. They found that a decrease in plant species numbers led to a quantitatively similar decrease in ecosystem stability regardless of which driver resulted in the biodiversity decline. The tillage on the Duarte Site has led to measureable changes in biodiversity within the depressions, swales, and small stream ecosystems that occur on the site. These changes have had, and will continue to have, detrimental effects on the biodiversity of the site and consequently ecosystem stability and productivity.

d. Faunal Support/Habitat Impacts

1. Overview

In the arid and Mediterranean regions of the American West, waters/wetland features are relatively rare. Consequently, and from the perspectives of both resident and migratory faunal species that have large and small home ranges, landscapes in arid regions that support relatively high densities of intact and interconnected complexes of waters/wetlands are even more rare and they are important. This is because faunal species rely upon intact and interconnected complexes of water/wetlands to provide a range of faunal habitats and their associated food and cover resources during dry and wet seasons and over a range of years that include wet and drought cycles. In effect, landscapes with a relatively high density of intact waters/wetland features provide faunal species a vital and irreplaceable diversity of habitat choices that are fundamental in maintaining the structural and functional integrity of faunal populations that occupy that landscape full time or that rely upon waters/wetlands complexes during seasonal migrations. Consequently, loss and degradation of waters/wetlands in arid Mediterranean regions has direct, indirect, cumulative and temporal repercussions locally, regionally, and on the continental scale of flyways that are used by wide ranging migratory birds and insects. Further, it has been demonstrated at local and landscape scales that interconnected complexes of depressions, swales and tributary stream ecosystems are extremely difficult to restore (Ferrer et al., 1998;Sutten and Francisco, 1998; Black and Zedler, 1998).

2. Direct Impacts: At the Duarte Site, the main direct impacts to waters/wetland faunal support/habitat area and functioning consist of the following:

Permanent elimination or significant degradation of a range of waters/wetland habitats (and their associated food and cover resources) that are available to a variety of faunal species. Many of these species are dependent on waters/wetland to complete all or portions of their life-cycles, including reproduction.

Permanent elimination, fragmentation,and significant degradation of the size and structure (quality) of waters/wetland habitat patches.

Permanent fragmentation, disruption and significant degradation of the interconnections within and among depression/swale complexes and connections down gradient to stream ecosystems. This constitutes fragmentation of the depression – swale – small tributary stream – Coyote Creek- Oat Creek - Sacramento River continuum.

Elimination or significant degradation of hydrologic and biogeochemical processes that are cyclic wet to dry and which are vital to some faunal species life cycles and which only occur within vernal depressions, swales and associated tributary stream.

3. ***Indirect Impacts: At the Duarte Site, the main indirect impacts to waters/wetland faunal support/habitat area and functioning consist of the following:***

Degradation of on-site and downstream water quality via detachment and mobilization of sediment.

Changes in the timing and volume of water delivery downstream to the Sacramento River – important to several classes of faunal species including macroinvertebrates and fishes, and other aquatic and semi aquatic vertebrates and invertebrates.

Changes in the timing and volume of delivery of dissolved, particulate, and physically or chemically bonded (sorbed or chelated) organic matter and nutrients downstream to the Sacramento River – important to several classes of faunal species including macroinvertebrates, fishes, and other aquatic and semi aquatic vertebrates and invertebrates.

4 ***Cumulative Impacts: At the Duarte Site, the main cumulative impacts to waters/wetland faunal support/habitat area and functioning consist of the following:***

Permanent fragmentation and significant degradation of faunal habitat patch sizes, patch connectivities, and patch interspersions with faunal habitats that occur in the surrounding landscapes/watersheds at several different scales. This is a synergistic cumulative impact because the relationships among habitat patch sizes, patch locations, and patch connectivities in the Duarte Site landscape are very old, structurally complex, and not replicable.

5. Temporal Impacts:

At the Duarte Site, the main temporal impacts to faunal support/habitat area and functioning consist of the fact that tillage operations in most instances resulted in *permanent* elimination or degradation of waters/wetlands. It is important to note that because the vernal depressions, swales, and small tributary streams on the Duarte Site are dependent on delivery of water from uplands via shallow subsurface flows, tillage operations in uplands as well as in waters/wetlands resulted in permanent alterations to or degradation of water flows to waters/wetlands.

e. HGM Analyses of The Functioning of the Duarte Site Waters/Wetlands After Late Fall of 2012

As discussed in the Methods section of this Expert Report, the DOJ Expert Team used an HGM functional assessment approach that was written specifically to address the functioning of low order riverine, slope and depressional waters/wetlands situated on pliocene and/or Pleistocene sandstone, shale and gravel deposits in the North Central Valley of California (Lee et al., 2015, In prep). Figures V-44 through V-46 summarize the DOJ Expert Team's assessment of the functioning of Duarte Site) depressional, swale, and stream ecosystems after Late Fall of 2012 tillage activities. The green fields in the polar plots are the reference area and pre Late Fall of 2012 Duarte Site conditions. Red fields are Duarte Site conditions post Late Fall of 2012. For the purposes of this functional assessment, classes of waters/wetlands (e.g. high terrace slopes (swales) and depressions, small streams, Coyote Creek) assessed by the DOJ Expert Team were considered (aggregated) as similarly situated landscape units. Appendix D contains our variable index scoring sheets. It includes assessment scores for the post December 2012 conditions.

In Figures V-44 through V-46, the suite of hydrologic, biogeochemical, plant community, and faunal support/habitat functions performed by depression, swale and stream ecosystems is arrayed around the polar plot. Consistent with standard HGM methodologies, a functional capacity index score of one ("1.0" – outermost circle) represents the "reference standard" condition or the best possible score for a particular function. Conversely, a zero ("0" – innermost point in the polar plot) is the lowest (most degraded) functional score. Concentric circles represent increments of degrading function, starting from the outermost circle (1.0 – best condition) to 0.75, 0.50. 0.25. 0.10. and 0 (Highly degraded, not recoverable).

Figures V-44 through V-46 show that compared to either the CCCA Area 13 or Agricultural Area reference sites, depressional, swale, and small stream ecosystems on the Duarte Site post Late Fall of 2012 are degraded over all hydrologic, biogeochemical, and faunal support/habitat functions. Plant community functions were degraded in high and low terrace swales (slopes) and depressions and in Coyote Creek. They were stable in small streams. Degradation of functions is shown by the HGM assessments mainly because tillage operations significantly impacted fundamental hydrologic and soil conditions on the site such as:

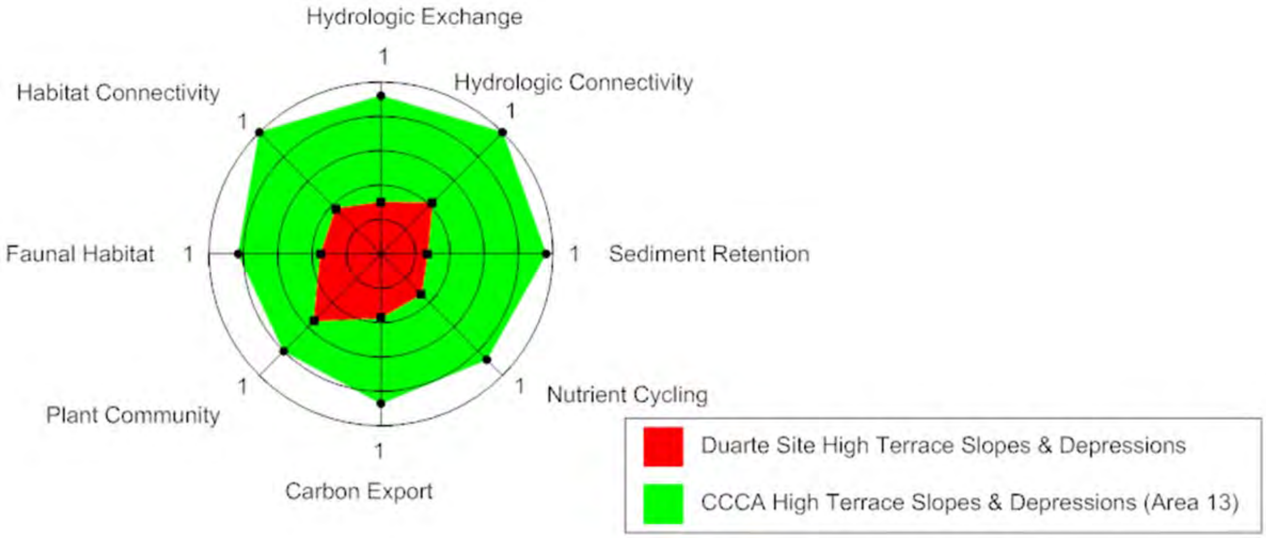
a. Physical features and properties of Duarte Site soils such as pathways for movement of water into and through soils and the location and volume of soil water storage capacities

b. The elevation of inlets and outlets for depression/swale complexes, thus impacting the flow and circulation of surface and shallow subsurface water flows.

c. The residence time and location of water that would either pond on or saturate soils within depressions, swales, and in small stream channels that were tilled

d. The physical arrangement/assembly of very old native plant communities displacing native assemblies from relative smooth, nearly level soil surfaces onto linear furrow tops and bottoms.

The import of the HGM functional assessments summarized in Figures V-44 through V-46 is that, considered as connected and similarly situated landscape units, the depressional, swale, and stream ecosystems that exist on the Duarte Site post Late Fall of 2012 are significantly degraded with respect to their physical, biogeochemical, and biological structure and functioning. When aggregated and because the Duarte Site waters/wetlands are connected along a river continuum (Vannote et al., 1980) the degraded functioning of these headwater waters/wetland ecosystems will negatively impact the physical, chemical and biological integrity downstream reaches of the Coyote/Oat Creek systems and the traditional navigable waters of the Sacramento River.



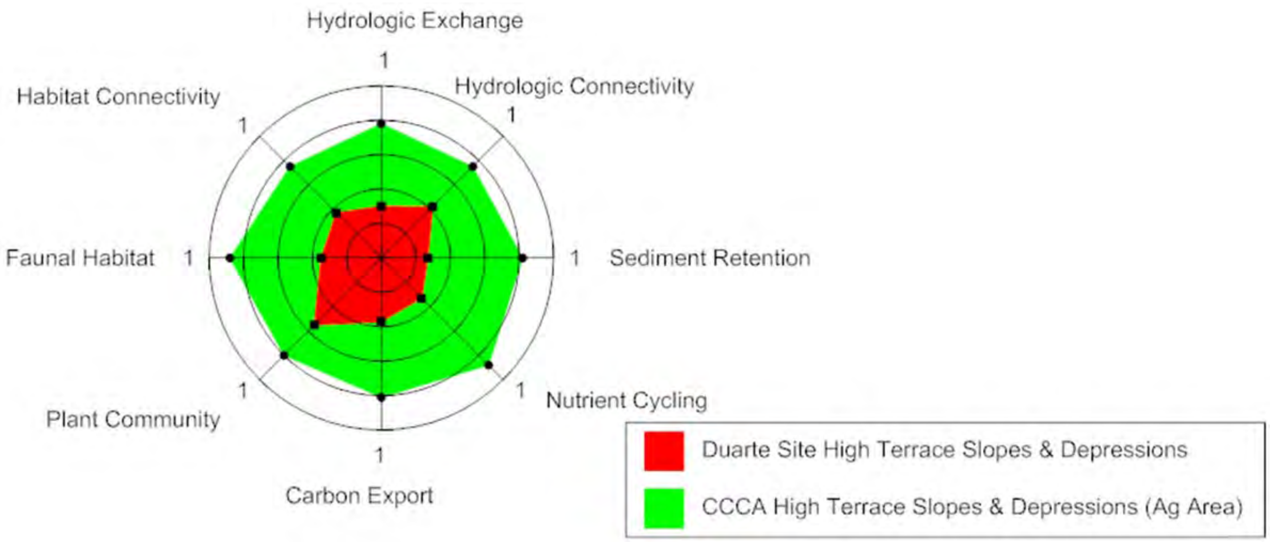


Figure V-44. Polar plots of the suite of Hydrogeomorphic wetland functions for the Duarte site post disturbance compared to the CCCA for high terrace slopes and depressors.

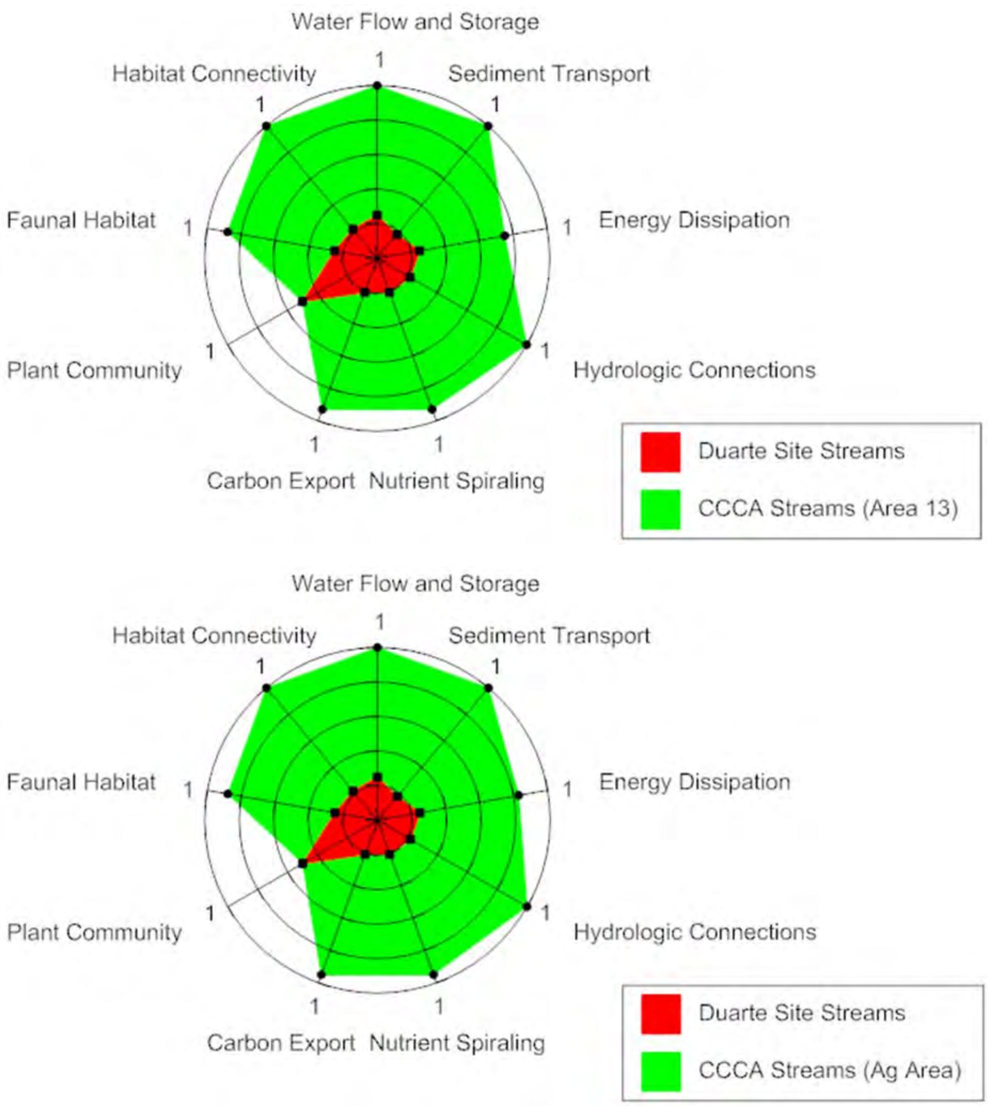
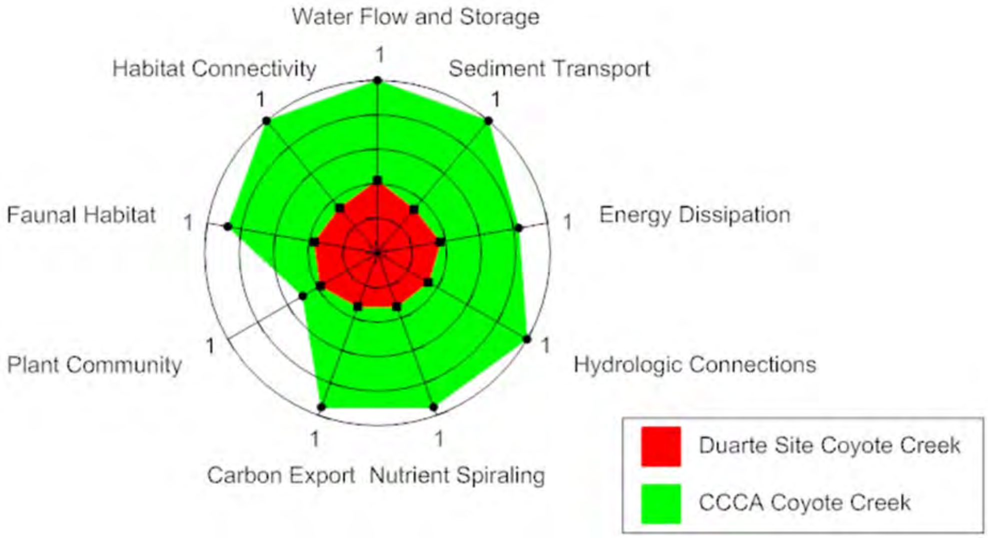


Figure V-45. Polar plots of the suite of Hydrogeomorphic wetland functions for the Duarte site post disturbance compared to the CCCA for streams.



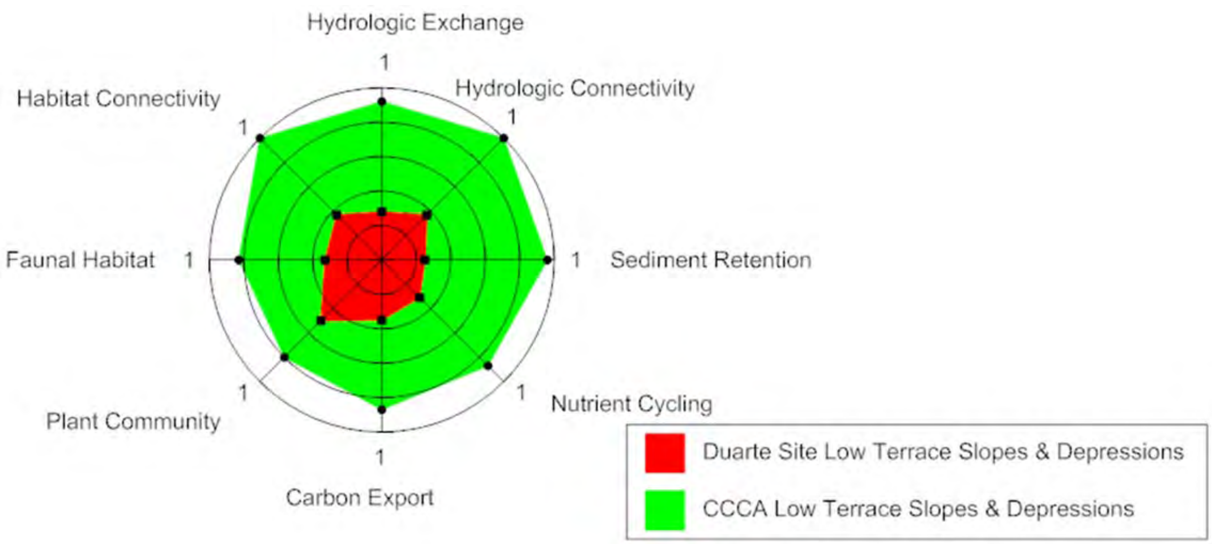


Figure V-46. Polar plots of the suite of Hydrogeomorphic wetland functions for the Duarte site post disturbance compared to the CCCA for low terrace slopes and depressions.

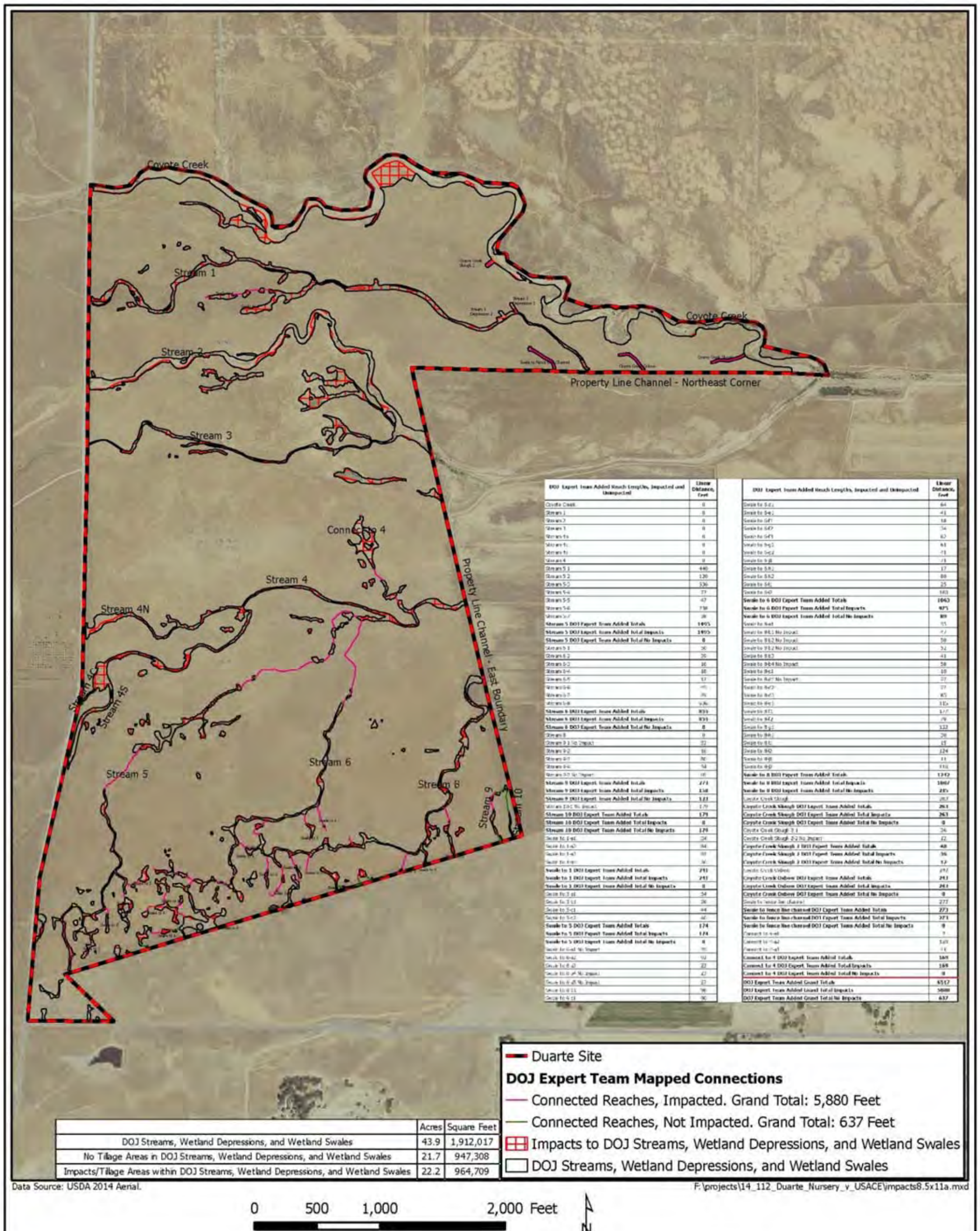


Figure V-47. Duarte Site: DOJ Expert Team Estimated Impacts to Streams, Wetland Depressions and Wetland Swales, Duarte Site, Tehama County, California.

VI. SUMMARY AND DISCUSSION

1. ***Area and Lineal Feet of Pre-Tillage Streams and Wetlands***: Before tillage in late 2012 the Duarte site supported a substantial amount of streams and wetland depressions and wetland swales (Figure V-33). From Figure V-33, our approximation of the wetland area and linear distances of streams is as follows:

   a. Total area of waters/wetlands = 1,912,017 ft^2 or 43.9 acres. This acreage includes virtually all of the streams and wetlands delineated by North State in 1994 and Northstar in 2012 as waters of the US under the CWA.

   b. The total linear feet of streams = 51,892 feet or 9.82 miles.

2. ***Coyote Creek Is One System:*** The streams and wetlands on the Duarte site function as branches of Coyote Creek, the main stem of which traverses the northern boundary of the Duarte Site. Wetland depressions and wetland swales occurred either within those branches or adjacent to (and in many instances abutting) those branches. The entire network of stream channels and the wetland depressions and wetland swales that occur within and adjacent to them are part of the Coyote Creek tributary ecosystem. An analogy is that a maple tree, for example, has a (dendritic) network of branches that occur at several scales, from small to large. However, if asked how many trees support that branch network, the answer would be one.

3. ***Coyote Creek Substantial Flows:*** The Coyote Creek ecosystem, including the streams and wetlands on the Duarte Site, contribute substantial flow, at least seasonally, and not only in response to precipitation, to Oat Creek and then to the Sacramento River. Coyote Creek, including the streams and wetlands that occur on the Duarte Site, were in the past and currently are tributaries to Oat Creek and the Sacramento River. These flows are documented in this Expert Report via the results of our on-going hydrology studies, which to date have included almost three water years (2012 – 2013, 2013-2014, 2014-2015).

4. ***River and Stream Ecosystem Functions:*** Physical, chemical, and biological functions of the Sacramento River, Oat Creek, and Coyote Creek ecosystems include the following:

5. ***Duarte Site before late 2012 Waters/Wetland Ecosystem Functioning:*** The late 2012 physical, chemical, and biological functions and the estimated level of those functions within the streams and wetlands on the Duarte Site and those similarly situated streams and wetlands within the Coyote Creek watershed are summarized in Figures V-28-V-30 of this Expert Report. These streams and wetlands exhibited intact hydrologic conditions, intact soils and biogeochemical processes, intact plant community structure and functioning, and intact faunal support/habitat structure and functioning.

Table VI-1. Riverine Waters/Wetland Functions National List (Following Brinson et al. 1995.

Hydrology	**Plant Community**
1. Dynamic Surface Water Storage	10. Plant Community
2. Long-term Surface Water Storage	11. Detrital Biomass
3. Energy Dissipation	
4. Subsurface Storage of Water	**Faunal Support/Habitat**
5. Moderation of Groundwater Flow or Discharge	12. Spatial Structure of Habitat
	13. Interspersion and Connectivity of Habitats
Biogeochemistry	14. Distribution and Abundance of Invertebrates
6. Nutrient Cycling	15. Distribution and Abundance of Vertebrates
7. Removal of Dissolved Elements and Compounds	
8. Retention of Particulates	
9. Organic Carbon Export	

6. ***Post Late Fall of 2012 Waters/Wetland Ecosystem Functioning:*** The significantly degraded or destroyed physical, chemical, and biological functions and the estimated level of those functions within the streams and wetlands on the Duarte Site streams and wetlands after the late 2012 tillage activities are summarized and compared to pre-tillage conditions in Figures V-44 through V-46 of this Expert Report.

7. ***Significant Nexus***: The main stem channel system of the Coyote Creek and Oat Creek ecosystems are an integral part of and have a significant nexus with the Sacramento River given their functional ecological relationships. The DOJ Expert Team has documented these relationships in this expert report via a combination of the following:

a. Our field observations of Duarte Site physical, chemical and biological conditions and comparisons of these conditions to to reference site conditions (and by inference, to Duarte Site conditions prior to Late Fall of 2012).

b. Our hydrologic and chemical hydrologic studies and demonstrations of hydrologic and chemical connections among Duarte Site waters/wetlands and downstream reaches of Coyote Creek.

c. Our assessment of the hydrologic, biogeochemical, plant community, and faunal support/habitat functioning of the Coyote Creek ecosystem and its tributary stream, and wetland depression and swale complexes as they occur at the north border of the Duarte Site (main stem Coyote Creek) and throughout the Duarte Site (Streams 1, 2, 3, 4, 5, 6,"7" (part of Stream 6) 8, 9, and 10).

8. ***Similarly Situated Waters/Wetlands:*** The streams and wetland depressions and wetland swales on the Duarte Site are similarly situated with the streams and wetlands in Coyote Creek watershed as illustrated at Figure V-5 in addition to examining the aerial

photographic interpretation of Mr. Stokely, the DOJ Expert Team members have all traveled and traversed most areas within the Coyote Creek watershed and then downstream in the Coyote Creek channel system to its junction with Oat Creek and the Sacramento River. Based on our field observations in the Coyote Creek watershed, it is reasonable to aggregate similarly situated waters/wetlands within the Coyote Creek ecosystem for the purposes of examining their significant nexus with the traditional navigable waters of the Sacramento River.

9. ***Significant Nexus between similarly situated streams and wetlands within the Coyote Creek watershed and the Sacramento River:*** It is also our opinion that the streams and wetland depressions and swales on the Duarte Site together with those similarly situated streams and wetlands within the Coyote Creek watershed are an integral part of and have a significant nexus with the Sacramento River given their ecological and functional relationships.

   Highlights of these ecological and functional relationships go to the transport of food resources (ie. dissolved and particulate organic carbon; dissolved nutrients) downstream in the Coyote Creek/Oat Creek system to the Sacramento River. In the Sacramento River main channel system and in the junction environment of Oat Creek with the main channel system of the Sacramento River, dissolved and particulate organic carbon and dissolved nutrients are important fuel sources for macroinvertebrate communities which in turn are the principal food source for listed adult and juvenile salmon and several other species of fin fish that are important to recreational and commercial fisheries in the Sacramento River (Michael Marchetti , Personal Communication to DOJ Expert Team Members, May 16, 2012) These food sources are critical in maintaining the integrity of several classes of organisms that depend on the Sacramento River and its tributaries to complete critical phases of their life cycles such as growth and reproduction.

10. ***Impact Event:*** In late 2012 a powerful Case tractor mounted with the Ag Wilcox Ripper – between five to seven shank gear operated in virtually all portions of the Duarte Site including within locations that are below the OHW mark of (i.e., within the main stem of) Coyote Creek and in the middle of the 10 stream and wetland swale/depression branches of Coyote Creek that occur on the Duarte Site. The only places where the team did not find indications of extensive tillage operations were the currently active channel portion of Coyote Creek and in the extreme southwest corner of the Duarte Site that is separated from the rest of the Duarte Site by a fence.

11. ***Discharges:*** Operation of the Case tractor mounted with the Ag Wilcox Ripper – between five to seven shank gear used for Duarte Site tillage operations resulted in discharges of dredged and fill material to the main stem of Coyote Creek and virtually all of the streams and wetlands on the Duarte Site. The DOJ Expert Team found evidence of discharges in the Coyote Creek channel system in several areas that were (and remain today) below OHW and in wetland depressions and wetland swales throughout the

Duarte Site. For example, our detailed field observations that are summarized in body of this Expert Report and in Appendix C show that these discharges took the form of

a. Re-distribuition of soils within waters/wetlands,

b. Dragging of chunks of upland soils into waters/wetlands

c. Causing tilled slabs of soils to fall into waters/wetlands.

d. Mixing of pierced, slowly permeable layers and strongly cemented layers (the latter being in the upper portions of Stream 5) with other parts of hydric soil profiles with the result of bringing pierced layers to the top of hydric soil profiles within wetland depressions and wetland swales.

The discharges of dredged material that occurred on the Duarte Site were not "incidental fallback." The DOJ Expert Team documented many instances where the pattern and depth of tillage and their associated turnaround furrows and tracks show that the Case/Wilcox operator(s) tilled directly or diagonally across depressions and swales and in many cases, directly up and down swales. As discussed in the Results section of this Expert Report, areas avoided were usually associated with turnaround (turn radius) constraints near fence lines and other obstructions, steep slopes, cut banks or breaks in terrain that constituted roll over hazards, and deeply ponded swales where the tillage gear would become seriously stuck.

Examining the extent of tillage operations within virtually all streams and wetland depressions and swales on the Duarte Site, there have to be hundreds, if not thousands of "passes" of the multiple shanked ripper.

12. ***Prior Tillage Operations:*** There is no indication from aerial photographs or records that the DOJ Expert Team has seen that a tillage operation as intensive as the Duarte Site tillage operations ever occurred on the Duarte Site. Further, there is no evidence that any tillage operations of any kind had occurred since at least 1988 on the Duarte Site. The delineation report of North State (1994) states that "land plaining disturbances to the project site occurred over five years" before that report. Aerial photographic interpretation is corroborated by Mr. Stokely.

13. ***Conversion of Use:*** Duarte managers have expressed in interviews (John Stossel, Fox News interview with John Duarte on 4/7/14) and through some actions (i.e., aerial seeding of wheat) that it was their goal to convert the use of the Duarte Site which, as indicated above, had been fallow and/or grazed by domestic livestock since at least 1988. The Duarte's identified the targets for conversion of their site as "wheat production" or "permanent crops, probably walnuts". After review of field hydrologic and soil conditions, air photos, and materials related to the sequence of Duarte tillage activities prior to and after late 2012, it is the DOJ Expert Team's opinion that the interval from at least 1988 to late 2012 (ie. at least 24 years) the Duarte Site lay fallow or was grazed by

domestic livestock. Further, it is our opinion that the tillage operations conducted to break up slowly permeable soil layers on the Duarte Site was an initial step in a process intended to -- and did -- change and manage hydrologic conditions in a manner that would favor crop production. Our opinion is that such activity does not constitute an established farming operation or on-going and continuous use of the site for farming wheat, walnuts or other crops.

14. ***Sequencing:*** Duarte managers did not heed "sequencing" of activities in waters/wetlands that focuses on avoidance of impacts or minimization of unavoidable impacts. Instead of tillage operations into and through streams and wetland depressions and wetland swales, Duarte managers had choices before them that consist of activities at or uses of the Duarte Site that could have been compatible with avoiding waters of the United States. Examples of such activities are:

    (a) Grazing of several classes of domestic livestock

    (b) Shallow plowing for crop production avoiding waters/wetlands

    (c) A combination of grazing and shallow plowing for crop production

    (d) Limited housing development

    (e) Limited industrial facilities location, including energy generation via solar or wind or a combination

    (f) Conservancy/Recreation/Hunting Club

15. ***Tillage Practices consistent with Deep Tillage or Deep Ripping:*** Duarte Site tillage operations in late 2012 wrenched up and moved soils, sub-soils, and slowly permeable soil layers from one location to another within streams and wetland swales and wetland depressions on the Duarte Site and from Duarte Site uplands into streams and wetlands. Such movements were not incidental in volume of material moved, distances moved, or effect(s) of movement on the structure and functioning of Duarte site streams and wetland depressions and swales as evidenced for example by:

    a. The development of furrow top and bottom microtopography within streams and wetland swales and depressions and at their outlets, and

    b. Movement of clod (chunks) of soil and slabs of slowly permeable soil layers that are found above the surface and mixed with surface layers throughout the site.

    DOJ Expert Team field observations and data show that the Duarte Site tillage operations do not constitute plowing. For example the definition of plowing provided at 33 CFR 323.4 (D) is as follows:

"Plowing means all forms of primary tillage, including moldboard, chisel, or wide-blade plowing, disking, harrowing and similar physical means utilized on farm, forest or ranch land for the breaking up, cutting, turning over, or stirring of soil to prepare it for the planting of crops. The term does not include the redistribution of soil, rock, sand, or other surficial materials in a manner which changes any area of the waters of the United States to dry land. For example, the redistribution of surface materials by blading, grading, or other means to fill in wetland areas is not plowing. Rock crushing activities which result in the loss of natural drainage characteristics, the reduction of water storage and recharge capabilities, or the overburden of natural water filtration capacities do not constitute plowing. Plowing as described above will never involve a discharge of dredged or fill material." (Underlines added)

In fact, tillage practices used on the Duarte Site can be construed as "Deep Tillage" using NRCS Practice Code 324 definition (NRCS, 2013):

"Definition: Deep tillage is the practice of performing tillage operations below the normal tillage depth to modify the physical or chemical properties of a soil. It includes tillage operations commonly referred to as deep plowing, sub-soiling, ripping, or row-till."

Further, NRCS Practice Code 324 Guidance (NRCS, 2013) offers the perspective that Deep Tillage does not apply to normal field operations.

"CONDITIONS WHERE PRACTICE APPLIES This practice applies to land having adverse soil conditions which inhibit plant growth, such as compacted layers formed by field operations, restrictive layers such as cemented hardpans (duripan) in the root zone, overwash or deposits from wind and water erosion or flooding. This practice does not apply to normal field operations and tillage methods for planned crop production." (underline added).

The U.S. Army Corps Regulatory Guidance Letter 96-02 states that Deep Ripping "is defined as the mechanical manipulation of the soil to break up or pierce highly compacted, impermeable or slowly permeable subsurface soil layers, or other similar kinds of restrictive soil layers," and further states that "deep-ripping and related activities typically involve the use of special equipment, involving heavy mechanized equipment and bulldozers, equipped with elongated ripping blades, shanks, or chisels often several feet in length." It is the DOJ Expert Team's opinion that the Case Challenger MT 835 C Tractor mounted with the Ag Wilcox Ripper fits this description and we directly observed that it was powerful enough to -- and did -- fracture and redistribute slowly permeable layers in Duarte Site soils.

16. ***Comparison to Other Tillage Operations:*** In the *Borden Ranch* court decision, the court stated that:

    (a) the wetlands on the Borden Ranch site "depend[ed] upon a dense layer of soil, called a 'restrictive layer' or 'clay pan,' which prevents surface water from penetrating deeply into the soil"; (b) "[f]or vineyards and orchards to grow on this land, the restrictive layer of soil would first need to be penetrated;" (c) "[t]his requires a procedure known as 'deep ripping,' in which four-to-seven foot long metal prongs are dragged through the soil behind a tractor or a bulldozer: and (d) "[t]he ripper gouges through the soil restrictive layer, disgorging soil that is then dragged behind the ripper."

    Drs. Lee (Lead Technical Expert), Rains (Lead Technical Support Science) and Stewart (Lead Peer Review Soils) were all present for field work, data syntheses and report production in the Borden Ranch case. Each of us (Lee, Rains, and Stewart) is of the opinion that although the depth of tillage, soil types and slowly permeable layers, and gear used on the Duarte Site are not exactly the same as on the Borden Ranch property, the effect of the tillage activity regardless of depth was functionally the same: break up slowly permeable layers to alter the hydrologic conditions on which waters/wetlands depend and set the site up for vertical movement of water in soil profiles to support crop production.

17. ***Impacts:*** In this Expert Report, the DOJ Expert Team has documented that Duarte tillage operations resulted in significant direct impacts to waters/wetlands on the Duarte Site. To summarize, these include the following:

A. Direct Impacts to Waters/Wetland Area and Functioning

(1) Figure V-47 shows that tillage operations on the Duarte site resulted in direct impacts to and significant degradation or destruction of at least 964,709 ft^2 (22.2 acres) acres of waters/wetlands and 5,880 linear feet of stream channels that are tributaries that discharge water directly into the traditional navigable waters of the Sacramento River. The most frequently occurring types of direct impacts direct impacts take the form of the following:

    (a) Accretion of bottom elevation of waters/wetlands - Duarte Site tillage operations resulted in the accretion the bottom elevation of streams and wetland depressions and swales or deposited upland materials into streams and wetland virtually throughout the 450 acre site.

    (b) Redistribution of materials within and proximate to waters/wetlands

(c) Destruction of native soil and hydrologic systems structure and functioning involving elimination of shallow subsurface storage and exchange of water, alterations in the timing, rate,and volume of discharges of water down gradient, and elimination or significant degradation of landscape hydrologic connections among Duarte Site waters/wetlands and down gradient in the Coyote Creek/Oat Creek ecosystems to the traditional navigable waters of the Sacramento River.

(d) Significant and discernable alteration of patterns of subsurface and shallow subsurface flow and circulation of water. Tillage operations fractured slowly permeable soil layers and encouraged water to travel downward in the soil profile

(e) Destruction and potential future elimination of waters/wetlands and significant changes in the extent of reach on the margins of most of the waters/wetlands on the Duarte Site.

(f) Destruction of the structure and functioning ancient native plant communities that are not recoverable

(g) Destruction of the structure and functioning of important waters/wetlands faunal habitats that support several classes of faunal species with very large (ie. to the Sacramento River) to very small home range requirements.

(h) With respect to faunal species with limited mobility and thus small home ranges in waters/wetlands systems it is the DOJ Expert Team's opinion that given (a) the complex structure, connectivity, and extent of former intact waters/wetland habitats that we observed on the Duarte Site and (b) the Vernal Pool Critical Habitat Map presented in Figure II-2, in all likelihood listed vernal pool fairy shrimp occurred on the Duarte Site prior to late 2012 and were directly impacted by tillage operations.

B. Direct Impacts to Waters/Wetland Ecosystem Functioning

Duarte Site tillage operations resulted in direct impacts to the suite of hydrologic, biogeochemical, plant community, and faunal support/habitat functions that the waters/wetland ecosystems on the Duarte Site perform. These impacts are detailed in Figures V-47 through V-49 of this expert report. Taken in aggregate, elimination or significant degradation of all classes of ecosystem functioning constitute significant degradation of the Coyote Creek/Oat Creek ecosystems, which discharge directly into the traditional navigable waters of the Sacramento River.

C. Indirect, Cumulative and Temporal Impacts

In this Expert Report, the DOJ Expert Team documented that Duarte Site tillage operations resulted in a suite of indirect, cumulative and temporal impacts to hydrologic, soil, plant community, and faunal support/habitat resources within and down gradient from Duarte Site waters/wetlands.

1. Duarte Site tillage operations fractured slowly permeable (or restrictive) soil layers in streams and in wetland depressions and swales throughout virtually all of the 450 acre site. This conclusion is supported in the plot by plot descriptions of soil conditions offered in Appendix C of this Expert Report ad corroborated by our observations of unfractured slowly permeable soil layers in the CCCA Area 13 and Agricultural reference areas.

2. ***Significant and discernable changes in the patterns of water flow and circulation:*** Duarte Site tillage operations impaired the flow and circulation of water within streams and wetland depressions and swales and reduced the reach of streams and wetland depressions and swales throughout virtually all of the 450 acre site. This conclusion is corroborated in each stream system by the plot by plot observations of hydrologic and soils conditions offered in Appendix C of this Expert Report. For example, the tabular summaries of stream walks in Streams 5 and 6 document changes in the patterns of water flow and circulation in these systems.

3. ***Harm/Degradation of the Suite of Waters/Wetland Ecosystem Functions:*** Duarte Site tillage operations significantly harmed and degraded or destroyed the suite of hydrological, biogeochemical, plant community, and faunal support/habitat functioning of streams and wetland depressions and swales throughout virtually all of the 450 acre site. The DOJ Expert Team's field observations, the plot by plot summaries offered in Appendix C of this Expert Report, combined with our HGM assessment of changes in ecosystem functions offered in Figures V-47 through V-49 show significant degradation or destruction.

4. ***On-Site Mitigation:***_On the Duarte Site, although the harm to streams and wetland depressions and swales may well be irreparable, it should be mitigated by restorative measures at the Duarte Site that have fidelity to national and regional (California) standards for mitigation of impacts to streams and wetland depressions and swales. The U.S. national standard for mitigation of unavoidable impacts to waters/wetlands is "no net loss of area and/or functioning." Table VI-1 offers standard definitions used by the U.S. EPA and the U.S. Army Corps of Engineers when they discuss approaches for mitigation of impacts to waters/wetlands. These definitions are found at (40 CFR § 230.92). Table VI-1 presents standard HGM Reference System Definitions. In

developing our perspectives and recommendations on environmentally beneficial mitigation measures at the Duarte Site, the DOJ Expert Team also reviewed and considered guidance provided in the following documents:

a. 2008 - Department of Defense, Department of the Army, Corps of Engineers 33 CFR Parts 325 and 332 Environmental Protection Agency 40 CFR Part 230 Compensatory Mitigation for Losses of Aquatic Resources; Final Rule.

b. February 20, 2012 - Special Public Notice issued by the U.S. Army Corps of Engineers South Pacific Division entitled "Standard Operating Procedure For Determination of Mitigation Ratios."

Table VI-2. Standard Definitions for Compensatory Mitigation

COMPENSATORY MITIGATION (40 CFR § 230.92):
Approaches for offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.

I. Restoration (re-establishment or rehabilitation): *Restoration* means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: *reestablishment* and *rehabilitation*.

1. *Re-establishment* means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions.

2. *Rehabilitation* means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

II. Establishment (creation): *Establishment* (creation) means the manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area and functions.

III. Enhancement: *Enhancement* means the manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

IV. Preservation: *Preservation* means the removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions.

Table VI-3. HGM Reference System Definitions (Brinson *et al* 1995)

REFERENCE TERM	DEFINITION
Reference Domain	All waters/wetlands within a defined geographic region that belong to a single hydrogeomorphic subclass
Reference Wetland	Waters/wetland sites within the reference domain that encompass the known variation of the subclass. Reference waters/wetlands are used to establish the ranges of variation.
Reference Standard Sites	Those sites within a reference waters/wetland data set from which reference standards are developed. Among all reference waters/wetlands, Reference Standard Sites are judged by an interdisciplinary team to have the highest level of functioning.
Reference Standards	Conditions exhibited by a group of reference waters/wetlands that correspond to the highest level of functioning (highest sustainable capacity) across the suite of functions of the subclass. By definition, reference standard functions receive an index score of "1.0".
Site Potential	The highest level of functioning possible given local constraints of disturbance history, land use, or other factors. Site potential may be equal to or less than levels of functioning established by reference standards.
Project Target	The level of functioning identified or negotiated for a restoration or creation project. This target must be based on reference standards and/or site potential and be consistent with restoration or creation goals. Project targets are used to evaluate whether a project is developing toward reference standards and/or site potential.
Project Standards	Performance criteria and/or specifications used to guide the restoration or creation activities towards the project target. Project standards should include and specify reasonable contingency measures if the project target is not being achieved.

In examining options for on-site and off-site mitigation on the Duarte Site, we also considered the following two questions:

1. What practicable and environmentally beneficial restoration, enhancement, or preservation measures should be taken at the Duarte Site to compensate for the loss of waters/wetlands?

2. If On-Site measures will not fully compensate for the loss of waters/wetlands, what off-site restoration, enhancement, preservation, or mitigation credit-purchasing measures should be taken?

The DOJ Expert Team analyses of the activities that took place on the Duarte Site show that many of the direct, indirect, cumulative, and temporal impacts to hydrologic, soil/biogeochemical, plant community, and faunal support/habitat conditions on the Duarte Site are not recoverable. This is an important point from the standpoint of developing practicable and cost-effective approaches for on-site restoration measures for Duarte Site waters/wetlands. Fundamental to developing perspectives on restoration activities on the Duarte Site should be the acknowledgement that the Duarte Site uplands and waters/wetlands are tightly coupled, especially with respect to the major hydrologic processes that maintain wet conditions in all classes of waters/wetlands (Figure III-12) The fact is that tillage operations on the Duarte Site fractured, decoupled, and degraded both upland and waters/wetland soils and associated shallow subsurface water delivery mechanisms from uplands to waters/wetlands. Therefore the Duarte Site potential to respond to restorative measures is compromised from how the waters/wetlands functioned prior to late 2012. With this fact as background, the following portions of this Discussion will focus on mitigation requirements and realistic approaches for restoration of waters/wetlands ecosystems that include re-establishment and re-habilitation of Duarte Site streams and wetland depressions and swales. Because Duarte Site "site potential" is compromised by tillage operations, these on-site restoration measures need to be coupled with off-site measures to reach a "no net loss" goal. Again, the goal of the DOJ Expert Team's recommendations is to achieve maximum environmental benefit in a practicable and cost-effective manner.

Step 1 - Conduct Protocol Surveys For Fairy Shrimp And Other Species Of Conservation Concern: The DOJ Expert Team recommends that the first step in approaching a design for restoration of Duarte Site waters/wetlands is to conduct protocol level surveys to document the presence or absence of fairy shrimp or other listed species.

Step 2 – Develop A Basis of Design Report That Includes Compliance Monitoring Protocols, Adaptive Management Measures, and Contingency Measures : The DOJ Expert Team recommends that Duarte Managers develop a "Basis Of Restoration Design" for the Duarte restoration site that will address the steps outlined below in this report. The Basis of Design will include the following:

A. An Ecosystem Approach - Use of an ecosystem approach to the restoration that is reference-based.

B. Articulation of Project Goals, Targets and Standards - Specification of overall Project Goal, Project Targets, and Project Standards (Table VI-2) that are stratified over hydrologic, biogeochemical, plant community, and faunal support/habitat functions. These Project Targets and Project Standards need to be developed to restore, as much as possible given current site potentials, the suite of waters/wetlands ecosystem functions for riverine, swale and depressional waters/wetlands that have been discussed throughout this Expert Report.

C. Use Of Reference Systems - Use the Area 13, Agricultural Area and SW fenced corner of the Duarte Site as a reference system and design template. For example, the goal for management of the plant communities on the restoration sites would be developed using a combination of monitoring of reference and restoration areas and reference system data to re-establish plant communities on restored sites.

D. Plans For Monitoring, Adaptive Management, Contingency Measures - include comprehensive plans for compliance monitoring of the all Duarte restoration sites for a period of 10 years following completion of restoration measures. First a baseline report will be developed with drawings of record that show the condition of the Duarte restoration site at "Time Zero" – immediately after restoration measures are completed. Annual reports will be submitted to the U.S. Army Corps by December 31 of each monitoring year. The Basis of Design must include provisions for adaptive management of the restoration and it will stipulate "first line" contingency measures that will be used to keep the restoration project on track to achieve the Overall Project Goal, Project Targets, and Project Standards.

There should also be a process of peer review, review, and approval of the plan by the U.S. Army Corps of Engineers; the DOJ Expert Team could assist with such review.

Step 3 – Smooth Waters/Wetlands Tillage Microtopography: The third step in restoring Duarte Site waters/wetlands is to use appropriate earth moving and cultivation tools and implements to smooth out the furrow top and bottom microtopography that was created in all classes of waters/wetlands on the Duarte Site. The "Project Target" (VI-2) is to re-establish pre tillage operation microtopography and hydrologic connections. The approach to smoothing operations needs to be tactical and will vary by waters/wetland class and by the post tillage conditions presented by each waters/wetland. For example,

a. In the Coyote Creek system and in those areas that were tilled below OHW, the smoothing operation could be accomplished by dragging (for example) a small rolling cultivator or a section of chain link fence heavily weighted with railroad iron or "I" beams and mounted behind small low ground pressure tractor or low ground pressure dozer (ie no larger than a D-5). The smoothing gear would need to "float" to the extent that it could conform to small changes in local topographic conditions while still accomplishing smoothing of tillage microtopography. In Coyote Creek and below OHW, the approach would be to accomplish the smoothing and then let the natural flooding processes self organize the system.

b. In swales that were tilled the same gear options would apply, but the smoothing operations would need to be accomplished in a manner that would not create sharp edges or transitions in the finished grade. The target is smoothing and creation of smooth bottom contours, smooth transitions to surrounding grades and especially smooth transitions at outlets to down gradient waters/wetlands. Some experimentation with gear may be necessary to discern the best direction of travel for the smoothing gear.

Step 4 - Establish Buffers, Smooth And Plant Native Species: The DOJ Expert Team recommends that the Duarte restoration needs to include 150 ft. buffers along the length of Coyote Creek on the Duarte Site above OHW and around all waters/wetland features on the property. Figure VI-2 presents a synthesis of buffer functioning developed by a national team of scientists gathered by the Environmental Law Institute in Washington D.C. It shows that buffering of nutrients and sediments is accomplished in approximately the first 150 feet of buffer width, and that buffers > 150 feet are effective in providing food and cover resources for faunal species.

For swales and depressions, the DOJ Expert Team recommends 100 ft buffers or buffers that travel to the local depression or swale watershed divide, whichever is less. Within buffers, smoothing of microtopography perpendicular to the direction of flow or slope needs to occur to avoid directing surface flows and sediment into the adjacent depression or swale. Buffers should be vegetated with a native seed mix that will develop quickly and help to prevent erosion and competitively exclude non-native weeds.

Step 5 – Establish An In Perpetuity Conservation Easement That Includes Compatible Land Uses Once Restoration Measures Are In Place And Successful: The Duarte Site Waters/Wetlands and their buffers should be identified, located, and then dedicated to an in perpetuity conservation easement that runs with the title to the land. The conditions of the Conservation Easement should allow land uses that are compatible with the location and overall goals of the restoration and which stipulate when those land uses can come into play. For example, it may be beneficial to initially preclude or restrict grazing by domestic livestock to allow for establishment of plant communities after smoothing operations. In time, it might be beneficial to introduce light to moderate grazing to the Duarte Site after certain measures are in place and shown to be successful.

Step 6 – Bonding: The cost of Duarte Site on-site restoration measures and associated monitoring and adaptive management needs to be estimated and a performance bond needs to be put into place to guarantee successful restoration project work and achievement of the overall Project Goal, Project Targets, and Project Standards.

D. Off - Site Mitigation

Duarte Site waters/wetlands are so degraded by tillage operations, and water delivery processes from uplands to waters/wetlands are permanently degraded or destroyed, the on-site measures (Steps 1-6 above) recommended by the DOJ Expert Team will, even if executed perfectly, certainly not be sufficient to mitigate for area and functional impacts and for temporal losses that started in late 2012 and will continue in perpetuity (ie. Duarte Site impacts are permanent impacts). Therefore, the DOJ Expert Team recommends that Duarte managers be required to identify off- site opportunities for stream and wetland depression and swale complex "Re-establishment" at an area ratio of 3 acres restored:1 acre impacted on the Duarte Site or "Rehabilitation" at an area ratio of 6 acre rehabilitted:1 acre impacted n the Duarte Site.

Use of established mitigation banks within the Coyote Creek/Oat Creek service area or purchase and long term management of a mitigation site or system of sites within the Coyote Creek/at Creek watersheds is strongly recommended.

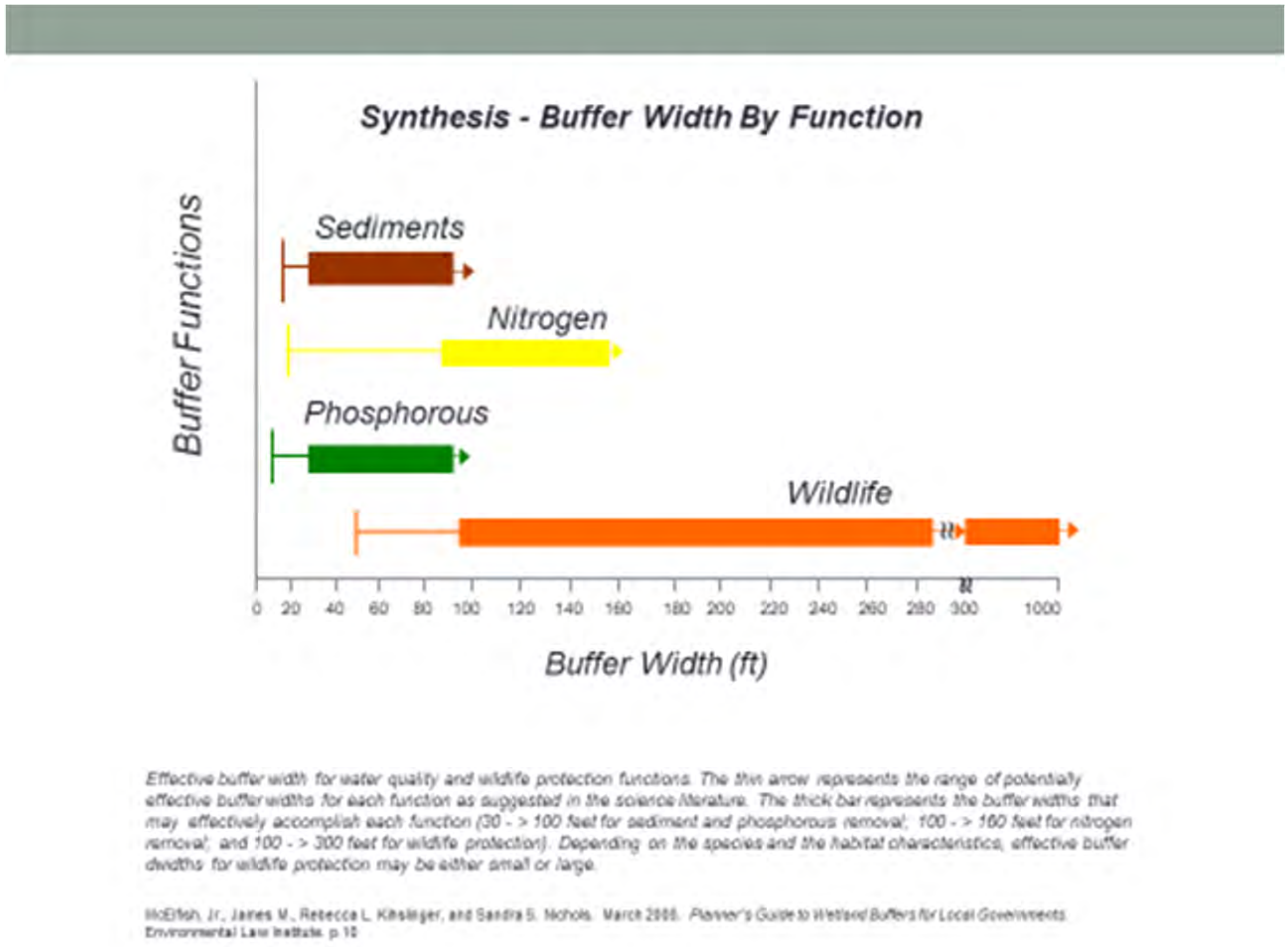


Figure VI-1. Environmental Law Institute Science Committee Summary of Waters/Wetland Buffer Functions.

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