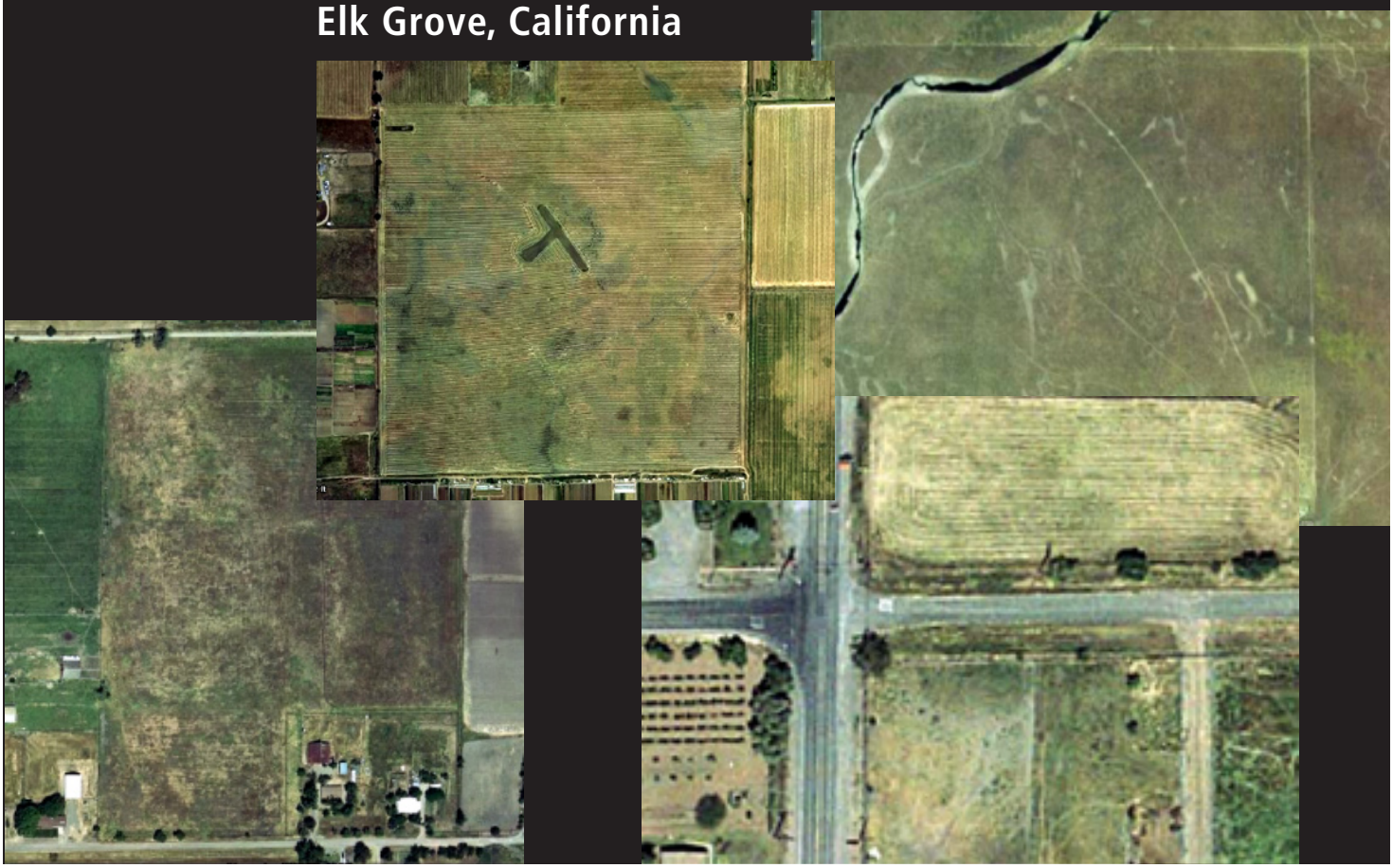
WETLANDS
SCIENCE
PROGRAM

CRAM Evaluation of Wetland Conditions

Werre Ranch, Arbor Ranch, Treasure, & Laguna Ridge South Infrastructure

Elk Grove, California



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Final Report

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CRAM Evaluation of Wetland Conditions

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Elk Grove, California

Final Report
December, 2007

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& Laguna Ridge South Infrastructure

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1.0 Objective

The primary objective was to assess the condition of wetlands on behalf of Reynen & Bardis (RB Homes) using the California Rapid Assessment Method (CRAM). A secondary purpose was to field-test and demonstrate CRAM to other interested parties.

2.0 Methods

The California Rapid Assessment Method (CRAM) is a rapid but comprehensive approach to evaluate wetland condition based on a broad array of visible field indicators (1). In practice, CRAM users address a standardized set of questions about the appearance and setting of a wetland by selecting the best-fit descriptions from a set of mutually exclusive choices. The questions and their alternative answers are organized into metrics and attributes of wetland condition. The alternative answers for any metric represent the full range of condition of that metric statewide, from the worst to the best achievable condition. Each answer has a fixed numerical value. Each choice of an answer therefore results in a numerical score for a metric, relative to its best achievable score. Different sets of metric scores are summed into different attribute scores, and the attribute scores are summed into an overall site score. All the scores for a given site are recorded in the field on standardized datasheets. The assessments are guided by a user's manual that specifies every aspect of the assessment, from the classification of the wetlands to be assessed to the use of each field indicator of condition.

Each CRAM assessment begins with a collection of site imagery, site-specific reports, and supporting materials. Field work begins with a delineation of the specific area of the selected wetland to assess. The assessment proceeds with an examination of the landscape context and buffer characteristics of the assessment area, followed by examinations of its hydrology, physical structure, and biological structure. CRAM assessments typically take less than one-half day of field work by 2-3 experts.

RB Homes selected wetlands to assess at properties referred to in existing reports as Laguna Ridge South Infrastructure, Arbor Ranch, Treasure and Werre Ranch (2-7). All the assessments were conducted over a two-day period (May 17 and 18, 2007). The assessments were authored by Joshua N. Collins, Ph.D. (San Francisco Estuary Institute) with assistance from Paul Jones (USEPA Region 9). One or more of the assessments were observed by James Romero (RB Homes), Justin Cutler (USFWS), Jeannette Owen (City of Elk Grove), Jim Gibson (Gibson & Skordal, LLC), Ginger Fodge (Gibson & Skordal, LLC), Peter Balfour (Ecorp Consulting), and Adam Ballard (Ecorp Consulting). While the observers were encouraged to discuss CRAM and the assessments, and although some of the observers provided helpful botanical expertise, Dr. Collins is responsibility for the assessments.

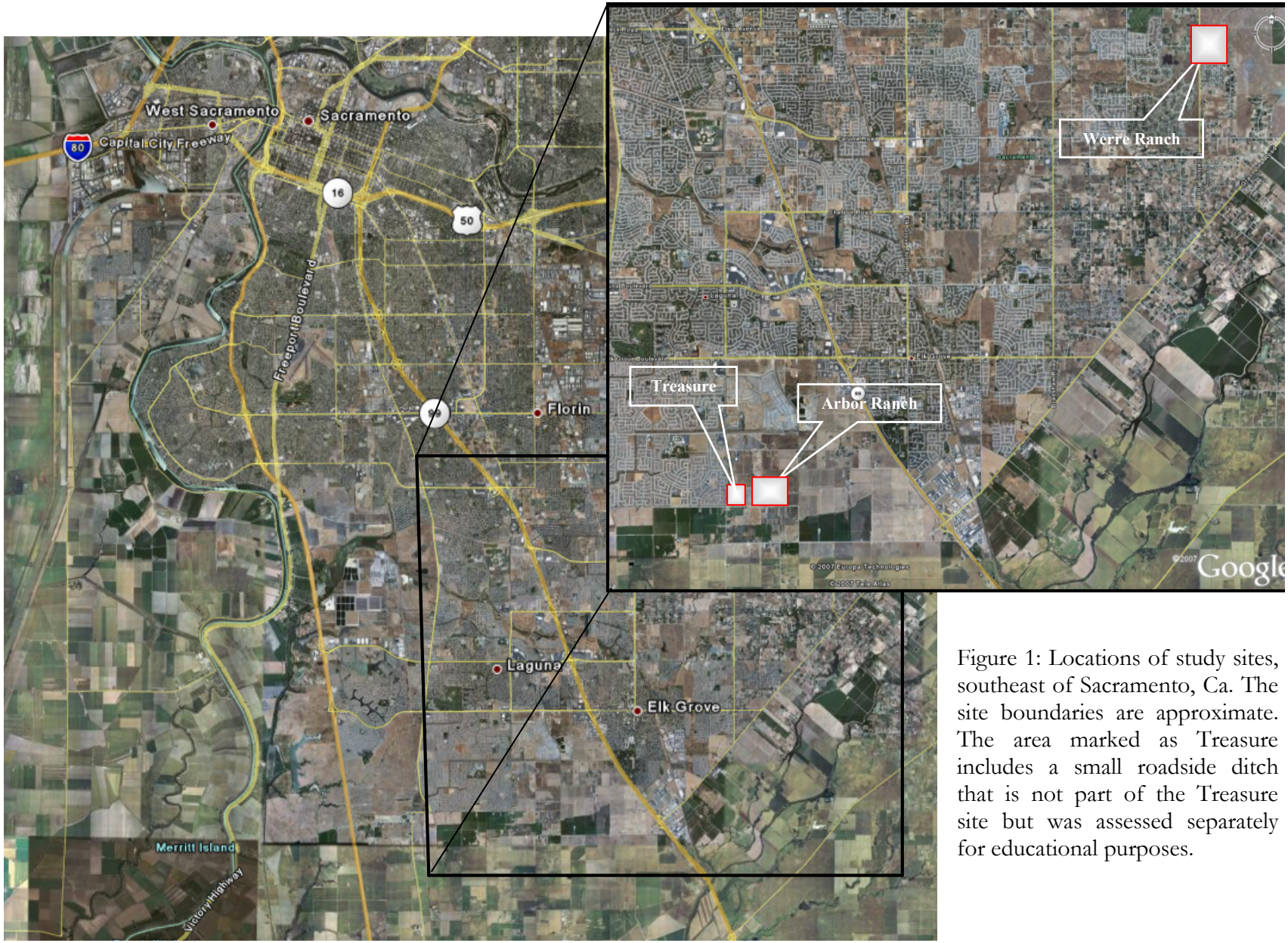

Figure 1: Locations of study sites, southeast of Sacramento, Ca. The site boundaries are approximate. The area marked as Treasure includes a small roadside ditch that is not part of the Treasure site but was assessed separately for educational purposes.

3.0 Results

3.1 Werre Ranch

The site is a one-quarter section of land referred to as Werre Ranch. Here the intent was to characterize the condition of the vernal pool landscape across the site. There is a Riverine Wetland on the site that was not selected for assessment.

With regard to vernal pools, the site consists of five Vernal Pool Systems according to the CRAM typology, plus a few individual pools that are not clearly part of any pool system. Based on the CRAM Manual, enough vernal pool systems should be assessed to fairly characterize the site as a whole, using the Vernal Pool System module of CRAM. After walking the entire site, the assessors chose three systems that in aggregate comprise most of the vernal pool landscape of the site (Figure 2) and represent the full range of pool characteristics. This site is subject to grazing under a conservation program designed to protect the vernal pools.

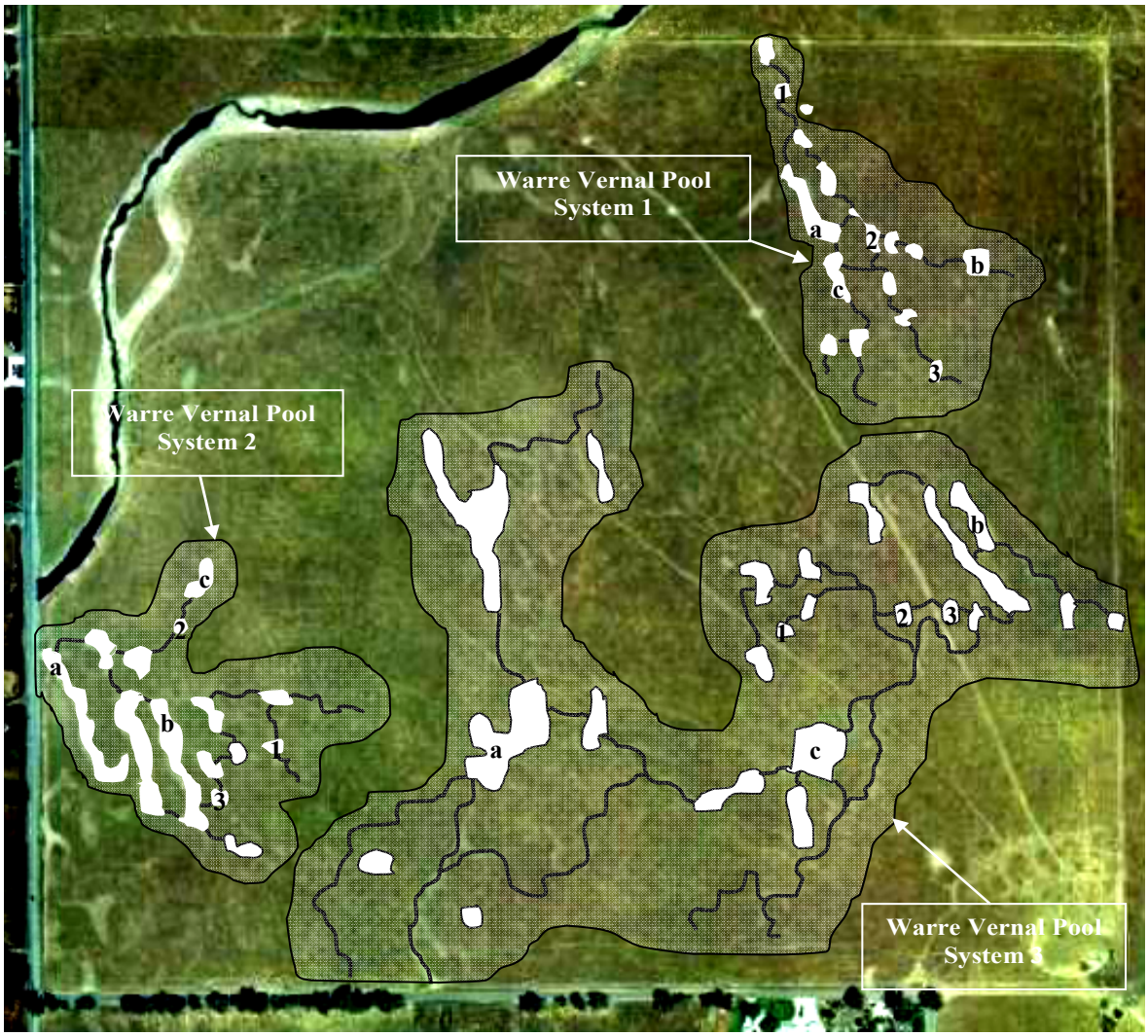

Figure 2: Vernal Pool Systems and component vernal pools and flow pathways assessed at Werre Ranch. Pools a-c and 1-3 were assessed as replicate large and small pools, respectively, in the context of the Vernal Pool System assessments.

Vernal pool systems are assessed by averaging scores for Topographic Complexity, Organic Matter Accumulation, Plant Co-dominance, Percent Invasion, and Horizontal Interspersion across 6 randomly selected component pools (three large pools and three small pools). The other metrics are assessed for the system as a whole.

There are no other CRAM results for Vernal Pool Systems that can be compared to the results obtained for Werre Ranch. The results can only be interpreted relative to the best achievable condition as incorporated into the CRAM scores. The metric, attribute, and overall system scores for Werre Ranch are presented in Table 1 below. The scores are generally high.

Verbal Pool System	Landscape Connectivity	Percent AA with Buffer	Buffer Width	Buffer Condition	**Landscape Context Attribute**	Water Source	Hydroperiod	Hydrologic Connectivity	**Hydrology Attribute**	Structural Patch Richness	Topographic Complexity	**Physical Structure Attribute**	Organic Matter Accumulation	Plant Co-Dominance	Percent Invasion	Horizontal Interspersion	**Biological Structure Attribute**	**System Score**
Werre Ranch 1	12	12	12	9	**94**	12	12	12	**100**	9	11	**83**	9	11	11	10	**85**	**90**
Werre Ranch 2	12	12	9	9	**90**	12	9	9	**83**	12	9	**88**	9	10	10	10	**81**	**85**
Werre Ranch 3	12	12	12	9	**94**	12	12	12	**100**	12	9	**88**	9	11	11	10	**86**	**92**
Average System Score as Overall Site Score																		**89**

Table 1: CRAM scores for Vernal Pool Systems at Werre Ranch.

3.2 Arbor Ranch

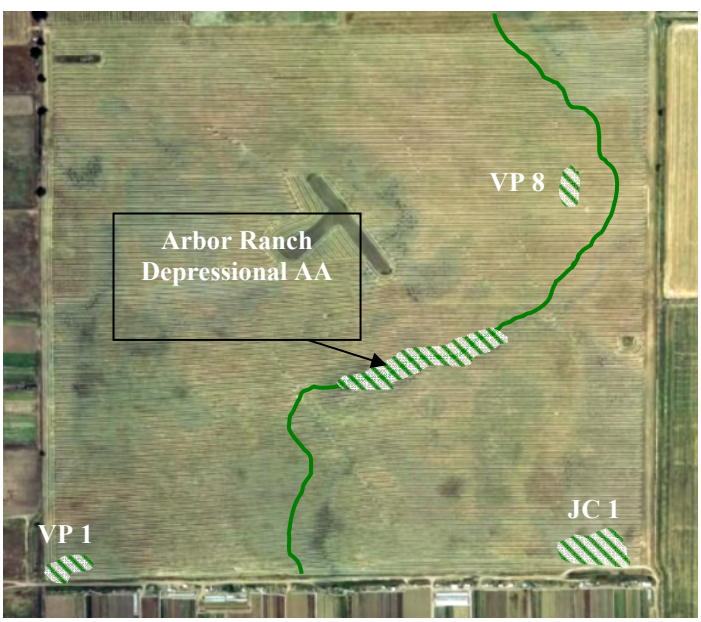

Figure 3: Locations of individual vernal pools and a depressional wetland assessed at Arbor Ranch.

Here the assessment focused on three individual vernal pools as delineated by the USCACE in 2005 (3), plus a depressional wetland in a remnant area of historical fluvial channel (Figure 3).

The assessors and observers agreed that these pools were the most evident and representative of vernal pool conditions for the site as a whole. The depressional wetland area was chosen because in was relatively clear in extent compared to other historical channel areas.

The codes for the vernal pools were taken directly from a map produced by the USACE and provided by RB Homes.

The scores for the depressional wetland are presented below in Table 2. There are no other published CRAM results for Depressional Wetlands that can be compared to the results obtained for Arbor Ranch. The results can only be interpreted relative to the best achievable condition as incorporated into the CRAM scores. The scores are low except with regard to hydrology, which would be higher except that discing has severely altered the hydroperiod such that it ba5ely supports wetland vegetation. Dry farming was noted as likely being a significant stressor.

Assessment Name/No.: Arbor Ranch Depressional Wetland			**Date (m/d/y): 5/18/07**
Attributes and Metrics		**Score**	**Comments**
Buffer and Landscape Context			
Landscape Connectivity		6	Few adjacent wetlands and aquatic habitats
Percent of AA with Buffer		12	
Average Buffer Width		12	
Buffer Condition		6	Non-native vegetation and severely disturbed soils
Attribute Score		**60**	
Hydrology			
Water Source		12	
Hydroperiod or Channel Stability		6	Disturbed soils impact wetting and drying cycles
Hydrologic Connectivity		12	
Attribute Score		**83**	
Physical Structure			
Structural Patch Richness		3	Devoid of structural and topographic complexity due to tilling and discing
Topographic Complexity		3	
Attribute Score		**25**	
Biotic Structure			
Organic matter Accumulation		6	Land is dry-farmed leaving little to no thatch
Plant Community submetric 1: Number of Plant Layers	6		Almost a monoculture
Plant Community submetric 2: Number of Co-dominant species	3		
Plant Community submetric 3: Percent Invasion	6		
Plant Community Metric (*average of submetrics 1-3*)		5	
Horizontal Interspersion and Zonation		3	Almost a monoculture with little vertical complexity
Vertical Biotic Structure		3	
Attribute Score		**35**	
		Overall AA Score	**51**

Table 2: CRAM scores for the Depressional Wetland at Arbor Ranch.

The scores for the Vernal Pools at Arbor Ranch are presented below in Table 3. The scores are low for Landscape Context and Buffer due to the intensively farmed setting. The scores for Physical Structure are low due to on-site farming practices that have leveled the land. Scores are higher for Hydrology due to the lack of artificial water sources and artificial drainage. This helps explain the moderately high Biotic Structure scores, although these are variable among the three vernal pools.

Assessment Name/No.: Arbor Ranch Vernal Pools	Date (m/d/y): 5/18/07		
	Vernal Pool		
	JC1	VP8	VP1
Attributes and Metrics	**Score**	**Score**	**Score**
Buffer and Landscape Context			
Landscape Connectivity	6	9	9
Percent of AA with Buffer	12	12	12
Average Buffer Width	9	12	9
Buffer Condition	6	6	6
Attribute Score	**58**	**73**	**70**
Hydrology			
Water Source	12	12	12
Hydroperiod	6	6	6
Hydrologic Connectivity	12	12	9
Attribute Score	**83**	**83**	**75**
Physical Structure			
Structural Patch Richness	3	3	3
Topographic Complexity	3	3	6
Attribute Score	**25**	**25**	**37**
Biotic Structure			
Organic matter Accumulation	9	9	9
Plant Community submetric 2: Number of Co-dominant species	9	9	12
Plant Community submetric 3: Percent Invasion	9	12	12
Plant Community Metric (*average of submetrics*)	9	10	12
Horizontal Interspersion and Zonation	9	3	9
Attribute Score	**75**	**61**	**83**
Overall Site Score	**60**	**61**	**66**

Table 3: CRAM scores for Individual Vernal Pools at Arbor Ranch.

Scores for individual vernal pools can be derived from the assessments of vernal pool systems. This enables a comparison between pools at Werre Ranch and pools at Arbor Ranch (Table 4). The data for Topographic Complexity, Organic Matter Accumulation, Plant Co-dominance, Percent Invasion, and Horizontal Interspersion were averaged across all 36 replicate component pools large and small for Werre Ranch. The aerial imagery was used to assess the other metrics, except for Physical Patch Richness, which was omitted from the comparison because it could not be assessed based on the pool system scores or the site imagery.

Comparison between Arbor Ranch and Werre Ranch Vernal Pools	5/18/07				5/17/07
	Arbor Ranch Vernal Pools				Werre Ranch
	JC1	VP8	VP1	Average Vernal Pool Condition	Average Vernal Pool Condition
Attributes	Scores	Scores	Scores	Scores	Scores
Buffer and Landscape Context	58	73	70	67	92
Hydrology	83	83	75	80	94
Physical Structure	25	25	37	29	80
Biotic Structure	75	61	83	73	84
Overall Site Score	60	61	66	62	89

Table 4: Comparison between Individual Vernal Pools at Arbor Ranch and average Vernal Pool conditions at Werre Ranch, based on CRAM scores.

The Vernal Pools at Werre Ranch tend to have higher scores than the Vernal Pools at Arbor Ranch. In general, low Biotic Structure Scores at Arbor Ranch are matched by low scores for Physical Structure and Landscape Context. This is due to the history of dry farming at Arbor Ranch that eliminated much of the natural topographic relief and has altered and homogenized the spatial and temporal patterns of soil moisture. An exception is Vernal Pool VP1 at Arbor Ranch, for which the Biotic Structure was comparable to that of Vernal Pools at Werre Ranch. VP1 overlaps with a turnaround area for farm vehicles that create micro-topographic irregularity that is reflected in a slightly higher Physical Structure score. This topographic complexity translates into gradients of soil moisture and texture that might partially account for the moderately high Biotic Structure scores.

3.3 Treasure

Figure 4: Location of the diffuse depressional wetland at the Treasure site.

The wetland assessed at the Treasure property is a broad area of variable hydric conditions associated with a modest drainage ditch (Figure 4). At the time of the site visit, there was no clearly defined wetland area. The most distinct wetland conditions were associated with the most intact remnants of the drainage ditch. However, even the wetland boundaries nearest the ditch had been blurred by plowing and discing. Given these uncertainties, the assessment team elected to reconnoiter the whole area as delineated by the USACE (4) to produce one spatially integrated CRAM assessment.

The CRAM scores for the depressional wetland at this site are presented below in Table 5. The scores are low, except for Water Source and Hydrologic Connectivity. In all other regards the wetland shows signs of severe stress due to dry-farming practices.

Assessment Name/No.: Saca-Bilby			Date (m/d/y): 5/18/07
Attributes and Metrics		**Score**	**Comments**
Buffer and Landscape Context			
Landscape Connectivity		6	Few adjacent wetlands of any significance
Percent of AA with Buffer		9	
Average Buffer Width		9	Some adjacent residential development
Buffer Condition		6	Abundant non-native species and disrupted soils
Attribute Score		**56**	
Hydrology			
Water Source		12	
Hydroperiod		3	Drainage ditch bisects site
Hydrologic Connectivity		12	
Attribute Score		**75**	
Physical Structure			
Structural Patch Richness		3	Dry farming has eliminated most physical structure
Topographic Complexity		3	
Attribute Score		**25**	
Biotic Structure			
Organic Matter Accumulation		6	
Plant Community submetric 1: Number of Plant Layers	6		
Plant Community submetric 2: Number of Co-dominant species	3		
Plant Community submetric 3: Percent Invasion	3		
Plant Community Metric (*vverage of submetrics 1-3*)		4	Almost a monoculture of invasive grasses
Horizontal Interspersion and Zonation		3	
Vertical Biotic Structure		3	
Attribute Score		**33**	
		Overall AA Score	**47**

Table 5: CRAM scores for the Depressional Wetland at the Treasure site.

3.4 Laguna Ridge South Infrastructure (example roadside ditch)

The Riverine Wetland assessed at this site is a roadside drainage ditch that conveys runoff from both sides of a paved two-lane road (see Figure 5 below). The ditch has been colonized by wetland plants and is bordered by walnut trees and other remnant vegetation from the agricultural past of this setting. This site is not part of any of the other sites assessed in this study. The CRAM assessors and observers elected to include it as an example of a roadside ditch typical of the area.

The CRAM scores for this wetland are presented below in Table 6. The scores are almost uniformly low. The average statewide score for this Non-confined Riverine Wetlands (see data at www.wetlandtracker.org) is almost twice the overall score for this site. Similar scores have been recorded for roadside ditches in the Napa Watershed, San Gabriel River Watershed, and elsewhere.

Figure 5: Location of the Non-confined Riverine Wetland at the Laguna Ridge South infrastructure (ditch) site

Assessment Name/No.: Treasure Homes Ditch			**Date (m/d/y): 5/18/07**
Attributes and Metrics		**Score**	**Comments**
Buffer and Landscape Context			
Landscape Connectivity		3	Few adjacent wetlands of any significance
Percent of AA with Buffer		9	Adjacent residential development and busy roadways
Average Buffer Width		3	
Buffer Condition		6	
Attribute Score		**36**	
Hydrology			
Water Source		6	Road runoff
Hydroperiod		6	
Hydrologic Connectivity		3	This is a roadside drainage ditch
Attribute Score		**42**	
Physical Structure			
Structural Patch Richness		3	Engineered ditch with drop box and revetment
Topographic Complexity		6	
Attribute Score		**37**	
Biotic Structure			
Organic Matter Accumulation		12	
Plant Community submetric 1: Number of Plant Layers	6		
Plant Community submetric 2: Number of Co-dominant species	6		
Plant Community submetric 3: Percent Invasion	6		
Plant Community Metric (*average of submetrics 1-3*)		6	Severely disturbed conditions overall.
Horizontal Interspersion and Zonation		3	
Vertical Biotic Structure		9	
Attribute Score		**62**	
		Overall AA Score	**44**

Table 6: CRAM scores for the Non-confined Riverine Wetland (ditch) at the Laguna Ridge South Infrastructure site.

4.0 Discussion

The CRAM assessments reported here were conducted during the prescribe assessment window of time. No unusual circumstances were encountered that would cause any special uncertainty in the results or require them to be qualified in any way. It is unlikely that a re-assessment of any of these sites would significantly change the CRAM scores.

With the exception of Riverine Wetlands, there are few CRAM data with which to compare the wetlands assessed in this effort with other wetlands. The statewide dataset for riverine wetlands includes more than a 100 cases that together indicate that the scores for the roadside ditch at Laguna Ridge South are relatively low.

The comparison between vernal pools at Werre Ranch and Arbor Ranch indicates that the pools at Arbor Ranch are not faring well. The main problem has been identified as large-scale disruption of hydrology and topography due to dry-farming. The CRAM scores for individual vernal pools as well as vernal pool systems at Werre Ranch indicate that these wetlands are in relatively good condition overall.

5.0 References

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3. USACE. 2006. Wetland delineation data forms and supporting maps for Arbor ranch, Elk Grove, California, as transferred to Mr. James Gibson pursuant to Freedom of Information Act Request No. 06-02-0122, dated February 21, 2006.

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