## Introduction

The Willamette River has been straightened, channelized, and armored along its length by federal and state agencies, municipalities, and private citizens (see Revetments, pages 32-33). The more urban and industrialized area near Portland tends to have 40-60% of the river banks in revetments and bank control structures. Other cities along the river also tend to restrict movement of the river by bank armoring and other structures designed to control the path of the river. Upper reaches of the Willamette River between Albany and Eugene are more geomorphically complex. These areas contain intermediate amounts of channel control structure, largely associated with attempts to prevent erosion of agricultural lands in the complex floodplains (Fig. 44, p. 32). The lands along the river between the Portland metropolitan area and Salem and between Salem and Albany have some of the lowest amounts of bank protection.

Revetments and banks that have been armored present both negative and positive implications for restoration of large rivers. From a river management perspective, the areas with low amounts of bank revetments are important resources to protect and opportunities to resist the trend to simplify the river and reduce its natural dynamic processes. They allow the river to function more naturally and, as a result, maintain ecological functions through natural processes of channel formation. These reaches are important for conservation and restoration, particularly when considered in comparison to the heavily armored sections of the river, which offer reduced ecological functions.

From a restoration perspective, areas with high amounts of revetments but less intensive human development offer potential opportunities for modification or removal of revetments. In this illustration of approaches for



Figure 189. Bank protection and drainage for new apartment buildings in the riparian area of the Willamette River in Salem.



Figure 187. Bank revetment used to repair a slump that occurred on the river bank of the Willamette River in Corvallis during the flood of February 1996.



Figure 188. Blockage of historical side channel and armoring with riprap in the upper Willamette River.

prioritization of river restoration, we will consider revetments to be opportunities for restoration, though we acknowledge that the revetments lower the current ecological condition of the river. River reaches that once were dynamic and complex can be restored to higher levels of ecological function by reconnecting existing but isolated side channels. Riprap and pilings can be removed completely or modified to maintain some stability but still allow higher flows to reconnect with the side channels. Efforts to reconnect historically complex river channels are greatly affected by hydrologic regimes. High flows are necessary to maintain open flow through side channels. Efforts to lower these high flows with flood control reservoirs reduce the ability of rivers to maintain off channel habitats. Restoration of channel complexity through modification of bank control structures will be increased if flood management strategies also allow for more natural flood regimes. Careful attention to concerns of private citizens and local communities is essential for constructive discussions of restoration options related to restoring the dynamic processes of the Willamette River and its floodplain.







Figure 191. Fringe of native riparian vegetation with riprap to stabilize the lower bank in Corvallis.

## **RIVER RESTORATION**

## Revetments



Note: 1 kilometer equals .62 mile