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Importance of Understanding Sedimentation for Tamarisk Control Efforts

Tamarisk Research Conference

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NNSA National Nuclear Security Administration

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Outline

- **Examine the Pecos River**
  - **Site description and history**
  - **Control efforts to date**
  - **Potential negative impacts**
  - **Erosion monitoring efforts**
    - **Digital Orthoquad and other Aerial imagery**
    - **GIS mapping**
    - **Bathymetric surveys**
- **Sediment Transport Model Development**
  - **Model Processes**
  - **Test Cases**
    - **Yen and Lee (1995) three dimensional hydrodynamics and sediment response**
- **Summary**

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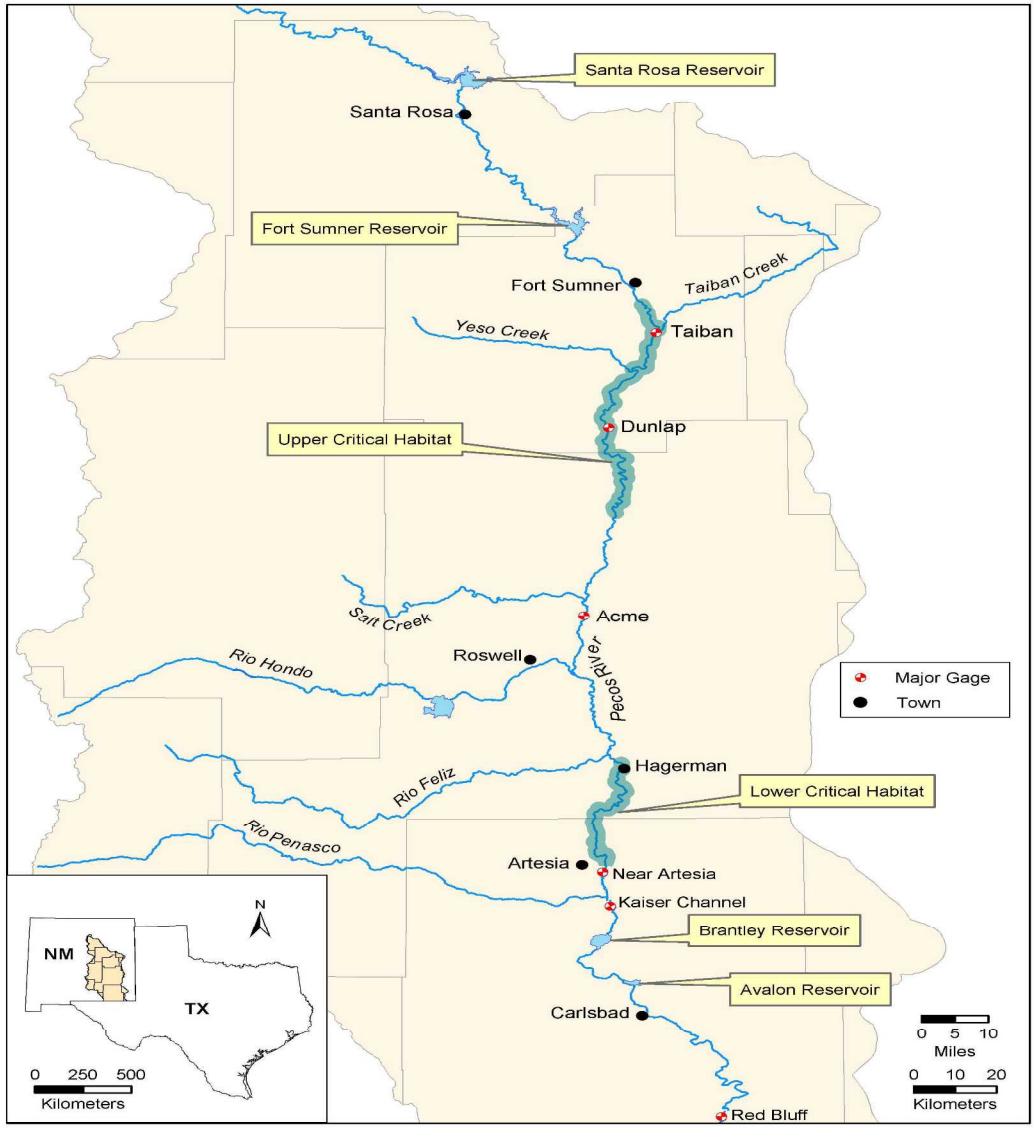
Pecos River



History

- Tamarisk originally an ornamental
- CSWCD used saltcedar for bank stabilization (1920's) and wind breaks
- Since ~1950 BoR actively controls floodplain tamarisk
  - Kept 50 ft buffer on river banks
    - Bank stabilization
    - Habitat cover
- Infestation includes 300+ river miles and tributaries

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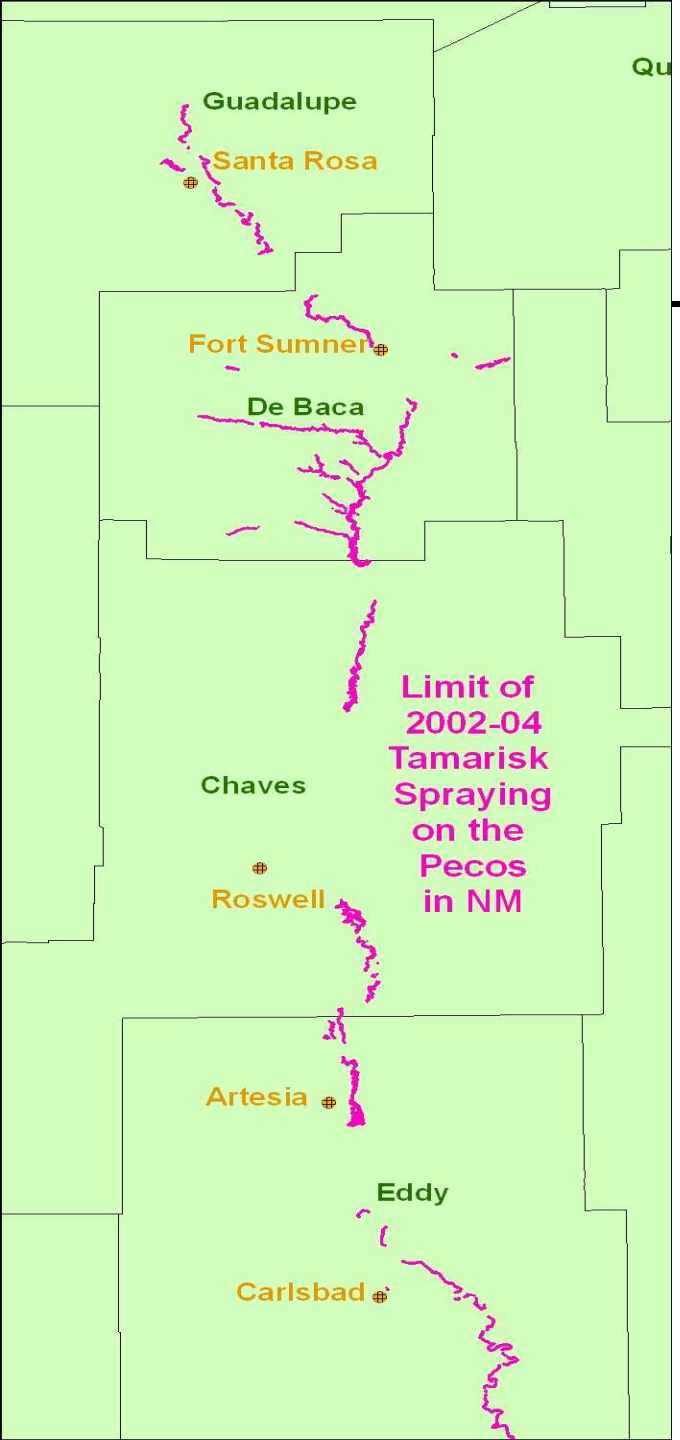

Pecos River

Current Control Efforts

- **Voluntary Program: land owner agreement with local soil and water district.**
- **Aerial spraying of herbicide covered ~16,000 acres since 9/2002. Ground spray of ~1,500 acres.**
- **~14,000 acres of river/tributary banks. ~6,000 acres between Sumner and Brantley Reservoirs**

Restoration Efforts

- **Root Extraction: ~535 acres + 300 acres by 2/07**
- **Mulching: 350 acres**
- **Prescribed Fire: 21 river miles North of Texas state line**
- **Planting: ~500 Trees and ~400 acres grass seed**

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Pecos River

Potential Negative Consequences

- **Increased bank erosion**
  - **Sedimentation at Brantley Reservoir**
  - **Avulsion causing property boundary changes and disputes**
- **Increased biomass in river**
  - **Dead tamarisk trees washed into river**
  - **Accumulation at river crossing**

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Pecos River

- **Dead saltcedar root systems provide little stability**

- **Sediments will accumulate in and reduce life span of Brantely Reservoir**

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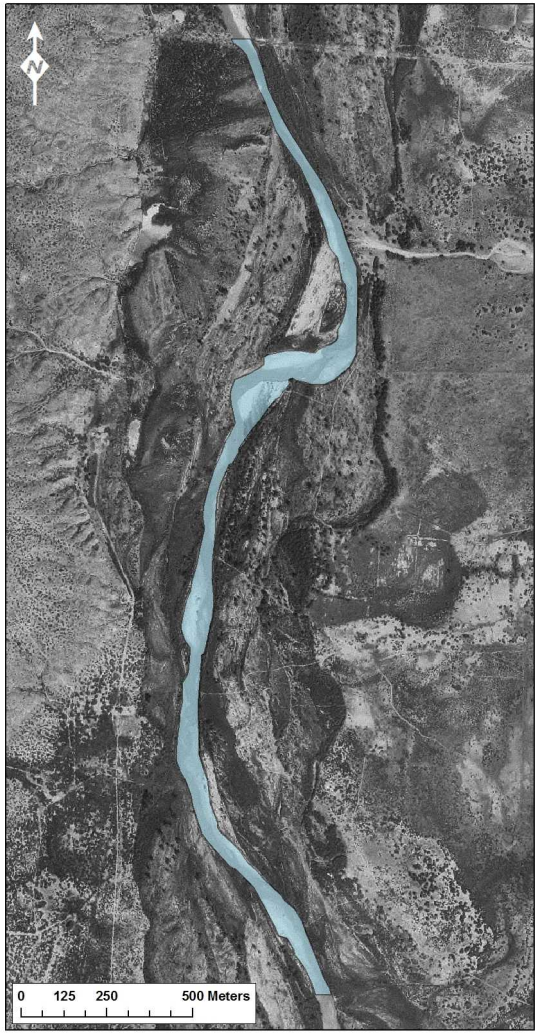
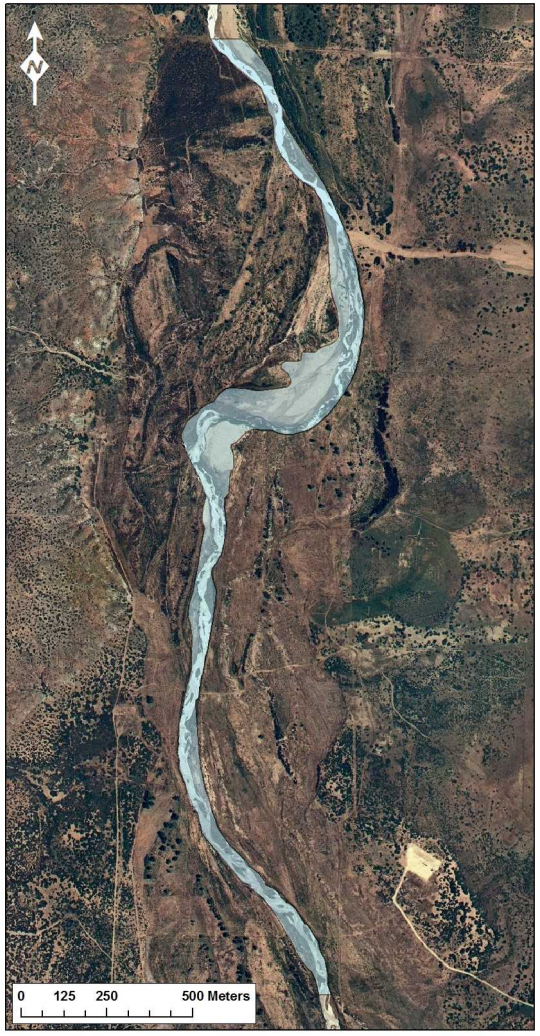
Monitoring Efforts: DOQQ GIS



1998



2005

- Images recently made available
- Determine temporal changes in river characteristic
- Pre/post tamarisk control

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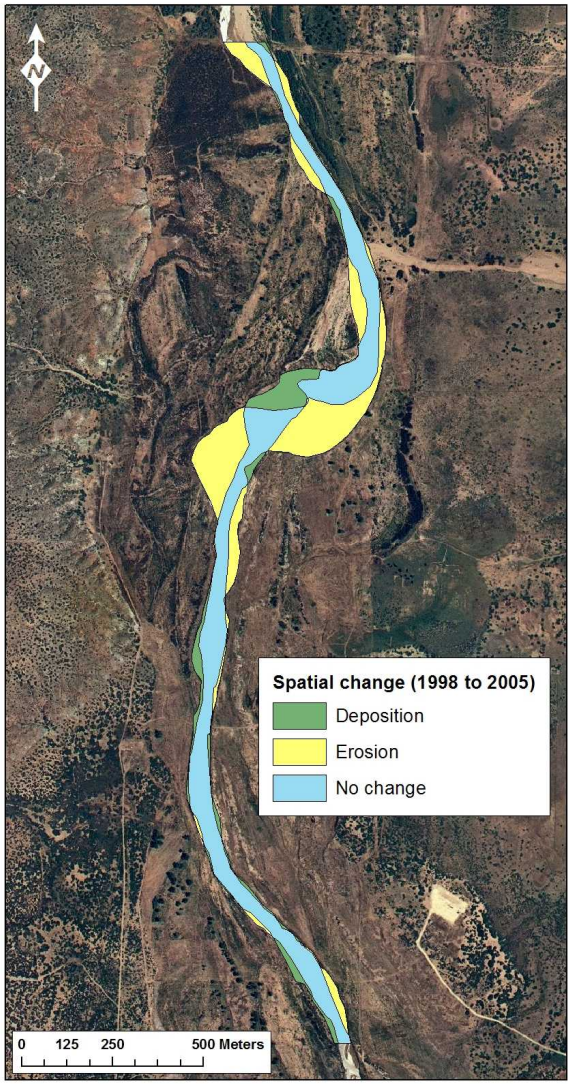
Monitoring Efforts: DOQQ GIS



Change	Square meters	% change
Deposition	28,000	11
Erosion	90,000	34
No change	143,000	55
Total	261,000	100

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Monitoring Efforts: GPS mapping

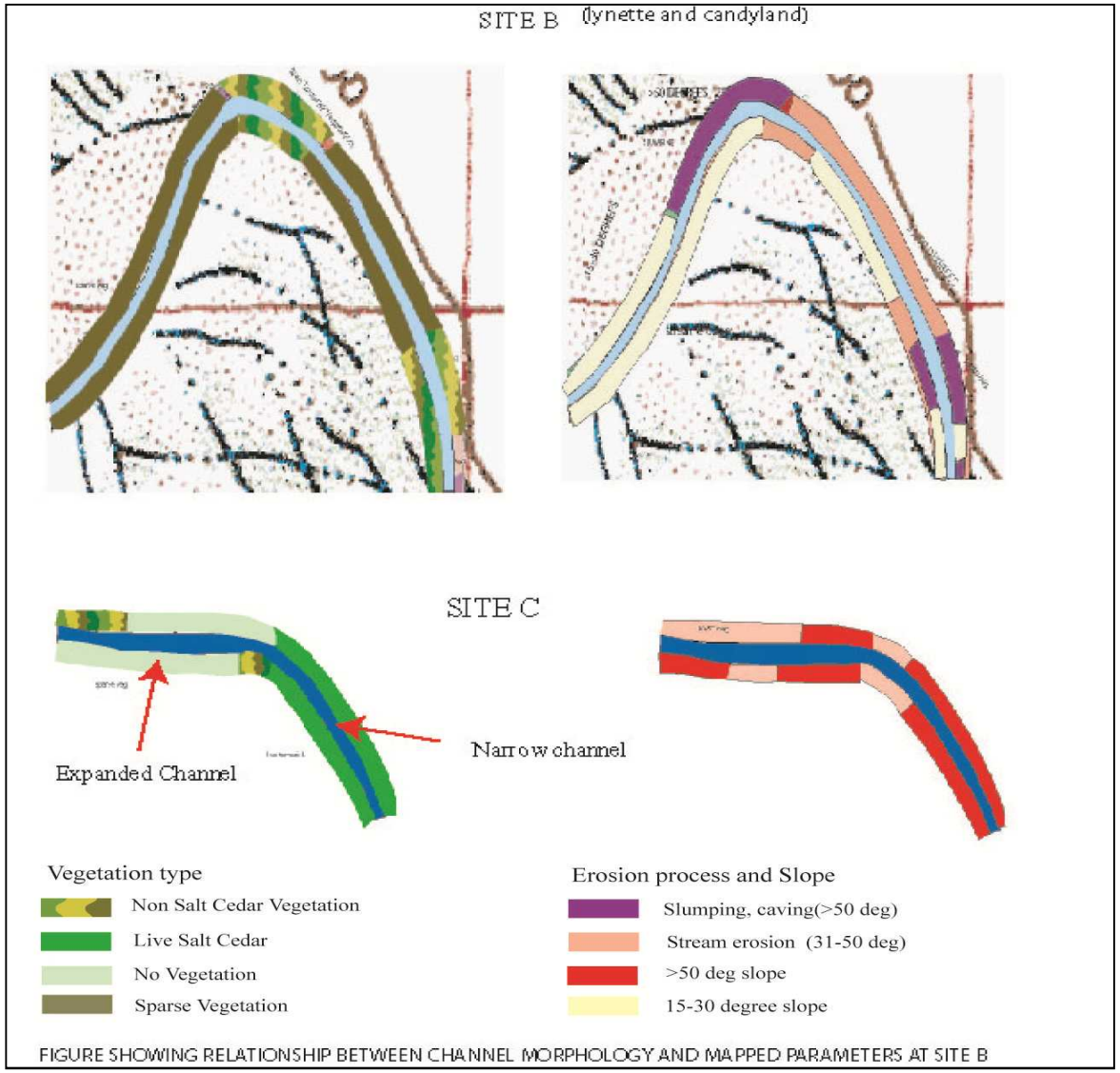

FIGURE SHOWING RELATIONSHIP BETWEEN CHANNEL MORPHOLOGY AND MAPPED PARAMETERS AT SITE B

Bank Characterization

- Bank Slope
- Vegetation type
- Soil properties

Changes with time to yield correlation to bank erosion

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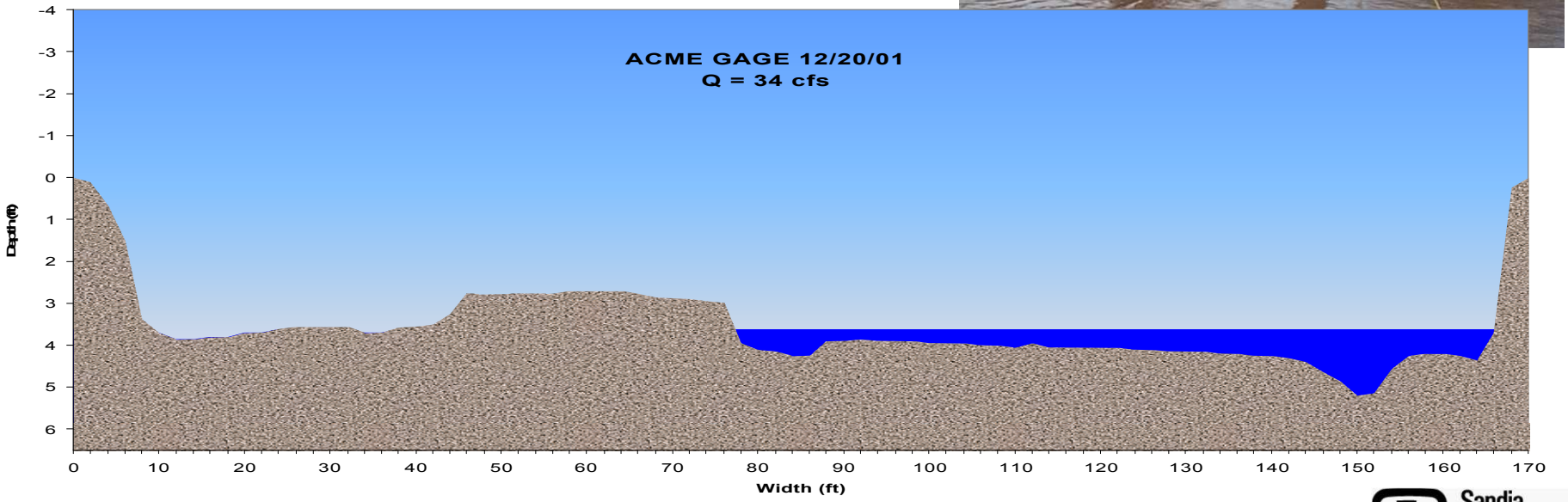
Monitoring Efforts: Point Surveys

- **Semi-permanent monitoring stations**
  - **11 single-sites North of Roswell (2001-2004)**
    - **Flow rate and cross-section data**
    - **bed form geometry and migration rates**
  - **5 multi-sites South of Roswell (2005-present)**
    - **Cross section data only**



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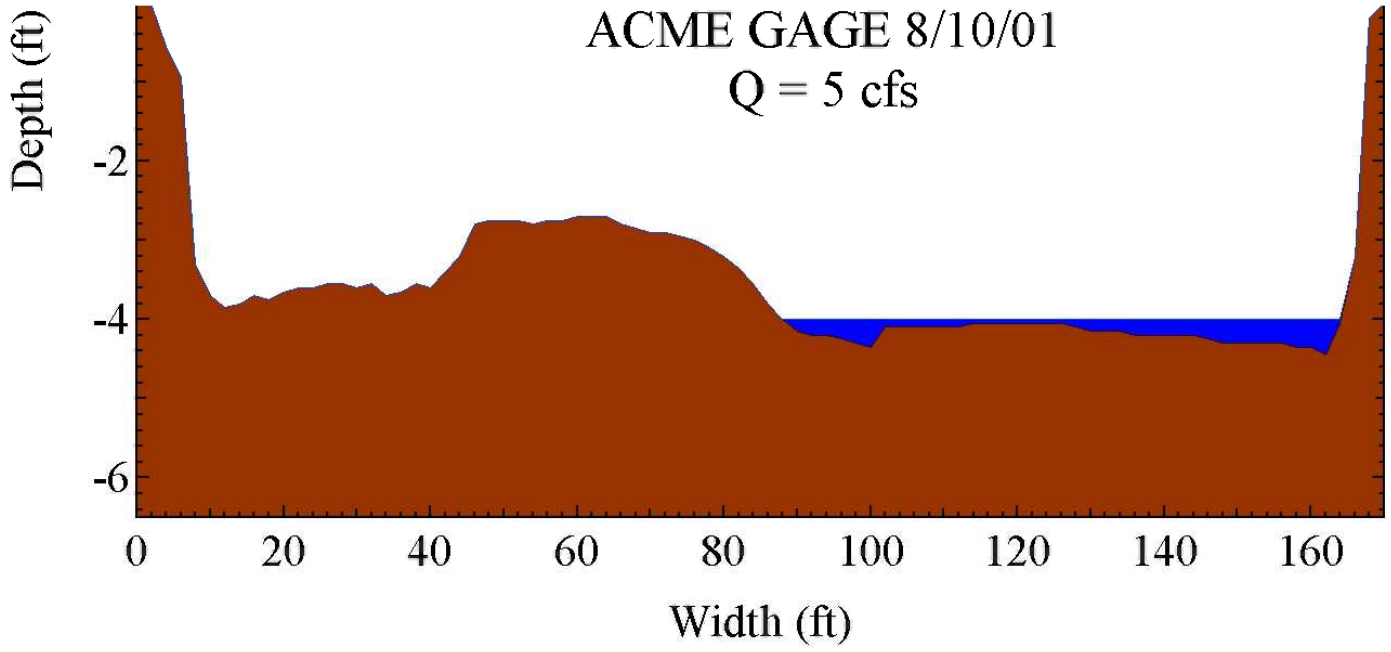
Monitoring Efforts: Point Surveys



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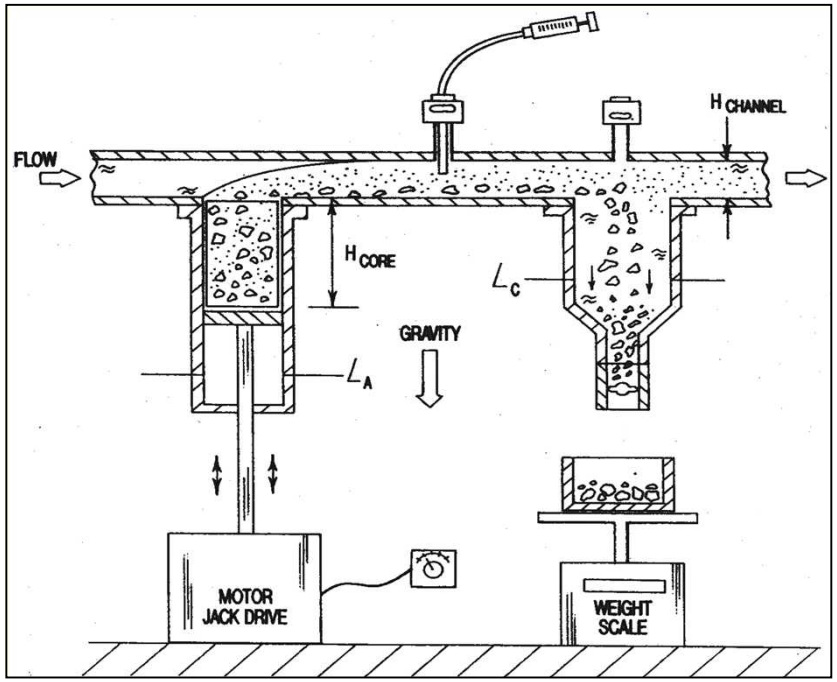
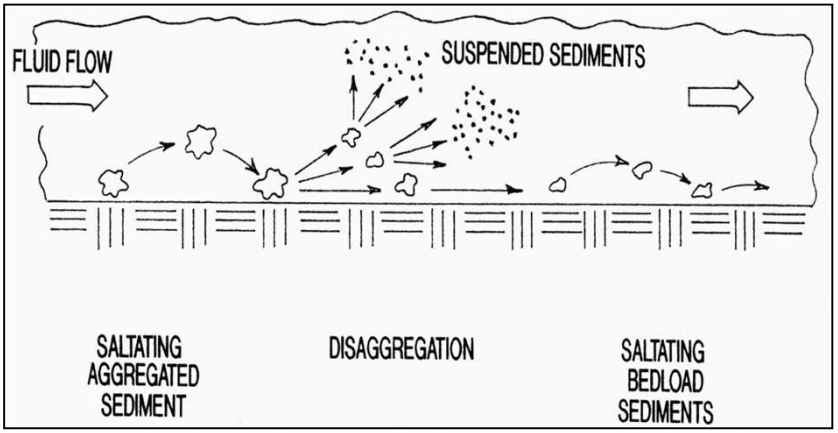
Sediment Transport Model Features





- **Uses SEDflume/ASSET flume data to quantify bed stability**
- **Uses multiple size classes**
- **Incorporates bedload and coarsening**
- **Incorporates cohesive bedload and consolidation**

o **Making improvements to include bank erosion**

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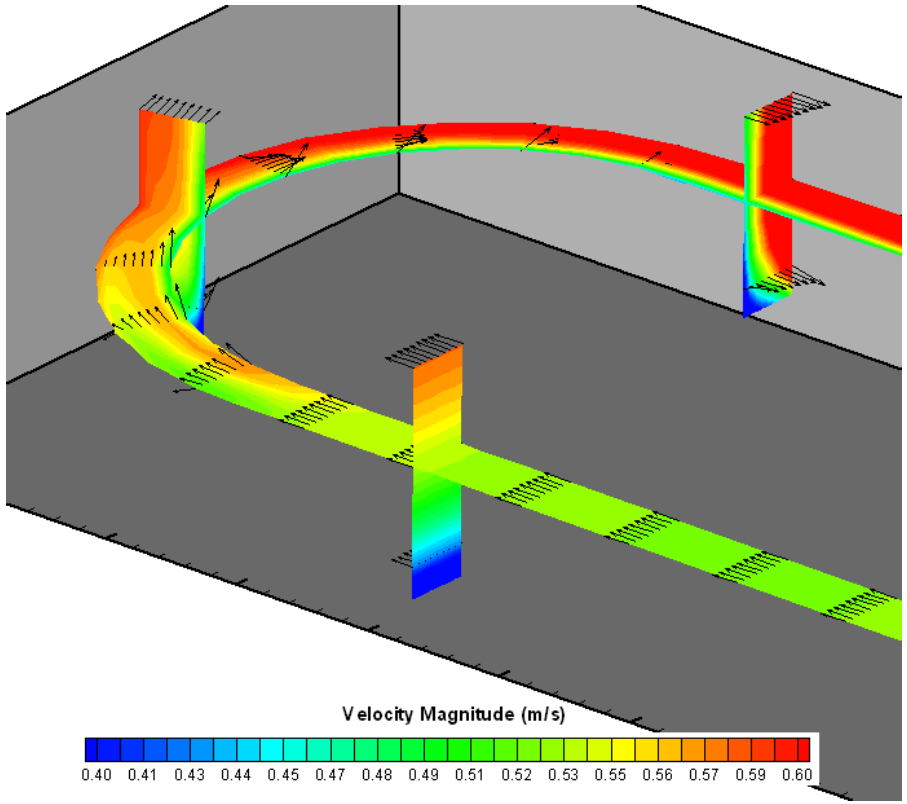
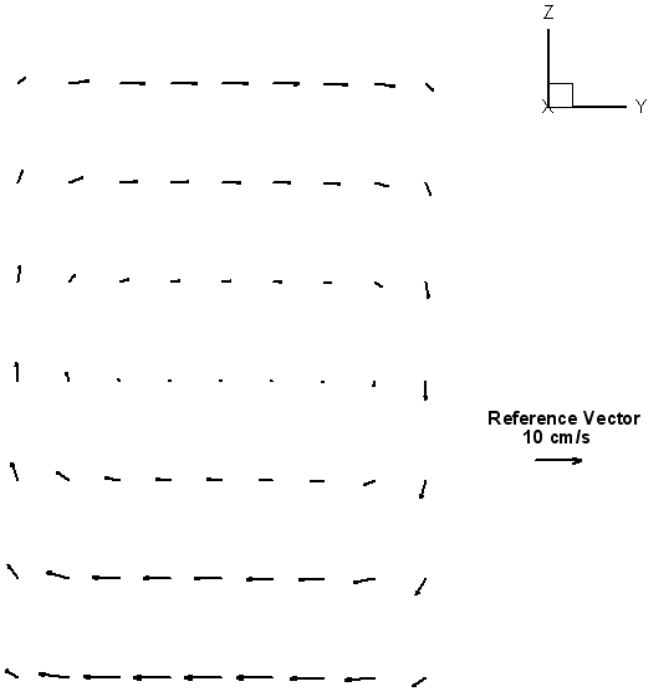
Yen and Lee (1995) Test Case

- **Experiments were conducted in a 180^{o} bend flow channel with graded non-cohesive sediments and unsteady flow to investigate sediment sorting.**





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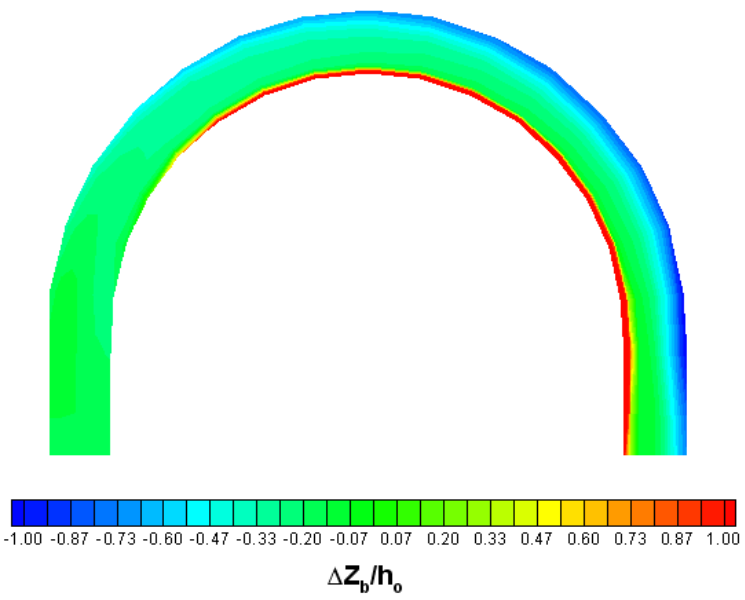
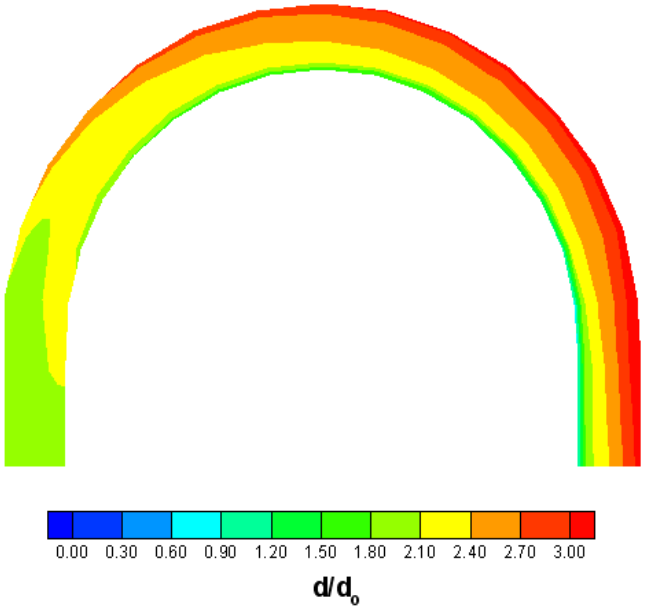
Yen and Lee Model Results



Change in Bed Thickness



Distribution of Particle Size

- **Results are consistent with laboratory measurements of bed thickness and particle size distribution after the experiments.**

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Summary

- There is risk in killing tamarisk lining river banks
- Quantifying risk is difficult
- Must include sedimentation issues in planning activities for tamarisk control
- SNL is developing tools and techniques to help

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