Objectives

Brief overview of River Engineering
with focus on:

1. River Equilibrium;
2. Riverbed Degradation
3. River Dynamics
4. River Engineering
5. Computer Modeling

Concept of Equilibrium
Bank Caving

Vertical Degradation

[Images of bank caving and vertical degradation]
Trenchfill Revetment

Channel Contraction

Additional Contraction Structures (ACS)

Kicker Dikes

Typical Stone Dyke
Locks and Dams

Concept of Equilibrium

Sediment Plug
Environmental Considerations

Construction Dredging
Dikes Used to Restrict Flow to a Single Low Water Channel

Additional Contraction Structures

Dykes
Vented Dykes

Simulation Results (Duan and Julien, ESPL, 2005)

Flow Depth and Velocity Vector

Bed Elevation Changes

Computer Modeling

Comparison with a Natural Case

The Rio Puerco in New Mexico: A meandering channel formed from an initially straight channel

Earth2D Simulated Meandering Channel Forming Processes (Duan and Julien, ESPL, 2005)
This laboratory experiment was conducted in WES-USAE (Friedkin, 1945). The discharge is 1.416 l/s, and the initial cross section is trapezoidal with a top width of 25.96 cm and a bottom width of 17.37 cm. The mean sediment size is 0.45 mm.

**Case 7: Inception of Meandering Channel**

Assumptions: 1) constant width; 2) the straight reach at the upstream remains rigid banks; 3) the outlet cross section is free to move; 4) sand bars out of computational domain is unmovable; 5) Although non-cohesive sand was used, the movable domain approach artificially stabilize sand bars that facilitate the evolution of meanders.

**Animation of Simulated Results**

**Meandering Evolution**
Transitional Meanders

T=20 hrs

Final Meanders

T=32 hrs

Concentration Field

Current situation

Concentration (mg/l)

Q=2000 cfs

Q=1000 cfs

Kankakee River

Iroquois River

Surface Elevation (ft)

With three short dikes

Surface elevation and velocity vector field
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THANK YOU for your Attention!