Habitat Equivalency Analysis: How Much Restoration Is Enough?

Natural resources are often injured when oil or hazardous materials enter the marine environment, possibly reducing the quality or quantity of services normally provided by these resources. For example, after a wetland is oiled, it may no longer provide suitable habitat for birds or support the organisms on which birds feed. If the wetland vegetation sustains long-term injury, other functions of the system, such as sediment stabilization and flood control, may also be impaired. Natural resource trustees responsible for restoring these injured resources have two objectives:

1) Restore the resource to baseline condition (the condition of the resource in the absence of the release); and

2) Compensate for the interim loss of the resource pending restoration to baseline. If recovery of the resource cannot be accelerated, more compensation for the interim loss may be needed.

Habitat Equivalency Analysis (HEA)[1] provides an analytical framework for estimating how much restoration is needed to compensate for the interim loss. HEA directly addresses the type and scale of the restoration, without directly valuing the interim loss in economic terms. However, the objective of compensatory restoration is to deliver a fair level of compensation for the interim loss of the resource, meaning the value of the increase in services from the replacement projects must be equivalent to the value of services lost due to the injury. Thus, using HEA, trustees select replacement projects that will generate services of comparable type and quality to those of the injured resource.

To perform HEA calculations, trustees must determine how long the injury will persist, the relative service level of the injured and replacement resources, and the lifetime of the replacement project. With this information, the trustees can calculate the amount of the restoration needed by establishing an equivalency between the quantity of lost services and the quantity of services generated through the compensatory restoration project over time[2].

An example of an HEA application is provided on the back of this page to illustrate these concepts.

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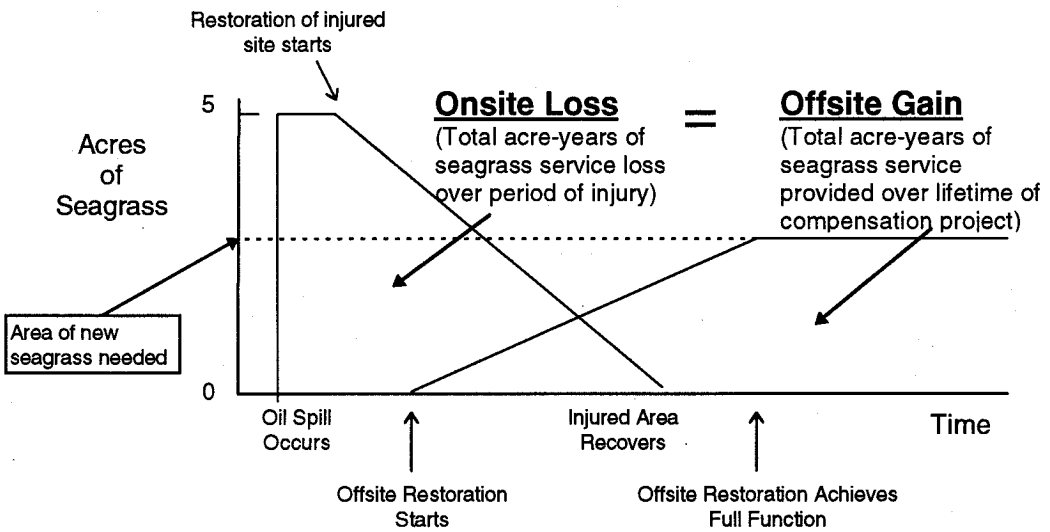
[1] Although the term *Habitat Equivalency Analysis* is used, the same concept may be applied to any loss that can be represented by resource-based measures over time such as numbers of fish-years or beach-days.

[2] In HEA, computations of resource services are time-adjusted to present value using discounting.

An Example: Compensatory Seagrass Replacement Project

Five acres of seagrass were destroyed following an oil spill. The oil heavily coated the seagrass blades and permeated the sediments. The purpose of HEA is to determine how much compensatory restoration work is needed to fully compensate for the 5 acres of injured seagrass. The Trustees consulted with seagrass experts to establish the basic parameters of the HEA, including:[3]

- 100% of the services provided by the 5 acres of seagrass beds were immediately lost at the time of the spill.
- 15 years would be required for the seagrass beds to recover to baseline after site cleanup and planting. Without intervention, recovery of the injured area would take considerably longer causing the total loss to the public as well as the cost to the Responsible Party to increase.
- Nearby sites exist for creation of suitable offsite replacement seagrass beds. New seagrass beds will require 15 years to reach maturity.
- All recovery trajectories are linear.



The figure below represents the loss in services caused by the spill and the replacement of those services through construction of new seagrass beds.

By equating the total loss (in seagrass acre-years) to the gain generated by the new seagrass beds, one may calculate the area of the compensatory restoration project that is necessary to replace the loss[4]. In this example, 2.2 acres of new seagrass beds would be needed in addition to restoring the destroyed 5 acres to compensate for the injured natural resource.

[3] This example is meant to illustrate the basic concepts behind HEA, more information is needed to conduct an actual analysis.
[4] Actual computations are based on acre-years discounted to the present (not displayed in diagram).