3

RESTORATION COSTING FOR PURPOSES OF NATURAL RESOURCE DAMAGE ASSESSMENT

3.1 INTRODUCTION

The primary component of a natural resource damage claim is the cost to restore, replace, rehabilitate, and/or acquire the equivalent of the injured natural resources and the services those resources provide. This chapter provides a framework for the generation of restoration cost estimates within a CERCLA, CWA or OPA based damage claim. This chapter includes a review of the rules for restoration alternative selection and costing provided by DOI and NOAA as well as some general guidance on restoration costing.

A common problem encountered by trustees in natural resource damage assessment involves understating the likely costs of restoration actions, leading to under-recovery of economic damages (i.e., funds recovered are insufficient to support the restoration actions envisioned by the trustees). In addition, responsible parties often reject trustee restoration cost claims as inaccurate, incomplete or poorly documented. Such concerns on the part of responsible parties can slow the settlement negotiation process and delay restoration of injured resources. Thus, development of defensible and complete restoration cost estimates will help to assure that sufficient funds are available to undertake desired restoration actions, and facilitate a more timely settlement with the responsible party. The purpose of this chapter is to provide guidance to Service personnel to allow for the development of defensible and complete restoration cost estimates.

The remainder of this chapter is presented in five sections. Section 3.2 reviews DOI's final and NOAA's proposed guidelines for restoration costing for purposes of damage assessment under CERCLA, CWA and OPA. Section 3.3 discusses cost categories frequently considered in restoration costing for purposes of damage assessment. Section 3.4 reviews the role of time in the development of a restoration cost claim. Section 3.5 describes various sources of uncertainty that may be encountered in restoration costing, and proposes several options for incorporation of such uncertainty into restoration cost assessments. Section 3.6 presents an example restoration costing exercise.

Given the broad range of environmental restoration projects that might be considered within a natural resource damage assessment, this manual does not provide unit costing data or detailed project costing guidelines.

3.2 DOI AND NOAA GUIDANCE ON RESTORATION COSTING[1]

3.2.1 THE ROLE OF COST IN RESTORATION ALTERNATIVE SELECTION

DOI's final rule and NOAA's proposed rule for damage assessment call on natural resource trustees to consider a range of possible restoration actions in both the planning and implementation phases of the damage assessment process. Under both rules trustees are required to identify a range of alternatives, including no-action, and then to compare and select from among these alternatives based on various factors. These factors include:

- Technical feasibility;
- Environmental effectiveness (i.e., the extent to which the alternative accomplishes the trustee's restoration goals and objectives);
- The relationship of the expected costs of the alternative to the expected benefits (including benefits that cannot be easily monetized);
- Cost-effectiveness;
- The level of risk and/or uncertainty associated with the alternative;
- The results of any actual or planned response actions;
- The potential for additional natural resource injury from the proposed alternative;
- The expected natural recovery period;
- The expected extent of natural recovery in the absence of restoration activities;
- The potential effect of the alternative on human health; and
- The extent to which the alternative complies with state, federal and tribal regulations and policies.

[1]The focus of this chapter is on the restoration costing process. Readers should refer to DOI's final rule and NOAA's proposed rule for further guidance on restoration alternative selection and the restoration planning process [43 CFR 11.82 and 15 CFR 990.75].

Application of a strict cost-benefit test to each alternative is not envisioned under either rule (see the preamble to NOAA's proposed rule for a discussion of this issue [59 FR 1134-35, Jan. 7, 1994]). However, cost is a component of several of the selection factors listed above.

3.2.2 Categories of Cost to Include in the Restoration Cost Estimate

DOI's final rule and NOAA's proposed rule describe two general categories of restoration costs that are recoverable within the natural resource damage assessment process: direct costs and indirect costs. Direct costs are those costs that are directly attributable to a selected alternative. Examples include compensation of government employees for the time and effort devoted to the selection and implementation of the selected alternative, and the cost of materials acquired, consumed or expended as part of a restoration action [43 CFR 11.83(b)(1)(i) and 15 CFR 990.74(d)(2)].

Indirect costs include activities or items required to support the selected alternative, but which cannot be directly accounted for. The most common category of recoverable indirect costs is traditional labor overhead, which is generally calculated as a percentage of direct labor costs. For example, government agencies often include the cost of leasing office space in their overhead rate. Many of the non-salary costs associated with trustee employees involved in planning or implementing a restoration alternative may represent claimable indirect costs [43 CFR 11.83(b)(1)(ii) and 15 CFR 990.74(d)(3)]. In some cases state or federal agency budget offices maintain indirect rate estimates that can be applied for purposes of restoration costing. DOI's damage assessment rule explicitly requires full documentation of the assumptions used by trustees to generate any indirect rate [43 CFR 11.83(b)(1)(iii)], and NOAA's proposed rule requires the calculation of any indirect rates "...in accordance with any reasonably sound method" [59 FR 1132, Jan 7, 1994].

3.2.3 Cost Estimating Methodologies

DOI presents several cost estimating methodologies that may be used in restoration costing. Specific methods listed in the DOI rule include:

- Comparison methodology -- consideration of the costs of a similar project, adjusted for factors specific to the proposed project. For example, a trustee agency may have recently completed a wetland restoration project in the assessment area, and thus may have information on the cost of this type of restoration activity.

- Unit methodology -- application of unit cost estimates for each required component of the restoration action (e.g., the cost per adult bird produced by a breeding program).

- Probability methodologies -- use of expected values or range estimates of the cost of a restoration action, or of specific components of the action (e.g., the use of an existing range estimate for the cost of a bird breeding program).

This approach may be more useful than the unit methodology, in that it more accurately reflects uncertainty in the cost estimate.

- Factor methodology -- use of a function (e.g., a proportion) of an existing cost estimate for a restoration action or component of an action (e.g., an existing cost estimate might be scaled up to reflect a larger program being conducted at a site).

- Standard time data methodologies -- use of standard estimates of the time required to complete a task (e.g., the use of standard time estimates in estimating the cost of a fish population monitoring program).

- Cost- and time-estimating relationships -- the use of a regression equation that describes the relationship between cost and/or time and the physical or performance requirements of a restoration action. For example, the cost of restoring a contaminated groundwater resource might be a function of the depth of the aquifer, the size of the contaminated zone, the type of treatment method to be used, and the volume of water to be treated) [43 CFR 11.83(b)(2)].

DOI also permits the use of other methods that "...are based upon standard and accepted cost estimating practices and are cost-effective...." [43 CFR 11.83(b)(3)].

In most cases trustees will apply several of these methods, or variants of these methods, to estimate restoration costs for purposes of damage assessment. Each method has the attribute of requiring documentation of all assumptions and data sources. While NOAA does not propose explicit guidance for restoration costing under OPA, every effort should be made to apply generally acceptable costing methodologies, such as those described by DOI, and to explicitly document all assumptions and data sources.

3.2.4 Pooling of Restoration Funds

NOAA notes the possibility of pooling recoveries from several cases to fund restoration activities [15 CFR 990.74(c)(3)]. While formal rules for this type of restoration arrangement are presented by NOAA (i.e., the development and public review of Regional Response Plans), trustees might use informal variations of this approach. Specifically, this approach may be appropriate in cases that involve resources for which an active and effective restoration program already exists. For example, an oil spill might result in the death of several piping plovers. Since active programs to restore and protect plover populations are underway in several areas of the country, it may be possible (and cost effective) to scale-up these programs as a means to restore the lost birds. When the selected restoration option involves a contribution to an existing fund or program, it will still be necessary to document the basis for the selection and the restoration cost claim.

3.2.5 PHASED APPROACH TO NATURAL RESOURCE RESTORATION

NOAA also notes the possibility of a phased approach to natural resource restoration, in which alternative actions are tested and reviewed prior to selection of a final alternative(s) [15 CFR 990.74(e); see also the preamble language at 59 FR 1132-33, Jan. 7, 1994]. The goal of this approach is to increase the likelihood of a successful restoration program. A phased approach will be particularly attractive, and possibly necessary, when there is substantial uncertainty regarding the likely feasibility and effectiveness of a restoration action at a given site. This approach also may be valuable when trustees require additional information to select between two or more proposed actions intended to accomplish similar restoration goals.

Development of cost estimates for a phased restoration planning and implementation process can be challenging. In most cases, responsible parties will be unwilling to sign a "blank check" to support restoration planning and implementation actions, prior to the selection of a final alternative. Thus, trustees may need to estimate the likely cost of the entire restoration program, components of which may remain uncertain at the time of settlement or presentation of the claim in court. In these cases trustees should generate a best estimate of the expected value of restoration costs, fully documenting all assumptions made in generating this cost estimate.

3.3 TYPICAL RESTORATION COST COMPONENTS

A wide-range of options have been proposed for the restoration of natural resources following the release of oil and other hazardous materials to the environment. Examples include, but are by no means limited to: contaminant removal (e.g., dredging of contaminated sediment "hot-spots" within a bay system, or biological treatment of an oil-contaminated beach); creation, restoration or protection of various ecosystem types (e.g., mangroves, marine and freshwater wetlands, seagrass beds, upland habitat, riverine environments, coral reef); and enhancement of fish and wildlife populations (e.g., operation of bird breeding facilities and fish stocking programs). In addition, trustees can choose a "no action" alternate (i.e., allow for the natural recovery of a resource). Despite the variety of environmental restoration options, it is possible to provide a general overview of cost components that are typical to many restoration efforts. The goal of this section is to assist trustees in the development of complete restoration cost claims through careful consideration of the various cost components that comprise the restoration action. One possible taxonomy of these cost components is presented in Exhibit 3-1, and is discussed below.

Both direct and indirect costs associated with a restoration program may be recovered as part of the damage claim. The costs associated with planning and development, and program implementation, evaluation and monitoring may include trustee employee salaries and overhead, travel costs, materials and supplies, and equipment purchase or lease costs. In some cases private contractors or other government agencies will perform various activities associated with the restoration process (e.g., sediment sampling activities conducted by the Corps of Engineers as part of the restoration effort). In these cases contract labor, overhead, materials and supplies, equipment and travel requirements should all be considered in developing the restoration cost estimate. In addition, any expected government contracting costs, which include the cost of bidding and

Exhibit 3-1

TYPICAL RESTORATION COST COMPONENTS

Planning Costs

- Restoration Plan Development
- Public Review, Public Meetings, Response to Public Comments, Community Relations
- Human Health and Safety Plan/Quality Assurance Plan
- Chemical/Physical/Biological Surveys
- Feasibility/Pilot Studies
- NEPA/CZMA Compliance, other Permitting and Regulatory Compliance Requirements

Implementation Costs

- Physical/Chemical/Biological Contaminant Removal/Treatment/Containment
- Habitat Reconstruction/Creation/Enhancement
- Wildlife Replacement/Restocking/Protection
- Land/Real Property Acquisition, Water Rights Acquisition
- Cash Contributions to Existing Mitigation/Banking Programs or Regional Response Plans
- Trustee Oversight of Restoration Actions Undertaken by the Responsible Party
- Community Relations/Education, Public Meetings
- Contracting Costs

Program Evaluation and Monitoring Costs

- Monitoring the Progress of Restoration Actions
- Evaluation of Restoration Program Results/Effectiveness
- Follow-up Studies/Actions, as Required
- On-going Management

competing the job, managing contracts, and providing for independent quality assurance and review of project results, should be included in the cost estimate.

3.3.1 Planning Costs

Restoration plan development costs are recoverable under DOI's final rule and NOAA's proposed rule. These include costs associated with: developing a detailed restoration plan; receiving public comments on the proposed plan, and revising the plan in response to these comments; developing human health and safety plans; conducting field sampling and other investigations as required to complete the plan; conducting feasibility and pilot studies to test the viability and effectiveness of possible options; and meeting NEPA, CZMA, and other state, tribal or federal project review, permitting and regulatory compliance requirements.

Note that public education may be required at various stages throughout the restoration process, to gain the cooperation of key groups (e.g., to minimize disturbance of the site being restored), to explain the need for management restrictions (e.g., a fishing closure to allow fish stocks to recover from a spill), or to encourage participation in the program (e.g., encourage farmer participation in co-funded soil conservation or stream protection programs). These types of activities are necessary to assure success of the restoration program, and thus are properly included in the damage claim.

3.3.2 Implementation Costs

Restoration program implementation costs can vary widely in type and magnitude, depending on the restoration option(s) selected. Common categories of these costs are listed in Exhibit 3-1. In some cases a settlement agreement may include a commitment by a responsible party to complete a specific restoration action, or to achieve a specific set of environmental objectives (e.g., to reduce contaminant concentrations to a specific level; to restore a fish population). Trustees may incur costs associated with oversight and review of these actions and should recover these costs as part of the settlement.

3.3.3 Project Evaluation and Monitoring Costs

Part of the restoration process involves monitoring and evaluating the results of the completed restoration program. For example, the trustees may choose to create a freshwater wetland to compensate for the loss of wetland acreage due to remediation activities at a site. In order to assure that full restoration of wetland functions and services has occurred, it may be necessary for trustees to monitor the site for several years, if not decades. If the restoration alternative is not functioning as expected, corrective actions could be undertaken.

It is important to note that evaluation and monitoring costs may occur even in cases in which the "no action" alternative is selected. For example, an affected seabird population may be expected to recover quickly following an oil spill event; thus, restoration actions may be deemed unnecessary.

However, monitoring of the affected wildlife population may be desirable to assure that natural recovery is progressing as expected, and to confirm that unexpected effects (e.g., excess reproductive failure) are not occurring.

3.3.4 Costs of Acquiring Equivalent Resources

DOI's rule for damage assessment restricts federal trustees from choosing acquisition of land (and, presumably, other real property, such as water rights) for federal management, unless restoration, rehabilitation and replacement actions are not possible [43 CFR 11.82(e)]. However, in some cases acquisition of equivalent resources may be deemed appropriate.

Acquisition of an equivalent resource may not be limited to ownership in fee, but can include purchase of easements, covenants and deed restrictions, as well as lease arrangements. Selection of the acquisition option may entail costs beyond the cost of acquiring a right to the property. For example, it may be necessary to compensate the local community for tax (or fee) revenue losses, to provide for management and upkeep of the property, and if the goal is to protect or enhance a species, to take actions to limit access to the property. Thus, trustees should carefully consider and document the expected long-term costs of resource acquisition.

3.4 Time Frame of Restoration Activities

In developing a restoration cost estimate as part of the damage claim or in costing out several restoration options for further consideration, trustees need to consider the time period over which the proposed actions will occur. Specifically, trustees need to incorporate into the analysis:

- Expected changes in the cost of project components over time;
- The expected lifespan of required capital equipment (i.e., to allow for replacement); and,
- The timing of recurrent expenses.

In addition, trustees will need to consider the expected rate of return (i.e., interest to be received) on funds recovered as a result of a damage claim. This issue is addressed in detail in Chapter 6.

3.4.1 Inflation

Prices for labor, overhead, materials, supplies and equipment will generally increase through time, in response to inflation. The rate at which these costs increase may vary. For example, fuel costs might be expected to increase at a rate greater than that of general inflation, while wages might be expected to lag the general rate of inflation. The rates of inflation in these general cost components will vary from year to year, and across geographic areas. Note that prices for some

goods and services might be expected to decrease through time. For example, costs to treat contaminated soils have generally fallen over time, due to the emergence of more cost-effective technologies. To the extent that a decline in the cost of a particular component of a restoration plan is expected, that factor should be taken into account in the costing process.

3.4.2 Recurrent Expenses

Some restoration program requirements will be recurrent. For example, a restoration action might require monitoring and evaluation of effectiveness every other year. Consideration should also be given to the expected lifespan of required capital equipment (e.g., boats or other equipment needed to support the restoration program). Detailed documentation of the recurring expense assumptions used in generating the cost schedule should be provided with the cost estimate. As shown in the example at the end of this chapter, careful accounting for the timing and frequency of these types of costs is required to establish a complete and defensible restoration cost claim.

3.5 Uncertainty in Restoration Costing

There are a variety of sources of uncertainty that may enter into the restoration costing process. For example, it may be difficult for trustees to develop firm cost estimates for some project components, given uncertainty in likely site conditions (e.g., the extent of contamination in a bay system) and other factors. Similarly, as with any major project, there may be unforeseen costs associated with an action. Finally, there may exist any number of conditions under which a project will fail. For example, for a project designed to create freshwater wetland there may be a possibility that the hydrologic conditions required to establish the wetland will not be achieved. Thus, trustees may wish to assure that sufficient funds are available to take actions to remedy failure or to undertake alternative actions.

It is impossible to account for and insure against all sources of uncertainty within the restoration costing process. This is particularly true for actions that involve novel restoration techniques or challenging field conditions. However, efforts should be made to account for obvious sources of uncertainty, and to make the assumptions used in accounting for these factors explicit in the restoration cost claim.

In some cases the responsible party may be willing to fund directly, or even conduct, the selected restoration option(s). This arrangement may be advantageous to the trustees, in that it places the burden on the responsible party to assure that sufficient funds are available for the required activities (e.g., the responsible party will be expected to cover any unexpected cost overruns). However, trustees should establish explicit and detailed performance goals; that is, the commitment on the part of the responsible party should not be for a given level of expenditure, but for the achievement of explicit restoration objectives.

3.6 RESTORATION COSTING EXAMPLE

An example restoration cost claim is detailed on Exhibit 3-2. This example involves the following restoration scenario:

> An oil spill has resulted in the abandonment of a seabird colony. In order to restore this colony, the trustees propose to initiate a bird recolonization project. This project will involve the use of decoys and audio cues to encourage breeding birds to return to the affected site. Given the technical nature of this project, several experts will be involved, as well as associated support staff. The site in question is located in a remote location; thus, the trustees need to account for travel costs and other costs associated with site access. The trustees plan to contract the restoration effort out to a private organization. It is expected that the project will require 10 years to complete.

The various cost components (for each year of expected activity), and the total present value of the claim are shown on Exhibit 3-2. The expected costs are broken into three categories: equipment, operating costs, and labor (i.e., "Salaries and Fringe"). Although presented in different categories, these cost components reflect the categories listed in Exhibit 3-1. For each cost component an estimate was made of the then-current cost of the item, expressed in 1994 dollars. For example, decoys were expected to cost $55,000, while the annual salary for a principal investigator was expected to be $47,000. The indirect costs associated with the required labor (i.e., "fringe benefits," in this case limited to health and other insurance charges) were calculated as a percentage of the total labor cost. In addition, the trustees allocated funds for management and peer review of the project.

In this example, costs were inflated at either three or five percent per year, depending on the cost component. The reported unit cost estimates were developed based on interviews with individuals involved in similar, on-going efforts. Note that the project was not expected to begin until 1997; thus, it was necessary to inflate the cost components over three years to estimate costs in the first year of the program.

Some of the cost components were expected to recur and/or increase over time, while others were expected to decline. For example, it was assumed that most of the equipment would be replaced in the sixth year of the program (i.e., a five year operating life was assumed). Thus, Exhibit 3-2 shows greater expenditures for equipment in year 6 of the program, as required equipment is replaced. Expenditures for equipment in years 2 through 5 and 7 through 10 represent maintenance costs. In addition, required labor was expected to decrease in year six to one-half of the initial value. In the intervening years the trustees expected to incur some costs associated with maintenance of the required equipment.

In this example the trustees accounted for possible uncertainty through the inclusion of a 10 percent contingency, which was applied to the total cost of the effort. This contingency rate was established based on the best professional judgement of the project planners; contingencies for other projects may be higher or lower, and may be expressed more appropriately in terms of absolute

Exhibit 3-2

EQUIPMENT	Inflation Rate	Unit Cost in Current 1994	YEAR 1 1997	YEAR 2* 1998	YEAR 3* 1999	YEAR 4* 2000	YEAR 5* 2001	YEAR 6* 67* 2002	YEAR 7* 2003	YEAR 8* 2004	YEAR 9* 2005	YEAR 10* 2006
Boat w/ Motor & Trailer	5%	$75,000	$86,822	$4,862	$5,105	$5,360	$5,628	$36,936	$6,205	$6,516	$6,841	$7,183
Zodiacs (2)	5%	$7,500	17,364	1,529	1,606	1,686	1,770	$21,586	1,952	2,049	2,152	2,259
Vehicles	5%	$50,000	57,881	5,095	5,350	5,618	5,899	$73,873	6,503	6,828	7,170	7,528
Decoys	5%	$55,000	63,669	6,518	6,844	7,186	7,546	6,338	6,655	6,988	7,337	7,704
Audio Equipment	5%	$30,000	34,729	6,597	6,926	7,273	7,636	$11,421	7,653	$8,036	8,438	8,860
Photo Equipment	5%	$7,500	8,682	1,630	1,711	1,797	1,887	1,981	2,080	2,184	2,294	2,408
Field Equipment	5%	$8,500	9,840	985	1,445	1,085	1,593	3,454	1,257	1,844	1,385	2,033
subtotal		--	$278,988	$27,216	$28,988	$30,005	$31,959	$155,590	$32,306	$34,445	$35,617	$37,976
OPERATING COSTS												
Gas and Oil	5%	$2,000	$2,315	$2,431	$2,553	$2,680	$2,814	$2,955	$3,103	$3,258	$3,421	$3,592
Overflights	5%	$8,500	9,840	10,332	10,848	11,391	11,960	12,558	13,186	13,846	14,538	15,265
Travel	5%	$40,000	46,305	48,620	51,051	53,604	56,284	59,098	62,053	65,156	68,414	71,834
Office and Support	5%	$100,000	115,763	121,551	127,628	134,010	140,710	147,746	155,133	162,889	171,034	179,586
subtotal		--	$174,223	$182,934	$192,080	$201,684	$211,769	$222,357	$233,475	$245,149	$257,406	$270,276
SALARIES AND FRINGE BENEFITS												
Principal Investigator (2)	3%	$47,000	$102,716	$105,798	$108,972	$112,241	$115,608	$59,538	$61,324	$63,164	$65,059	$67,011
Assistants (4)	3%	$25,000	109,273	112,551	115,927	119,405	122,987	$95,008	97,858	100,794	103,818	106,932
Fringe @ 30% of above		$21,600	$63,597	$65,505	$67,470	$69,494	$71,579	$46,364	$47,755	$49,187	$50,663	$52,183
Management & Review @ 5% of above	0.05	$4,680	$13,779	$14,193	$14,618	$15,057	$15,509	$10,045	$10,347	$10,657	$10,977	$11,306
subtotal		--	$289,365	$298,046	$306,987	$316,197	$325,683	$210,955	$217,284	$223,802	$230,516	$237,432
Total		--	$742,580	$508,200	$528,060	$547,890	$569,410	$588,900	$483,060	$503,400	$523,540	$545,680
Contingency	10%	--	$74,258	$50,820	$52,806	$54,789	$56,941	$58,890	$48,306	$50,340	$52,354	$54,568
Total + Contingency		--	$816,838	$559,020	$580,866	$602,679	$626,351	$647,790	$531,366	$553,740	$575,894	$600,248
Contractor Fee	10%	--	81,684	55,902	58,087	60,268	62,635	64,779	53,137	55,374	57,589	60,025
GRAND TOTAL		--	$898,522	$614,922	$638,953	$662,947	$688,986	$712,569	$584,503	$609,114	$633,483	$660,273
	Discount Rate											
Present Value (1994$)	0.0563	--	$762,372	$493,936	$485,884	$477,260	$469,569	$459,757	$357,027	$352,230	$346,797	$342,197
Total Present Value of Years 1 through 10 (1994$)			$4,547,028									

* Equipment costs incurred in these years reflect expected replacement and maintenance expenditures.

dollars. In addition, the trustees expected that the contractor hired for this effort would charge a 10 percent fee on all cost components.

The last two rows of Exhibit 3-2 contain estimates of the present value of this effort. This calculation is described in more detail in Chapter 6.