Delta Working Landscapes – Cost Analysis Report

September 2013

Introduction

This report discusses the costs associated with conservation practices of habitat friendly farming and wetland farming practices on agricultural lands for the Working Landscape projects and the potential for cost savings and other benefits.

Project Implementation Costs

Implementation costs for the Working Landscape projects are presented in Table 1. The cost analysis table provides a breakdown of costs per project site. In some cases, multiple projects were completed at a single project site.

Project costs include both grant funding, landowner in kind services and/or monetary contributions on a per site basis. Several projects received outside funds and/or services provided at no additional cost to the grant or land owner, such as reclamation districts conducting grading work or funding from the USFWS Partners Program. These costs are included in the implementation costs as "Other". For Habitat Friendly Agriculture efforts, several individual projects were implemented on each site. In these instances, the individual project costs were averaged across project sites. For example, the Wilson Ranch Site costs include costs from four separate restoration areas. Cost do not include indirect costs associated with the restoration project, including the cost of the land, the opportunity cost for lost revenue of agricultural production for wetland projects, maintenance, or overhead costs associated grant funding oversight and administration.

Contractor and material costs typically include project associated costs such as mobilization of equipment, operation of equipment such as scrapers, excavators and tractors, labor, control structures, plants and seed. Private costs associated with conservation derive from installation and maintenance costs. The Program costs included labor and material costs at each site, including those provided in kind by the landowners.

Bio-Engineering services include Hart Restoration and Ducks Unlimited's staff costs and generally consist of project management, biological services, engineering services, land surveying and other associated staff costs directly related to the project.

Habitat Friendly Agriculture

The habitat friendly agriculture projects included installing native plant buffers (i.e., vegetated ditches and grassland enhanced levee slopes) that separate farmland from waterways. A total of 15 sites, on five different ranches, totaling 55,336 linear feet, were planted with over 100,000 plants along farm edges, ditch banks and levee slopes.

For installation purposes, these areas required initial weed management be performed by either disking, harrowing, or applying herbicides to invasive weeds.

Three different plant sizes were installed including, seeds, seedlings, and larger-size plants up to 1 gallon-sized containers. The suitability of these different planting techniques varies with different site conditions. Broadcast application of seed material is best suited for clean sites with little weed competition. For this method to work, considerable prior site preparation is required that generally involves re-contouring, soil treatment (disking, roto-tilling, etc.) and/or application of pre-emergent herbicides. Few sites in our project area were suitable for this approach. These plants were installed were hand planted with shovels and power driven augers. One site included re-contouring the steep slopes of a tidally influenced channel prior to planting.

Costs for buffer vegetated ditches, and levee slopes varied from $1.95-$4.19 per plant; $4.95-21.28 per linear foot; which roughly equates to $14,000-$72,000 per acre. Estimated acreage equivalents for buffers and vegetative ditch banks were based on an average planted buffer widths, ranging from 3 to 20 feet, length of project in an attempt to provide a cost per acre comparison for different types of restoration practices and planting techniques. This estimation should only be used for comparison purposes. Generally speaking, lineal projects should only be compared to other lineal projects.

Several factors account for the variation of costs for habitat friendly agriculture. These include the degree of weed infestation and site preparation needed, the size of the container plants used, the width of the linear strips, various site conditions, irrigation, and other environmental factors. Weedier sites, such as the ditches at Vino Farms Ranch (Ditch Site #1) required more labor and were more expensive than cleaner sites. Larger sized container plants are more expensive than smaller plugs, for example. Our larger well rooted tree bands (2 7/8 square by 9 inches deep) cost about $1.95, while plugs may only cost about $0.30. Wider buffer strips (such as the Van Loben Sels Ranch) are more expensive than narrower strips. Hardpan clay soils are more difficult and expensive to plant than well balanced loam soils. During two of the three winters of the project extreme drought required some additional irrigation (such as the Van Loben Sels Ranch), and this added to the cost as well.

Seasonally Flooded Agriculture and Wetlands

Wetland and agricultural demonstration projects involved the winter flooding of agricultural lands, creating seasonal and semi-permanent wetlands. Restoration of wetlands was accomplished by installing water management infrastructure such as water control structures and water conveyance channels. In addition, perimeter and interior berms were constructed to manage the extent and depth of flooding. Seasonal wetlands and winter flooded agricultural areas are ideally managed to provide shallow flooding from a 4-18 inches to provide optimal foraging opportunity. Semi-permanent wetlands are managed with greater water depth (typically greater than 2.5-feet) within the swales to promote hydrogeomorphic interspersion and vegetation strata diversity.

Wetlands were constructed by experienced contractors utilizing large excavation equipment. Contractor work included the supply of labor, material and equipment required to complete the excavation, hauling and placement of earth materials for the construction of created islands, embankments fills, and the excavation of swales and potholes.

Specific construction work included:

- Disking of borrowing and embankment areas
- Excavation of suitable material from -swales and potholes
- Moisture conditioning on embankment materials
- Placements of embankment fill areas
- Excavation and base preparation for water control structures and pipe
- Excavation of suitable material for borrow areas for embankment backfill
- Backfill of water control structures and pipe with compacted fill
- Tie-in of backfill embankment to existing improvements
- Installation of precast concrete water control structure weirs
- Installation of corrugated HDPE pipe
- Installation of flash boards
- Installation of wetland and upland vegetation

For wetland projects, there is tremendous difference in cost between projects which ranged from approximately $1,200 per acre to over $12,000 per acre. Several factors are attributed to these differences. Some of the project costs usually remain the same from project to project. Generally, the cost of control structures remained the same throughout our projects. However, dependent on water availability and size of project, different sizes and quantities of control structures to efficiently manage water were required, which contributed to cost variability.

The cost of constructing swales, potholes, berms and islands is generally referred to as earthwork and is largely the most substantially different cost per project. The economy of scale has a great affect on the cost per acre for these types of projects. Earthwork variables include quantity of excavation and placement of materials. Specifically the type of material placement such as whether you are building a loafing island or a compacted berm can largely affect the cost. Site conditions can change the type of equipment the contractor will need to use, which in turn can raise or lower the cost for earthwork.

Types of soil can dramatically affect the cost of handling soil materials. If the soils are hard compact clay, versus loam materials the effort to excavate and place those materials is dramatically different. The opposite end of the soil spectrum can equally affect the cost of

earthwork such as if the materials are sandy, this may entirely limit certain types of activities all together. Generally, the easier the soil material is to work with, the lower the cost will be.

In addition, the less adverse the project conditions the easier it is for the contractor to complete the work in a timely manner, which corresponds to less cost to the project.

It should be noted, that the cost per acre for developing infrastructure related to winter flooding of corn had the lowest cost per acre of all the restoration activities at a cost of $395 per acre in comparison to an average cost of $6,118 for seasonal and semi-permanent wetland restoration projects.

Potential Cost Savings and Benefits

Conservation practices using native or non-invasive plants have been found to have potential long-term cost savings associated with reduced maintenance as well as other benefits. One study found a $60 per acre per year long-term cost savings associated with maintenance costs of hedgerows in comparison with clean field borders that require spraying and mowing (Audubon California 2013).

In order to track the potential for long-term cost savings, baseline operation and maintenance data, project implementation costs, and ongoing project maintenance costs would need to be collected over time and then compared. In order to establish a comprehensive baseline for cost tracking, the following operations and maintenance cost data would need to be collected from the landowner:

- Management hours
- Laborer hours
- Equipment operator hours
- Equipment hours and type of equipment
    - Operating costs of equipment
- Cost of materials:
    - Additional planting costs
    - Selective Herbicide and Pesticide application costs
    - Volume and cost of irrigation water (if applicable)

- Pest Management Cost
    - Rodent shields
    - Beaver damage repair
- Mosquito vector costs
- Monitoring hours

In addition to a potential for maintenance cost savings, wildlife friendly agriculture projects are intended to provide habitat for wildlife, improve water quality by reducing runoff of pesticides and sediment, enhance levee stability, and retard levee erosion. Wetland restoration practices provide waterfowl brooding habitat, a food source, and additional wetland functions and services which promote healthier waterbird populations. These benefits are not only qualitative, but can provide economic benefits as well through, improving value of farmland and diversifying recreational opportunities. Long-term monitoring for wildlife use and erosion by the landowner on the project sites can be performed to track these benefits. The Yolo County Resource Conservation District has developed a guide for landowners to track these benefits (Yolo County RCD 2002). For an additional discussion regarding these and other non-monetary benefits, refer to the Delta Protection Commission Working Landscapes Program Feasibility Report.

References

Audubon California 2013. Hedgerows turn farm edges into bird habitat. Available online at: http://ca.audubon.org/hedgerows-turn-farm-edges-bird-habitat. Accessed September 6, 2013.

Yolo County Record Conservation District (RCD) 2002 - Monitoring on Your Farm A Guide to Tracking and Understanding the Resources and Wildlife on Your Land. Available online: http://www.yolorcd.org/documents/monitoring_your_farm.pdf. Accessed September 6, 2013.

Table 1. Working Landscape Project Implementation Costs

Site	Contractor/Materials	Bio-Engineering Services	Total	Size (Acres)	Cost per Acre	Size (Linear Feet)	Cost per Linear Foot
Habitat Friendly Agriculture							
Heringer Vineyards							
Hart	$ 65,922.00	$ 27,400.00	$ 93,322.00				
Total	**$ 65,922.00**	**$ 27,400.00**	**$ 93,322.00**	**6.5**	**$ 14,363.32**	**18,868**	**$ 4.95**
Wilson Ranch							
Hart	$ 35,330.00	$ 16,725.00	$ 52,055.00			8,948	$ 5.82
Total	**$ 35,330.00**	**$ 16,725.00**	**$ 52,055.00**	**0.72**	**$ 72,402.96**	**8,948**	**$ 5.82**
Van Loben Sels Ranch							
Hart	$ 40,435.00	$ 23,287.00	$ 63,722.00				
Total	**$ 40,435.00**	**$ 23,287.00**	**$ 63,722.00**	**1.03**	**$ 61,866.02**	**2,995**	**$ 21.28**
Vino Farms (Vegetated Buffers)[1]							
Hart	$ 17,410.00	$ 9,200.00	$ 26,610.00				
Total	**$ 17,410.00**	**$ 9,200.00**	**$ 26,610.00**	**1.03**	**$ 25,758.48**	**3,000**	**$ 8.87**
Winchester Vineyard							
Hart	$ 4,044.00	$ 10,985.00	$ 15,029.00				
Other[2]	$ 8,100.00		$ 8,100.00				
Total	**$ 12,144.00**	**$ 10,985.00**	**$ 23,129.00**	**0.38**	**$ 61,432.88**	**4,100**	**$ 5.64**
Seasonally Flooded Agriculture and Wetlands							
Vino Farms Wetland Site (Lambert Rd)							
DU	$ 25,550.00	$ 6,237.00	$ 31,787.00				
Landowner	$ 3,000.00	$ -	$ 3,000.00				
Total	**$ 28,550.00**	**$ 6,237.00**	**$ 34,787.00**	**6**	**$ 5,797.83**		
San Joaquin Farms							
DU	$ 75,000.00	$ 8,092.70	$ 83,092.70				
Landowner	$ 49,960.00	$ -	$ 49,960.00				

Site	Contractor/Materials	Bio-Engineering Services	Total	Size (Acres)	Cost per Acre	Size (Linear Feet)	Cost per Linear Foot
Other[3]	$ 25,000.00	$ -	$ 25,000.00				
Total	**$ 149,960.00**	**$ 8,092.70**	**$158,052.70**	**134**	**$ 1,179.50**		
Uslan Property							
DU	$ 64,539.00	$ 17,538.40	$ 82,077.40				
Landowner	$ 5,000.00	$ -	$ -				
Total	**$ 69,539.00**	**$ 17,538.40**	**$ 82,077.40**	**8**	**$ 10,259.68**		
C&M Ranch							
DU	$ 21,039.00	$ 12,216.60	$ 33,255.60				
Landowner	$ 1,500.00	$ -	$ 1,500.00				
Total	**$ 22,539.00**	**$ 12,216.60**	**$ 34,755.60**	**3**	**$ 11,585.20**		
Woody's by the River							
DU	$ 21,034.00	$ -	$ 21,034.00				
Landowner	$ 33,966.00	$ -	$ 33,966.00				
Total	**$ 55,000.00**	**$ -**	**$ 55,000.00**	**140**	**$ 392.86**		

Notes:

Estimated Acreage Equivalent	Based on an average planted buffer widths, ranging from 3 to 20 feet, and length of project

[1]Costs are for Vino Farms Lambert Road Sites and Ditch Site #1. Costs for Ditch Site #2 are unavailable

[2]Funding provided by the USFWS Partners for Fish and Wildlife program

[3]Additional in kind services provided by Reclamation District 999