

Dams and Water Developments¹

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Abstract: The U.S. Army Corps of Engineers is involved in the construction and regulation of many activities relating to water resource development. Such activities include dams and reservoirs, channelization and erosion control on rivers and tributaries, and coastal works. These activities can result in an array of visual effects depending on the specific activity type and means of implementation.

An array of water resource activities typically impacts our natural watershed systems. Such activities include dams and associated reservoirs, flood and erosion control on tributaries and rivers, the regulation of dredging and filling, and the protection of shorelines. For our portion of the simulated field trip, we will follow a natural progression of those elements found at the headwaters and downstream to the coastline, primarily of the west. We should emphasize that many water resource activities significantly alter the character of the natural landscape, particularly those activities whose elements are architectonic and imposing. However, some activities may enhance landscape values which were monotonous, lacking in visual diversity beforehand. Other landscapes can be rehabilitated after the activity has ensued resulting in little discernible visual impact.

Water resource development is probably best exemplified by the concrete dam. In the early 1900's these structures, such as Roosevelt

Dam in Arizona, were first constructed to relieve increasing demands for irrigation. By the mid-thirties, the concern for flood control became equally important to garner support for dam construction.

Characteristically, in terms of size, form, material and texture, the concrete dam is an imposing structure in relation to the natural landscape. However, this hardened image can take on an ephemeral, fanciful quality simply by water cascading over its spillway. Earthen dams can have an overbearing visual impact, as well, considering their austere form, juxtaposed with the natural topography, and texture, since their embankments are often void of woody vegetation native to the locale. Appurtenant structures are often associated with dams such as outlet works, power generating facilities and fish ladders to facilitate migration. Fish hatcheries are often constructed downstream from the dam to mitigate loss of fishery values, since the reservoir may not provide a suitable or sustaining environment for many species.

Construction activities present many visual impacts such as denuding expansive areas of vegetation and conveying fill material to the site, whose quarry may remain evident long after the project has been completed. As the dam slowly evolves, it begins visually to dominate the surrounding environs. Roads and bridges are normally relocated from the proposed reservoir area often requiring extensive cutting and filling operations. Particularly in hot, arid climates, cut and fill slopes may remain

^{1/} Presented at the National Conference on Applied Techniques for Analysis and Management of the Visual Resource, Incline Village, Nevada, April 23-25, 1979•

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scathed for several years.

Today, the construction of dams is not universally endorsed. Fewer optimum locations for flood control and power generation, adverse environmental impacts, costs, and the feasibility of non-structural alternatives have diminished the dam's role in solving our water resource problems of the future.

Bodies of water may visually enhance the landscape and can provide recreational benefits. We often idyllically perceive the act of recreating and quite often our expectations materialize, like sailing or camping adjacent to impounded water. But all too often, recreational areas become over-utilized resulting in the visual and physical deterioration of the environment, particularly, as more and more accouterments of our culture subjugate the natural setting. Poorly designed facilities can further erode visual quality although such problems can be resolved by rehabilitation providing their use is controlled in relation to the carrying capacity of the site. Even recreational facilities that are propitiously designed can have a cumulative effect on those landscapes that were pristine in character.

The operation of man-made reservoirs frequently results in drawdown to increase storage capacity, to utilize water for agricultural, domestic and industrial purposes and to generate power. The fluctuation in water level creates unsightly mud flats devoid of vegetation and shorelines susceptible to erosion. Several agencies are determining what plants can withstand this extreme fluctuation in water level; this process is slow and the results are inconclusive since many species that are usually vigorous growers have not responded in a like manner under these conditions. As a result, rip-rap, gabions or other artificial means are frequently employed to control erosion.

In the southwest we often encounter flood control structures, both concrete and earth fill, which only impound water during infrequent but often intense flooding conditions. These structures whose embankments may be barren, rip-rapped slopes can visually dominate those flood plains that are expansive and uneventful. In rural settings, the flood pool area may be available for agricultural use; frequently, these dry reservoirs are in suburban areas and provide excellent opportunities for intensive recreational use such as golfing, athletic fields and playgrounds. Within the dry reservoir sub-impoundments can be constructed to enhance wildlife, recreation and scenic values, while not affecting flood control capacity.

The visual aspects of streams and rivers

can be radically affected by adjacent land use. In urban areas the character of such streams can be negatively impacted by encroaching development, often oblivious to potential visual and recreational amenities. Development occurring within the flood plain is susceptible to periodic flooding and damage. Under these conditions, when the carrying capacity of the flood plain is severely impacted, we often employ structural methods to control flooding. While such solutions may not enhance the visual quality of the landscape, large volumes of water are efficiently conveyed.

Many materials and methods of construction are employed in channelization projects. Some flood control channels are earth bottomed with riprapped slopes; given time, vegetation may become established softening the structural framework. When the right-of-way is restrictive, vegetation can be planted and irrigated to encourage rapid growth for screening. If the right-of-way is of sufficient breadth, the alignment of channelized streams can be varied to avoid existing vegetation altogether. Concrete channels can be completely buried possibly creating an artificial stream bed above by pumping water from below, a deceptively naturalistic solution. Flood walls are used along large rivers resulting in their visually isolation from the surroundings, Austere flood-walls can be superficially altered by texture and form or murals painted by local teenagers during their summer vacation.

Since these flood protection projects are usually located in urban areas, their rights-of-way may present excellent opportunities for hiking, biking and, occasionally, equestrian trails, linking residential areas with schools, stores and parks. However, to provide any type of public access within the right-of-way, usually strong objections from adjacent homeowners have to be overcome.

Sometimes a bypass channel is constructed to carry flood water around an urban area. While the river is preserved, the channel may be oblivious to the integrity of the landscape. In urban areas, these bypass channels insure stable flows through the city, enabling intensive development along the river's edge. If propitiously handled, as in Sari Antonio, Texas, the river can become a visual amenity and foster economic growth.

We are required to first consider non-structural solutions, particularly, within flood plains that have not been severely impacted by development susceptible to flood damage. Indian Bend Wash, in Scottsdale, Arizona combines structural inlet and outlet works with a green-belt floodway, containing trails, parks

and other compatible facilities. In addition to these flood control projects, we are often involved in river bank stabilization to deter severe erosion. Although extensive grading and placement of material may take place, existing trees can be preserved, subduing the contrived bank.

Coastal work is an important function of the Corps. Projects vary from the construction of ship channels to beach renourishment. We also construct breakwaters to protect harbors and shorelines from wave action often creating habitats for fish and wildlife. Unrestrained development can disrupt the natural process of deposition, resulting in severe beach erosion. Huge, jack-like structures called dolosse are sometimes used to protect shorelines. While the visual impact of such structures is austere and imposing, further erosion is often contained.

Dredging navigation channels is one of our oldest activities, and depending on how the fill material is disposed, no visual impact may result. Sometimes dredging is done by pipeline creating fill areas which simulate natural sandbar nesting and feeding areas for wildlife.

Presently, we are regulating filling operations performed by others in wetland areas, activities which have destroyed countless acres in the past. Fresh water wetlands are susceptible to diking and draining for agricultural purposes or quarrying operations. Saltwater marshes often succumbed to the pressures of urban development. We also must approve and issue permits for all structures to be located within navigable waters. Individual boat docks may not have significant visual impact but their cumulative effect can be consequential.

While there are many other examples of water resource projects, our simulated field trip has given you a broad indication of our involvement. We have briefly discussed dams and reservoirs, channelization and erosion control on rivers and tributaries, and coastal works - projects which have significantly affected our visual environment.