

## CHAPTER 5

## OPEN-RIVER NAVIGATION

5-1. General. Open-river navigation implies the use of natural streams for navigation without locks and dams, such as the Missouri River and Mississippi River below St. Louis, Mo. Except for short reaches, there are very few, if any, natural streams left in the United States that could be developed for unrestricted traffic. However, many of the factors affecting the development of open-river navigation are also applicable to canalized streams utilizing low-lift locks and dam.

5-2. Cost. The development of open-river navigation usually involves lower first cost but maintenance cost could be high because of the complex nature of these streams, tendency to meander and migrate, and difficulty of designing the training and stabilization structures needed. Operation cost of the waterway is generally small, consisting mostly of periodic surveys and inspections, channel marking, and possibly some traffic control.

5-3. Factors Affecting Navigation. Open-river navigation could be adversely affected by high-velocity currents, limited channel depth during low water, lack of suitable docking and staging areas, and constant changes in river stage and discharge. Unless their effects are considered and minimized or eliminated, navigation could be suspended for periods that could affect transportation cost to such an extent that the potential of the waterway would not be fully developed.

5-4. Feasibility Study. The feasibility study should consider all of the factors that could affect navigation and cost. This study should include analyses of the following:

a. Frequency and duration of river stages and discharges based on existing records.

b. Channel width, depth, and alignment available, particularly during low flows.

c. Composition of the bed and banks.

d. Sediment characteristics of the stream and changes produced by variations in stages and discharge.

e. Training and stabilization structures and corrective dredging

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required and their effects on sediment movement, currents affecting navigation, and the flood-carrying capacity of the stream.

f. Type and volume of traffic that could be developed and justified with various improvement plans.

g. Navigation periods that would be affected by unusually wet or dry years and ice.

h. Model studies required to determine problems that will be encountered and types and amount of training structures required and to develop plans for the improvement of critical reaches.