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River Training vs. Flood Risk in the Piedmont Section of the Vistula, Poland

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Flood risk is the possibility of a river overflowing its banks due to weather conditions and temporarily inundating a flood plain. The flow of floodwaters results in economic losses and the loss of human life. The magnitude of flood risk depends on the duration of elevated water stages, the height of elevated water stages and the resulting extent of flooding across a flood plain. However, actual losses caused by floods are determined by land use in each given area. Well-planned human activity across valley floors and in river channels can lead to a reduction in flood risk. Poor planning, on the other hand, can increase flood risk and lead to substantial losses in populated river valleys.
One form of human activity that has not yet been fully evaluated with respect to flood risk is river channelization. The construction of levees makes the inundation zone much more narrow, increases high water levels in rivers during major floods and increases the rate of floodwater flow. This makes it easier to breach levees and inundate large areas outside levees. Dams serve to reduce the height of flood waves. However, when the rate of flood wave formation is significant, a reservoir may help generate an even larger flood wave further downstream. Channelized rivers are usually a little shorter, less sinuous, deeper and more narrow. This results in flood waves that concentrate more quickly and move faster. In addition, the extent of the flood is different as is the height of the peak wave.
The acceleration of the flood wave is one of the stated goals of river channelization, which is designed to reduce flood risk. Channelization efforts systematically make the river channel deeper along shortened sections with a large gradient, although downstream sections with a smaller gradient become more shallow. In general, this leads to a higher rate of river flow. The construction of levees yields larger fluctuations in water levels. Increasingly deeper river channels are characterized by ever shorter durations of elevated water levels. Shallower downstream sections of rivers with a small inter-levee zone experience increased flood risk due to higher upstream flood wave intensities and larger fluctuations in water levels. Existing river channelization methods have becoming objects of scrutiny in recent years. Some researchers argue that channelization does not really decrease flood risk, which actually increases along shallow sections of river, where groundwater levels increase and saturate flood plains for longer periods of time. A good example of a river channelized since the middle of the 19th century is the Piedmont section of the Vistula in southern Poland. This section of the Vistula is characterized by variable flood risk, variable geometric parameters and variable dimensions of the inter-levee zone. The purpose of the presentation is to: (1) describe the current state of flood risk along this stretch of river, (2) describe the rate of river flow, and (3) describe changes in flood risk since the start of channelization efforts with respect to changing channel geometry and changing rates of river flow reflecting the effects of channelization work.