USA: Texas: Lavaca Bay Restoration, Point Comfort, Calhoun County

Overview

From the late 1960s to early 1970s Alcoa (Alcoa, Inc and Alcoa World Alumina, LLC) operated a chlorine-alkali processing unit at its Point Comfort, Texas, plant that discharged mercury into Lavaca Bay. Coal tar processing contaminated other areas around the facility with polycyclic aromatic hydrocarbons (PAHs). In 1988, a portion of Lavaca Bay was closed for the taking of finfish and crabs for consumption after mercury levels in these resources were found to exceed levels considered safe for human consumption. A trustee council, made up of representatives of the Texas Natural Resource Conservation Commission (TNRCC), the Texas General Land Office (TGLO), the Texas Parks and Wildlife Department (TPWD), U.S. Fish and Wildlife Service (USFWS), and National Oceanic and Atmospheric Administration (NOAA), was established to review, select, and oversee implementation of restoration actions for natural resources injured by the release of mercury and PAHs. A comprehensive restoration plan was developed and Alcoa implemented a suite of projects in and around the bay to compensate for natural resource losses resulting from the site contamination. A staged approach to restoration was adopted with the first stage focused on recreational fishing service losses. To offset these losses, three fishing piers were constructed, a boat ramp was replaced, two timber docks were built and an existing jetty was modified to improve access and enhance recreational fishing opportunities in the bay. The second stage focused on natural resource injuries and service losses of an ecological nature. To restore these losses, 729 acres of land were purchased for transfer to the U.S. Fish and Wildlife Service for preservation as part of the Aransas National Wildlife Refuge, 70 acres of inter-tidal salt marsh were created within the refuge and 11 acres of new oyster reef habitat were created in Lavaca Bay. The restoration projects implemented by Alcoa were identified through an expedited natural resource damage assessment (NRDA) process that was undertaken cooperatively with Alcoa and the natural resource trustees. The cooperative assessment process permitted comprehensive coverage of all NRDA issues associated with the site and led to good working relationships between federal/state partners, Alcoa, and the local community.

Project Details

Lead entity types:

- Governmental Body

Adaptive management

Describe adaptive management processes and mid-course corrections taken to address unforeseen challenges and improve outcomes in each of the following categories:

Other:

The cooperative agreements between Alcoa and the trustees avoided costly and time-consuming litigation and resulted in accelerated investigations and restoration of natural resources and compensation for the lost use of some resources by the public. The parties ultimately agreed to a set of reasonable, conservative assumptions of natural resource injuries and losses based upon available information rather than expending additional time and money on more focused assessment. Another benefit of cooperative assessment is increased public participation and awareness. Public outreach is a fundamental element of the remedial process under CERCLA (Superfund). By participating in both the remediation and restoration, the trustees were able to capitalize on this opportunity and involve the community in their decision-making. In particular, the trustees were able to review the potential restoration project alternatives during these meetings and select projects with a high potential for success and public approval.

State of Progress:

- Implementation

Project Start:

2001-02-05

Project End:

2010-02-05

Total budgeted expenses:

- USD >100 million

Global Regions:

- Northern America
- Americas
- World

Countries:

- United States of America

Ecosystem Functional Groups / Biomes:

- Semi-confined transitional waters biome

Ecosystems:

- Permanently open riverine estuaries and bays

Extent of project:

- Other

Extent of restoration:

- Other

Degradations:

- Contamination (biological, chemical, physical or radiological)

Description:

From 1966 to 1970, the Alcoa Point Comfort (PCO) facility discharged mercury - containing wastewater into Lavaca Bay from its chlor-alkali processing operations. Alcoa terminated the direct discharge of this wastewater into the bay in 1970 after the Texas Water Quality Board notified Alcoa of potential adverse environmental impacts associated with this discharge. Other areas around the facility were also contaminated with PAH as a result of processing coal tar. In April 1988, the Texas Department of Health (TDH) issued a "˜closure order' prohibiting the taking of finfish and crabs for consumption from a specific area of Lavaca Bay due to elevated mercury concentrations found in these species. The site was placed on the National Priorities List in 1994. Placement on this list was primarily based upon levels of mercury found in several species of finfish and crabs in Lavaca Bay, the fisheries closure imposed by TDH in 1988 and the levels of mercury detected in bay sediments in areas adjacent to the PCO facility. The trustees used the Habitat Equivalency Analysis (HEA) method (Unsworth and Bishop, 1994) for scaling the size of the restoration actions to compensate the public for lost services from injured natural resources. HEA considers the loss or reduction in services provided by resources as the injury "measure". Therefore, the trustees estimated how the mercury and PAHs could influence the ability of resources to provide ecological services. The concept of using ecological services as the injury measure is relatively complex. One key concept underlying this approach is that natural resources in an ecosystem are interrelated through the services upon which they depend or provide. Ecological services can be identified as "the functions performed by a natural resource for the benefit of another natural resource and/or the public". Thus, benthic invertebrates provide a "food" service to fish which consume them, and fish in turn provide a "recreational fishing" service to the public. Connections among physical resources, between physical and biological resources and services they provide for Lavaca Bay marshes are depicted in File#3. The interrelationships among natural resources in the Lavaca Bay ecosystem were the cornerstone of this assessment. The trustees considered the effect of habitat contamination on resources dependent upon that habitat by determining reductions in likely service flows from that habitat, rather than by trying to directly assess injury to the dependent resources. This approach is consistent with a restoration-based assessment, where the focus is on the restoration of resources and services. The HEA method requires the development of injury parameters to quantify lost habitat resources and services. The parameters needed to estimate losses within the HEA framework include the area of habitat injury, the degree of injury within that habitat, and how that degree of injury changes over time. The degree of injury is determined by the condition of key or representative resources or services in the habitat (for example, primary production or macrofaunal density). The losses are quantified by year, as lost service acre-years, where a service acre-year is the loss of one acre of habitat and its associated resources and services for one year. To make losses that occur in different time periods comparable, a discount factor is applied to the losses to determine discounted service acre-years (DSAYs). Using this methodology the discounted habitat losses were determined to be 747.12 DSAYs for Dredge Island Marshes, 489.5 DSAYs for other marshes and 244.72 DSAYs for oyster reef (see NOAA, 2001a for more information). Other parameters are necessary to quantify the benefits of restoration actions in a HEA. They include when the habitat restoration project begins, the time until the habitat provides full services, the level of services provided between the time when the project begins and when it provides full services, and the relative services of the created or enhanced habitat compared to the injured habitat before the incident. Given the size of a project and the discount rate, these parameters define the discounted service acre-year benefits that result from the restoration action. The task is to determine the size of the projects (scale) such that the discounted service acre-year benefits just offset the discounted losses. It was determined that the creation of at least 9.3 acres of oyster reef and at least 61.3 acres of marsh would be needed to compensate the public for interim ecological losses from contamination and response actions initiated through the end of 1999. For additional details concerning the scaling calculations, see the Lavaca Bay Injury Quantification and Restoration Determination Technical Memorandum (Trustees, 2000). The trustees developed a random utility model to estimate the recreational fishing service losses due to the fishing closure and the benefits from the implemented restoration actions (see Adamowicz, Louviere and Williams, 1994 and Adamowicz et al., 1997 as examples). Typically, a random utility model determines the change in value of a recreational trip for a change in an environmental condition at a recreation site. If a site's environment is degraded, the model estimates the lost value per recreation trip resulting from the degradation. Likewise, for an environmental improvement at a recreation site, the model determines the added value per trip resulting from the improvement. Because the values are defined in a common metric, i.e., dollars, it is possible to add lost values for different degraded environments and to compare these lost values with values gained from environmental improvements. Based on the values calculated using this model, the trustees determined that the recreational restoration projects constructed (i.e. three fishing piers, replacement boat ramp, two

timber docks and a modified jetty) were sufficient to fully compensate the public for all the recreational fishing losses resulting from the release of contaminants at the ALCOA PCO Site (see NOAA, 2001b, appendix B for more information).

Planning and Review

Goals and Objectives

Was a baseline assessment conducted:

unsure

Was a reference model used:

RM5

were_goals_identified:

YES

Goals and objectives:

- Other

Goals Description::

The overall goal of the restoration was to make the environment and public whole for injuries to natural resources and/or service losses resulting from the releases of hazardous materials and clean-up activities at the site. The restoration addressed the recreational fishing service losses by increasing and improving angler access in Lavaca Bay. Ecological service losses were compensated through in-kind restoration (e.g. the creation of a new marsh to compensate for lost marsh services) of marsh and oyster reef habitats. The trustees determined that restoration actions would be required to return the ecosystem to baseline conditions as the resources were not expected to recover in a reasonable amount of time without human intervention.

Stakeholder Engagement

Were Stakeholders engaged?:

unsure

Description of Stakeholder Involvement:

The designated natural resource trustee agencies involved are the National Oceanic and Atmospheric Administration (NOAA) of the US Department of Commerce, the Texas Natural Resource Conservation Commission (TNRCC), the Texas General Land Office (TGLO), the Texas Parks and Wildlife Department (TPWD), and the U.S. Fish and Wildlife Service (USFWS) on behalf of the US Department of the Interior (DOI) (collectively, "˜the trustees'). TPWD was the lead trustee on the project. Restoration alternatives were evaluated by the trustees, experts from industry, and restoration scientists, to determine the best options to compensate the public for recreational fishing losses and ecological services impaired or lost by the release of hazardous materials. Restoration plans were reviewed by interested members of the public and the potential for both on-site and off-site restoration was considered. Decisions guiding restoration implementation and monitoring were developed as a part of a settlement agreement between natural resource trustees and responsible parties. Final authority to make determinations regarding injury and restoration rests solely with the trustees. All restoration activities were completed by Alcoa with oversight by the trustees.

Ecosystem Activities and Approaches

General Activities: 1) Research and planning The trustees consulted with local scientists and state agency personnel to obtain perspective on the benefits and feasibility of restoration alternatives. These efforts were important in assisting the trustees in identifying restoration actions that had the potential to be feasible, had strong net environmental benefits, and met restoration requirements to compensate for injuries resulting from Site contamination. The trustees also considered public access and recreational opportunities provided by a restoration project as positive attributes. An additional factor considered was the acceptance of the projects by the community. Restoration alternatives that were complimentary with other community development plans/goals were considered more favorably. The trustees determined that the restoration activities must have an ecological and geographical relationship to the injured resources and service losses. They approached restoration planning with the view that the Lavaca/Matagorda Bay system represented the relevant geographic area for the restoration actions because the

injuries and losses occurred in that area. The suitability of potential restoration sites was evaluated through site visits, aerial overflights, and ground surveys. The Trustees held public meetings in Port Lavaca to solicit public input and suggestions for restoration activities and sites prior to and after developing the restoration plan. The restoration alternatives chosen included land purchase, salt marsh and oyster reef creation, construction of fishing piers and docks, and improvements to an existing boat ramp and jetty. Performance criteria and monitoring events for each project were established. Although a monitoring program increased the cost of the restoration, it was necessary as knowledge of the status of early restoration actions was critical in determining the need for maintenance and corrective actions to ensure that the long-term project goals were attained. 2) Implementation Land Purchase The Whitmire Property, 729 acres (see File #2, area labeled "Habitat Preservation Location"), was purchased and will be transferred to the U.S. Fish and Wildlife Service for addition to the Aransas National Wildlife Refuge where it will be protected and preserved for the ecological services it provides. Transfer of this property will occur within thirty days following the certification of the marsh restoration project by the lead trustee. The parcel contains about 60 acres of estuarine marsh habitat, 205 acres of upland coastal prairie and shrubland, 78 acres of freshwater marsh and transitional shrubland, and an approximately 370 acre shallow freshwater lake. Marsh Restoration (See Consent Decree Exhibit 3 Marsh Implementation Plan in links section, below) Intertidal marsh was created along the northshore of Powderhorn Lake. The marsh was created by scraping down an area of approximately 31 acres of existing land to appropriate elevations for planting marsh vegetation and creating tidal channels. The soil from the 31 acres was placed into Powderhorn Lake to create approximately 39 additional acres of marsh. A breakwater was constructed on the southern edge of the created marsh to protect against erosion. Once the construction was completed and the area was ready for planting, Spartina alterniflora plugs were planted on 5 foot centers where the elevations were appropriate for this species. Spartina patens was planted at higher elevations in 2 to 3 rows, on 3-5 foot centers. The marsh contains both primary and secondary channels and 25% open water in the area constructed on existing land and 35% open water in the area constructed in existing water. To maximize function, the marsh was constructed so that no planted areas are more than 10 meters from a primary or secondary channel. Oyster Reef Restoration (See Consent Decree Exhibit 4 Oyster Reef Implementation Plan in links section, below) An 11 acre oyster reef was constructed in the southeast portion of Lavaca Bay near the pass between Keller Bay and lower Lavaca Bay, adjacent to natural reefs and scattered oyster clusters. It is composed of 27 parallel segments, perpendicular and/or diagonal to the tidal currents, separated by 50 foot wide gaps of open bay bottom. The reef was constructed from limestone base rock placed on top of geotextile filter fabric. After settling, the top of the reef base was on average 12 inches higher than the surrounding bay bottom, with no spot less than 6 inches, to prevent burial by natural sedimentation. All activities were completed from April 13 through May 2, 2005 prior to the June spawning peak so that clean substrate was available for the oyster spat. Recreational Projects (See Consent Decree Exhibit 5 Recreational Projects Implementation Plan in links section, below) To compensate for recreational fishing loses, three fishing piers, one each at Six-Mile Park, Point Comfort, and Port Lavaca Bayfront were constructed. In addition an existing auxiliary boat ramp was replaced, two timber docks were built and an existing jetty was modified to improve access and enhance recreational fishing opportunities in the bay. The projects were designed consistent with current engineering standards for piers and docks on the Texas Gulf coast to achieve a 30-year life span. Surveys were conducted to document utilization of these projects. The surveys were for information purposes only and no corrective actions were conducted based upon the results. 3) Results Marsh Restoration (See Phase 1 Marsh Monitoring Report in links section, below) The constructed marsh has been monitored to determine percent foliar cover, as well as ensure the primary channels remain free flowing and the low water depth in no less than 0.5 feet. After an initial vegetation survival survey in December 2006 corrective action was taken to reduce erosion across the transition zone. Some areas of the marsh have required the addition of fertilizer and replanting. The results of the 2008 monitoring indicate that the average percent foliar cover was 85.5%, the marsh acreage determined through aerial photography was 72.1 acres, all of the channels met the flow requirements outlined in the consent decree, and the breakwater was performing exceptionally well. The marsh has developed to the point where no further corrective action is anticipated. Oyster Reef Restoration (See Oyster Reef Ecological Performance Evaluation Report in links section, below) After at least 70% settlement, the reef had a suitable solid base with a surface elevation that was on average 12 inches higher than the surrounding bay bottom and no individual spot was less than 6 inches above the bay bottom. The combined areal size of the reef segments was at least 10.9 acres. Data collected at 14 sampling stations distributed over the reef complex has indicated that the entire reef is providing oyster habitat. Oysters dominated the organisms found on the rocks collected at the sample sites and, based on the abundance of small oysters and oyster spat, the construction of the reef was timed very well and the oyster set was excellent.

Project Outcomes

Eliminate existing threats to the ecosystem: Oyster Reef The oyster reef restoration will not required further restoration activities and has been certified by the lead trustee. Marsh The marsh system is steadily maturing into a productive self-sustaining estuarine ecosystem and supports a variety of aquatic, avian, and terrestrial wildlife species. The abundance of birds and fish in the Alcoa marsh, compared with the abundance of wildlife in surrounding marshes, suggests that the Alcoa marsh is as attractive to coastal wildlife as any of the natural marshes in the area. The resiliency of the restoration was demonstrated in 2008 when the marsh was inundated by Hurricane Ike. Despite minor debris deposition, there was no change in the percentage of foliar cover. Monitoring will continue and the marsh restoration will not be considered complete until the planted areas continue to have at least 75% foliar cover and this condition is maintained without major corrective action for a period of two years. Recreational Fishing The projects constructed have been extremely popular with the public and are providing the increased access for which they were designed (Rice, personal communication). Economic vitality and local livelihoods: Marsh Construction Constructing the marsh has provided ecological services (e.g. fish spawning and nursery habitat, nutrient cycling, erosion control, shorebird nesting and loafing habitat, etc) similar to those lost due to the hazardous material release. The marsh also provides recreational opportunities such as bird watching, walking and nature study. Oyster Reef Restoration Establishing the oyster reef has provided ecological services (e.g., water filtration, benthic-pelagic coupling from feeding activity; food for fish and invertebrates that prey upon molluscan larvae and seed, benthic biomass; and habitat value) similar to those functions lost due to the hazardous material release. The oyster reef also provides recreational fishing opportunities that were lost due to the fishery closure imposed as a result of elevated contaminant levels. Recreational Projects In addition to the improved access and additional fishing opportunities provided by the docks, piers, etc., all of the projects benefit non-anglers by providing or enhancing

opportunities for other recreational activities, such as boating, walking, picnicking and bird watching. The projects also help support existing property values and fishing related commercial activities.

Monitoring and Data Sharing

Does the project have a defined monitoring plan?:

NO

Open Access URL:

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Long Term Management

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