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1. Rivers move in space and over time. Most projects incorporate this design fact at the beginning and remove it at some later point.

2. The 100 year flow is only of importance to insurance agents, it has no biologic and or geologic significance.
Geometric and Temporal Considerations
Similar Flow/Energy Regime

Gradient – 0.2%

Different

X Section

270 Ft.

Deschutes

YAKIMA RIVER NR. ZILLAH
34.4 Acres of changed process

5000 Ft.
2000 (and counting) acres of changed process
• Rivers move over space and time, we need management regimes which recognize movement.
• Wide Floodplains are very sensitive to changes in sediment or energy processes
• Impacts of altered processes are distributed across large areas and time scales, they are in general ongoing and expanding disturbances
• Change is driven by large energy events, not construction or event (high peak flow, landslide, fire, microburst) date
  • Difficult to diagnose cause and effect
  • Restoration actions will be dependent on flood events too – Break Projects Up Into Phases
• Let river be designer, you can only nudge processes back to natural

Design Principles shown in Red
3 Examples of Altered Processes that Invite Cooperation

(because the $$ will be spent regardless)
FIGURE 1-b  CLASS 2

Final equilibrium grade
Temporary grades
Reservoir level

Original equilibrium grade
Original base level

FIGURE 1-c  CLASS 3

From Lane, 1953
The Riverine Response—planform & vertical change

- Coarse and Fine Sediment Accumulation in Floodplain = Reduced Conveyance, simplified habitats and substrate
- Channel Incision & Narrowing = Increased risk of levee erosion failure

simultaneous risk of levee overtopping and toe failure
• Altered Process are a threat to infrastructure and habitat
  • Focus on Sustainability – work with riverine processes
  • Maximize Environmental Benefit – Restore lost or degraded life histories
• Even after diagnosis, you will need policy buyoff to implement
  • CFHMP
  • Recovery and Subbasin Plans
• Cooperation really helps with implementation funding
  • Habitat (SRFB, NOAA, USFWS)
  • Emergencies (Corps, FHWA, State)
  • Dual Purpose or Integrated
    • Corps 1135 Ecosystem Restoration
    • Floodplains by Design (TNC and Ecology)
    • Yakima Basin Integrated Plan

Design Principles shown in Red
Tools
Extended Mixing Zone Outfall (allows channel migration)
Highly constricted

New channel entry
2013 Levee Setback in Cooperation with Corps (PL84-99) and Ecology (FCAAP)
Donald Wapato Floodplain Restoration Ecology and SRFB 2010