Information Paper

US Army Corps
of Engineers
Seattle District

Date: 28 February 1995

PL 84-99 LEVEE VEGETATION MANAGEMENT

PURPOSE

The purpose of this document is to provide guidance for local project sponsors regarding vegetation management on non-Federal levees which qualify for federally cost-shared rehabilitation.

Bank protection projects,flood control structures on saltwater and non-qualified levees are not addressed by these guidelines.

BACKGROUND

The U.S. Army Corps of Engineers, (COE) has been charged by Congress with nationwide responsibility for the protection of life and property from flood damage. Public Law (PL) 84-99 (33 USCA 801n) authorizes the COE to prepare for floods, conduct flood fights, rescue activities, and assist in the restoration of damaged non-Federal flood-control facilities. The Seattle District conducts annual inspections of its PL 84-99 program levees to insure that Federal funds are not expended on levee systems where inadequate design, construction, or maintenance has contributed to levee damage.

Current guidance for the maintenance of levee vegetation is derived from Engineer Regulation (ER) 500-1-1, Natural Disaster Procedures. All COE Districts receive direction from Headquarters through this ER, which describes suitable levee vegetation as a covering of sod-producing grasses with minimal trees up to a maximum diameter of 2 inches. These guidelines were developed by COE technical experts in response to catastrophic eastern and southern flooding during the 1930s. Their experience indicated that levee failures often resulted from inadequate inspections due to vegetation obscuring the levees embankment. Vegetation-induced scour, vibration, movement and the subsequent uprooting of trees and rootballs. The current ER requirements have been designed to ensure preservation of a levee system's structural integrity, level of protection; and adequate access for maintenance, flood fighting and inspection. Resource agencies acknowledge the COE's responsibilities but have expressed concern over the loss of fish and wildlife habitat along river corridors.

PL 84-99 LEVEE VEGETATION MANAGEMENT (cont.)

GUIDELINES

Seattle District recognizes the importance of riparian vegetation to the fish and wildlife resources of the Pacific Northwest. As a result, Seattle District's non-federal levee inspection program has exercised discretionary judgement and allowed the retention of additional vegetation, some do exceed ER 500-1-1 criteria. Such variations have been permitted only when the vegetation does not significantly reduce access or conveyance, threaten structural integrity, or hamper inspections. Some vegetation, however, is more compatible with the requirements of flood-control structures than others.

Black Cottonwood and Red Alder are considered unsuitable as levee vegetation when more than a few inches in diameter due to their ubiquitous presence and rapid growth into tall, single-stemmed trees with large crowns and relatively small rootwads. Such trees become subject to movement, displacement of rock and windthrow, particularly on a saturated levees that are exposed to high winds. Slope instability and loss of material exacerbates local turbulence and erosion, reduces the levee cross section and may eventually lead to loss of structural integrity. Large trees, dislodged by floodwaters, often jeopardize downstream riverbanks, bridges, and other structures and become hazards to navigation.

Himalayan and Evergreen Blackberries also require frequent maintenance, as they often form dense thickets and prevent observation of the levee embankment. Vegetation which attracts burrowing animals is also considered highly undesirable.

Vegetation considered suitable for retention of PL 84-99 levees include sod-producing grasses, ferns, fobs, and legumes. The native Trailing Blackberry may also be retained, as it does not grow as large as the exotic blackberry species. Shrubs, such as Bitter Cherry, Hazelnut, Red-osier Dogwood, Snowberry, Elderberry or Douglas Spirea, and small trees such as Vine Maple and the Hooker, Sitka, and Erect Willows are also recommended. When mature, selected tree species should have relatively small flexible, resilient stems with minimal hydraulic resistance, capable of bending with high flows, and deflecting debris as well as withstanding prolonged inundation and drought conditions.

In addition to the above examples, Coyote Willow, Serviceberry, Black Hawthorn, Ninebark and similar species, spaced to allow adequate inspection and access, are suggested for retention or propagation on levees east of the Cascades.

Other candidate species are currently being evaluated to determine erosion control, fish, wildlife, and cultural benefits.

The application of grass seed mixtures is recommended to prevent erosion of levee tops, shoulders, backslopes, and access areas as well as reducing the establishment of invasive, noxious or toxic plant species on the project.

Control of Noxious Weeds, as described in Washington Admini-strative Code (WAC) 16-750-015, and the COE Emergent Noxious Weed Control report of January 1993, is recommended for all local vegetation management programs.

APPLICATIONS

The attached drawings, (Enclosure 1) provide an overview of vegetation maintenance guidelines for typical levee sections. Field application of these guidelines must also consider the following site-specific variables.

Levee Materials. For example, areas where levees have been constructed of silty sand or other permeable materials, levees must be larger, with flatter slopes to avoid exceeding design limits and limit the piping of fine materials. On such levees, vegetation would be more limited in species, size and density than on levees of similar configuration, that have been constructed with more substantial materials.

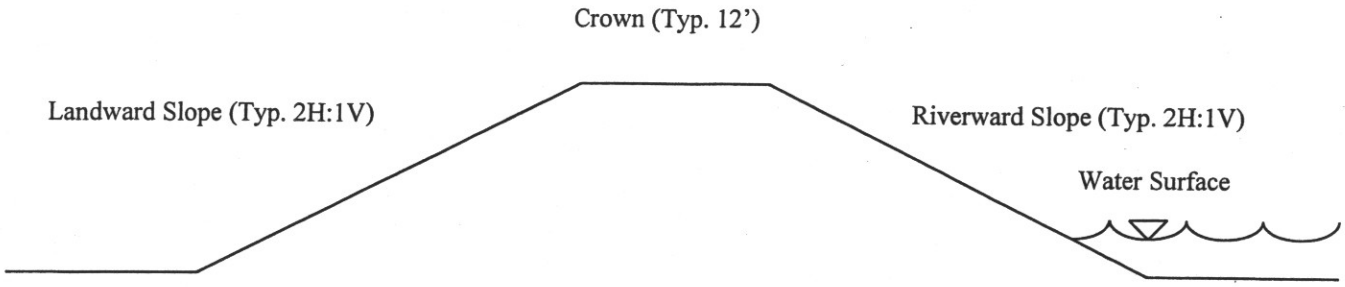
Hydraulic Conditions. Water volume, velocity, depth, width, bank slope, bend curvature, level of protection and flood history often indicate what flood conditions occur and which types of vegetation would be most suitable for a given levee section. The outside of historically flooded riverbends, for example, would be subject to greater erosive impacts than adjacent straight sections or the insides of riverbends.

Proximity to Critical Facilities such as hospitals, bridges, roads and utilities must also be considered when determining appropriate types and amounts of levee vegetation. For example, straight levee sections adjacent to pasture lands, golf courses, parks and other areas with relatively low damage potential may be allowed to retain more and/or larger streambank vegetation than similar levee sections which are located on the outside of riverbends adjacent to bridges, hospitals, access roads or other essential facilities.

For further information regarding this document or qualification for the PL 84-99 program call Emergency Management Branch,
Doug Weber or Vic Yoshino at (206) 764-3406.

Comments may also be electronically transmitted to (206)764-3319, or mailed to:
Emergency Management Branch, Seattle District, U.S. Army Corps of Engineers,
Post Office Box 3755, Seattle, WA, 98124-2255.

BASIC LEVEE SECTION



SLOPE	VEGETATION
LANDWARD SLOPE	Occasional woody vegetation less than 4" DBH. Spacing must allow for visual inspection of levee slope. 4' Dia. clumps of brush on 30' centers.
RIVERWARD SLOPE	Occasional woody vegetation less than 4" DBH. Spacing must allow for visual inspection of levee slope. 4' Dia. clumps of brush on 30' centers.
CROWN	Grasses which must be maintained for vehicle access. No woody stemmed vegetation.

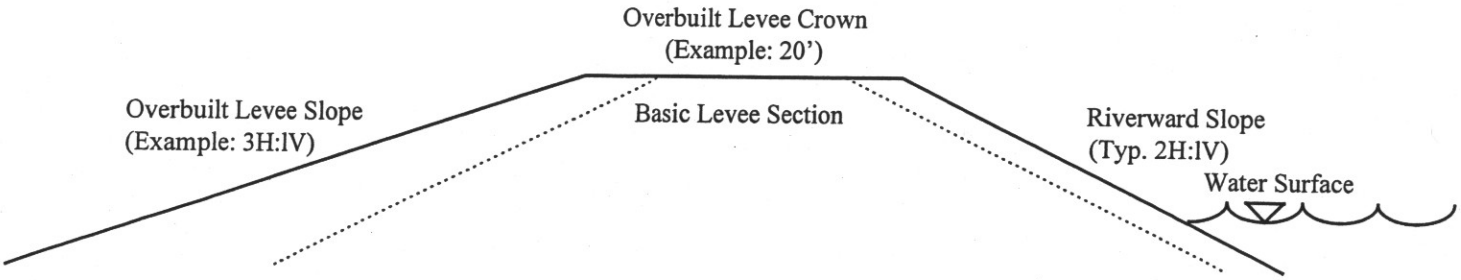
NOTES::

1. Benches on the riverside of the levee can have unlimited growth as long as the root systems do not enter the levee prism.

2. Vegetation on all revetted riverward slopes designated as critical are limited to a maximum 4" DBH.

3. All 1evees will be managed to encourage herbaceous vegetation, shrubs and flexible stemmed type trees. (example: Hooker Willows)

OVERBUILT LEVEE SECTION



SLOPE	2H: 1V	2H: 1V T0 3H: 1V	GREATER THAN 3H:1V
LANDWARD SLOPE WITH OVERBUILT CROWN	Occasional woody vegetation less than 8" DBH. Spacing must allow for visual inspection of the levee slope. 4' Dia. clumps of brush allowed on 30' centers.	Occasional woody vegetation less than 10" DBH. Spacing must allow for visual inspection of the levee slope. 4' Dia. clumps of brush allowed on 30' centers.	Occasional woody vegetation less than 12" DBH. Spacing must allow for visual inspection of the levee slope. 4' Dia. clumps of brush allowed on 30' centers.
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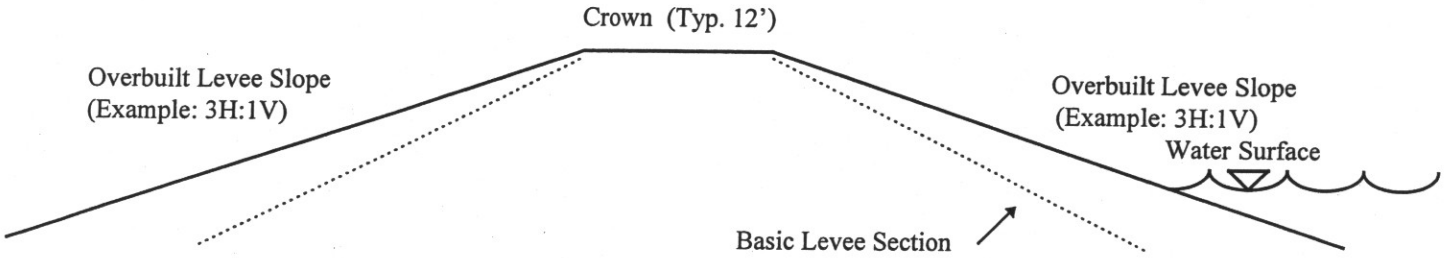

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