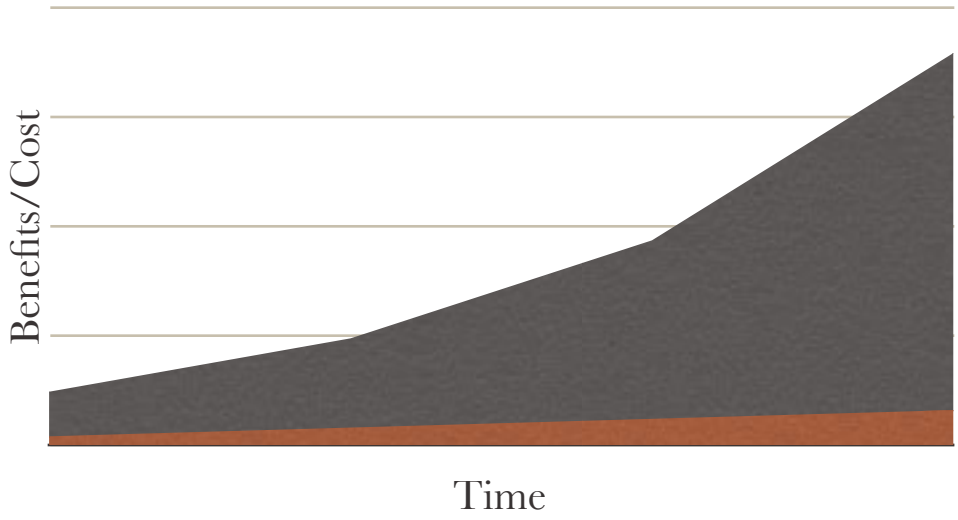
RCRCD Benefit-Cost



Analysis

Preliminary Draft*

(Not for publication or distribution; final draft forthcoming after appropriate review by RCRCD staff, board, and author).

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Benefit-Cost Analysis

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Executive Summary

The following analysis estimates the total costs (both explicit and implicit) and the total benefits (both market and "non-market") of the Riverside Corona Resource Conservation District (RCRCD). Estimates are based on a review of audited financial statements, Geographic Information Systems (GIS) data analysis, CoStar Industrial Review for the Inland Empire, RCRCD program materials, and the development of a basic pricing model for environmental quality in the RCRCD's district.

Scope and Method

Time and resource constraints limit the scope of this preliminary analysis to the use benefit-transfer methods and a hedonic pricing model focused primarily on the mitigation activities of the District. With respect to detailed estimation of the true benefits of conservation efforts, Contingent Valuation (CV) models are considered optimal. However, CV models are both time and labor intensive (i.e., expensive). A proposal for additional research utilizing this approach is included in the Appendix. The costs and benefits addressed herein are limited to a 10 year time horizon; where net present values are calculated, a discount rate of 3% is assumed throughout.

Results

Preliminary analysis reveals the RCRCD generates a benefit-cost "ratio" of 5.10 Plainly, for every $1 in total cost spent on the RCRCD's goals and objectives, $5.10 in benefits are produced. A detailed discussion of this result including sensitivity testing follows in the Appendix material. Under a 10 year time horizon where benefits are assumed to exist beyond the current year (10 years into the future), the ratio increases to 6.20.

Project Analysis

COSTS

Total costs include not only the explicit--or accounting costs--of the organization, but also the implicit--or opportunity costs--of the factors of production utilized in the day-to-day operations of the District. Opportunity costs are defined as the next best alternative use of a resource. Total costs defined this way are higher than accounting costs. Markets exist for land, labor, capital, equipment, machinery, etc. If the RCRCD did not employ these factors, how would they be used? Adding opportunity cost of these factors recognizes the trade-offs that exist in a world of scarcity. Because of nature of the RCRCD's structure as a Special District, property taxes collected are added to the total costs (assuming these dollars--if not collected on behalf of the District--would be spent on alternative uses by households).

Preliminary findings suggest labor factors are paid at opportunity cost. (This is evidenced by a lean staff with very little turnover paid at prevailing wages determined by the State of California). Because of the District's unique location in Southern California and within the city of Riverside, the implicit cost of the land contributes the most to the total cost calculations.

The total cost estimate is summarized in Table 1 below:

Table 1		
Explicit costs	$1,401,570	(based on year end June, 2010
Implicit costs		
land 8 acres	$3,516,163.20	(at $10.09 per acre)*
property taxes	$ 59, 949	
Total costs	$4,977,682.20	*see appendix for details

Mitigation is the second largest expense behind Salaries and related human resource expenses. Overall, mitigation represents 25% of total expenses for the fiscal year ending June 2010. Given the importance of mitigation activities in the RCRCD programs, it is useful to break the total costs in Table 1 down into $/acre allocations. Based on analysis of program materials, audited financials, and accounting records, **$5903.88 in total costs per acre** are allocated for mitigation.

BENEFITS

Estimating the value of conservation efforts, land and water management programs, and educational programs of the District is challenging due to the very nature of environmental resources. These resources have value by virtue of the their existence (since some cannot be replenished), by virtue of their use and enjoyment and also by virtue of the fact future generations will most certainly be made worse off if the stock of these resources is depleted or the quality of the stock is diminished. To be sure, accurately measuring the true value of open spaces, healthy water supplies and ecosystems is in some sense impossible. Economists use models to estimate the non-market portion of the benefits generated from these resources. Depending on the scope and time constraints, a variety of approaches can be implemented (Contingent valuation models, Hedonic Pricing Models, Travel Cost Methods, Productivity Models, and Market Pricing for example).

This report is based on GIS analysis of District assets, Market Pricing and Hedonic Pricing Model approaches to establish a baseline total benefit figure including both market and non-market values. There is great potential for additional research of the non-market portions of the District's efforts. A proposal for this additional research is included in the Appendix.

Mitigation

Mitigation was identified as the most important contribution of the District in a meeting with the District Manager and Board members. Table 2 summarizes the benefit estimates from the District's mitigation activities.

Table 2		
Market value mitigation	$28, 234.68/acre	(Easement holdings as of 6/2010)
Non-market value mitigation	$2,143.73/acre	(GIS analysis and basic pricing model)
Total value mitigation	$30,378.41/acre	
Marginal value mitigation	$24, 474.53/acre	(Per acre benefit in excess of cost)

Other Programs

For purposes of this project, the Land and Water Management, Habitat Restoration and Education activities of the District are combined for estimation of benefits and costs. Clearly there are spillover effects of these different programs. For example, improved irrigation practices affect water consumption and soil viability. Restored habitats influence water sources and land uses as well. Education activities link all of these areas to the extent households and firms respond with changed behaviors. Ideally, each of the unique contributions would be estimated separately. However, given the time and resource constraints a benefit-transfer approach has been utilized to estimate combined benefits and costs overall.

Table 3 summarizes the benefit and cost information based on the estimates detailed above for the previous fiscal year end.

Table 3 Benefit-Cost Other Programs:

Table 3			
Total Benefit	$ 83/eco. serv. acre*		
Total Cost	$73.42/eco. serv. acre		
Marginal value	$9.58/ eco. serv acre	*benefit-transfer method	

Using the benefit-transfer method, benefits of these activities translate into $83 per acre of ecosystems service and costs translate into $73.42 per ecosystems service acre. The marginal value of these combined efforts is $9.58 per ecosystems acre.

Although it presents some practical and conceptual challenges, it is useful to aggregate these benefits and costs to present the overall net benefits for RCRCD. Not every service provided by the District translates into benefits per acre of land. However, by assuming positive spillover effects can potentially benefit households and firms within a reasonable area of the District's boundaries the benefits can be summed together. Table 4 presents the summarizes the marginal value and benefit-cost results.

Table 4

Table 4	Current year	Net Present Value*	
Marginal value mitigation	$24, 474.53/acre		
Marginal value other programs	$9.58 / eco. sys. acre		
Total marginal value	$24, 484.11/ overall acres	$40, 937.09	
Benefit/Cost	5.10	6.20	*10 year horizon

EXTENSIONS

Finally, current conservation efforts create benefits that potentially extend beyond the current period. Assuming a 10 year horizon (which is conservative by peer-reviewed scholarship) the Benefit/Cost ratio above increases to 6.20.

It should be noted and emphasized that with more time (and resources) estimates of the benefits--particularly the non-market values--would more than likely adjust upwards. Although costs would increase under a 10 year time horizon, a survey of the labor market trends, capacity utilization rates, and overall condition of resource markets indicate benefits would increase at a greater rate than costs.

As the District continues its education efforts through the Land Use Learning Center and Plant Materials Centers Programs increased non-market benefits are expected. These type of benefits are best estimated using some type of Contingent Valuation method. Although some inferences can be made through revealed preference modeling, it has been shown that CV studies are better suited to capturing non-use values and benefits. Thus, it may serve the District well to undertake more comprehensive studies in the future.

Appendix

METHODS

Of the variety of methods available for the estimation of environmental benefits, a **Market Price** method was adopted together with the Benefit-transfer method. GIS analysis of the RCRCD's area together with Hedonic Pricing Models were utilized to generate an observed or "revealed preference" for environmental quality through conservation and restoration activities. Specifically, Census 2010 data, Dominant Tapestry data, Household Expenditures data (from a spending Potential Index--SPI--developed by esri) are included in the modeling process.

Benefit-transfer takes advantages of available estimates of benefits from other published studies to transfer or translate the benefits of the existing study. This method is only as good as the original study. However, in cases where the non-market valuations are difficult to obtain (i.e., public goods cases, spillover effects, time and labor intensive conditions), this approach is widely used. This project draws on the published study of Loomis, et al (2000) where $/ acre benefits were estimated for a variety of ecosystem services generated from conservation easements, mitigation, habitat restoration, and land/water management practices.

Opportunity cost of the 9.5 acres of land where the District is located surveying the Business sectors, zoning, capacity utilization rates, and residential housing demographics in a 15 miles radius of the facility. The CoStar Industrial Report data revealed a range of current rental rates for the land and/or facilities. These were averaged with the potential residential housing values (per sq. foot) that could potentially exist if the the land were sold, re-zoned, and developed for housing. This average of $10.09 per square foot assumes flexibility in rezoning for either industrial or residential purposes.

Proposal for future and/or additional research

Should the RCRCD desire, the results of this benefit-cost analysis could be tested via alternative modeling methods. With a longer time horizon (six months to a year), a Contingent Valuation Model could potentially be developed drawing on survey data collected and analyzed. There are at least two possibilities for moving forward. First, the consultant could contract under similar terms to complete the additional modeling. Second, with student involvement from the University of Redlands (and potentially other campus programs) and under the direction/supervision of the consultant, the research could be undertaken as an extension of the classroom experience. The second possibility provides additional learning opportunities for these students as well as other citizens in the District with similar interests.

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