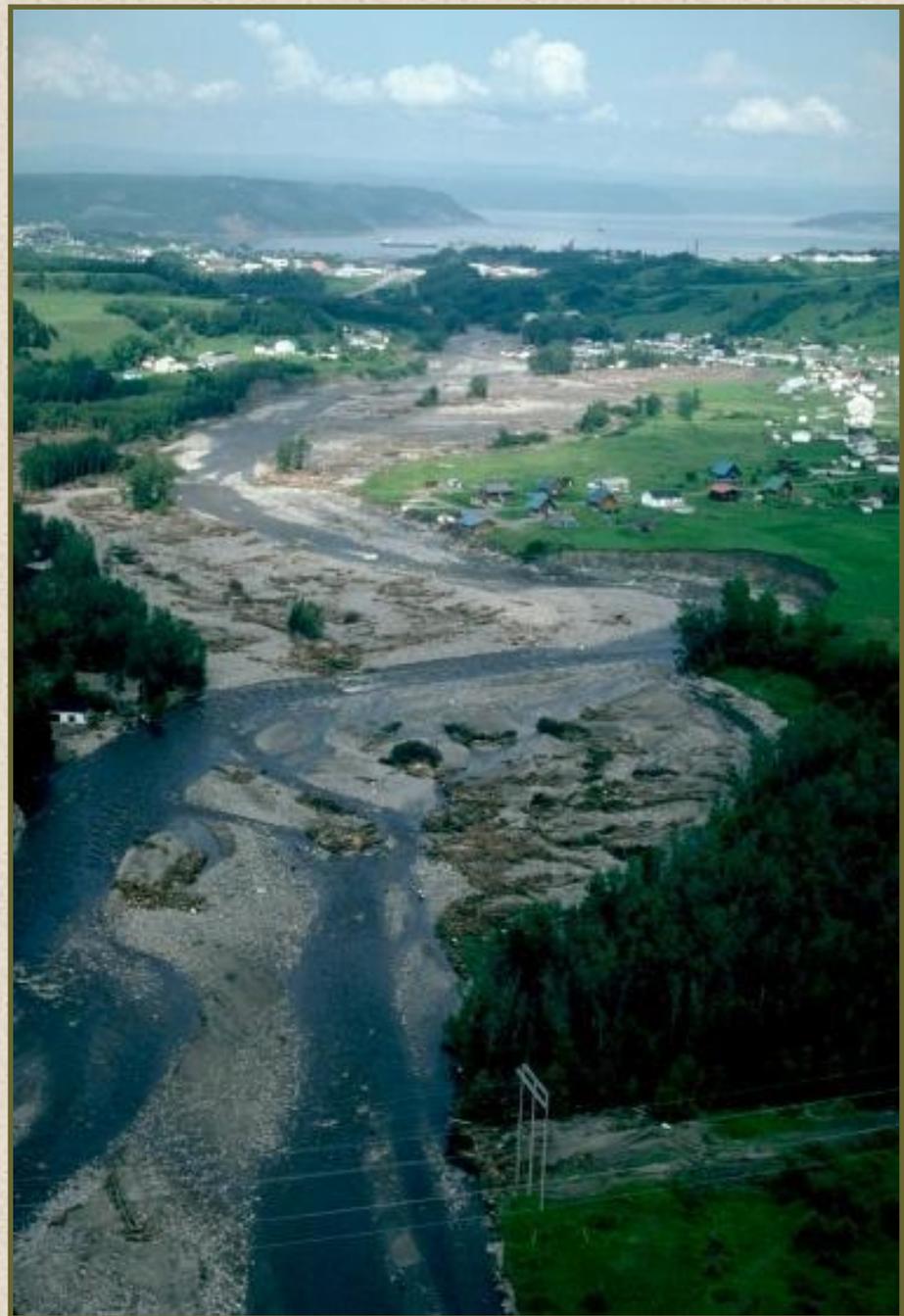


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70+ years of observing river behavior and interactions with private and public investments.



Understanding River Behavior

Fluvial Geomorphology:

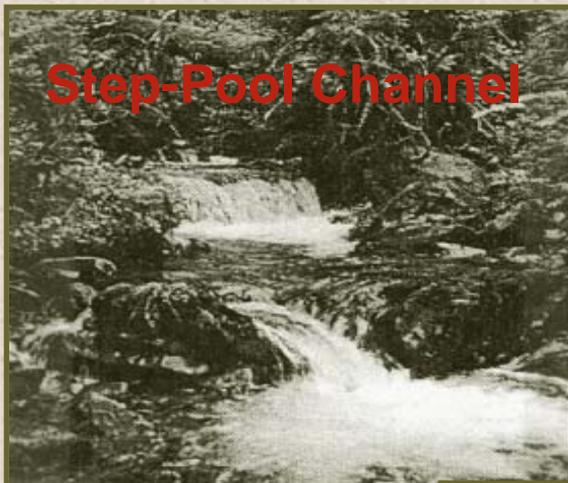
The study of landforms created by flowing water

- **Fluvial Geomorphology** (key concepts and principles)
 - Channel Classification
 - Channel Equilibrium
 - Channel evolution

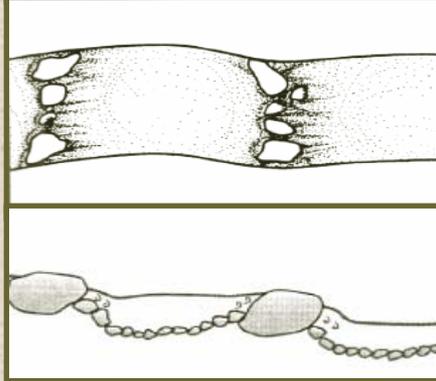
Channels are classified by how they look with the expectation that appearance is determined by process. If we understand river processes we can forecast behavior.

Montgomery and Buffington Classification System

Step-Pool Channel



B



Ripple Dune Channel



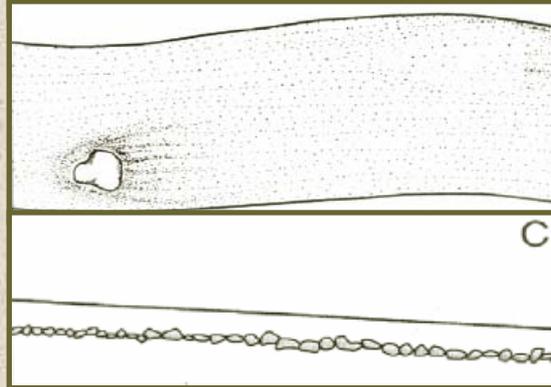
Riffle Pool Channel



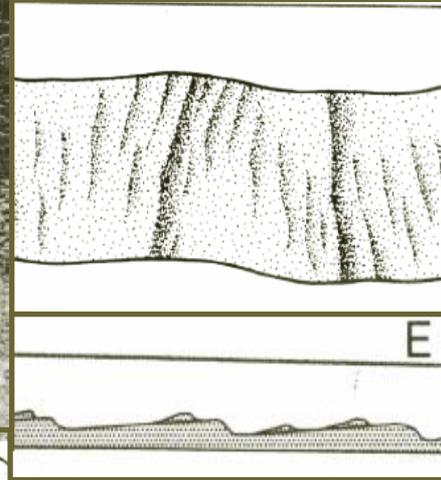
Plane Bed Channel



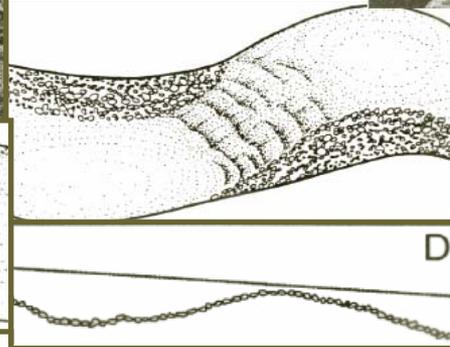
C



C

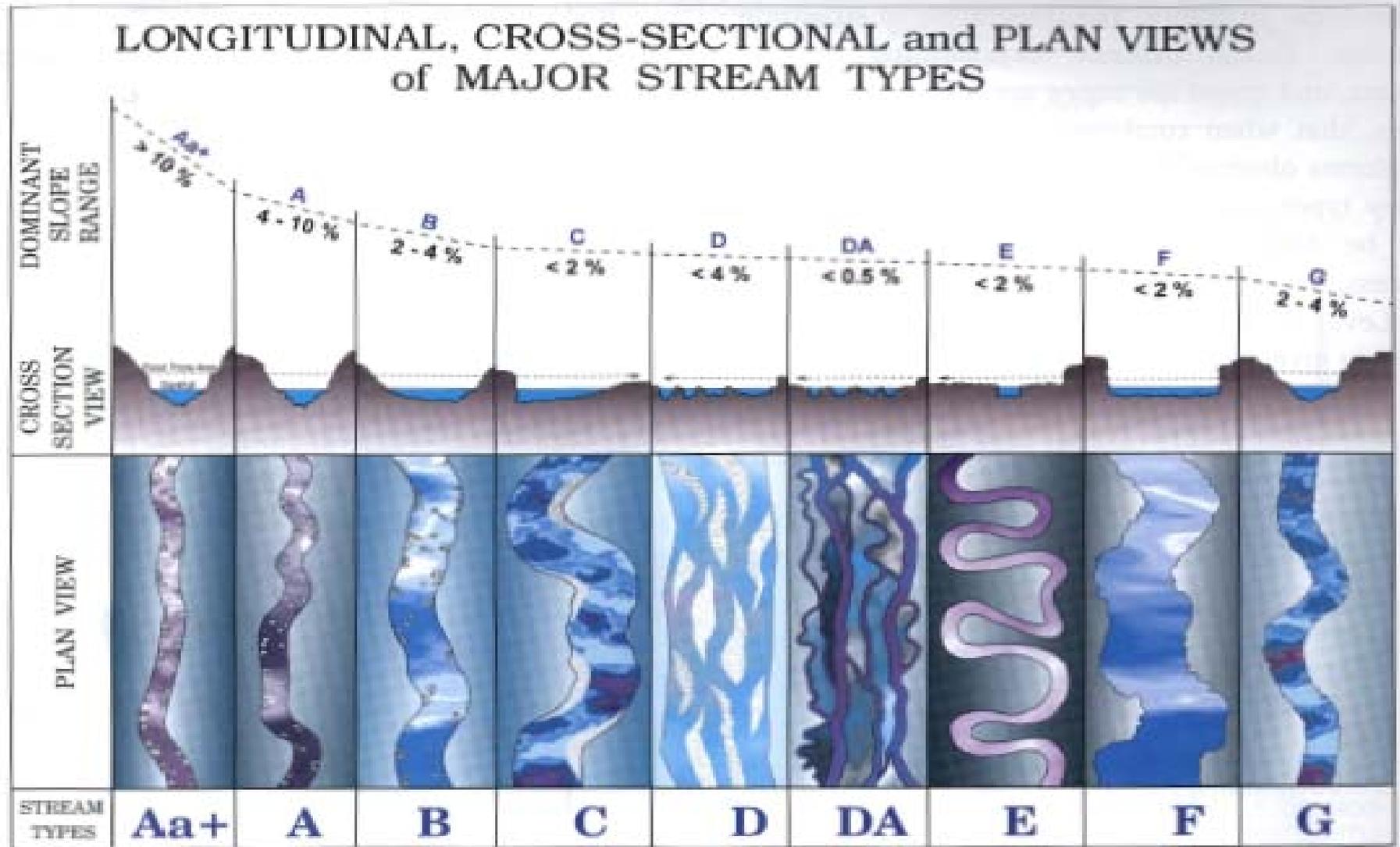


E



D

Rosgen Classification System



Rosgen (1996)

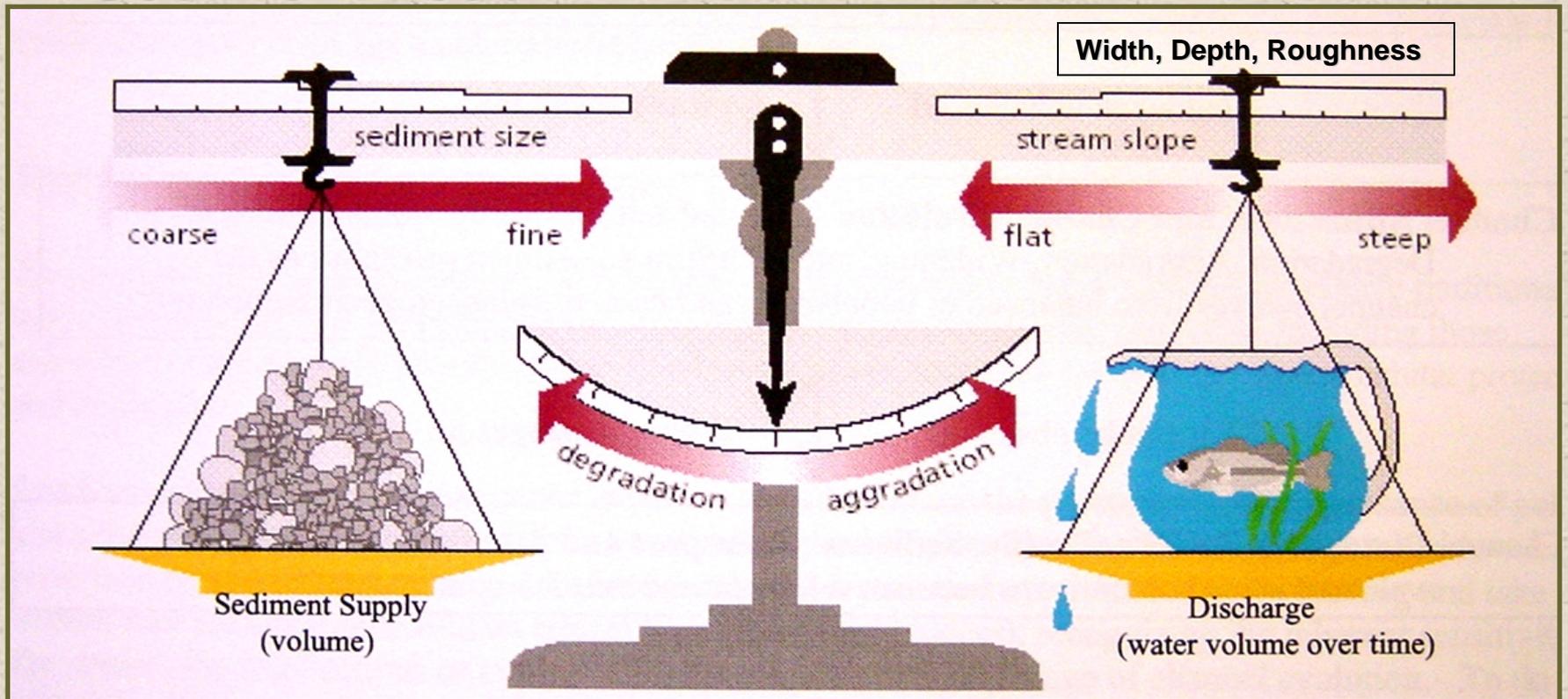
River Reaches



Channel Equilibrium

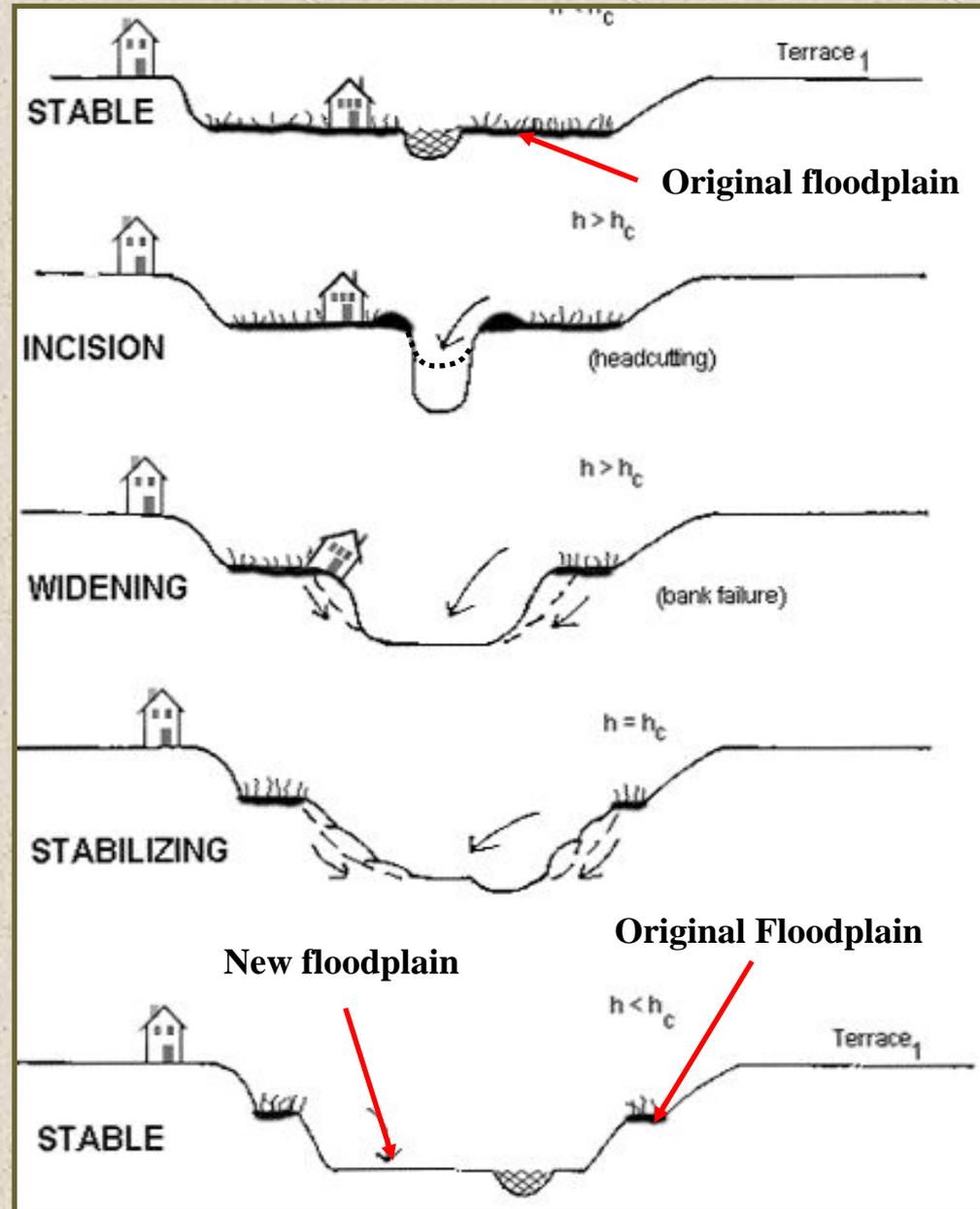
Sediment Load

Transport Capacity



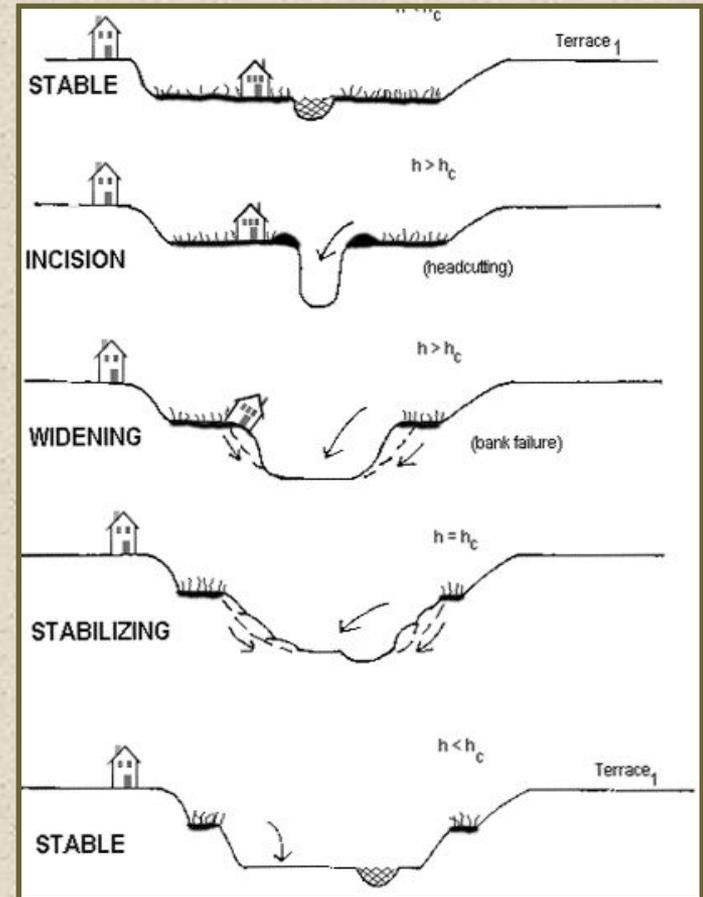
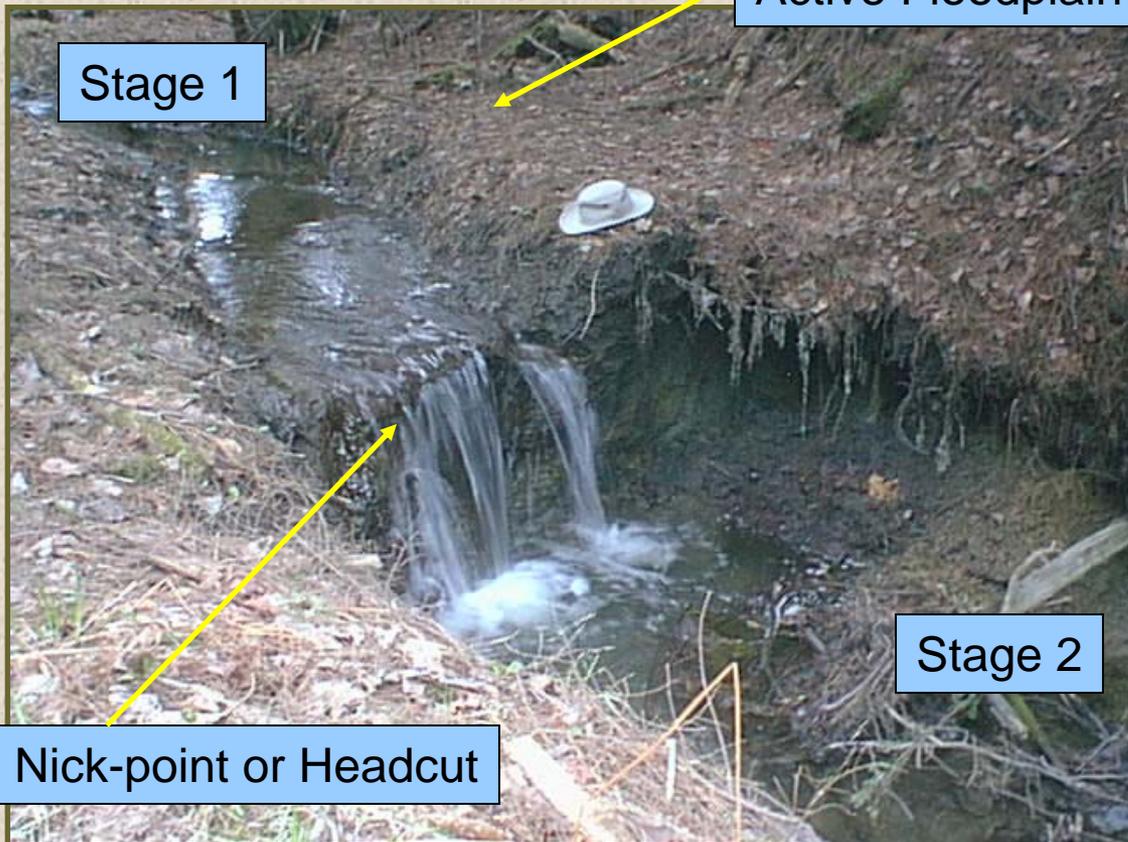
Lane (1955)

Channel Evolution



Schumm Channel Evolution Model

Stages 1 and 2: Equilibrium to Incision

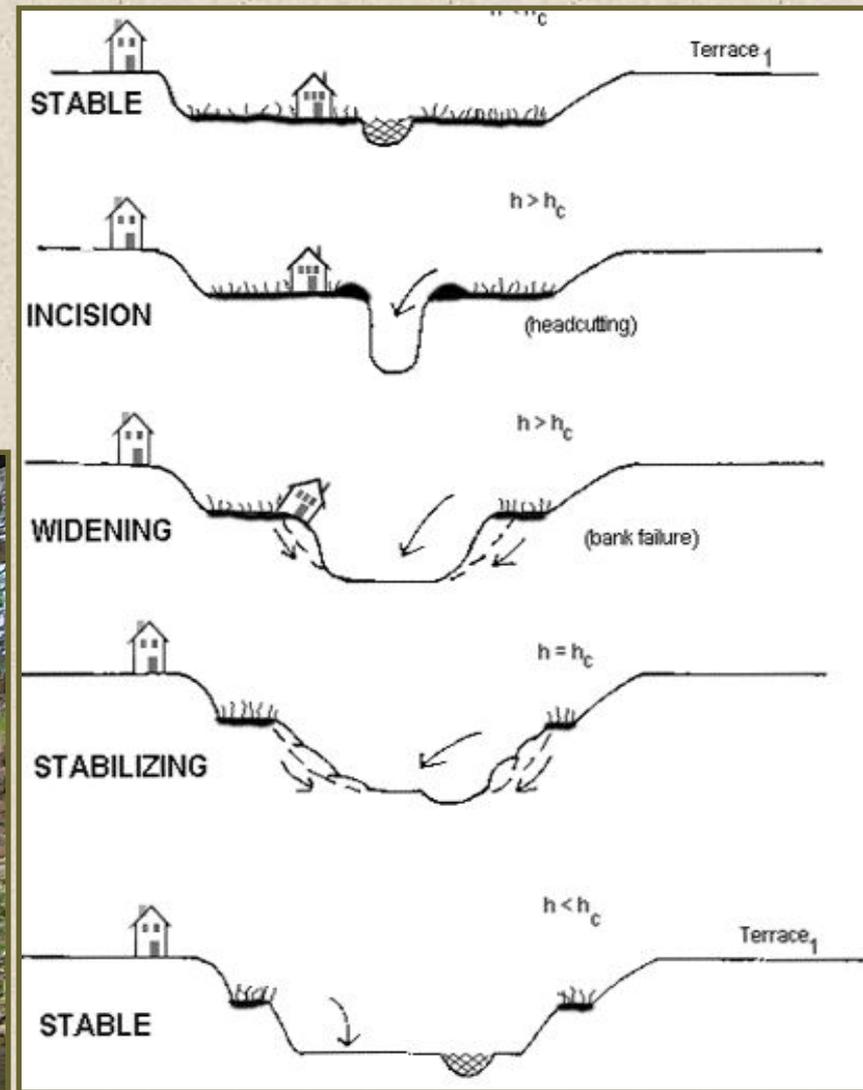


Stage 3: Widening

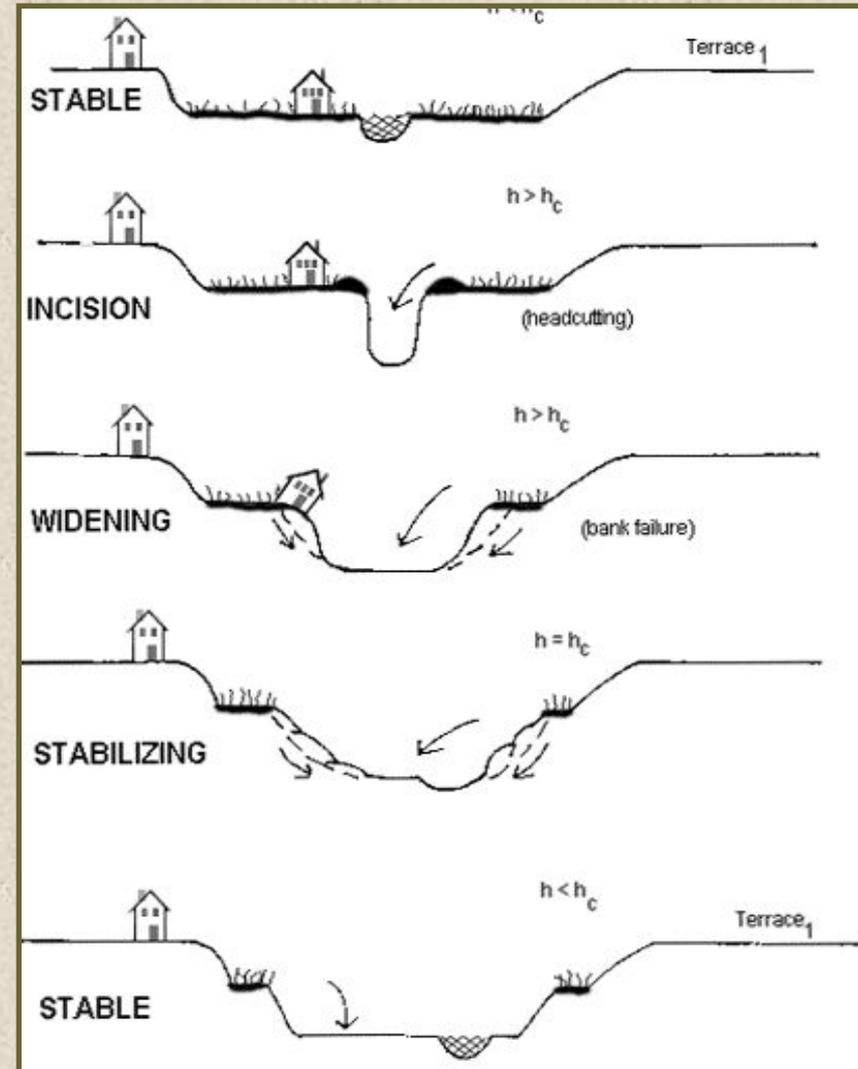
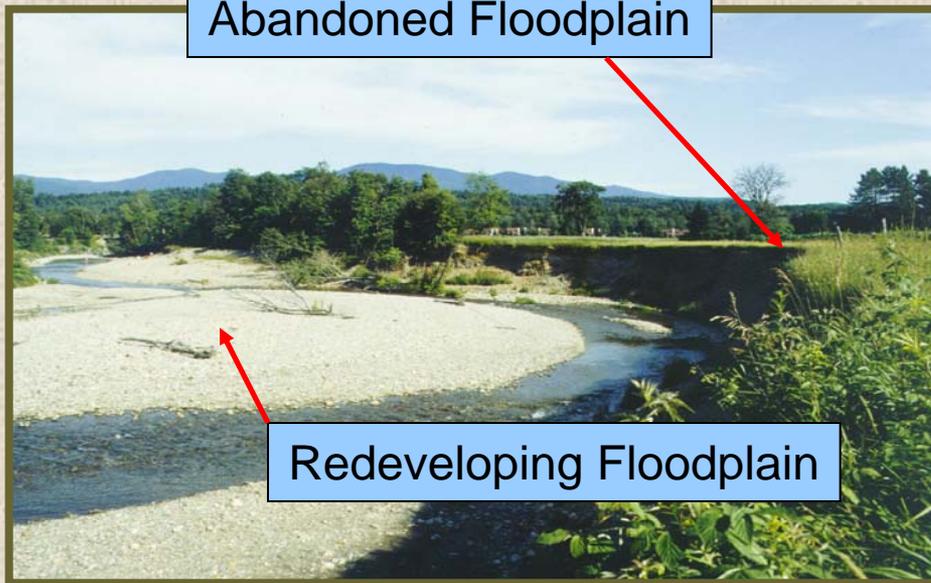
Abandoned Floodplain



Failing Banks



Stage 4: Continued widening and floodplain development

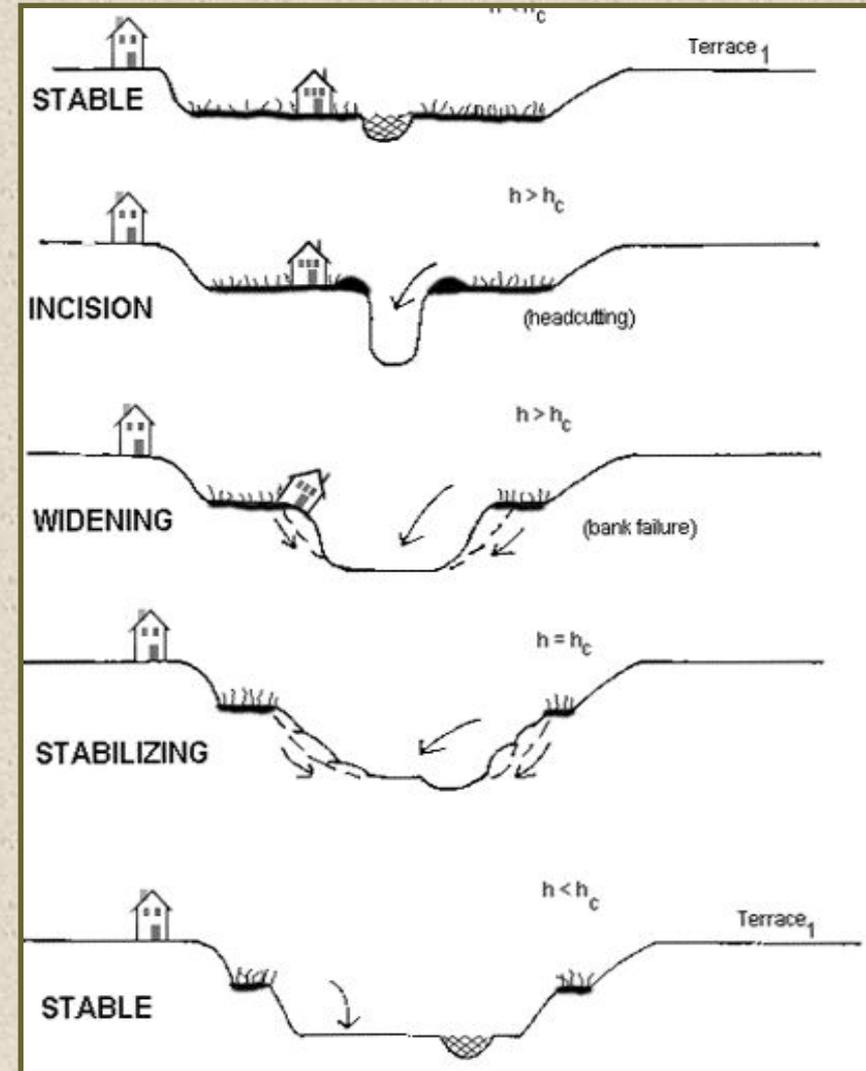


Stage 5: Return to Equilibrium

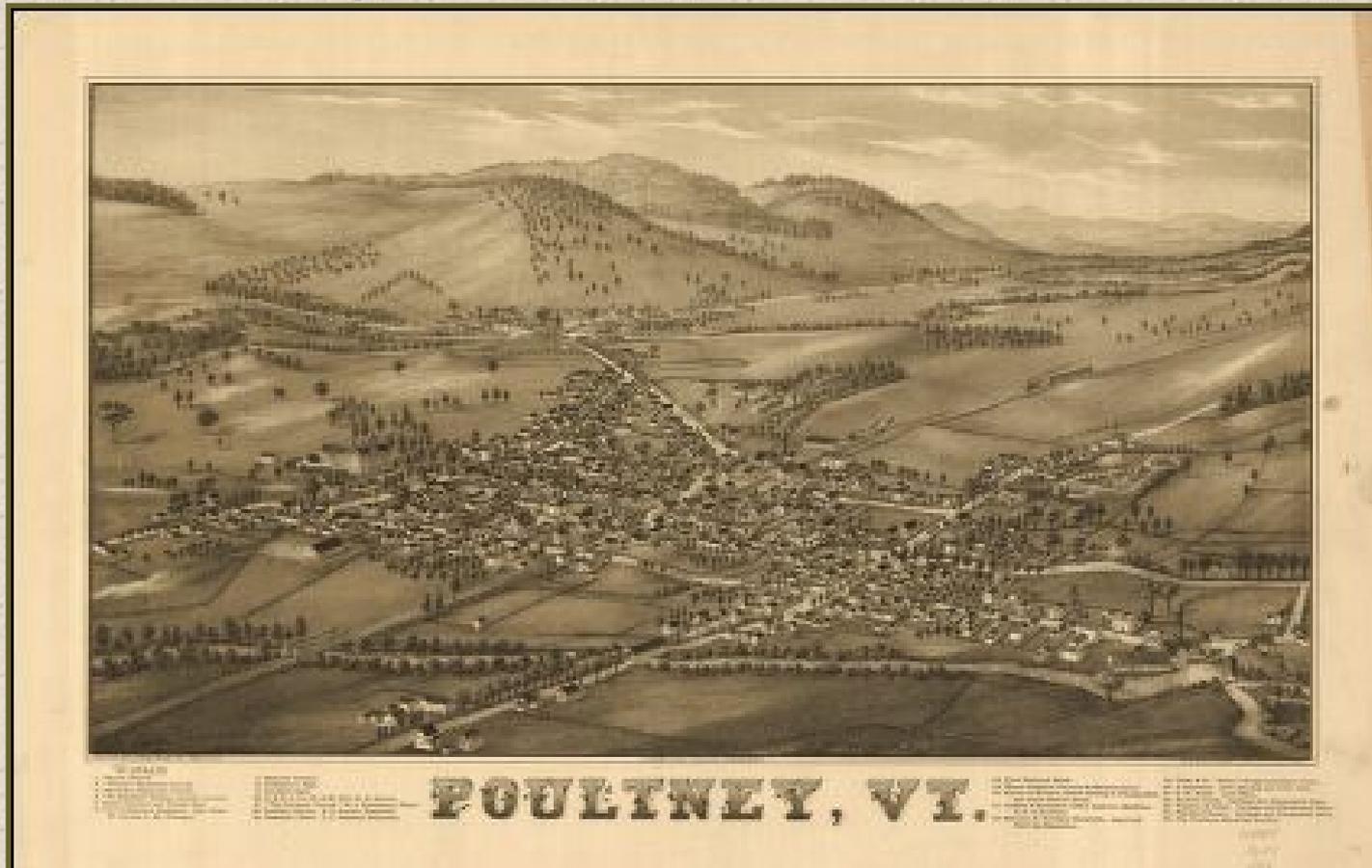
Abandoned Floodplain



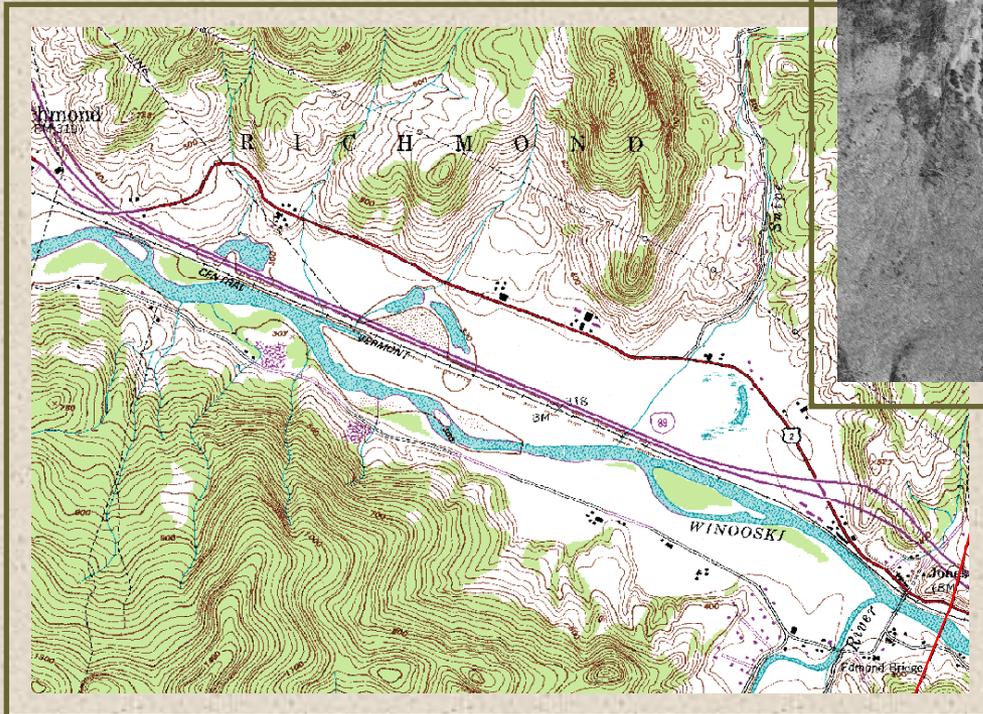
Redeveloped Floodplain



Throughout Vermont changes in land cover and land use have resulted in dramatic changes to **average annual flow and sediment inputs.**



Channel **planform** and **slope** have been significantly altered to accommodate transportation infrastructure agriculture and other land uses.



Post flood recovery works have altered channel dimension and boundary condition.



Timescale of Geomorphic Response (relaxation period)

Micro-scale changes (bedforms): 1-10 yrs.

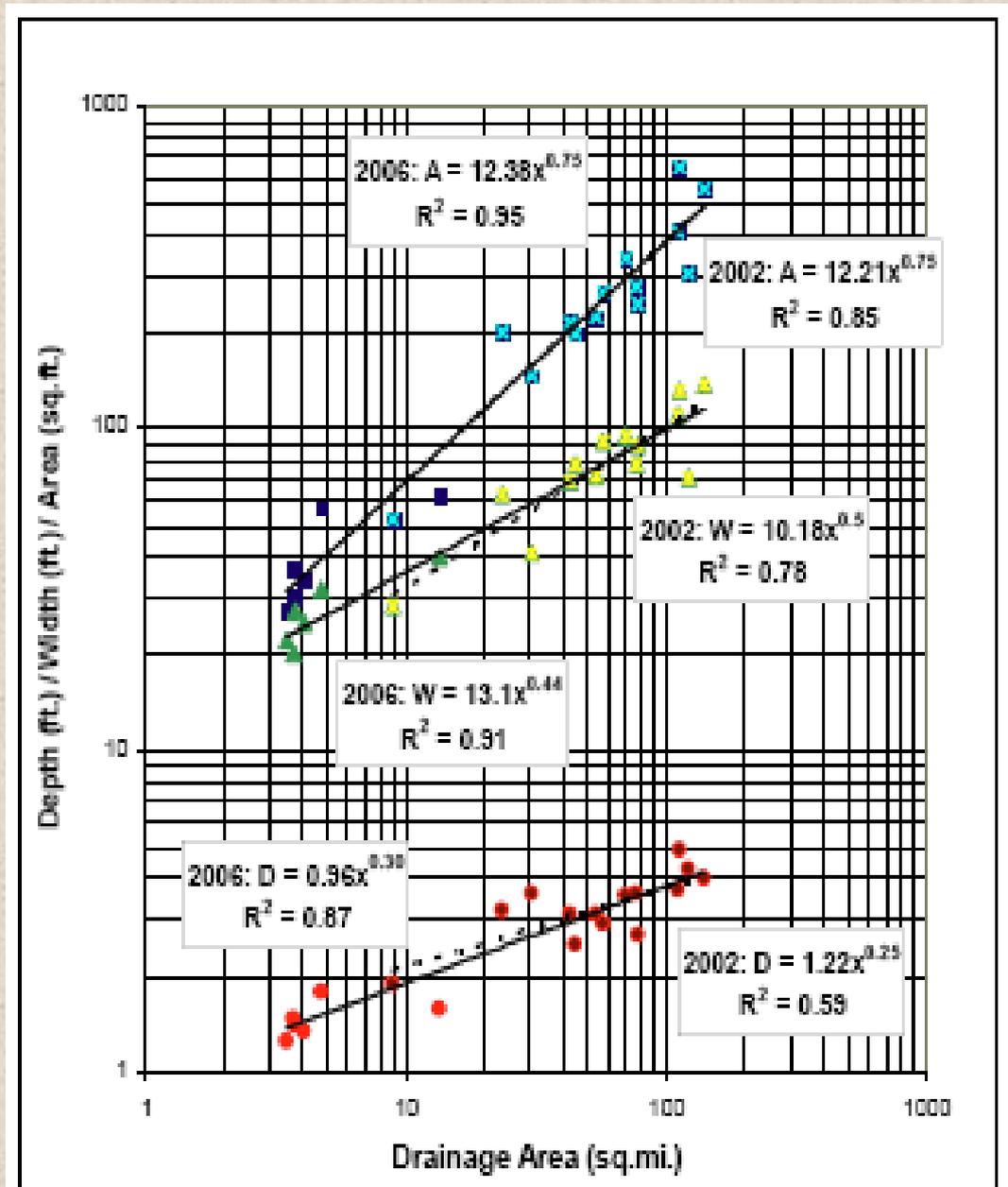
Meso-scale changes (cross section dimensions) 10-100 yrs.

Macro-scale changes (meander geometry and floodplain)
100+ yrs.

Rivers today are likely still adjusting to changes going back to the 1800's deforestation

Hydraulic Geometry Curves

for
understanding
the stable
condition



Most Probable Form and Self Maintenance

Given consistent inputs (average annual precipitation and sediment input), every river has a single most probable form toward which it is **constantly** working (Leopold, 1994).

