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Investigation of Wildlife O&M Costs

Independent Economic Analysis Board

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Investigation of Wildlife O&M Costs

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Executive Summary and Conclusions

Introduction

The purpose of this task was to investigate operations and maintenance (O&M) costs for wildlife projects to further the cost-effectiveness goal of the Fish and Wildlife Program. The scope of this study explicitly did not include land easements or acquisitions, nor did it include fish projects. Wildlife projects were studied because of the perception that there are better measures for quantitative analysis, not because they are believed to be less cost-effective than other (i.e. fish) projects. In particular, wildlife project cost per acre can be measured and has been discussed as a possible basis for cost-effectiveness comparisons.

The investigation has proceeded on three independent paths: 1) exploring the potential use of wildlife project cost data from Pisces for cost benchmarking, 2) examining the availability and potential usefulness of other wildlife project cost data from the region, and 3) considering the application of cost management and economic incentives.

In summary:

- In its current form Pisces can provide useful information on relative costs of wildlife projects, but only at a very coarse level of resolution, and with caveats. More detailed, informed, and case-by-case comparisons are likely to be more accurate and useful.

- The IEAB recommends that project reporting and Pisces be modified to include 1) cost shares from other (non-BPA) sources by work element, and 2) the expected life of any investments expected to last more than 1 year. Other changes to Pisces may be justified.

- There are many wildlife projects in the region that are not part of the Fish and Wildlife Program that can provide useful cost and management information.

- There is potential for cost-effective changes to project contracting and management practices, but there are impediments to their implementation in some areas of the program.

Cost benchmarking with Pisces

Cost benchmarking refers to use of quantitative standards or points of reference for judging project costs. Cost benchmarking might be used in many different ways as part of the broad cost-effectiveness goal of the fish and wildlife program. Benchmarks might be used for screening project proposals, for performance evaluations, or for calculating allowable costs.

BPA's Pisces database was analyzed to determine if it could be used to develop cost benchmarking information based on an equation or a standard cost per acre for specific project types. The IEAB has previously investigated Pisces data for its potential value for cost benchmarking (IEAB 2006). That study found that

> There is great variation in the types of projects, their objectives, and local conditions that affect activities and their expected costs. For typical questions about benchmarking and cost-effectiveness, there are still project-specific and site-specific conditions that should be considered.

With help from BPA and the Wildlife Advisory Committee of the Columbia Basin Fish and Wildlife Authority (Wildlife Committee), Pisces and other data on 2006 costs and characteristics for over 30 wildlife projects were compiled and factors that affect costs were examined. Cost per acre was hypothesized to be inversely related to acreage, positively related to distance from urban areas, and affected by cover type. A statistical regression equation using acreage, habitat type and distance to population center to estimate the expected cost per acre of a project. Results generally confirmed the hypothesized relationships.

Some useful information is provided by the equation, but the application of the equation alone for formal cost-benchmarking must be discouraged. There are a number of known problems with the Pisces data for this application, including costs that are not reported and costs that are not annualized.

For all projects used in the sample, actual reported costs were compared to costs predicted by the regression equation. Most projects have unique conditions that cause the cost per acre predicted by the equation to be very different from the actual. For eleven out of 32 projects, the predicted cost per acre was less than 50 percent or more than 150 percent of the actual. For these projects, project managers provided eleven different reasons to explain these outliers, none of which suggested that the projects were more or less cost-effective.

For some projects the actual and predicted cost are similar, but this does not imply that the equation can provide accurate benchmarking. Table ES-1 shows costs per acre for five other representative projects that happen to have similar predicted and actual costs per acre. The statistical 95 percent confidence interval associated with the predicted costs is shown.[1] The confidence intervals indicate that there is a wide range of cost per acre to be expected even for projects that may have similar actual and predicted costs per acre. This wide range between confidence bounds means that the regression is not very good at predicting cost per acre if we require much confidence in our estimates.

Table ES-1.
Cost Per Acre Measures (No Acquisition or Easement) for Five Projects of Different Size and Habitat Types

			2006 Cost Estimates, $/Acre			
					95% Confidence Bounds	
Wildlife Project Name	**Acreage**	**Habitat Type** [1.]	**Actual**	**Predicted by Equation**	**Lower**	**Upper**
Lower Yakima Valley Riparian/Wetland Rest.	21,000	RW	$28.41	$23.64	$6.63	$98.64
Asotin Wildlife Area O&M	10,105	SG	$13.43	$15.17	$4.53	$58.59
Southern Idaho Wildlife Mitigation	6,681	EFM	$74.32	$51.74	$15.45	$203.82
Wanaket Wildlife Area	2,817	DW	$64.28	$79.51	$24.31	$299.88
Hangman Creek Wildlife Restoration	1,100	RW	$141.45	$152.42	$46.65	$575.75

[1.] RW = Riparian/wetland, EFM = Eastside forest/meadow, DW = desert wetland, SG = shrubsteppe/Grassland

Given the current status of Pisces data, cost benchmarking for wildlife projects using Pisces data, i.e., judging a project largely on the basis of its Pisces cost per acre compared to a cost standard or results of an equation, can not be recommended. There is too much potential for erroneous conclusions. Any one project may have unique features that make it non-comparable to the Pisces projects. For most projects, there does not appear to be a group of similar projects that could provide a cost per acre for an accurate comparison. Projects included the Pisces data set may not be cost effective, or they may be under-funded, so they should not be used to judge other projects for cost effectiveness.

Also, general cost benchmarking could have unintended consequences that could lead to inefficient funding requests. For example, benchmarks might be viewed as allowable costs that would be requested even if actual expected costs were less.

The IEAB does recommend that, for any subject project, detailed project-by-project comparisons might provide useful information for cost-effectiveness analysis. Projects may be comparable if they have the same goals and site conditions. There may be a project or even a group of projects that are similar to the subject project, or some project

[1] A confidence interval provides an estimate of the probability distribution of the estimates based on the "tightness of fit" provided by the regression equation.

cost components may be comparable across projects even when other cost components are not. The equation might be useful, but only if combined with detailed project-specific information and a list of important factors that may increase or decrease costs (Table 1, for example).

Also, a project cost might be benchmarked by reference to its own costs, either in the past or as planned. This type of benchmarking might be used with incentives to achieve more cost effective spending. However, some projects are already under-funded. Also, changes in cost structure within a project from year to year are common; for example, if it is transitioning from restoration to maintenance or if a large capital replacement cost was required. Again, detailed understanding of each project is the only appropriate basis for cost efficiency considerations.

The IEAB recommends two changes in the Pisces data base that would improve its usefulness for cost analysis. Pisces does not include two types of important data needed to estimate annual cost.

1. Only the share of costs paid by BPA is included. The costs paid by others and the associated work element should be included.
2. Information on the expected life of investments is not included. The expected life of investments should be included for any investment with an expected life of more than one year. This information would also help the Program predict future funding needs.

The IEAB recommends that these data should be reported and included in Pisces or some other accessible format.

Four other potential Pisces improvements were considered. More detailed analysis is needed to determine if additional cost is justified to modify reporting requirements and Pisces to implement these improvements. The more detailed analysis might identify changes that are smaller in scope and cost that would be useful.

3. Some of the Pisces work elements include a large variety of types of activities. More disaggregation of these work elements may be useful, but it is not clear that the additional cost would provide much more opportunity for analysis. The detailed analysis would determine the share of Program costs that involve those work elements that include a wide range of activities and the potential for a disaggregation to provide useful cost comparisons.

4. The disaggregation of costs currently provided by BPA is not accurate enough for economic analysis. For this analysis, BPA attempted to differentiate costs by grouping work elements into habitat maintenance, habitat enhancement, and other activities - environmental compliance, planning and coordination, project administration, acquisition and easement, and other – but this exercise did not provide accurate accounting. The detailed analysis would investigate alternative ways of categorizing and reporting cost data and decide if changes are justified.

5. The Pisces data do not differentiate costs for enhancement versus maintenance. The potential reporting costs of accurately differentiating maintenance from enhancement could be large. There is currently a policy question regarding how existing habitat units should be counted toward BPA's mitigation requirement. If maintenance and enhancement habitat units are counted equally as BPA has proposed then there is little reason to differentiate among them. The detailed analysis would determine if there is an important reason to differentiate habitat units created by maintenance or enhancement and, if so, the potential costs and accuracy of methods to split costs.

6. Pisces costs are not linked to habitat units. Pisces will report measured habitat units. However, some enhancement requires large time lags to achieve and the link between specific activities and habitat units is often indirect. Any attempt to assign habitat units to activities would be an estimate at best. The detailed analysis would determine the potential costs and accuracy of methods to associate activities and their costs with habitat units.

The work required to implement 3 through 6 would result in increased costs for BPA and for project managers to collect and report data. On the other hand, it is not clear that the resulting data would be very useful or accurate. The detailed analyses would examine these trade-offs.

Use of wildlife project cost data from other sources

There are many other wildlife projects in the region managed by State and federal agencies and non-governmental organizations (NGOs). Data were collected from these managers and compared to the BPA project data. Some projects are not similar to the BPA projects in that they are managed as cropland for waterfowl, or they emphasize recreation or education, or they do not have an enhancement objective, and there are many more unique characteristics.

Taken together, the other projects provide a useful addition to the information base for comparison. Table ES-2 provides a summary of these sources and a finding with respect to average costs and costs compared to BPA wildlife project costs. The first row of the table labeled BPA/IEAB is the Pisces based data discussed in the first section of the paper. Very generally, cost data from these projects suggest that BPA wildlife project costs are not far out-of-line. However, detailed analysis as discussed above would be required to obtain more robust conclusions.

The IEAB believes that the set of potential projects for comparison with BPA projects could include the projects managed by federal and state wildlife agencies and NGOs. Again, cross-project cost comparisons should be detailed and handled on a case-by-case basis.

Table ES-2.
Summary of Wildlife Cost Data from Other Agencies and Sources

Data Source	Number Projects in Sample	Average Acreage of Projects	Average cost, 2004$ Per acre	Comparable to BPA wildlife data?	Finding Relative to BPA data
BPA/IEAB	32	9,746	$24	NA	NA
ODFW	12	11,894	$24	Yes	Similar cost structure
WDFW	26	30,098	$11	Somewhat	Lower cost per acre for similar projects, not much O&M yet
COE	15	949	$38	No	Most have crop production for waterfowl feed
CNLM(2004) survey data	10	3,511	$104	Somewhat	Larger cost per acre for similar projects, but no shrub-steppe and more public
IEAB land trust survey	8	14,579	$14	Yes	Similar cost structure

Cost management and incentives

The IEAB has engaged wildlife project managers and others to develop general ideas and subjective analysis about some alternative ways to achieve more cost effective O&M spending. No formal analysis has been conducted, but several concepts deserve more consideration. There is a range of experience and approaches in the region. More empirical analysis of various funding mechanisms might be useful.

Annual contracting and inflexible spending rules can be a disincentive to efficient spending. Each year there may be incentive to “spend it or lose it.” From the managers’ perspective there is no incentive to save funds because unspent funds are lost to the project. Wildlife projects need to be able to adjust to unforeseen conditions in the field. However, under current spending rules, managers have little incentive to change budgeted spending patterns that are no longer efficient.

The annual contracting process might be modified to allow more flexible spending to achieve efficiency. Longer duration budgets, carry-over of funds and more flexible fund allocation among project costs might allow projects to create and capture more efficiency gains.

Settlement agreements resulting in a trust fund provide managers the maximum flexibility to adjust spending according to conditions. However, there can be a lack of accountability regarding how funds are spent and there are significant risks that the funds and/or the habitat may be mismanaged.

There are a number of middle courses between annual contracting and settlement agreements that provide accountability, flexibility and an incentive for savings. Project contracting could move to a 2 or 3-year cycle. Perhaps the longer cycle could be provided for projects with a history of good performance. Projects that are unable to meet their budget and performance goals might be returned to the annual contract system. Less frequent contracting would reduce the amount of time required for contract planning and preparation and could thereby provide more cost savings.

Benefits to the Fish and Wildlife Program could be realized if funds contracted for a specific purpose could be used for more cost-effective methods that accomplish the same ends. Annual contract savings could be allowed to be carried over to the following year for priority purposes.

The Fish and Wildlife Program would also benefit from the development and implementation of more incentive systems to encourage cost-effective behavior by fish and wildlife project managers, employees and contractors. For example, allowing projects to capture some of the savings for project use could provide an incentive for cost savings within projects. However, there are significant institutional barriers to new incentive structures.

There are two general types of incentive systems: compensation-based and competition-based. Compensation based systems require a performance standard or criterion to be used as a baseline. Incentives are then paid based on a comparison of actual performance with the performance standard.

For reasons previously discussed, performance standards should not generally be based on other projects, though case-by-case comparisons will often be useful. Rather, performance standards should be based primarily on a projects' own performance, either in relation to the past, or as planned. Own-performance standards may include past or planned technologies or methods as well as costs. Incentives are then paid based on a comparison of actual performance with the past or planned performance.

There are major impediments to using incentives for some wildlife projects. Most wildlife projects are implemented on State or tribal land. Under Bonneville Purchasing Instructions section 11.7.1.2. BPA does not normally seek competitive bids from wildlife areas on State or tribal lands. Compensation for State or tribal employees and competitive bidding rules are determined by State and tribal standards, not BPA or federal standards.

Still, competition-based incentives could be implemented at several levels.

1. BPA could request proposals and bids for existing and new projects targeted to high-priority habitat, and BPA would select among projects that provide habitat units or acreage at the lowest unit cost.
2. BPA might request proposals for project management on existing wildlife projects. This option would not work for existing projects on State and tribal lands.

3. Project managers could be required to seek more competitive bids for more of their wildlife management activities. Possibly the existing project staff would be able to bid for the work as well. This incentive could probably only be implemented when contracts are renewed.

All of these options have some potential to reduce program costs. More use of competitive bidding is likely to be more successful in combination with manager incentives, increased spending flexibility and longer-duration budgeting. A variety of possible contracting terms and conditions are discussed in the main report.

Finally, some efficiency savings might be possible by combining some wildlife projects, by combining some project management activities from similar projects, or by more sharing of project resources. The analysis of BPA project costs suggests a strong economy of scale factor. Small projects that are similarly located and have similar management needs might be combined to achieve the economy of scale. Additional research might help to identify specific costs that could be reduced by project combinations and the types of combinations that would be most successful.

Investigation of Wildlife O&M Costs

Introduction

The purpose of this task was to investigate O&M costs for wildlife projects to help develop better ways to further the cost-effectiveness goal of the fish and wildlife program. Implicitly, the cost-effectiveness goal is to reduce cost while maintaining or increasing habitat values. More cost-effective O&M spending would allow total spending to be reduced or more funds could be applied to other projects and other program objectives.

Our focus on wildlife projects does not reflect a belief that these projects are more or less cost-effective than other (i.e. fish) projects. Rather, our interest in wildlife projects occurs primarily because some historic data exists on wildlife project costs, this data has been discussed as a possible basis for cost benchmarking and cost-effectiveness comparisons.

The scope of this study explicitly did not include land easement or acquisition costs, nor did it include fish projects. However, lessons learned from the wildlife projects could help promote cost-effectiveness of fish projects. Some types of costs incurred − certain improvements in riparian areas, for example − are the same for fish projects as for wildlife projects.

The investigation has proceeded on three independent paths: 1) potential for Pisces wildlife project cost data to be used for cost benchmarking, 2) potential use of other wildlife area cost data from the region, and 3) cost management and economic incentives.

Task 1.

Analyze existing cost information from 2006 projects and investigate the extent to which sources of variation in ongoing costs can be identified and quantified

The purpose of this sub-task was to investigate data from Pisces to see if useful cost benchmarking standards could be developed.

Cost-effectiveness analysis is hard to apply to the Fish and Wildlife Program because there are few unambiguous measures of success. For wildlife mitigation, habitat units are the preferred measure, but there are disagreements about the counting of habitat units supported by maintenance, there are lags between land management and habitat response, and there is no method for aggregating or comparing habitat units over different species. This report focuses on habitat acreage as a potential measure of wildlife habitat. Habitat units may provide better measures for cost-effectiveness analysis in the future.

CBFWA Wildlife Committee O&M White Paper

The CBFWA Wildlife Advisory Committee (Wildlife Committee) developed a white paper for the IEAB titled “Discussion of Factors Affecting Operations and Maintenance

Costs Associated with Wildlife Mitigation Projects Implemented under the Northwest Power Planning and Conservation Act of 1980 (Scheeler and Pope, 2007). The paper describes many reasons why O&M costs differ among projects.

> "Individual mitigation projects are dispersed throughout the Columbia Basin and have diverse characteristics including size, approach, ecology, implementing agency, and other factors that may affect costs. . . These elements work separately and synergistically to cause cost variations. The complex nature of these interactions may make standardization or bench marking of mitigation costs impractical and inefficient. While standardization may be accomplished through the development of "reasonable" or "target" cost ranges for particular activities, those ranges may be so wide as to make the value of the exercise questionable."

The paper concludes with a summary of factors that affect O&M costs. This summary is reproduced in Table 1 below. The IEAB has met with Wildlife Committee representatives on several occasions and many of the concerns expressed in their white paper are addressed in the discussion which follows.

Data Revision and Grouping Exercise

The IEAB worked with BPA and the Wildlife Committee to analyze wildlife project data contained in the Pisces database. Pisces is a computer program developed by BPA's Fish and Wildlife Division to improve management of Fish and Wildlife projects, and to improve the ability to report information about the Fish and Wildlife Program. Pisces is a project management tool and was not directly designed to provide data for economic analysis.

BPA extracted 2006 data from Pisces and developed a procedure to aggregate from Pisces work elements to broader cost categories. BPA provided these data to the Wildlife Committee whose members provided letters to Council Staff regarding potential corrections and improvements. The IEAB reviewed the comment letters and suggested some changes to BPA staff. One consistent theme of these letters was that the aggregation of work elements to broad cost categories (maintenance versus enhancement in particular) was erroneous. The members noted their accounting systems did not differentiate between work for maintenance and work for enhancement so BPA's proposed aggregation could not accurately differentiate between these two activities. Therefore, the IEAB and the Wildlife Committee agreed that the best indicator for cost should include BPA's "maintenance" and "enhancement" categories. For the analysis we evaluate "total cost exclusive of easement or acquisition costs." Easement or acquisition costs include costs of pre-acquisition activities as well as land costs.

A summary of these data, sorted by acreage is provided as Table 2. Average 2006 cost per acre in 2004 dollars exclusive of acquisition and easements costs was $24. Average parcel size was 9,746 acres. The costs do not include some funds provided by other agencies, so the actual costs per acre are higher. The amount of funds provided by other agencies is not believed to be large relative to the BPA contribution.

Table 1.
Summary Outline of Cost Factors from Attachment A of "A Discussion of Factors Affecting Operations and Maintenance Costs Associated with Wildlife Mitigation Projects Implemented Under the Northwest Power Planning and Conservation Act of 1980"

1. Mitigation Goals, Objectives and Strategies
    a. Habitat types based on loss assessments establishing mitigation obligations
    b. Protection vs Restoration/Enhancement vs Conversion
    c. Degree of self sustaining and naturally functioning ecologies inherent in project
2. Project Site Specifics (many are mitigation obligation driven)
    a. Topography
    b. Soils
    c. Climate
    d. Project size
    e. Project continuity and configuration
    f. Existing habitat types and conditions (note link to mitigation objectives)
    g. Travel and access infrastructure
    h. Adjacent land use and condition
    i. Other peripheral threats
    j. Distance to implementing agency facilities
    k. Distance to major population centers
    l. Local Economies
    m. Surrounding and overlaying jurisdictions (local, state, federal, tribal)
    n. Cultural Resources
    o. TES Species
    p. Environmental Hazards
3. Implementing Agency (efficiency and approach)
    a. Indirect rate
    b. Organizational structure
    c. Job Classifications and requirements
    d. Staff seniority
    e. Management philosophy/mandates
    f. Existing institutional protocols
    g. Inherent capacities and authorities
4. Financial Resources/Rate of implementation
    a. Initial restoration/enhancement funding levels
    b. Funding availability/prioritization and affect on baseline management plan funding
    c. Funding vehicles (trusts, funding streams, annual appropriations)

The data suggest that, as project size increases, BPA cost per acre generally decreases. There are many reasons for this, only some of which are related to economies of scale. Taken together, the projects appear to have some cost components that are not much affected by acreage. Some of the large acreage projects have habitat types or purposes that do not require intensive management. Some of the larger projects may not be funded at levels sufficient to provide the quality of management that is obtained on some of the smaller projects.

Using Table 2, a very general description can be provided regarding the range of costs to be expected for different project sizes and types. This general description should not be used for cost benchmarking. Large (10,000 acres plus) projects on shrub-steppe/grassland or watershed projects typically have costs in the range of $5 to $20 per acre per year. Medium sized projects (5,000 to 10,000 acres) of these types have costs in the $20 to $40 range, but there are just a few observations. Projects in this size range that are not steppe/grassland or watershed projects typically have costs in the $25 to $100 per acre per year range, but again there are few observations. There are no shrub-steppe/grassland or watershed project types less than 5,000 acres and there are no projects at all in the range of 3,000 to 5,000 acres. Below 3,000 acres, projects greater than 900 acres typically cost $50 to $300 and projects less than 900 acres are typically $100 to $800 per acre per year.

The Wildlife Committee suggested ways to group projects into categories that might affect observed costs (Pope 2007). Three grouping schemes were recommended; 1) based on size, 2) based on cover type, and 3) based on proximity to population centers, to capture cost factors.. The projects were grouped into six cover types; riparian wetland, desert wetland, shrub-steppe grassland, eastside forest/meadow, wetland/upland prairie/riparian, and watershed. Distances to towns or cities were provided (Pope, 2007).

Econometric Analysis

Statistical analysis can be used to summarize important sources of variation in the cost data based on the hypothesized sources of variation as provided by the Wildlife Committee. Across projects, a simple examination of the data shows that cost per acre is obviously negatively related to total acreage. Wildlife projects may have a large fixed cost component so average cost per acre declines as the fixed cost is spread over more acres. With this cost structure, cost per acre and acreage is best described by a logarithmic function. The adjusted R-square of the simple regression of the log of cost per acre on log of acreage is 0.78. The coefficient on the log of acreage is highly statistically significant. This function is shown as a solid line in Figure 1.

Information about the cover types does not explain much more of the variation in cost per acre over the acreage alone. Preliminary analysis indicated that only the shrub-steppe and watershed cover types taken together are significantly different from the other types. A dummy variable for the shrub-steppe/grassland and watershed cover types is significant ($p = 0.03$). The distance variable explains little more of the variation. A log of distance variable is almost significant, so it is retained in the selected equation. With the cover type dummy variable and the log of distance included the adjusted R-square for this multiple regression increases to 0.83. The F-statistic for the equation is 50.2.

Table 2. 2006 Data for Statistical Analysis of Wildlife Project Costs (No Easement or Acquisition Costs), 2004 dollars

Project Number	Project Title	Project Sponsor	Habitat Type 1.	Total Cost per Acre without Acquisition/ Easement	Acreage Managed Under the Project	Distance to Nearest Population Center
1990-044-01	Lake Creek Land Acquisition	CDAT	RW	$640	150	20
1995-057-01	Southern Idaho Wildlife Mitigation	IDFG	EFM	$96	166	10
1992-061-00	Albeni Falls Wildlife Mitigation	KTOI	EFM	$856	211	120
2000-016-00	Tualatin National Wildlife Refuge Additions	USFWS	RW	$516	232	1
1991-078-00	Burlington Bottoms Wildlife Mitigation	ODFW	RW	$224	417	20
1992-059-00	Amazon Basin/Eugene Wetlands	TNC	WUR	$153	494	1
1991-060-00	Pend Oreille Wetlands Acquisition (Flying Goose O&M)	KT	RW	$157	600	60
2000-021-00	Ladd Marsh	ODFW	RW	$48	940	1
2006-003-00	Desert Wildlife Area O&M	WDFW	DW	$214	1,000	16
2001-033-00	Hangman Creek Wildlife Restoration	CDAT	RW	$156	1,100	40
1992-061-00	Albeni Falls Wildlife Mitigation	CDAT	EFM	$237	1,207	45
1992-068-00	Willamette Wildlife Mitigation	ODFW	WUR	$328	1,668	4
2000-009-00	Logan Valley Wildlife Mitigation	BPT	EFM	$39	1,760	40
2003-012-00	Shillapoo Wildlife Area	WDFW	RW	$64	2,371	1
1992-061-00	Albeni Falls Wildlife Mitigation	IDFG	EFM	$161	2,739	90
1990-092-00	Wanaket Wildlife Area	CTUIR	DW	$68	2,817	25
1992-061-00	Albeni Falls Wildlife Mitigation	KT	EFM	$111	2,995	100
1995-057-02	Southern Idaho Wildlife Mitigation	SBT	EFM	$64	5,013	50
1995-060-01	Iskuulpa Watershed Project	CTUIR	WS	$26	5,937	25
2000-027-00	Acquisition of Malheur Wildlife Mitigation Site	BPT	SG	$36	6,385	60
1995-057-00	Southern Idaho Wildlife Mitigation	IDFG	EFM	$79	6,681	50
2002-014-00	Sunnyside Wildlife Mitigation	WDFW	RW	$25	8,391	6
2000-026-00	Rainwater Wildlife Area	CTUIR	WS	$24	8,678	20
2006-005-00	Asotin Wildlife Area O&M	WDFW	SG	$14	10,105	14
1994-044-00	Sagebrush Flat Wildlife Mitigation	WDFW	SG	$19	10,171	15
1996-094-01	Scotch Creek Wildlife Mitigation	WDFW	SG	$18	15,469	11
1996-080-00	NE Oregon Wildlife Project (Precious Lands)	NPT	WS	$23	16,286	80
1991-061-00	Swanson Lakes Wildlife Area O&M	WDFW	SG	$10	20,065	52
1992-062-00	Lower Yakima Valley Riparian/Wetland Restoration	YN	RW	$33	21,000	30
1998-022-00	Pine Creek/Wagner Management	CTWSI	WS	$4	33,557	120
1992-048-00	Hellsgate Big Game Winter Range	CCT	SG	$11	54,600	70
2006-004-00	Wenas Wildlife Area O&M	WDFW	SG	$2	74,020	7
Data not currently usable for analysis			Average	$24		
1992-068-00	Green Island Willamette Wildlife Mitigation	ODFW	WUR	Pisces does not provide data for each	856	4
1992-068-00	Big Island Willamette Wildlife Mitigation	ODFW	WUR		54	1
1992-068-00	Muddy Creek Willamette Wildlife Mitigation	ODFW	WUR		220	1
1998-003-00	Spokane Tribe Wildlife Mitigation	STOI	No data	$39	4,377	no data

1. RW = Riparian/wetland, EFM = Eastside forest/meadow, WUR = Wet/Upland Prairie/Riparian, DW = desert wetland, WS = watershed, SG = shrubsteppe/Grassland

The selected regression equation is:

1. Log(Cost/Acre) = 3.84 - 0.6138Log(Acres) - 0.3462(SG or WS) + .15Log(Dist) where

- Cost/Acre is the 2006 project cost per acre, not including acquisition or easement costs, in 2004 dollars
- Acres is the project acreage as corrected by BPA as of April 2007
- SG or WS = 1 if the land is shrub-steppe/grassland or watershed, 0 otherwise.
- Dist = Distance to nearest population center in miles

The standard errors for the coefficients on the log of acreage, the cover type dummy, and distance are 0.092, 0.139 and 0.077, respectively.

The regression can predict an expected cost per acre for any parcel based on acreage, cover type and distance from population center. Actual and predicted cost per acre is plotted in Figure 1 below. Figure 1 also shows results of the simple regression. The variation explained by cover type and distance can be seen as the difference between the actual and predicted data points relative to the simple regression.

Figure 1. Actual Cost per Acre and Acreage, Predicted Cost per Acre at Each Acreage, and Simple Regression of Cost per Acre on Acreage

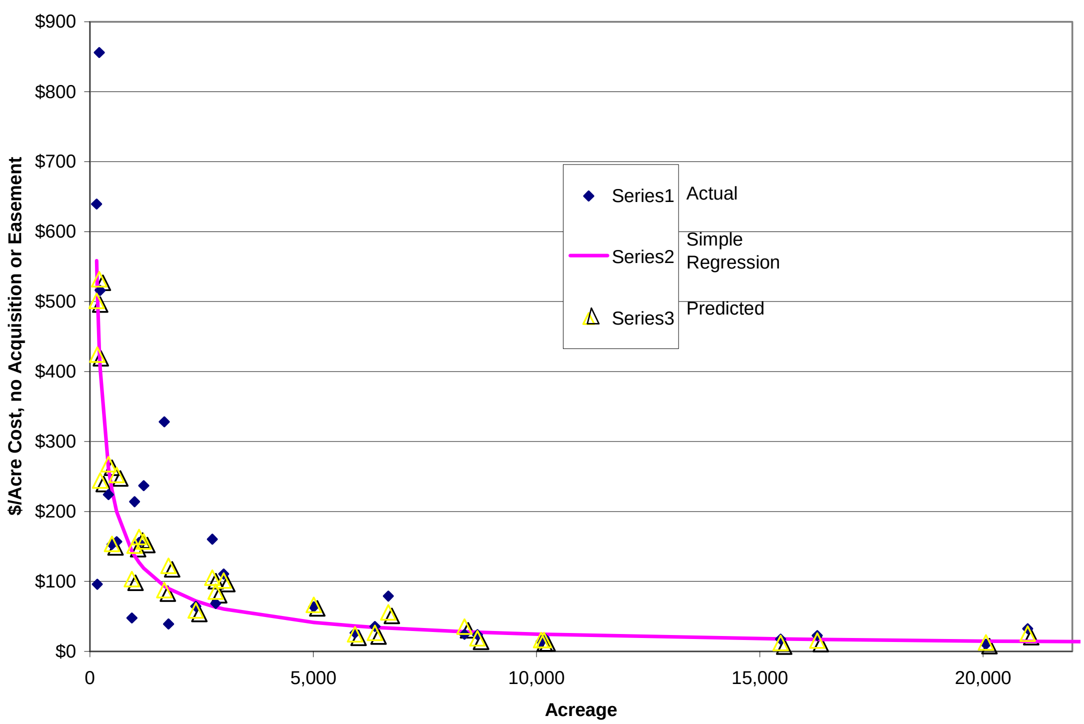

Table 3 shows projects that have an actual cost per acre more that 150 percent of the predicted value, and projects with an actual cost less than 50 percent of the predicted value. Reasons why these projects may be more or less costly per acre than predicted by the regression equation were provided by project managers. The large number of different factors mentioned reflects the large variation in conditions under which these projects operate. Managers also mentioned issues concerning the accuracy of cost data.

For the Willamette and Tualatin Projects:

> Most of the projects in the Willamette are in restoration or enhancement phases hence the higher management and treatment costs. Additionally the Willamette is faced with some unique climatic (moderate year-round growing seasons) factors and anthropogenic factors that require more maintenance and operations costs for restoration projects. The year-round growing season and wet climate results in a serious battle to contain and eradicate invasive plants including reed canary grass, blackberry, Japanese knot weed, etc. Additionally, there is an extensive seed bank (in the soil) of grassy exotics (bent grass, velvet grass, etc.). Most of the projects involve land that was disturbed through farming activities for over 70 years so the conversion to native conditions may require 3-10 years of intensive pro-active management. Additionally, many of the projects involve some wetland component and the cost of such work is very high in the Willamette. Additional factors are the cost of native seeds. The native Willamette species are very difficult to cultivate and grow commercially for restoration work. Also many of the project sub-contractors are learning as they go because the methods for the restoration work are fairly new and untested (Pope 2007c).

Table 4 shows costs per acre for all other projects in the sample and the statistical confidence interval associated with the predicted costs is shown. The confidence intervals show that, even if the predicted cost happens to be close to the actual cost, there could still be a wide range of cost per acre to be expected if a high level of confidence is required.

For example, suppose that we wished to estimate the expected cost per acre for a project with the same acreage, cover type and distance as the Asotin Wildlife Area. The regression equation would predict a cost per acre of $15.17, quite close to the actual Asotin cost per acre of $13.43. However, the confidence bounds for this estimate indicate that we can only be 95 percent confident that the cost per acre should be between $4.53 and $58.59, a very wide range. Even if less confidence is accepted the range in potential costs is still large.

Findings

This investigation concludes that there is no simple set of numbers or an equation that can be used for cost benchmarking without substantial potential for error. Table 1 showed that there are many reasons for the large variation in project costs. Only three of these reasons (size, habitat type and distance) have been included in the regression equation. There are many other variables that affect wildlife project costs (Table 1) for which data are not readily available. Furthermore, the data as provided by Pisces and developed for the statistical analysis has a number of known deficiencies. Still, case-by-case comparisons are recommended and are discussed under Task 3.

Table 3.
Projects with Actual Cost per Acre More than 150 Percent or Less than 50 Percent of Predicted, and Possible Reasons Why

Project Title	Total Cost per Acre without Acquisition/ Easement	Predicted Total Cost per Acre without A/E	Actual as a Percent of Predicted	Possible Reasons Why Actual 2006 Cost/Acre is More or Less than Predicted
Willamette Wildlife Mitigation	$328	$88	373%	See text above
Tualatin National Wildlife Refuge Additions	$516	$244	211%	
Albeni Falls Wildlife Mitigation	$856	$532	161%	211 acre project, Altered natural systems, and complex administrative/management issues (Soults, 2007)
Hellsgate Big Game Winter Range	$11	$7	158%	Properties were never prepared prior to acquisition and boundary fences, surveys, assessments etc., had to be completed while operation and management activities took place. (Berger 2007).
Albeni Falls Wildlife Mitigation (IDFG)	$161	$106	152%	This project is actually about 12 smaller parcels, five of which are just in one contract, Pond Oreille. (Factor 2e, Table 1). Complex management with neighbor issues; need good fences. Weed control, fencing, access management are expensive. On Boundary Creek project, expensive wetlands restoration on former agricultural land (Servheen 2007)
Albeni Falls Wildlife Mitigation (CDAT)	$237	$157	151%	Benewah Creek, which is actually a fisheries project, is included. Two miles of stream, very high cost/acre for re-grading, recreating floodplain, etc. Costs were compressed into 3 years rather than about 10. (Mikkelsen 2007)

Table 3. Continued				
Project Title	**Total Cost per Acre without Acquisition/ Easement**	**Predicted Total Cost per Acre without A/E**	**Actual as a Percent of Predicted**	**Possible Reasons Why Actual 2006 Cost/Acre is More or Less than Predicted**
Wenas Wildlife Area	$2	$4	47%	Not adequately funded for the size of the project. A couple of important work element costs may not have been reported by Pisces. They are not "on the ground" funds, but they are critical for the operation and maintenance of the wildlife area. State of Washington pays Payment In Lieu of Taxes (PILT), not paid by BPA. This would add another $59K onto the numerator.(Pamplin, 2007)
Ladd Marsh	$48	$103	46%	O&M costs are shared with project partners. Project has recently had success in acquiring follow-up restoration funding from various non-BPA sources. This funding has been used to offset costs of seed and vegetation management and may not continue into the future (Nowak 2007).
Pine Creek/Wagner Management	$4	$11	42%	BPA has not approved a management plan for the project and until one is approved, little funding will go to O&M.
Logan Valley Wildlife Mitigation	$39	$123	32%	The Logan Valley Wildlife Mitigation Site is in a maintenance phase. The pristine nature of this project reduces maintenance costs as weed infestations are of minimal concern. Enhancements continue but are completed with funds other than those provided by BPA and are therefore not tracked in Pisces. In addition, personnel and equipment sharing between this project and the Malheur River Wildlife Mitigation Site has helped to reduce costs.(Speten 2007)
Southern Idaho Wildlife Mitigation	$96	$424	23%	This plot “the Krueger Property” of 166 acres is managed as part of Boise River Wildlife Management Area which is 33,000 acres total. The plot is accounted as a different “project” because it happens to fall in the Middle Snake region. Also, its actually shrub-steppe, not EFM (Servheen 2007)

Table 4.
Expected Costs (No Acquisition or Easement) for Projects of Different Size and Habitat Types

Name	Acreage	Miles to Population Center	2006 Cost Estimates, $/Acre Actual	Predicted	95% Confidence Bounds Lower	Upper
Lower Yakima Valley Riparian/Wetland Restoration	21,000	30	$28.41	$23.64	$6.63	$98.64
Swanson Lakes Wildlife Area O&M	20,065	52	$9.50	$12.08	$3.63	$46.48
NE Oregon Wildlife Project (Precious Lands)	16,286	80	$21.38	$14.66	$4.37	$56.71
Scotch Creek Wildlife Mitigation	15,469	11	$16.51	$11.25	$3.33	$43.25
Sagebrush Flat Wildlife Mitigation	10,171	15	$18.14	$15.26	$4.52	$58.31
Asotin Wildlife Area O&M	10,105	14	$13.43	$15.17	$4.53	$58.59
Rainwater Wildlife Area	8,678	20	$22.39	$17.57	$5.21	$67.22
Sunnyside Wildlife Mitigation	8,391	6	$23.18	$32.75	$9.53	$131.25
Southern Idaho Wildlife Mitigation	6,681	50	$74.32	$51.74	$15.45	$203.82
Acquisition of Malheur Wildlife Mitigation Site	6,385	60	$33.59	$25.03	$7.30	$96.67
Iskuulpa Watershed Project	5,937	25	$24.59	$22.97	$6.81	$89.18
Southern Idaho Wildlife Mitigation	5,013	50	$59.78	$61.78	$18.50	$239.17
Albeni Falls Wildlife Mitigation	2,995	100	$102.81	$94.17	$27.92	$364.45
Wanaket Wildlife Area	2,817	25	$64.28	$79.51	$24.31	$299.88
Shillapoo Wildlife Area	2,371	1	$60.37	$54.68	$15.54	$222.87
Hangman Creek Wildlife Restoration	1,100	40	$141.45	$152.42	$46.65	$575.75

Task 2.

Identify and acquire other sources of information on land management costs and describe why they can or cannot provide useful information for cost benchmarking for fish and wildlife program costs

This section reviews cost data provided by other wildlife agencies in the region and compares the projects and their cost data to the BPA projects and data.

Wildlife Habitat Incentive Program

The Wildlife Habitat Incentive Program (WHIP) provides technical assistance to landowners and cost-share payments through cooperative agreements for approved practices. Data on WHIP approved costs for Washington, Idaho and Oregon are provided in Appendix 1. These data do not represent actual prices paid; they are offer prices that may not be accepted by any landowners. There is substantial variation in types and dollar amount of reported costs by State. Still, these data may be helpful for cost comparisons involving specific items and custom work.

ODFW Wildlife Areas

Data were obtained from ODFW (Rickerson, 2007). ODFW personnel (Anglin, 2007) stated that funding levels in recent years have been inadequate for routine maintenance and some needed work has been deferred. Therefore, the costs in Table 5 below probably understate the amount needed to achieve the intended purposes. Average cost per acre was $24. Average parcel size was 11,894 acres. This cost per acre is about the same as the cost for the BPA Fish and Wildlife projects, for about the same size projects. The apparent economies of scale shown in the BPA data also occur in these data, resulting in similar costs for projects of similar size.

Table 5.
ODFW Wildlife Area Budget Summary, Average of 2005 and 2006 Data, 2004 Dollars, Areas with Designated Staff

Wildlife Area	Acres	Person-nel Services	Service & Supplies	Capital/ Contrac-tual	Total Budget	Total Cost/ acre
Jewell Meadows	1,117	$238,666	$143,355	$0	$382,021	$342
EE Wilson	1,683	$144,554	$67,530	$0	$212,084	$126
Denman	1,860	$78,894	$31,538	$0	$110,432	$59
Klamath	3,717	$123,880	$47,785	$573	$172,238	$46
Ladd Marsh	5,970	$135,453	$47,785	$0	$183,238	$31
Elkhorn	8,674	$227,355	$71,035	$71,678	$370,068	$43
Sauvie Island	12,000	$424,341	$170,540	$113,728	$708,609	$59
Fern Ridge	12,716	$112,788	$88,880	$0	$201,668	$16
Wenaha	17,087	$108,556	$62,338	$7,646	$178,540	$10
Summer Lake	18,677	$184,912	$82,171	$7,646	$274,728	$15
PW Schneider	25,000	$150,095	$91,138	$0	$241,233	$10
White River	34,224	$218,865	$144,939	$98,031	$461,835	$13
Average	11,894	$179,030	$87,420	$24,942	$291,391	$24

WDFW Wildlife Areas

Cost data for Washington wildlife areas in 2006, provided by WDFW, are displayed in Table 6 below (Dahmer, 2007). The following notes were provided with the data: The costs do not include capital budget dollars used for facility maintenance, repair, and replacement for fences, roads, gates, buildings, irrigation structures, fish passage structures, etc. The two-year (07/09) capital budget for wildlife areas statewide exceeds $5,000,000. The numbers also do not include administrative costs or grants that are regularly used to maintain and enhance the areas (RMEF grants, State Lands Restoration & Development grants, etc.). A very basic level of equipment costs is included.

Average property size is 30,098 acres and average cost per acre is $7.47. This includes indirect costs of $0.62 per acre. If capital costs are included, at an average of $2.5 million per year, cost per acre is $10.66. This cost per acre is about half of the BPA wildlife project costs, but the WDFW projects are more than three times larger on average. These projects appear to be less expensive than expected based on the BPA data. Perhaps some of the WDFW projects receive a low level of management compared to the BPA projects.

COE Lower Snake River Compensation Plan on-site lands

DeHerrera and Key (2002) compiled O&M cost data from Corps of Engineers (COE) O&M maintenance contracts for Wildlife Habitat and Structures in Southeastern Washington and Northern Idaho, and Wildlife Habitat and Structures for Lower Monumental and Ice Harbor Dams and McNary Lock and Dam. Data are provided in Table 7. Detailed data for these projects are provided in Appendix 2.

Average cost per acre with joint costs was $49. Average parcel size was 949 acres. These projects are generally intensively managed lands that produce food for wildlife. Most of the costs are O&M of irrigation systems on a small share of the acreage, or establishment of annual food plots on actively managed acreage. The cost per acre actively managed is $371. These projects are not generally comparable to the BPA projects.

FERC license mitigation requirements

Most if not all utilities with FERC-licensed hydropower projects have license conditions requiring the acquisition (through fee simple purchase or easement) of land to mitigate the effects of the hydropower projects on wildlife. Nationwide there are over 1,000 FERC-licensed projects as of April 2007, including 48 in Idaho, 18 in Montana, 26 in Oregon, and 52 in Washington. Cost data are not available in a standard format, but some observations about costs are below.

Table 6.
Washington Wildlife Areas Budget Figures and Cost Per Acre Calculations, 2004 Dollars

Wildlife Area or Activity	Acres	Total Funds with Indirect Applied, 2004$ [1.]	Cost $/Acre
Statewide O&M Activity Budgets			
Equipment Purchases		$122,070	
Vegetation Management Team		$215,792	
Grading		$30,257	
Weed Control		$113,766	
Subtotal [2.]		$481,885	
Individual Wildlife Area Budgets			
Desert [3.]	1,000	$195,920	$195.92
Shillapoo [3.]	2,371	$217,772	$91.85
St. Helens	2,941	$53,696	$18.26
Lake Terrell	3,814	$192,580	$50.49
S. Puget Sound/Scatter Creek	6,700	$104,694	$15.63
Wells	8,170	$236,004	$28.89
Sunnyside [3.]	8,391	$275,917	$32.88
Sherman Creek	9,396	$63,768	$6.79
Asotin [3.]	10,105	$148,777	$14.72
Sagebrush Flat	10,171	$214,275	$21.07
Olympic	10,364	$283,704	$27.37
Cowlitz	13,940	$283,568	$20.34
Klickitat	13,948	$102,791	$7.37
Scotch Creek [3.]	15,469	$248,530	$16.07
Wooten	16,000	$125,226	$7.83
Skagit/Snoqualmie	18,864	$333,844	$17.70
Sinlahekin	19,144	$216,436	$11.31
Swanson Lakes [3.]	20,065	$189,249	$9.43
Chief Joseph	22,900	$215,968	$9.43
Methow	31,000	$208,872	$6.74
Chelan	32,536	$114,331	$3.51
Oak Creek	47,200	$178,261	$3.78
Wenas [3.]	74,020	$293,800	$3.97
Colockum	91,603	$198,108	$2.16
L.T. Murray	100,442	$227,014	$2.26
Columbia Basin	192,000	$438,807	$2.29
Total	**782,554**	**$5,843,797**	
Average	30,098	$224,761	$7.47

1. Includes indirect costs at 28.89%. 2004 dollars are 2006 dollars times .939

2. $481,886 of O&M funding are allotted under statewide codes which are not captured when looking at individual wildlife area budgets.

3. Includes costs funded by BPA

Seattle

- Settlement agreement on Skagit project for a 20-year license period.
- As of 2003 about 8,400 acres had been acquired
- About $500,000 - $1,500,000 available for "enhancement and management", depending on how much is spent on acquistion; $450,000 spent to date since 1995.
- Therefore, cost per acre per year is about $5
- A Land Management Committee decides how to spend the money.
- Seattle contracts with outside companies for discrete large projects (e.g., bridge removal) that are beyond the scope of utility staff, and it uses utility crews for tasks when union rules mandate and crews are in the area anyway.

Table 7.
Summary of Data on O&M Costs for COE Wildlife Mitigation Projects, 2002 Dollars

Name	Acreage	$ Cost	$ Cost/Acre
Upper Goose Pasture HMU	32	$17,364	$543
Lower Goose Pasture HMU	47	$7,426	$158
Ridpath Bar HMU	64	$20,494	$320
Chief Timothy HMU	66	$23,134	$351
New York Bar HMU	210	$32,558	$155
Willow Bar HMU	232	$10,201	$44
Central Ferry HMU	296	$7,773	$26
Rice Bar HMU	330	$14,127	$43
Swift Bar HMU	526	$63,420	$121
Hellsgate HMU	650	$14,027	$22
John Henley HMU	967	$18,189	$19
Ice Harbor Lock and Dam Areas [1.]	2,032	$170,282	$84
Lower Monumental Lock and Dam Areas [1.]	2,486	$109,956	$44
Nisqually John HMU	3,077	$4,954	$2
McNary Lock and Dam Areas [1.]	3,213	$29,624	$9
Average	949	$36,235	$38
Average with joint costs		$46,460	$49
Average for managed acres only	125	$46,460	$371

1 Data are for a year of January 1 to September 30. All others are from March 1 to September 30

Snohomish

- License conditions require land acquisition: 4,863 acres under management.
- 2004-06 costs varied from $250,000 to $375,000.
- Therefore, cost per acre per year is roughly $60
- Increases due to relicensing support; some projects shifted between years.
- Forest thinning is put out to bid; bidders pay Snohomish for wood products.

Cowlitz

- License settlement: 525 acres @ $27/acre/year in maintenance for fee-simple lands, $13.50/acre/year for maintenance of easements.
- Some settlement parties view terms as employment opportunities, which implies potentially higher-than-optimal labor intensity.

Land trusts and conservancies

The Center for Natural Lands Management completed a survey of long-term conservation management practices at 28 preserves in Arizona, California and Oregon (CNLM 2004). The subject projects were chosen to illustrate a variety of situations. They are owned by public agencies, private non-profits or private parties in mitigation banks. Their lands may have been acquired through either the conservation (grants, conservation purchases, gifts etc) or habitat mitigation process.

Although the cost of stewardship cannot be predicted accurately from the size of the preserve, the economies of scale are dramatic. Costs range from around $1,000 an acre per year for many smaller projects to well under $100 per acre for the larger projects. The costs per acre depend on the activities that take place on the land. The least costs per acre are for large projects and are basically maintenance with minimal amount of enhancement efforts.

The Oregon part of the survey included ten separate parcels (Table 8). The smallest was 14 acres of wetland restoration. The largest, at over 26,000 acres, was the Umatilla National Wildlife Refuge that is maintained as a wildlife management area for activities that include site restoration, wildlife viewing, hunting, and nature education services. Annual management costs averaged $104 per acre per year for 10 projects. The range in cost per acre per year is $29 to more than $980. The projects that include enhancement efforts, monitoring and research, and public education programs are the most expensive at $441 to $983 per acre annually. These projects appear to be more expensive than expected based on the BPA data.

Survey of Several PNW Land Trust NGOs

There are several non-government organizations (NGOs) in the Pacific Northwest that manage or convey land for ecosystem benefits. Several of these organizations were contacted to provide information on annual land management costs (Table 9). The land trusts provide several functions, which range from simply receiving land (or functions of the land) into their trust and enforcing the agreement, to providing monitoring of existing species, enhancement of present functions, and research and public education. The annual costs per unit vary greatly according to the services provided. As monitoring and enhancement/restoration programs increase, costs increase according to the level of service provided. Active public use, which may include research and education, increases annual costs per acre dramatically to over $500 per acre. As properties are being prepared for conveyance to public entities, the costs (legal etc) may reflect only a short-term cost flow. Average acreage was 14,579 and average cost per acre was $14. These projects appear to cost about the same as similar BPA projects.

Summary of usefulness of other sources of cost information

This section has shown that there are many sources of information outside of the fish and wildlife program that could provide a useful basis for comparison with BPA wildlife projects. The data suggest, generally, that costs of BPA projects are comparable to other projects in the region. However, some other "wildlife" projects are not similar to the BPA projects in terms of their purposes and management. For example, the COE projects are generally more like farming projects than wildland management. Other agencies have much higher levels of interaction with the public than most BPA projects. Very generally, projects that are most similar to the BPA projects are probably those managed by ODFW (Table 5), WDFW (Table 6) and some of the projects managed by others (Tables 8 and 9). Because of the wide variety of objectives and functions for conserving wildlife land, any comparison of costs (per acre or per habitat unit) among projects should involve projects that share objectives, functions, and comparable physical characteristics. This similarity should be established on a case-by-case basis.

Table 8
Pacific NW – Oregon Sites in a Natural Lands Management Cost Analysis, 2004 Dollars

Property Description	Location	Ownership	Major Habitat	Method of Management	Acres	Total Annual Cost	Annual Cost per Acre
Weather's Wetland Mitigation Site	Keiser, Salem, Willamette Valley	Private/conservation easement	wetlands	Restoration, monitoring	14	$4,959	$354
Roberts Island Preserve	Eugene, McKenzie River	McKenzie River Trust	Islands, wetlands, river channels	Monitoring, enhancement	20	$3,648	$182
Agate Desert Preserve	Medford, Rogue R. Valley, SW Oregon	The Nature Conservancy (fee simple and easement)	Native grassland	Monitoring, enhancement	53	$25,242	$476
Jackson-Frazier Wetland	Corvallis, Willamette Valley	Benton County	Wetlands	Monitoring, research, public education	144	$141,481	$983
Camp Polk Meadow Preserve	Sisters, Central Oregon	Deschutes Basin Land Trust (fee simple and easement)	Meadow, wetlands	Restoration, enhancement, public education	148	$65,300	$441
Mud Slough Mitigation	Salem, Willamette Valley	Private/Conservation Easement	Wetlands	Restoration, monitoring	396	$19,983	$50
Blind Slough Swamp Preserve	Mouth of Columbia R., NW Oregon	Owned by State of Oregon/managed by The Nature Conservancy	Sitka Spruce, swamp	Monitoring, enhancement	928	$27,219	$29
Denman Wildlife	Medford, Rogue R. Valley, SW Oregon	State of Oregon ODF&W	Grassland, wetlands, woodlands	Wildlife management; monitoring by The Nature Conservancy; mitigation by USFWS	1920	$226,000	$118
South Slough National Estuarine Research Reserve	Coos Bay, SW Oregon	Oregon Dept of State Lands	Wetlands, tidal marsh	Restoration, research, monitoring, education	4,770	$1,957,104	$410
Umatilla National Wildlife Refuge	Umatilla, Columbia R., NE Oregon	Federal: US Fish & Wildlife Service	Marsh, shrub/steppe, islands	Wildlife management, restoration, site maintenance	26,715	$1,194,000	$45
Average					3,511	$366,494	$104

Information taken from "Natural Lands Management Cost Analysis – 28 Case Studies." Prepared for the Environmental Protection Agency by Center for Natural Lands Management, Fallbrook CA, October 2004.

Table 9
Informal Survey of Several Land Trusts in the Pacific Northwest, 2004 Dollars

Property Description	Location	Ownership	Major Habitat	Method of Management	Acres	Total Annual Cost	Annual Cost per Acre
Green Island	Eugene, Willamette Valley	McKenzie River Trust, funds from BPA and others	River island, wildlife habitat, farm and forestry	Monitoring, enhancement	400	$11,268	$28
Willow Creek Wildlife Mitigation Project	Eugene, Willamette Valley	The Nature Conservancy, City of Eugene, BPA Funding	Low-lying prairie lands/wetlands	Wildlife habitat units, mitigation, management and restoration	405	$204,862	$506
Tenmile Creek Valley	Florence, Oregon Coast	McKenzie River Trust, NGO and private property	Riparian forest habitat, endangered species	Conservation easement enforcement	560	$6,790	$12
Middle Fork John Day	Grant County, SE Oregon	The Nature Conservancy	Riparian area for salmon	Management, monitoring, restoration	1,600	$115,794	$72
Williamson River Delta	Klamath Basin, SE Oregon	The Nature Conservancy, funding from various sources	Wetlands /estuary for Klamath Lake	Monitoring, restoration fish and wildlife	7,440	$377,007	$51
Boardman	Columbia Basin, NE Oregon	The Nature Conservancy	Shrub steppe wildlife habitat	Mitigation for water withdrawal, monitoring, restoration	22,690	$207,132	$9
Zumwalt Prairie	Enterprise, NE Oregon	The Nature Conservancy, funding from BPA and other agencies	grasslands	Management, monitoring, research on grazing etc.	33,000	$342,210	$10
Sycan Marsh	Klamath Basin, SE Oregon	The Nature Conservancy, funding from various sources	Marsh, wetlands, grazing, forests	Restoration of fish and wildlife, controlled cattle management	50,539	$325,948	$7
Average					14,579	$198,876	$14

Task 3.

Describe cost-benchmarking numbers or equations that may be useful for comparison with proposed project costs in the future.

There are currently no cost-benchmarking numbers or equations that can generally be used for quickly assessing costs of prospective wildlife projects. The cost data in Pisces are misleading because of (a) exclusion of cost shares paid by partner agencies and (b) mixing of annual O&M with up-front investment costs. Even where these errors are avoided or can be corrected, there are often more variables that affect cost than there are wildlife projects to analyze. In this situation, statistical techniques can not isolate the effect of each variable and the amount of prediction error for the statistical cost estimate is large.

Direct cost comparisons to assess cost effectiveness of competing projects should be approached on a case-by-case basis. For any one project there may be another project that is so similar that cost comparisons will be useful. The list of potential projects for comparison includes the projects in Tables 2, 5, 6, 8 and 9. There is no guarantee that such an approach would work for all projects, because some projects differ in structure, magnitude or complexity from all others, making comparison of costs meaningless.

The cost bench-marking approach requires a relatively detailed understanding of the unique situation for each project and information on how to make adjustments for differences in the variables that affect cost. For the acreage, habitat type and distance variables, the cost equation developed in the Task 1 section (Equation 1) might provide some help. Equation 1 could be used to estimate the expected difference in cost per acre from a similar project but with a known difference in acreage, cover type or distance.

For projects with similar objectives in terms of habitat units and species, future cost-effectiveness comparisons should be based on habitat units, not acreage. It would not be wise to compare costs of projects with completely different objectives unless weights for the different objectives can be provided.

A more detailed approach might utilize cost data that is more disaggregated than that available in Pisces. With detailed cost data, individual projects could be viewed by their cost components. Two projects that are not totally comparable may have comparable components, so some costs or project features might be excluded from the comparison.

Task 4.

Scope of work for additional work needed to obtain better cost benchmarking estimates.

BPA has conducted studies to examine contracting and reporting policies to achieve a more cost-effective fish and wildlife program (Moss Adams 1997). Recently, reporting and accounting procedures have been emphasized. BPA began important accounting changes in 2002 to comply with Federal accounting standards and Sarbanes-Oxley mandates. BPA's Fish and Wildlife Program Process Improvement Initiative began in 2004 to provide more robust reporting on F&W program expenditures and greater financial controls for F&W contracts, to make program data more standard, transparent, and accessible, and to enable reporting on program performance (BPA 2007). Work elements were defined and Pisces initiated in 2004. Pisces was first used in 2005 and its applications have expanded since to include cash flow predictions, streamlined accounting, and more sophisticated program reporting.

Pisces was not designed for economic analysis, and the cost accounting system embodied in Pisces is less than complete for cost benchmarking purposes. Some of these omissions would be expensive to change, and the quality of resulting data is not clear. Furthermore, wildlife projects are more complicated than some other types because the habitat unit metric is complicated. Metrics for some other project types; e.g. hatcheries, are more straight forward.

The following changes to Pisces and related accounting methods are recommended:

1. Pisces should include all costs, not just the share funded by the Fish and Wildlife program.

As of July 2007, BPA is working on potential methods to include the other cost shares (Zelinsky 2007). The simplest option, which is likely to be adopted for now, is to include data on expected cost shares plus a text box. The IEAB also recommends that Pisces disaggregate cost shares for different work elements. On average, the share of costs paid for wildlife projects from sources other than BPA are small. This improvement may have more effect on some other project types such as fish habitat and hatchery projects.

2. Pisces does not consider the expected life of an investment. It would be useful to associate an expected life with each expenditure so that annualized costs can be derived.

Much of the cost data is useless for cost-effectiveness analysis without information on the expected life of investments. Some maintenance activities must be done annually while others can be done very infrequently. Some expenditures may be cost-effective even though their investment cost per acre is higher. For example, high-quality fencing costs more per acre but its cost per acre per year may be less.

There is no action forthcoming on this issue (Zelinsky 2007), largely because it's hard to convince people that the additional data collection will be worthwhile. Information on the expected life of investments would be useful for planning as well as economics because future replacement costs and their timing could be estimated.

The following changes to Pisces and related accounting methods should be investigated:

3. Pisces was not designed to count enhancement costs as opposed to maintenance costs. If the council wishes to examine these, then the maintenance baseline must be established and activities that contribute to enhancement must be differentiated.

To differentiate costs and amounts of maintenance and enhancement, the accounting must establish a baseline maintenance habitat level, and it must differentiate the activities that contribute to maintenance and enhancement.

New functionality in Pisces that allows wildlife crediting to be included will enable comparisons of costs to habitat units in the future. The measure of habitat units will be actual, as measured by the HEP team, after improvements have been implemented. Enhancement habitat units are the measured increase over baseline levels. The system will track increases in habitat units associated with a parcel and what work elements were conducted.

To obtain costs of maintenance HUs and enhancement HUs, additional work will be required to estimate the share of each work element cost that is intended for enhancement. This would definitely be more work for project managers, and the result for most projects might be a rough estimate. Furthermore, some planned habitat levels will not be realized for years, even decades. Therefore, it is unclear whether or not useful information on costs of HUs obtained by maintenance versus enhancement should be developed.

This potential value of differentiating maintenance and enhancement is unclear because of different perspectives regarding what share of baseline habitat units should be credited to the fish and wildlife program. Apparently, BPA counts all acquired and protected habitat as mitigation while the Council has recommended that only half of these units be counted. Much of the reason for counting enhancement versus maintenance habitat units would be lost if BPA's policy is accepted by everyone.

4. The disaggregation of costs that can currently be provided by BPA is not accurate enough for economic analysis. For this analysis, BPA attempted to differentiate costs by grouping work elements into habitat maintenance, habitat enhancement, and other activities - environmental compliance, planning and coordination, project administration, acquisition and easement, and other – but this exercise did not provide accurate accounting.

There may be a need to disaggregate costs more according to their function. One project manager provided this opinion:

> Pisces may "someday" be utilized as a cost-effective and standardization methodology, but only if F&W managers can agree on appropriate compartmentalization of meaningful implementation categories (Planning and Design (P&D), Construction and Implementation (C&I), O&M, RM&E), understanding of variable costs (i.e., "Work Element" categories, implementation categories like % of O&M per Work Element), and related measures (i.e., habitat types, geography, etc.) rather than a one-size-fits-all approach (Soults, 2007).

Planning and Design (P&D), Construction and Implementation (C&I), and Research, Monitoring and Evaluation (RM&E) are not part of O&M costs. Presumably, these types of costs should be differentiated from the existing work element types that are focused on the type of resource rather than the purpose of the work. The detailed analysis would investigate alternative ways of categorizing and reporting cost data and decide if changes are justified.

5. There is no accounting of costs in relation to specific types of habitat units. When expenditures are associated with a single focal species or a subset of project species the accounting could include this information.

This problem is similar to 3. above. There is no tracking of costs in relation to planned habitat units. Rather, actual HUs will be determined from HEP surveys. More work would be required to estimate which work elements on a parcel contributed to which HU types. It is not clear that this would be useful since the assignment of costs to the HU types might be unclear. Also, the HUs to be reported are measured, not ultimate, so information about how time lags might affect future habitat values can not be considered.

6. Some work elements are so broad that they encompass a large number of different types of improvements; for example, "create, restore or enhance wetland." Some disaggregation may be required for meaningful cost analysis.

This problem pertains more to some work elements than others ("enhance floodplain" is another). New work would be required to estimate potential gains from disaggregation, to develop the new disaggregation, and project managers would need more time to report results.

It is not clear how important these specific work elements are to the overall program. "Create, restore or enhance wetlands" and "Enhance floodplain" are each 4.0 and 0.4 percent, respectively, of all 2006 wildlife costs, so additional disaggregation could not provide much more improvement in total cost accounting.

TASK 5

Investigate the potential for reducing ongoing costs through cost management and incentives.

Cost management refers to the application of cost accounting and management changes to reduce costs. BPA and wildlife project managers already practice sophisticated cost management practices, but further improvements might be possible through changes or additions to existing practices through the use of new cost-management tools and economic incentives.

The cost-accounting tool Pisces was discussed in the previous section. This section focuses on other cost management opportunities.

BPA cost management requirements

BPA follows a number of federal criteria in negotiating contracts and determining reimbursement costs. Some of these are described in the Bonneville Purchasing Instructions Manual (BPI). The principles and procedures in Appendix 13-A "Contract Cost Principles for Commercial Organizations" are used in pricing most negotiated contracts and contract modifications with commercial organizations. BPI Appendix 13-A must be incorporated by reference in contracts with commercial organizations as the basis for determining reimbursable costs.

The Office of Management and Budget (OMB) Circular A-87, "Cost Principles for State and Local Governments," sets forth the principles for determining the allowable costs of contracts and subcontracts with State, local and federally recognized Indian tribal governments. These principles are most pertinent to wildlife areas since most of the areas are owned by States or tribes. OMB Circulars No. A-21 and A-122 provides principles for determining the costs applicable to work performed by educational institutions and non-profits, respectively, under contracts with the Government.

State and Tribal current cost management systems

States typically have laws that govern contracts with other governments and private businesses. For example, the new Oregon Public Contracting Code (ORS subchapters 279A, 279B, and 279C) became effective March 1, 2005. Revised Code of Washington Title 39 covers contracting procedures in that State.

Merit Pay

It is unusual for public employees to be compensated based on measured cost savings or similar accomplishments above a standard, especially if the standard is measured in dollars. Teachers in some states can receive incentive pay. Oregon has a school Superintendent Performance Incentive Program. In North Carolina, an Incentive Pay

Program provided annual bonuses to groups that achieved cost savings targets (SGPRC, 1981). The group could share up to 25 percent of any demonstrated cost savings. In the first year of the program some participating employees received $250 to $585 each.

Federal and BPA Performance Pay

The federal government uses incentive pay to improve performance in several ways. The Merit Pay System for managers in GS grades 13, 14, and 15 was replaced by the Performance Management and Recognition System (PMRS) in 1984. PMRS attempted to resolve Merit Pay System problems involving funding, acceptance, performance measurement, and administration, but was terminated in 1993. Currently, the Office of Personnel Management (OPM) oversees demonstration projects and agency award programs.

> Title VI of the Civil Service Reform Act, now codified in 5 U.S.C. 4703, authorizes the OPM to conduct demonstration projects that experiment with new and different human resources management concepts to determine whether changes in policies and procedures result in improved Federal human resources management. (Federal Register 1999).

The GAO (2004) recently noted that:

> Prior work has identified nine key practices for effective performance management based on experiences in public sector organizations both in the United States and abroad. Among these practices, there is a growing understanding that the federal government needs to fundamentally rethink its current approach to pay and better link pay to individual and organizational performance. Federal agencies have been experimenting with pay for performance through the Office of Personnel Management's (OPM) personnel demonstration projects.

BPA uses several programs to provide incentives for employees including individual awards, an Organization-Level Team Share Recognition Award Program, and the Success Share Recognition Award Program. The latter provides cash payouts to employees if BPA meets pre-designated target goals established each year. All eligible employees share equally in the payout. Payments under these programs were nearly eliminated following the budget crisis of 2004 (Beckett 2004).

For 2007, any payout under the BPA Success Share awards was to be contingent on achieving both the Treasury payment target and at least $5 million in modified net revenue. Incentives were to be based on performance against the equally weighted targets below.

- Transmission and generation reliability

- Transmission system, hydro generation system, and energy efficiency/demand management
- Regional Dialogue implementation
- ESA compliance long-term action plan
- Stakeholder satisfaction (Power, Transmission and EE customers; constituents; tribal governments)
- Treasury payment and modified net revenue
- Internal operating costs
- Safety (BPA 2007c)

New economic incentives

Economic incentives would reward BPA managers, wildlife project managers, contractors or project staff for more cost-effective project management. There are two general types of incentives: compensation-based and competition-based. Compensation-based incentives are based on a performance standard with the manager, contractor or employee receiving a share of the cost savings relative to the standard. With competition-based incentives, multiple parties are given the opportunity to bid for work and the lowest-cost bid that will complete the work is selected.

Compensation-based incentives

There is a large economic literature about the use of compensation to induce efficiency. The most common economic incentives are the prospect of being demoted because of poor performance (a negative incentive) or the potential for additional salary in the future based on superior performance (a positive incentive).

The wildlife O&M question in this task is similar to a situation in which a principal (BPA) cannot observe the behavior of an agent (the manager), and thus cannot tie compensation directly to performance. Economic theory points to strong effects of pay-for-performance on output and quality of the agent, but empirical confirmation of the theory is weak.

Using objective criteria such as cost-effectiveness for evaluating performance runs the risk that the agent will pay “too much” attention to those criteria and “too little” to others that may be important but harder to evaluate. Using subjective criteria, on the other hand, runs different risks, because agents may engage in non-productive behaviors that are aimed at influencing the subjective decisions.

Any measure that provides information on performance can be used in the compensation package as a payment vehicle. Compensation can be “non-linear.” Performance by the agent below some threshold can lead to lower pay. Non-linear compensation can create incentives for inefficient behaviors; compensation should be closely related to the actual achievement of goals. Compensation should change with measures of performance, but must also take into account "noisiness" of measures, marginal returns to effort, and risk tolerance of agents and principals.

Compensation schemes can have unintended consequences. Some agents might find or think that the resulting distribution or amount of compensation is unfair to them, and conflict among competing managers could be inefficient. Rewards for "aggregate measures of performance" help to avoid this problem.

Since BPA must contract with State and tribes for wildlife projects on States and tribal lands, there is little potential for cost savings based on compensation incentives unless

- the State and tribes are able to provide incentive pay, or
- BPA can provide compensation to State employees above their State compensation.

Below, some concepts for incentives are discussed without consideration of how cost savings might be distributed within the project or among project managers or staff.

Base performance standards on groups of similar projects: This type of standard has been discussed. Based on the quality of information included in Pisces this approach does not appear to be generally applicable. BPA Fish and Wildlife projects operate in a wide range of purposes, ecosystems, and institutional settings. This diversity makes it difficult to establish benchmarks or numerical performance standards across projects to measure a project performance against.

However, case-by-case comparisons may be useful. The comparability of two or more projects should be established on a case-by-case basis.

Base performance standards on past costs or technology: The performance standard would be based on savings relative to past expenditure levels. Past expenditure levels, adjusted for inflation, would become the performance standard for the project. This standard has potential for application in BPA wildlife projects.

Managers, given financial incentive to cut costs, may find new ways to do so. The incentive might be structured as an annual bonus for cost savings measured relative to the past years. The incentives program should also include verification that the cost savings were not created by a reduction in present or future habitat value. Possibly, verification of specific actions taken to cut costs would be required. For example, an incentive would be paid for a change in technology that is known to have the same or more habitat benefit for less cost. Incentives based on verifiable technical changes might also generate information about ways to cut costs in other projects.

Base performance standards on planned costs or technology: This approach would provide additional compensation to workers or contractors who are able to reduce costs below planned levels. Similar to above, but the performance standard would be based on planned costs rather than past costs. Verification that habitat values are not being compromised should be included. Possibly, verification of specific actions taken to cut costs would be required.

Base performance on habitat and costs: Some types of changes might reduce costs very little or not at all, but the amount or quality of habitat might be increased. These types of cost-effective improvements should not be neglected, but development of performance standards would require some work. To qualify for the incentive, an increase in habitat production would have to be demonstrated and the change would have to be shown to be cost-effective.

Incentives for more cost-effective use of employee time: Most of the costs of many wildlife projects are for personnel. Therefore, incentives for cost-effective use of personnel are essential. Rewards or bonuses might be provided for personnel who are able to identify technologies or other methods for obtaining cost savings.

Incentives to leverage funds: Managers should be rewarded for finding new sources of funds or other resources such as volunteer labor that can reduce Program costs. The performance standard is simply the amount of funds obtained, or savings from volunteer labor or other gifts could be based on past or planned costs that are avoided.

Incentives to share resources: Some wildlife projects may have equipment or other technologies that could be applied in other projects to save costs. Incentives might be developed to reward managers of both projects for sharing of resources that result in cost savings.

Conclusions about compensation issues

- BPA is constrained with respect to salary-based incentives because wildlife project managers and staff are not BPA employees; they must often be compensated according to State or tribal laws or standards.
- Proceed cautiously in making changes to compensation practices.
- Use subjective and objective criteria and "learn by doing."
- Reduce "noise" in measures of performance.
- Do not try to distinguish between "O&M" and "enhancement" activities and their associated costs.

Competition-based incentives

Opportunities for more use of competitive bidding to obtain cost savings occur at several points in contracting and management. The types of work required by the Program should be examined to determine the types of work that would most likely be provided at lower cost by bidding.

BPA generally writes cost-reimbursable contracts. If costs turn out to be more than expected BPA will generally cover it. Cost-reimbursable contracts provide little incentive for managers to overstate funding requests because of a risk that costs may come in higher than expected. However, incentives to overstate funding requests might include the potential for precedent, operational flexibility, and the potential for using excess funding for increased compensation, if possible. There could be some incentive to understate costs if managers believe their realistic budget request will be cut back but their chances of obtaining more funds in the future, perhaps with better documentation, are good.

Since most wildlife areas are owned by the States or tribes, BPI section 11.7.1.2 applies and competitive bids are not obtained. Under BPI section 11.7.1.2. BPA can not normally seek competitive bids from wildlife areas on State or tribal lands. However, BPA could work with the State and tribal managers to identify work that should be put out to bid.

A 1997 study found that:

> There is a lack of competition in the procurement process. When a project involves an entity that has the responsibility to manage the property or resource to be affected by the services to be performed, BPA exercises its ability to conduct noncompetitive transactions under Bonneville Purchasing Instructions (BPI) 11.7.1.2. Practically, BPA cannot expect to receive competing proposals when this clause applies.
>
> Unless permission is granted to another organization, only the entity with responsibility for managing the targeted property is likely to have authority to perform work on the property.
>
> However, many of the contracts with public entities encompass sizable subcontracts with other public entities and private firms. BPA should not be limited in its ability to receive proposals that contain competitively bid subcontractor services.
>
> Recommendation: Assess the feasibility of modifying the Bonneville Purchasing Instructions to acquire subcontractor services by competitive procurement. At a minimum, this should require receipt of three proposals for services or, if three proposals were not able to be obtained, evidence that bids were solicited from at least three firms. All other contracts should be competitively bid in accordance with requirements established in the BPI (Moss Adams LLP 1997).

To implement this recommendation, BPA will need to consider what types of costs should be competitively bid. This information could be compared to project plans and costs to determine discrete activities that should be bid. Guidance on competitive bidding to be required in a contract under 11.7.1.2 could be added to the BPI. The language might require the contractor to make use of competitive bidding to the extent authorized by their own State or tribal laws and policies.

Competitive bidding works best when a product is purchased repeatedly and when there are multiple bidders qualified to produce the good or service. The nature of the contract terms offered affect the quality of the contractors attracted to bid on the work. For example, shifting from fixed wage to piece work may increase the average quality of the workers. This is because workers who can benefit more from piece work will be attracted to the offers of compensation by piece.[2] Each bid is developed by bidders having different cost structures and different information about how to accomplish the work cost-effectively.

Contractors should be required to own their equipment, because that increases the incentive to maintain the equipment, compared with the case in which the principal provides the equipment.

Some theory suggests that long-term contracting relationships promote efficiency. Dynamic agency contracts are renegotiated over time based on previous performance. Such contracts can encourage “honest behavior” because both sides have a lower incentive to “cheat” on the arrangement if the contract has a chance of being renewed (presumably the original contract created value for both counterparties, or it would not have been entered into in the first place). In a repeated contracting relationship (i.e., where principal/agent arrangements are renewed over time), future rents will provide an incentive for both counterparties to act in an honest manner, and the higher the future rents, the stronger the incentive.

Under a quota system project sponsors would be paid based on a minimum production target. Quotas have nonlinear effects: if the agent has exceeded the quota, the incentive for further effort disappears. Similarly, if the agent has no or little chance of meeting the quota, the incentive is also substantially weakened. Incentives should be based on continuous measures of achievement, not quotas. In the case of wildlife, measures to use for quotas would be problematic. Therefore, contracts that include quotas are not recommended for wildlife projects.

OMB Circulars No. A-87 encourages Federal agencies to test fee-for-service alternatives as a replacement for current cost-reimbursement payment methods. The National Performance Review's (NPR) recommended the fee-for-service approach to reduce the burden associated with maintaining systems for charging administrative costs to Federal programs and preparing and approving cost allocation plans. This approach was expected to increase incentives for administrative efficiencies and improve outcomes. These recommendations may be applicable within BPA’s contracting process.

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[2] A relevant study might be Harry Paarsch and Bruce Shearer. Tree planters in British Columbia displayed a positive output elasticity with respect to changes in rates for piece work. “The Response to Incentives and Contractual Efficiency: Evidence from a Field Experiment”, Centre interuniversitaire sur le risqué, les politiques économiques et l’emploi, Working Paper 07-01, January 2007. Available at http://ssrn.com/abstract=962146.

Conclusions about contracting issues

- Program expenses should be examined to determine potential opportunities for cost savings through competitive bidding.
- For most wildlife projects, competitive bidding is limited because projects are on State or Tribal land, but BPI 11.7.1.2 might be changed to encourage more competitive bidding within projects
- Proceed cautiously in making changes to contracting practices.
- For eligible lands, invite proposals for land O&M compensated based on "dollars/task" or "dollars/acre" with performance standards based on past or planned habitat values
- Do not try to distinguish between "O&M" and "enhancement" activities and their associated costs.
- Agents contracted to conduct O&M should be required to own and provide their equipment.
- Because of the problems with timing and non-linear incentives, quotas for wildlife projects should be avoided.

Cost management tools

Additional cost management tools discussed here are more flexible funding, combining resources, additional research on cost-effectiveness, and value engineering.

More flexible funding

Project managers have noted situations where inflexible BPA funding has resulted in lost opportunities for cost savings. BPA's annual budgeting process might be modified to allow more flexible spending to achieve efficiency. Annual budgeting can be a disincentive to efficiency when budget savings cannot be used in future years. Each year there may be an incentive to "spend it or lose it" even if the spending has become less desirable or efficient. The funds are available this year, so they are spent this year. From the manager's perspective there is little incentive to save funds if unspent funds are lost to the project. Wildlife projects should be able to capture some of their annual savings with the remainder returned to the program. In some cases it may be efficient to delay spending until next year when conditions are more appropriate for the activity. In these cases managers should be able to document why the spending should be delayed and the funds should be held over.

Inflexible spending rules can also be a disincentive to efficient spending. If funds cannot be transferred among activities there is no incentive to respond to the changing relative efficiencies of alternative activities. Wildlife projects need to be able to adjust to unforeseen conditions in the field. Weather conditions, habitat conditions and opportunities change in ways that can not be foreseen in advance. Under current spending rules, managers have an incentive to spend according to their budget even if this spending pattern is no longer efficient. Perhaps some alternative method would now cost less, but there is little incentive to use it because it's not in the plan and the project can not capture any of the cost savings.

Settlement agreements resulting in a trust fund provide managers the maximum flexibility to adjust spending according to conditions and, if the managers care about the projects, provide an incentive to save funds. However, there can be a lack of accountability regarding how funds are spent and there are significant risks that the fund and/or the habitat may be mismanaged.

There are a number of middle courses between annual budgeting and settlement agreements that provide accountability, flexibility and incentive for savings. Funds that are budgeted for a specific purpose should be allowed to be used for more cost-effective methods that accomplish the same ends, and projects should be able to capture some of the savings for project use.

Project budgeting could move to a 2 or 3-year cycle. Perhaps the longer cycle could be provided for projects with a history of good performance. Projects that are unable to meet performance standards might be returned to the annual budget system. Multi-year agreements might include a clause to allow renegotiation. Less frequent budgeting would reduce the amount of time required for budget planning and preparation and could provide more cost savings.

Combining resources

There appears to be some potential for cost savings by combining resources among wildlife projects. The regression analysis of BPA project costs indicates a strong economy of scale factor; apparently each project requires similar management resources regardless of size. Possibly, similar small projects could be combined and the amount of management and administrative resources reduced. A few agencies and tribes each manage multiple projects; perhaps some of the management functions of these projects could be combined. One project, Albeni Falls, is managed by multiple agencies. Perhaps the project should be aggregated into one project managed by one agency, or some of the management functions could be assumed by one management group. It is possible that combinations of projects across project sponsors could create new transactions costs that might outweigh the benefits.

Research into cost-effective alternatives

Another approach to cost management would directly increase the amount of investment in research that would identify cost-effective alternatives. Evaluations that will search for lower-cost options could be required as part of project proposals. This approach can be combined with incentives, and the incentives approach provides managers and others a reason to do the research to find more cost-effective options. Value engineering, discussed below, is an example.

Value engineering

Value Engineering (VE) was developed at General Electric Corp. during World War II and is widely used in industry and government, particularly in areas such as defense, transportation, construction, and healthcare. VE is defined as "an analysis of the functions of a program, project, system, product, item of equipment, building, facility, service, or supply of an executive agency, performed by qualified agency or contractor personnel, directed at improving performance, reliability, quality, safety, and life cycle costs." The OFPP (Office of Federal Procurement Policy) Act requires every Federal agency to maintain a Value Engineering program.

The purpose of the Value Engineering Change Proposal (VECP) Program is to induce contractors to propose contract modifications which reduce cost without reducing product or process performance. The VECP is the formal document a Contractor uses to submit a cost saving recommendation to the government in accordance with the VE contract provisions. A VECP must be submitted under an existing contract and must result in a change to that contract. In addition, the change must result in a reduction in the system's life cycle cost. To induce better analysis, VECP can be combined with economic incentives.

Value engineering is often done by systematically following a multi-stage Job Plan. Four basic steps in the Job Plan are:

1. Information gathering - This asks what the requirements are for the job. Function analysis, an important technique in value engineering, is usually done in this initial stage. It tries to determine what functions or performance characteristics are important. It asks questions like; What does the job do? What must it do? What should it do? What could it do? What must it not do?
2. Alternative generation - In this stage value engineers ask; What are the various alternative ways of meeting requirements? What else will perform the desired function?
3. Evaluation - In this stage all the alternatives are assessed by evaluating how well they meet the required functions and how great will the cost savings be.
4. Presentation - In the final stage, the best alternative will be chosen and presented to the client for final decision.
5. Steps to ensure identification of cost-effective alternatives.
6. Changes in funding patterns over time.
7. Cooperative multi-project management.
8. Reward structures for managers. Here, the incentives should be addressed.

Value engineering can be viewed as a formal method for cost-effectiveness analysis. Given the expense of implementing such a process it might be best applied to some of the larger structural components of the fish and wildlife program rather than land management.

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Wildlife Habitat Incentives Program Cost Lists , 2007, abbreviated and organized by BPA Work Element

Oregon				Idaho				Washington			
BPA Work Element and *WHIP Practice Name*	*Component*	*Unit Type*	*Unit Cost*	*Practice_Name*	*Component*	*Unit Type*	*Unit Cost*	*Practice Name*	*Component*	*Unit Type*	*Unit Cost*
Conduct Controlled Burn											
				Brush Management	Burn	ac	$10				
Remove Vegetation											
Brush Management (Ac.)	Brush Management, Biological	Acre	$15								
Brush Management (Ac.)	Brush Management, Chemical	Acre	$100	Brush Management	Chemical	ac	$25				
Brush Management (Ac.)	Brush Management, Mechanical	Acre	$175	Brush Management	Mechanical	ac	$25				
Brush Management (Ac.)	Brush Management, Mechanical, Difficult	Acre	$200								
Brush Management (Ac.)	Brush Management, Piling	Acre	$60								
Practice No-till and Conservation Tillage Systems											
Conservation Cover (Ac.)	Seedbed Preparation, Seed & Seeding, Native	Acre	$300	Conservation Cover	Native Vegetation	ac	$140	Conservation cover seedbed preparation	Seed and Seeding (eastside)	AC	$162
Conservation Cover (Ac.)	Seedbed Preparation, Seed & Seeding, Non-Native	Acre	$150								
Contour Buffer Strips (Ac.)	Seedbed Preparation, Seed & Seeding, Native	Acre	$300								
Contour Buffer Strips (Ac.)	Seedbed Preparation, Seed & Seeding, Non-Native	Acre	$150								
Cover Crop (Ac.)	Seedbed Preparation, Seed & Seeding	Acre	$75								
Upland Erosion and Sedimentation Control											
Grassed Waterway (Ac.)	Erosion Control Fabric	SqFt	$4								
Grassed Waterway (Ac.)	Seedbed Preparation, Seed & Seeding, Native	Acre	$300								
Grassed Waterway (Ac.)	Seedbed Preparation, Seed & Seeding, Non-Native	Acre	$150								
Grassed Waterway (Ac.)	Shaping and Site Preparation	Acre	$200								
Grassed Waterway (Ac.)	Shaping and Site Preparation	CuYd	$6								
Plant Vegetation											
Range Planting (Ac.)	Range Planted, Broadcast, Introduced	Acre	$100	Range Planting	Native, Site Prep, Seed and Seeding	ac	$100.00				
Range Planting (Ac.)	Range Planted, Broadcast, Native	Acre	$150								
Range Planting (Ac.)	Range Planted, Drill, Introduced	Acre	$90								
Range Planting (Ac.)	Range Planted, Drill, Native	Acre	$150								
Critical Area Planting (Ac.)	Erosion Control Fabric	SqFt	$4	Critical Area Planting	Critical Area Planting (All components with shaping) Not to exceed 5 ac.	ac	$250	Critical area planting grading and shaping		AC	$127
Critical Area Planting (Ac.)	Seedbed Preparation, Seed & Seeding, Native	Acre	$350	Critical Area Planting	Critical Area Planting (All components with moderate shaping) Not to exceed 5 ac	ac	$475	Critical area planting plugs and planting	Native herbaceous species	No	$1.50

Wildlife Habitat Incentives Program Cost Lists , 2007, abbreviated and organized by BPA Work Element

Oregon				Idaho				Washington			
Plant Vegetation											
Critical Area Planting (Ac.)	Seedbed Preparation, Seed & Seeding, Non-Native	Acre	$200	Critical Area Planting	Critical Area Planting (All components with heavy shaping) Not to exceed 5 ac	ac	$690	Critical area planting site prep	Seed and Seeding	AC	$325
Critical Area Planting (Ac.)	Shaping and Site Preparation	Acre	$100								
Critical Area Planting (Ac.)	Shaping and Site Preparation	CuYd	$6								
				Restoration and Management of Rare or Declining Habitats	Range Site Planting	ac	$100.00				
				Restoration and Management of Rare or Declining Habitats	Forest Site Planting	ac	$300.00				
				Riparian Forest Buffer	Riparian Forest Buffer	ac	$1,500	Riparian forest buffer site prep	Seed and Seeding	AC	$325.00
								Riparian forest buffer damage protection		No	$1.35
								Riparian forest buffer oregon white oak	establishment or release & protection	No	$15.00
								Riparian forest buffer tree/shrub	planted	No	$2.00
								Riparian forest buffer tree/shrub	planted (potted balled stinger/ripper planting)	No	$5.00
								Riparian forest buffer tree/shrub	planted unrooted cuttings	No	$1.00
Riparian Forest Buffer (Ac.)	Moisture Conservation, Intense	Acre	$150								
Riparian Forest Buffer (Ac.)	Moisture Conservation, Non-Intense	Acre	$75								
Riparian Forest Buffer (Ac.)	Moisture Conservation, Tree Matts	Sqft	$1								
Riparian Forest Buffer (Ac.)	Site Prep, Tree/Shrub, Planted	Acre	$400								
Riparian Forest Buffer (Ac.)	Tree/Shrubs Bare Root, Planted	Each	$2								
Riparian Forest Buffer (Ac.)	Tree/Shrubs Cuttings, Planted	Each	$2								
Riparian Forest Buffer (Ac.)	Tree/Shrubs Live Stakes, Planted	Each	$1								
Riparian Forest Buffer (Ac.)	Tree/Shrubs, 1 gallon Container, Planted	Each	$5								
Riparian Forest Buffer (Ac.)	Tree/Shrubs, 2 gallon Container, Planted	Each	$10								
Riparian Forest Buffer (Ac.)	Tree/Shrubs, 5 gallon Container, Planted	Each	$14								
Riparian Forest Buffer (Ac.)	Tree/Shrubs, Container, Planted	Each	$5								
Riparian Herbaceous Cover (Ac.)	Seedbed Preparation, Seed & Seeding, Native	Acre	$300	Riparian Herbaceous Cover	Riparian Herbaceous Cover Seed Bed Preparation, Seed and Seeding	ac	$300.00	Riparian herbaceous cover site prep	Seed and Seeding	AC	$325.00
Riparian Herbaceous Cover (Ac.)	Seedbed Preparation, Seed & Seeding, Non-Native	Acre	$150								
Tree/Shrub Establishment (Ac.)	Animal Damage Control, Barrier	Each	$2	Tree and Shrub Establishment	Without Vexar or Chemical	ac	$320.00				
Tree/Shrub Establishment (Ac.)	Animal Damage Control, Cage	Each	$15	Tree and Shrub Establishment	With Vexar or Chemical (Pronone)	ac	$610.00				
Tree/Shrub Establishment (Ac.)	Animal Damage Control, Repellant	Acre	$75								
Tree/Shrub Establishment (Ac.)	Moisture Conservation, Intense	Acre	$150								

Wildlife Habitat Incentives Program Cost Lists , 2007, abbreviated and organized by BPA Work Element

Oregon

Install Fence			
Fence (Ft.)	Fence, All Types	Foot	$3
Fence (Ft.)	Fence, Barbed Wire	Foot	$2
Fence (Ft.)	Fence, Buck & Pole	Foot	$20
Fence (Ft.)	Fence, Electric, Permanent	Foot	$2
Fence (Ft.)	Fence, Electric, Temporary	Foot	$1
Fence (Ft.)	Fence, Smooth Wire	Foot	$2
Fence (Ft.)	Fence, Woven Wire	Foot	$3.50
Fence (Ft.)	Gate	Each	$300
Fence (Ft.)	Solar Panel System	Each	$350
Develop Pond			
Pond (No.)	Concrete Work, Non-Reinforced	CuYd	$150
Pond (No.)	Concrete Work, Reinforced	CuYd	$250
Pond (No.)	Excavation/Fill, Import	CuYd	$8
Pond (No.)	Excavation/Fill, Import, Difficult	CuYd	$12
Pond (No.)	Excavation/Fill, On-Site	CuYd	$4
Pond (No.)	Excavation/Fill, On-Site, Difficult	CuYd	$5
Pond (No.)	Geotextile Fabric	SqFt	$1
Pond (No.)	Gravel, Sand	CuYd	$25
Pond (No.)	Pipe, All Types	DiaInF	$2
Pond (No.)	Pond	Each	$5,000
Pond (No.)	Rock	CuYd	$35
Develop Alternative Water Source			
Pumping Plant (No.)	Livestock Water Pump	Each	$850
Pumping Plant (No.)	Nose, Ram, Sling, Other Similar Pump	Each	$800
Pumping Plant (No.)	Solar Panel System	Each	$6,000
Watering Facility (No.)	Reservoir Stand	BdFt	$4
Watering Facility (No.)	Tank or Trough	Each	$1,500
Watering Facility (No.)	Tank or Trough	Gallon	$3
Watering Facility (No.)	Tank or Trough, Difficult	Gallon	$4
Spring Development (No.)	Collection Pipe	Foot	$5
Spring Development (No.)	Concrete Work, Reinforced	CuYd	$250
Spring Development (No.)	Excavation/Fill, On-Site	CuYd	$50

Idaho

Fence	Electric	ft	$1.25
Fence	Wire, 3 Strand	ft	$1.75
Fence	Wire, 4 Strand	ft	$2.00
Fence	Wire, 5 Strand	ft	$2.30
Fence	Jack (wood rail)	ft	$5.75
Fence	Woven Wire	ft	$4.50
Fence	Corral (Metal Rails & Posts)	ft	$15.00
Fence	Corral (Wood Panels & Posts)	ft	$8.00
Watering Facility	Watering Facility (open steel tank)	no	$850.00
Watering Facility	Storage Tank (new)	gal	$2.50
Watering Facility	Storage Tank (used)	gal	$0.25
Watering Facility	Watering Facility (Heated)	no	$1,500
Spring Development	Spring Development	no	$2,350

Washington

Fence cattle guard		No	$4,000
Fence electric charger for fence		No	$300
Fence fence	Corral (includes gates)	ft	$11
Fence fence - includes gates}{\insrsid11404049	Ft	ft	$3.50
Fence fence	Installation, wet/rocky or steep terrain	ft	$1

Wildlife Habitat Incentives Program Cost Lists , 2007, abbreviated and organized by BPA Work Element

Oregon				Idaho				Washington
Develop Alternative Water Source								
Spring Development (No.)	Geotextile Fabric	SqFt	$1					
Spring Development (No.)	Gravel, Sand	CuYd	$25					
Spring Development (No.)	Rock	CuYd	$35					
Spring Development (No.)	Spring Collection Box	Each	$750					
Spring Development (No.)	Spring Development	Each	$3,000					
				Water Well	Livestock Water Only - Max $10,000 cost share	ft	$40.00	
Wildlife Watering Facility (No.)	Wildlife Watering Facility	Each	$1,200	Wildlife Watering Facility	Wildlife Watering Facility	no	$780.00	
Create, Restore, and/or Enhance Wetland								
Wetland Creation (Ac.)	See Restoration below, most practices apply	CuYd	$8	Wetland Creation	Wetland Creation	ac	$5,000	
Wetland Enhancement (Ac.)	See Restoration below, most practices apply	CuYd	$8	Wetland Enhancement	Management Practice	ac	$35.00	
Wetland Restoration (Ac.)	Drain Tile Removal	Foot	$3	Wetland Enhancement	Management Practice plus Structures	ac	$2,000	
Wetland Restoration (Ac.)	Excavation/Fill, Import	CuYd	$8	Wetland Restoration	Management Practices	ac	$35.00	
Wetland Restoration (Ac.)	Excavation/Fill, Import, Difficult	CuYd	$12	Wetland Restoration	Management Practice plus Structures	ac	$5,000	
Wetland Restoration (Ac.)	Excavation/Fill, On-Site	CuYd	$4					
Wetland Restoration (Ac.)	Excavation/Fill, On-Site, Difficult	CuYd	$5					
Wetland Restoration (Ac.)	Geotextile Fabric	SqFt	$1					
Wetland Restoration (Ac.)	Gravel, Sand	CuYd	$25					
Wetland Restoration (Ac.)	Invasive Species Control	Acre	$150					
Wetland Restoration (Ac.)	Pipe, All Types	DiaInF	$2					
Wetland Restoration (Ac.)	Rock	CuYd	$35					
Wetland Restoration (Ac.)	Site Preparation	Acre	$200					
Wetland Restoration (Ac.)	Structures/Tide Gate, Removal	Each	$1,000					
Wetland Restoration (Ac.)	Wetland Herbaceous Plantings	Acre	$400					
Wetland Restoration (Ac.)	Woody Debris Placement	Each	$300					

Appendix 2. **Detailed Cost Data for COE-maintained Wildlife Mitigation Areas Collected by Herrera and Key (2002). 2002 Dollars.** **Contract Year is March 1 to September 30.**				
John Henley HMU (967 acres)				
O&M Activity	Quantity	Unit	Unit Price	Amount
Establishment of annual food plots	10	AC	$600.00	$6,000.00
Mowing with residue removal	12	AC	$165.00	$1,980.00
Mowing without residue removal	12	AC	$80.00	$960.00
O&M of irrigation sets	5	MO	$1,600.00	$8,000.00
Litter collection	7	EA	$82.00	$574.00
Mowing trails, roads, & risers	1	JB	$200.00	$200.00
Fertilize pastures	4	AC	$120.00	$480.00
			TOTAL	$18,194.00
			COST/ACRE	**$18.81**
Ridpath Bar HMU (64 acres)				
O&M Activity	Quantity	Unit	Unit Price	Amount
Establishment of annual food plots	3	AC	$600.00	$1,800.00
Mowing with residue removal	12	AC	$165.00	$1,980.00
Mowing without residue removal	12	AC	$80.00	$960.00
O&M of irrigation systems	5	MO	$2,900.00	$14,500.00
Litter collection	7	EA	$82.00	$574.00
Mowing trails, roads, & risers	1	JB	$200.00	$200.00
Fertilize pastures	4	AC	$120.00	$480.00
			TOTAL	$20,494.00
			COST/ACRE	**$320.22**
New York Bar HMU (210 acres)				
O&M Activity	Quantity	Unit	Unit Price	Amount
Establishment of annual food plots	8	AC	$600.00	$4,800.00
Mowing with residue removal	21	AC	$165.00	$3,465.00
Mowing without residue removal	21	AC	$80.00	$1,680.00
O&M of irrigation sets	5	MO	$4,200.00	$21,000.00
Litter collection (incl. N.Y. Island)	7	EA	$82.00	$574.00
Mowing trails, roads, & risers	1	JB	$200.00	$200.00
Fertilize goose pastures	7	AC	$120.00	$840.00
			TOTAL	$32,559.00
			COST/ACRE	**$155.04**
Central Ferry HMU (296 acres)				
O&M Activity	Quantity	Unit	Unit Price	Amount
Establishment of annual food plots	9	AC	$600.00	$5,400.00
Litter collection	7	EA	$82.00	$574.00
Fertilize rangeland/pastures	15	AC	$120.00	$1,800.00
			TOTAL	$7,774.00
			COST/ACRE	**$26.26**
Rice Bar HMU (330 acres)				

O&M Activity	Quantity	Unit	Unit Price	Amount
Establishment of annual food plots	10	AC	$600.00	$6,000.00
Mowing of fireline w/o residue removal	5	AC	$80.00	$400.00
O&M of irrigation sets	5	MO	$800.00	$4,000.00
Litter collection	43	EA	$82.00	$3,526.00
Mowing trails, roads, and tree plots	1	JB	$200.00	$200.00
			TOTAL	$14,126.00
			COST/ACRE	**$42.81**
Willow Bar HMU (232 acres)				
O&M Activity	Quantity	Unit	Unit Price	Amount
Establishment of annual food plots	17	AC	$600.00	$10,200.00
			TOTAL	$10,200.00
			COST/ACRE	**$43.97**
Swift Bar HMU (526 acres)				
O&M Activity	Quantity	Unit	Unit Price	Amount
Establishment of annual food plots	31.5	AC	$600.00	$18,900.00
Mowing with residue removal	46.5	AC	$165.00	$7,672.50
Mowing without residue removal	46.5	AC	$80.00	$3,720.00
O&M of irrigation sets	5	MO	$6,000.00	$30,000.00
Litter collection	13	EA	$82.00	$1,066.00
Mowing trails, roads, & risers	1	JB	$200.00	$200.00
Fertilization of rangeland/pastures	15.5	AC	$120.00	$1,860.00
			TOTAL	$63,418.50
			COST/ACRE	**$120.57**
Nisqually John HMU (3,077 acres)				
O&M Activity	Quantity	Unit	Unit Price	Amount
Fertilization of rangeland	20	AC	$120.00	$2,400.00
Litter collection	31	EA	$82.00	$2,542.00
			TOTAL	$4942.00
			COST/ACRE	**$1.61**
Chief Timothy HMU (66 acres)				
O&M Activity	Quantity	Unit	Unit Price	Amount
Establishment of annual food plots	3	AC	$600.00	$1,800.00
Mowing with residue removal	12	AC	$165.00	$1,980.00
Mowing without residue removal	12	AC	$80.00	$960.00
O&M of irrigation sets	5	MO	$2,900.00	$14,500.00
Litter collection	37	EA	$82.00	$3,034.00
Mowing trails, roads, & risers	1	JB	$200.00	$200.00
Fertilization of pastures	5.5	AC	$120.00	$660.00
			TOTAL	$23,134.00
			COST/ACRE	**$350.52**
Hellsgate HMU (650 acres)				
O&M Activity	Quantity	Unit	Unit Price	Amount
Establishment of annual food plots	2	AC	$600.00	$1,200.00
Mowing without residue removal	5	AC	$80.00	$400.00

O&M of irrigation systems	5	MO	$1,500.00	$7,500.00
Litter collection	43	EA	$82.00	$3,526.00
Mowing trails, roads, & risers	1	JB	$200.00	$200.00
Fertilize rangeland	10	AC	$120.00	$1,200.00
			TOTAL	$14,026.00
			COST/ACRE	**$21.58**
Upper Goose Pasture HMU (32 acres)				
O&M Activity	Quantity	Unit	Unit Price	Amount
Establishment of annual food plots	1	AC	$600.00	$600.00
Mowing with residue removal	19.5	AC	$165.00	$3,217.50
Mowing without residue removal	19.5	AC	$80.00	$1,560.00
O&M of irrigation systems	5	MO	$1,500.00	$7,500.00
Litter collection	43	EA	$82.00	$3,526.00
Fertilization of pastures	8	AC	$120.00	$960.00
			TOTAL	$17,363.50
			COST/ACRE	**$542.61**
Lower Goose Pasture HMU (47 acres)				
O&M Activity	Quantity	Unit	Unit Price	Amount
Establishment of annual food plots	6.5	AC	$600.00	$3,900.00
Litter collection	43	EA	$82.00	$3,526.00
			TOTAL	$7,426.00
			COST/ACRE	**$158.00**

This contract also featured other work requirements that were spread among the HMUs. These work requirements are listed in the following table.

O&M Activity	Quantity	Unit	Unit Price	Amount
Chemical weed control, land-based spraying	1500	HR	$64.95	$97,425.00
Chemical weed control, aerial spraying	250	AC	$63.50	$15,875.00
Routine inspection/maint. of goose nest structures	79	EA	$50.00	$3,950.00
Fence maintenance (panels)	100	PA	$45.00	$4,500.00
Inspect/maint. gallinaceous guzzlers	44	EA	$79.25	$3,487.00
Winterization of irrigation systems	1	JB	$5,000.00	$5,000.00
Dewinterization of irrigation systems	1	JB	$5,000.00	$5,000.00
Sterilization of parking lots	1	JB	$5,006.53	$5,006.53
Mowing of food plots (late winter)	5	AC	$120.00	$600.00
Tree removal	30	EA	$300.00	$9,000.00
Litter collection at Tucannon HMU	43	EA	$82.00	$3,526.00

The following projects have a contract year of January 1 to September 30.

McNary Lock and Dam Areas (3,213 acres)				
O&M Activity	Quantity	Unit	Unit Price	Amount
Establishment of annual food plots	1	AC	$630.00	$630.00
Mowing without residue removal	5	AC	$85.00	$425.00
Litter collection	20	EA	$80.00	$1,600.00
Fence maintenance (panels)	10	EA	$48.00	$480.00
Inspect/clean/repair gallinaceous guzzlers	1	EA	$85.00	$85.00
Tree removal	80	HR	$125.00	$10,000.00
Chemical weed control	200	AC	$82.00	$16,400.00
			TOTAL	$29,620.00
			COST/ACRE	**$9.22**
Ice Harbor Lock and Dam Areas (2,032 acres)				
O&M Activity	Quantity	Unit	Unit Price	Amount
Establishment of annual food plots	27	AC	$630.00	$17,010.00
Mowing w/residue removal	40	AC	$170.00	$6,800.00
Mowing w/o residue removal	40	AC	$85.00	$8,000.00
Litter collection	100	EA	$80.00	$8,000.00
O&M of irrigation sets – Big Flat HMU	6	MO	$5,570.00	$33,420.00
O&M of irrigation sets – Lost Island HMU	6	MO	$2,550.00	$15,300.00
O&M of irrigation sets – Hollebeke HMU	6	MO	$4,100.00	$24,600.00
Fence maintenance (panels)	20	EA	$48.00	$960.00
Inspect/clean/repair gallinaceous guzzlers	17	EA	$85.00	$1,445.00
Fertilization of goose pastures	12	AC	$120.00	$1,440.00
Winterization of irrigation systems	1	JB	$4,000.00	$4,000.00
Dewinterization of irrigation systems	1	JB	$4,000.00	$4,000.00
Tree removal	100	HR	$125.00	$12,500.00
Chemical weed control	400	AC	$82.00	$32,800.00
			TOTAL	$170,275.00
			COST/ACRE	**$83.80**
Lower Monumental Lock and Dam Areas (2,486 acres)				
O&M Activity	Quantity	Unit	Unit Price	Amount
Establishment of annual food plots	5	AC	$630.00	$3,150.00
Mowing w/residue removal	15	AC	$170.00	$2,550.00
Mowing w/o residue removal	15	AC	$85.00	$1,275.00
Litter collection	20	EA	$80.00	$1,600.00
O&M of irrigation sets – Skookum HMU	6	MO	$4,430.00	$26,580.00
O&M of irrigation sets – 55-Mile HMU	6	MO	$3,950.00	$23,700.00
Fence maintenance (panels)	10	EA	$48.00	$480.00
Inspect/clean/repair gallinaceous guzzlers	11	EA	$85.00	$935.00
Fertilization of goose pastures	7	AC	$120.00	$840.00
Winterization of irrigation systems	1	JB	$3,016.42	$3,016.42
Dewinterization of irrigation systems	1	JB	$3,020.00	$3,020.00
Tree removal	80	HR	$125.00	$10,000.00
Chemical weed control	400	AC	$82.00	$32,800.00
			TOTAL	$109,946.42
			COST/ACRE	**$44.23**

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