Repairing the Pecos River at Bitter Lake National Wildlife Refuge

Photo: Ken Stinnett

New Mexico Watershed Forum, 2010 Conference

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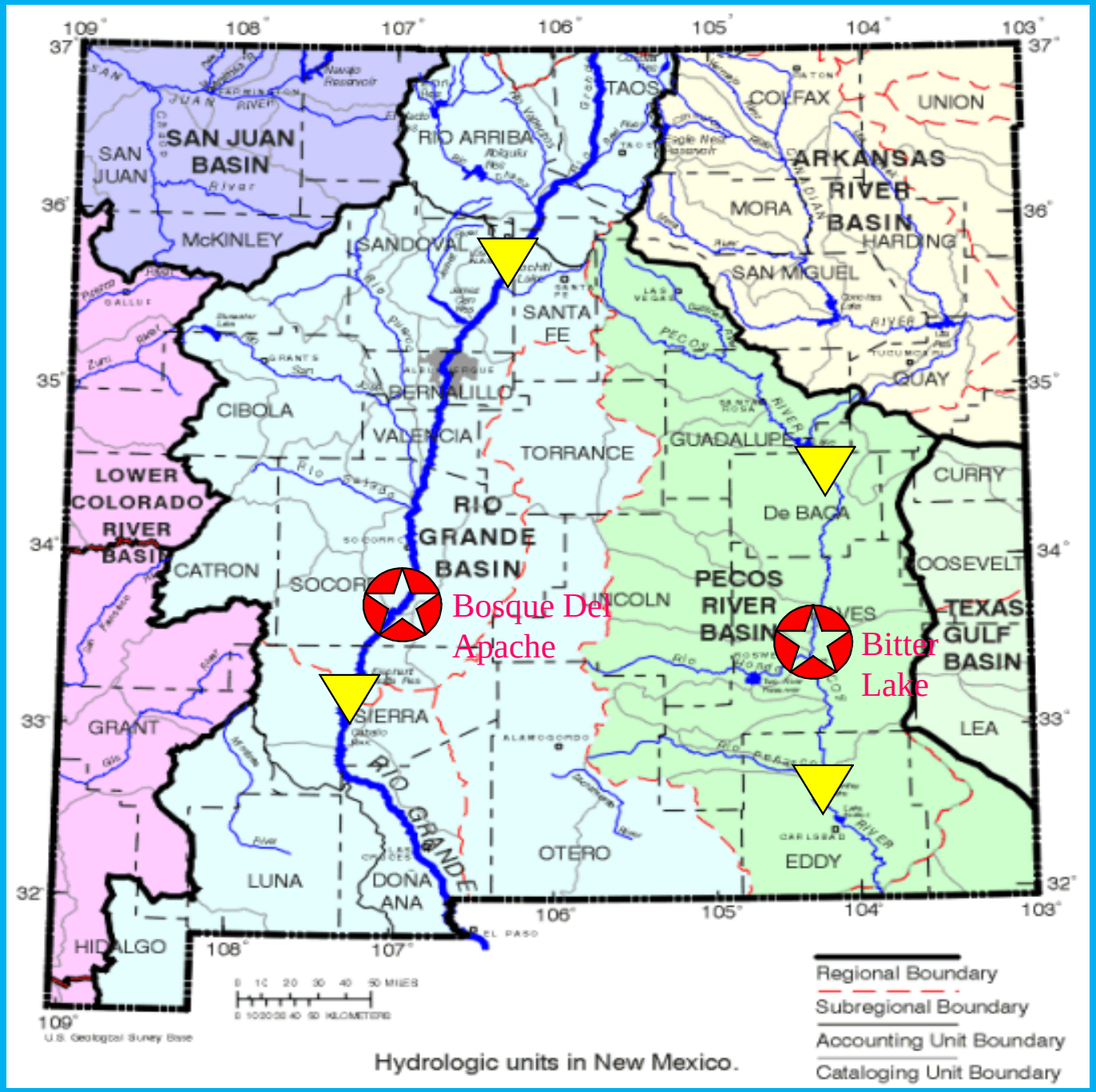
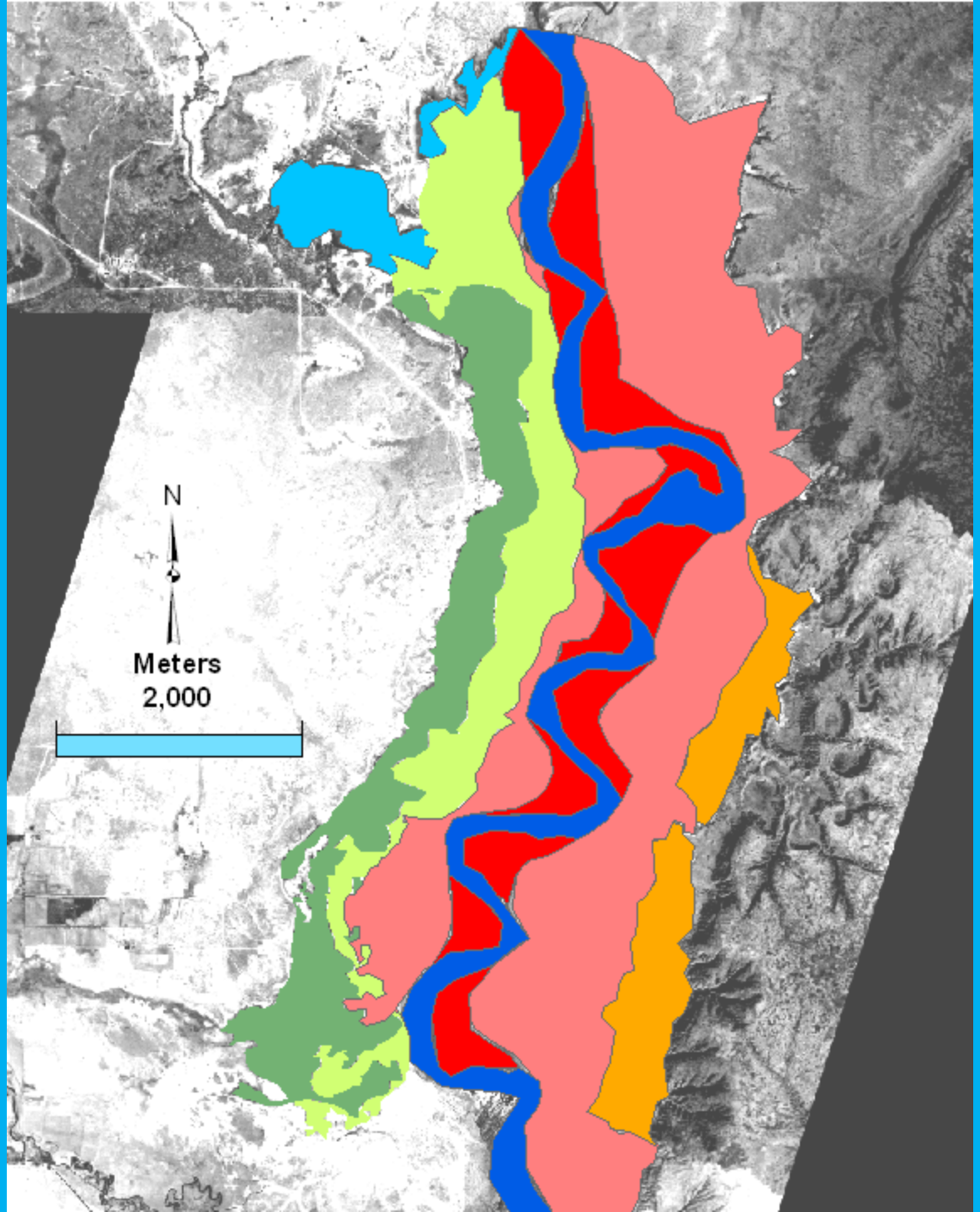
US Fish and Wildlife Service

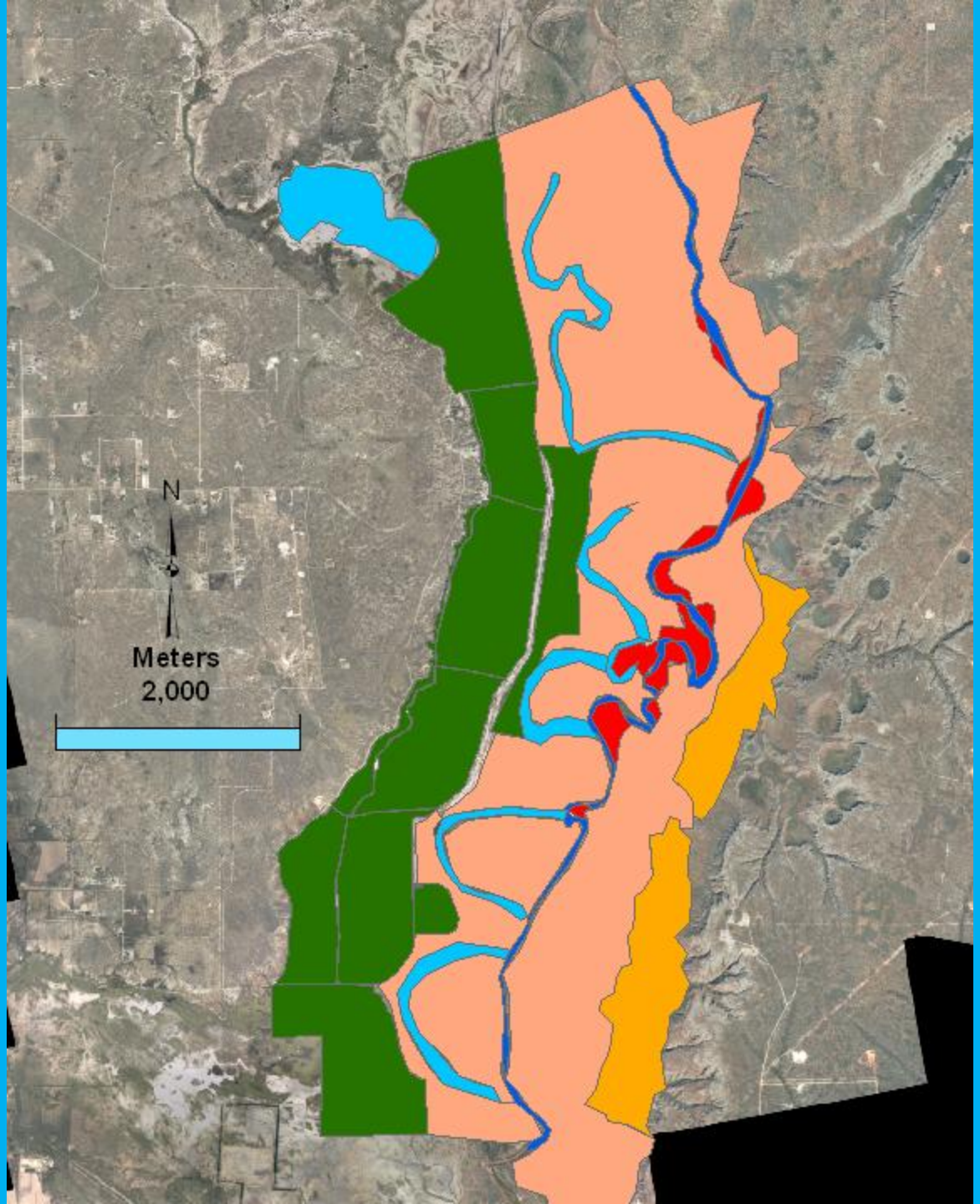
Re-wilding the Pecos River at Bitter Lake NWR

- What data we used for restoration design
- Partnerships and outreach
- Project overview
- Lessons learned



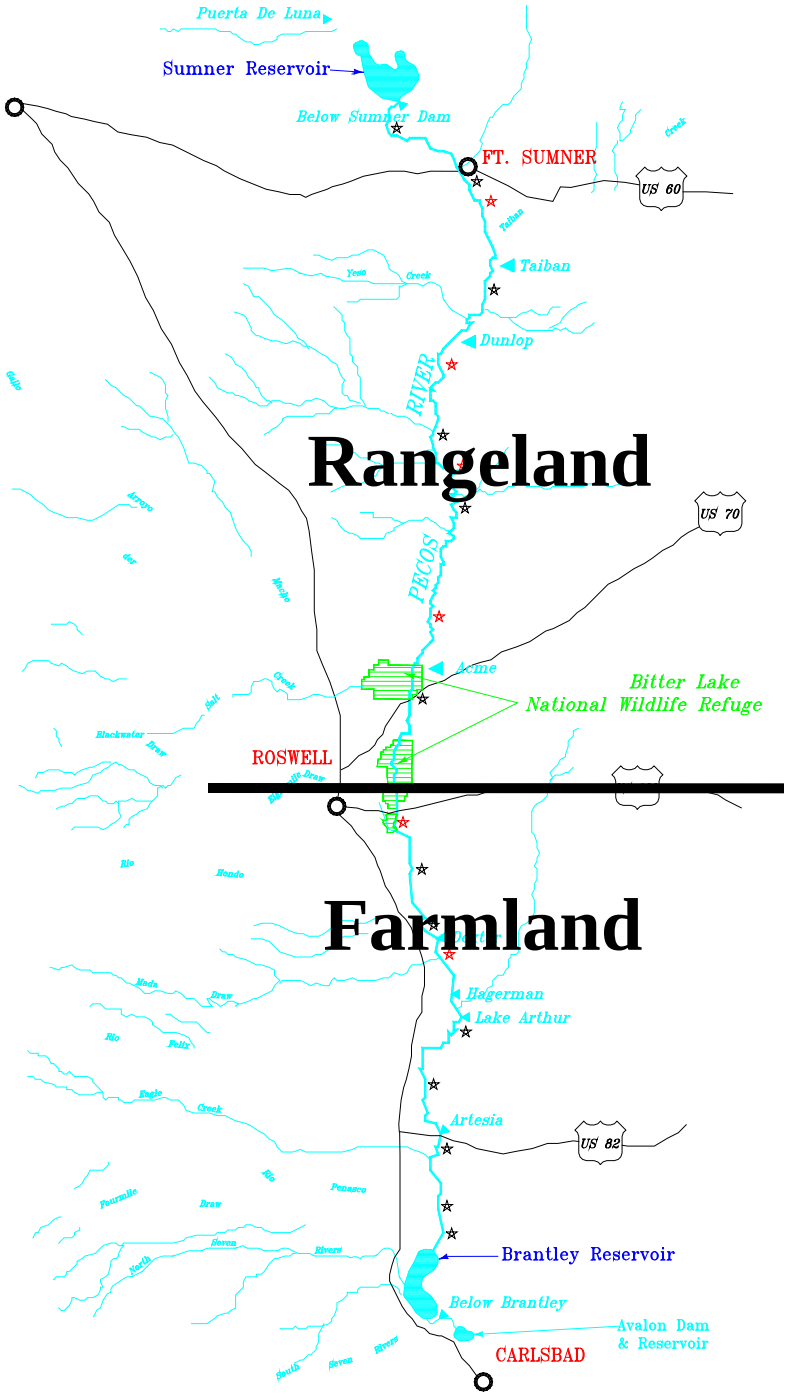
Hydrologic units in New Mexico.


N
Meters
2,000


N
Meters
2,000

History of Project

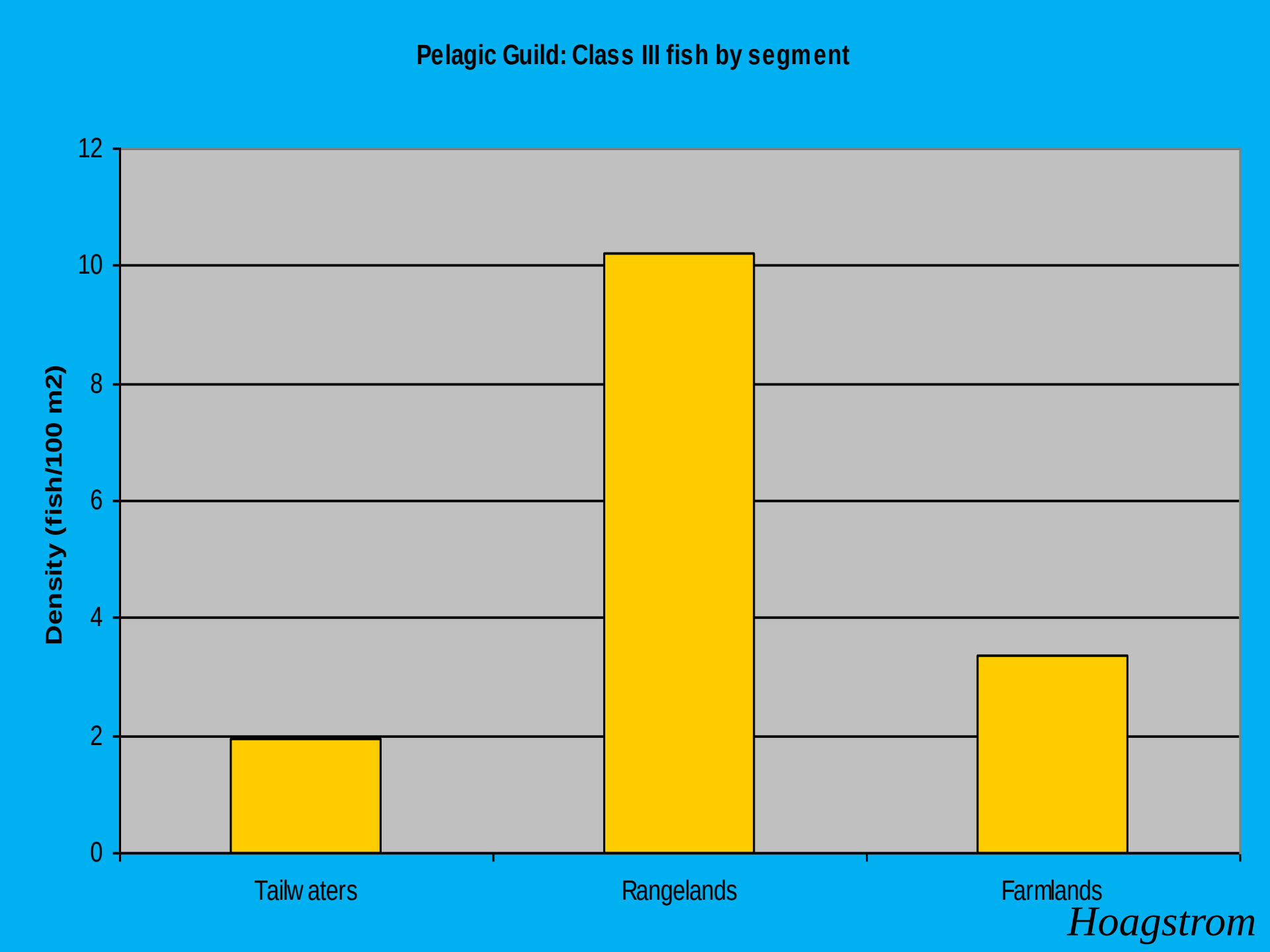
- **Pecos River fisheries investigations in the 1990s**
  - **Identified Refuge as critical location for pelagic spawning fishes**
  - **Identified habitat trends**
  - **Bureau of Reclamation contracted initial conceptual restoration plan (1999)**
- **Initial EA in 2000**
  - **Heavily criticized by Pecos compact water managers**
- **2002-2006: Project in the hopper**
- **2007: Planets align**
  - **NMRERI Grant!!!**
    - ***NMISC, WWF partnership; CID, Chaves County support***
  - **BOR: Pecos River Biologic Opinion**
- **2009 stimulus money for Phase III : tamarisk clearing on North Tract**

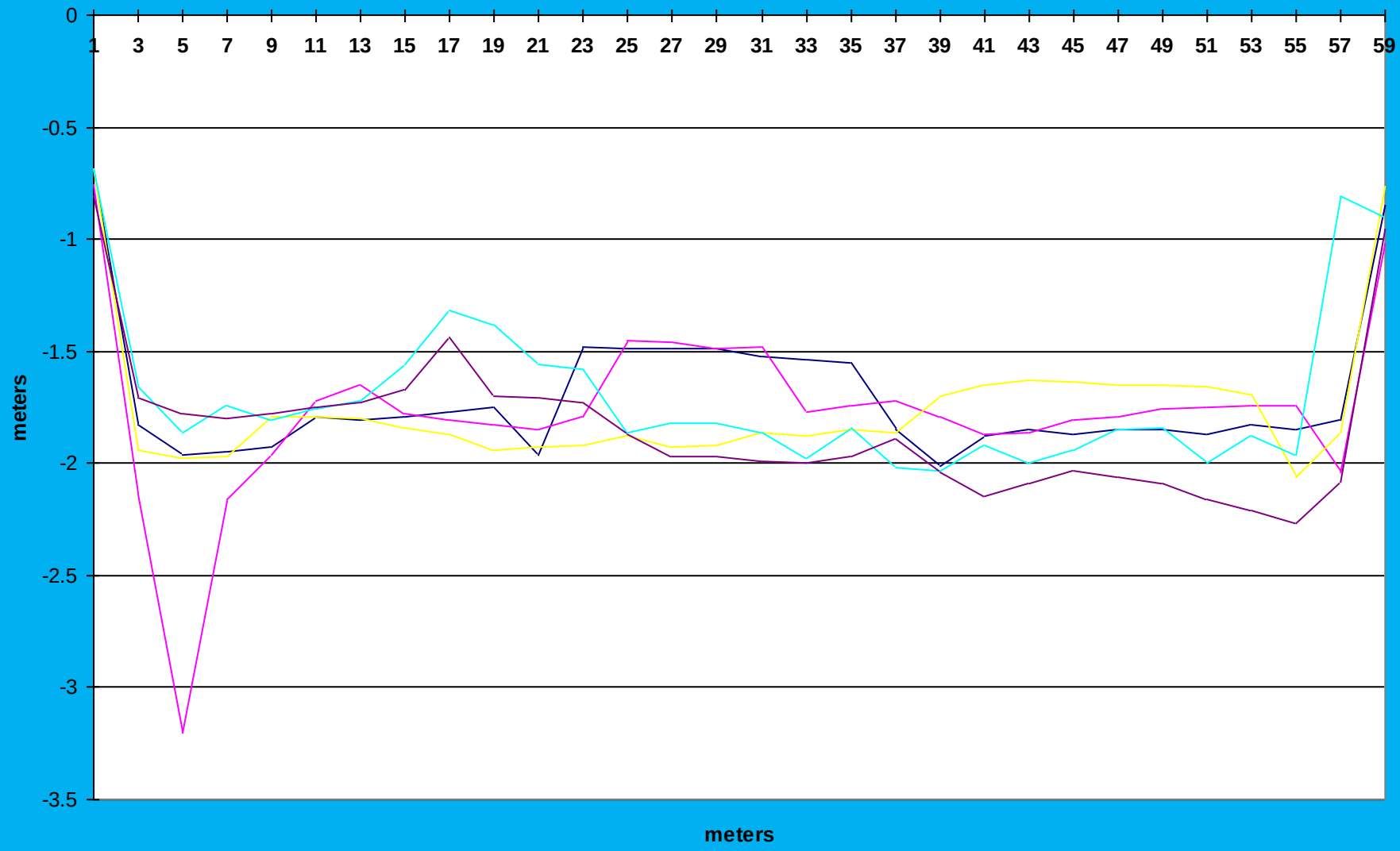


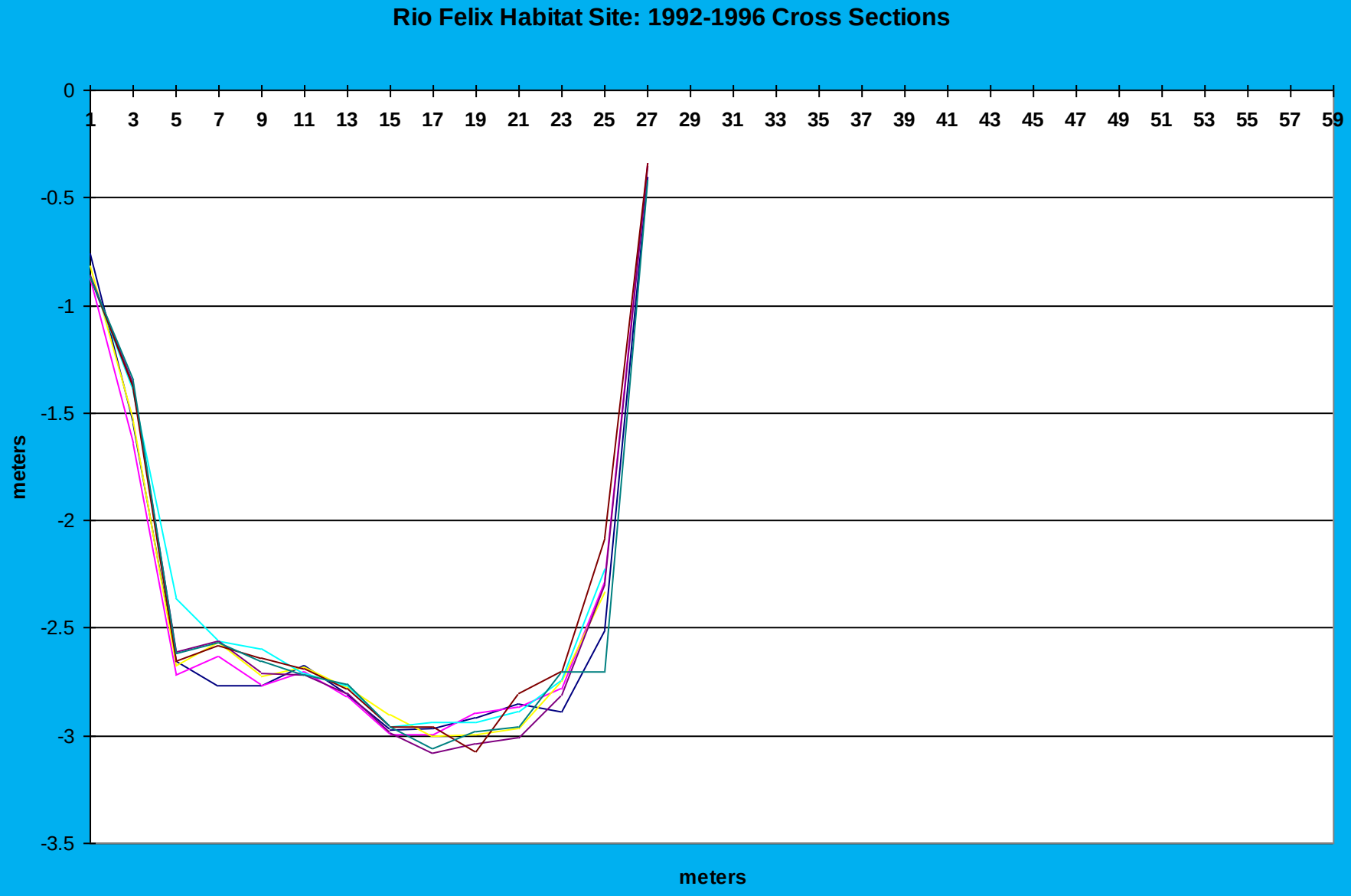
RIVER REACH	
	Below Sumner Dam
1	60 Bridge
	Old Fort Park
	18 Mile Bend
	Cedar Creek
	Arroyo Araña
	Atkins Ranch
2	Crocket Draw
	Gasline
	70 Bridge
	380 Bridge
	Salee Park
	Dexter
	Rio Felix
3	
	Lake Arthur
	Huey Park
	82 Bridge
	Kaiser Channel
	Brantley Inflow

Good habitat
River drying

Poor habitat
Always wet


Pelagic Guild: Class III fish by segment
Density (fish/100 m2)
12
10
8
6
4
2
0
Tailw aters
Rangelands
Farmlands
Hoagstrom


Atkins Ranch Habitat Site: 1995 and 1996 Cross Sections
0
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
meters
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59
meters

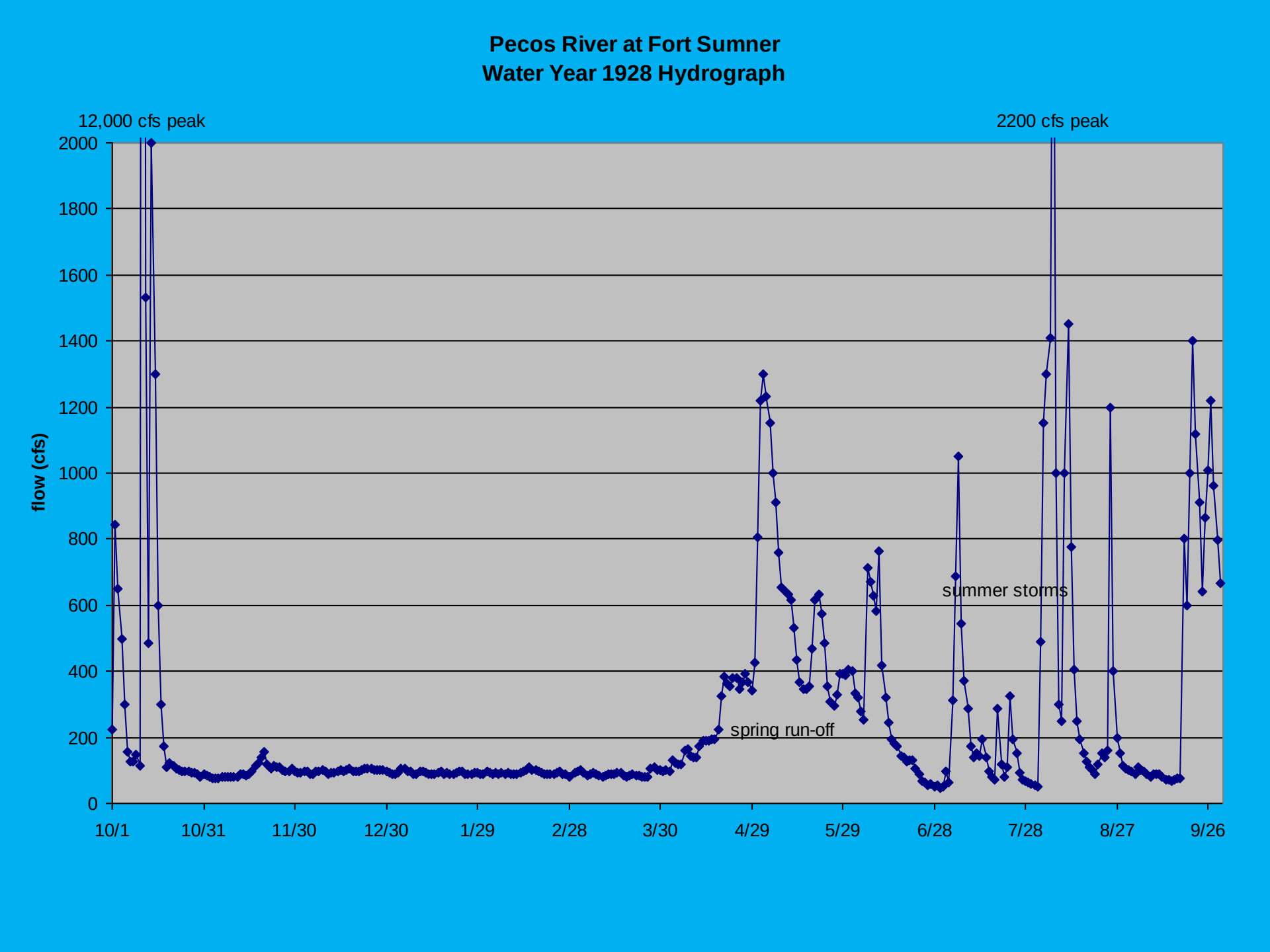

Rio Felix Habitat Site: 1992-1996 Cross Sections
0
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
meters
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59
meters


August 2003: *How low can you go?*

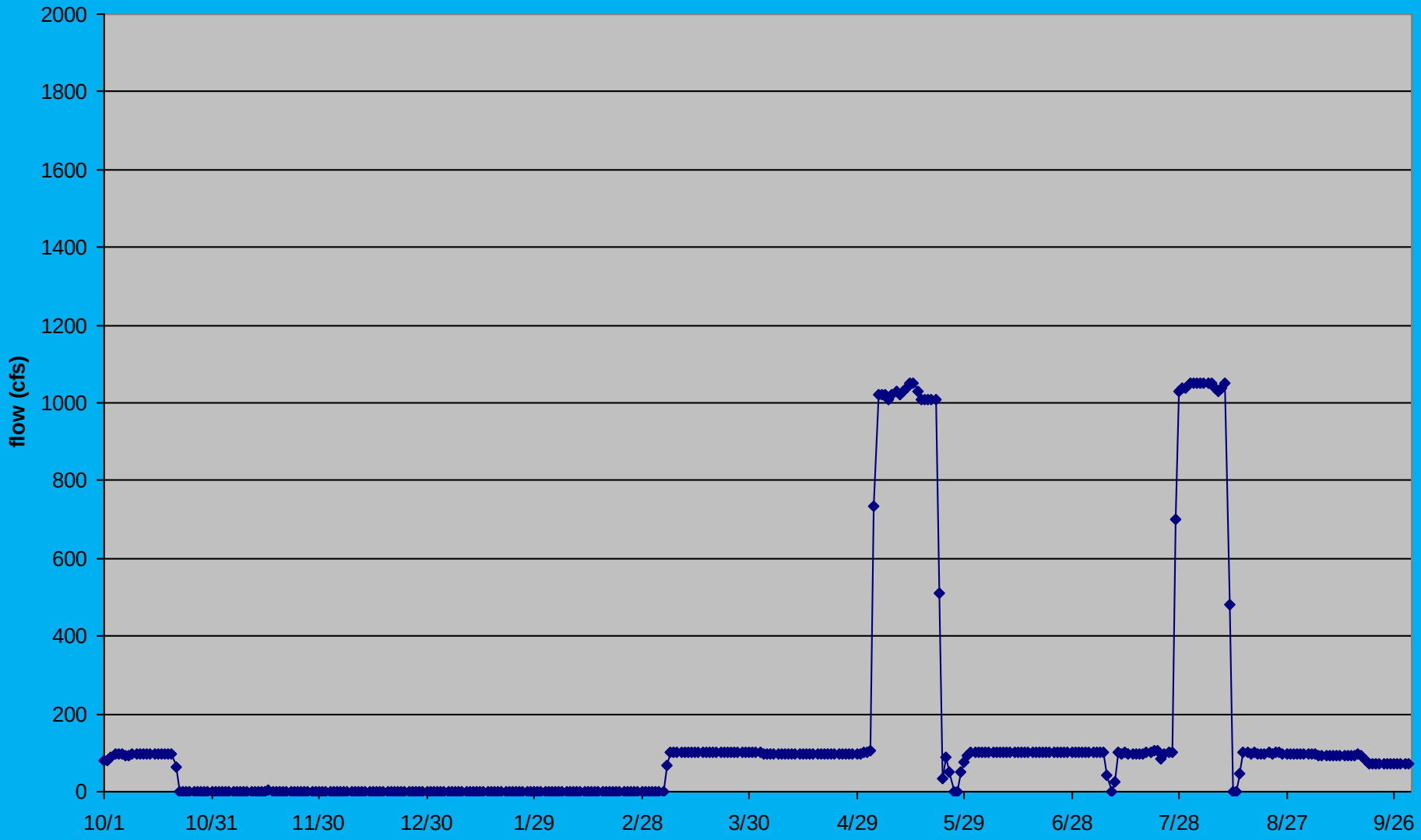
Design Approach

Flo Engineering, 1999: Kuhn, O'Brien and Fullerton

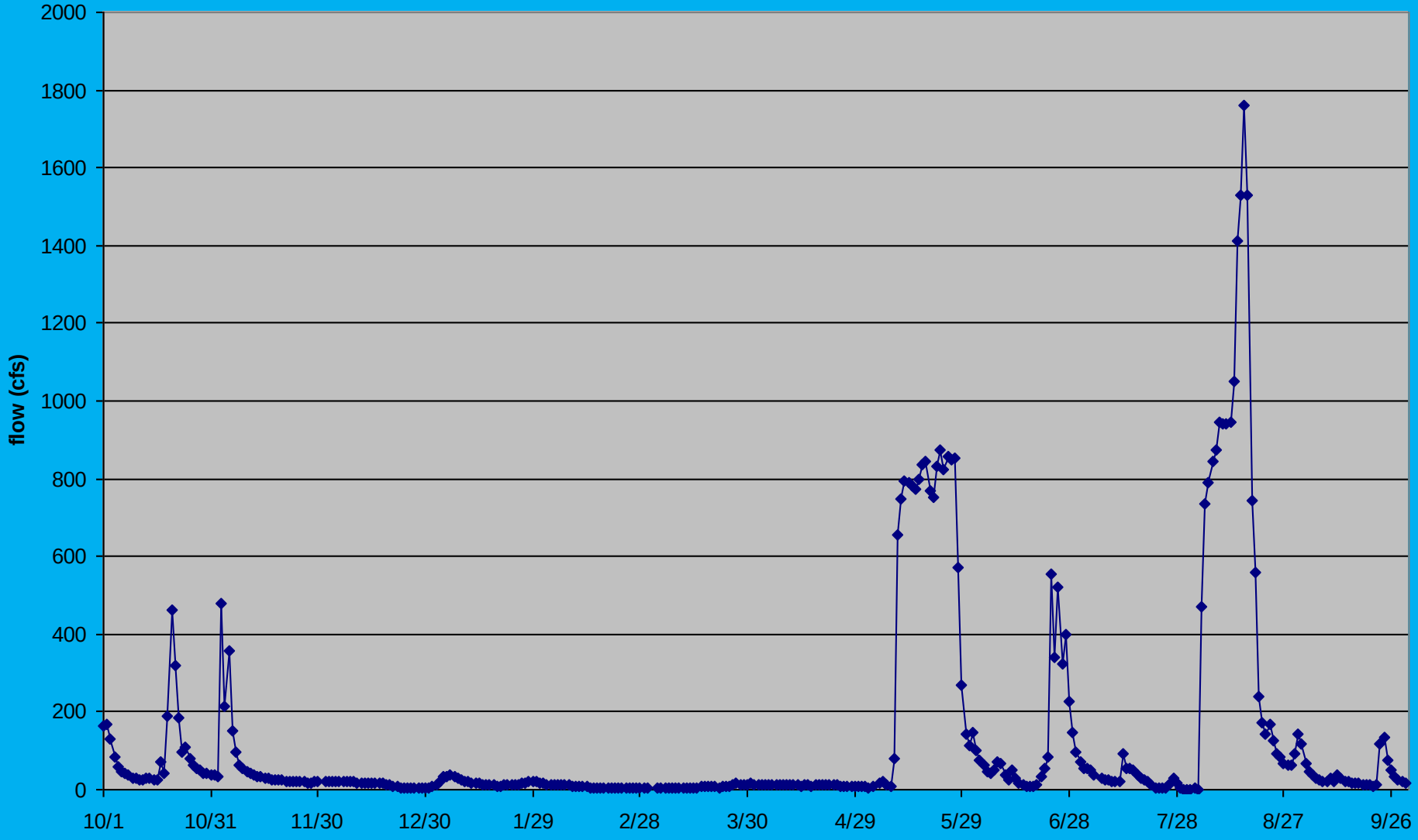
- **Segmented modern Pecos at and near Refuge into habitat reaches**
- **Collected geomorphic information on modern Refuge reaches, historic Refuge channels, and reference reaches north of Refuge**
  - **35 cross sections survey giving geomorphic and hydraulic parameters**
  - **Sinuosity, slope, channel width, width-depth ratio, entrenchment**
- **Analyzed the historic versus modern hydrology**
- **Analyzed how the modern hydrology interacts with the modern geomorphology**
- **Created Reach Specific Design alternatives in a matrix**


Pecos River at Fort Sumner
Water Year 1928 Hydrograph
12,000 cfs peak
2200 cfs peak
flow (cfs)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
10/1
10/31
11/30
12/30
1/29
2/28
3/30
4/29
5/29
6/28
7/28
8/27
9/26
spring run-off
summer storms

Pecos River at Fort Sumner
Water Year 1984 Hydrograph

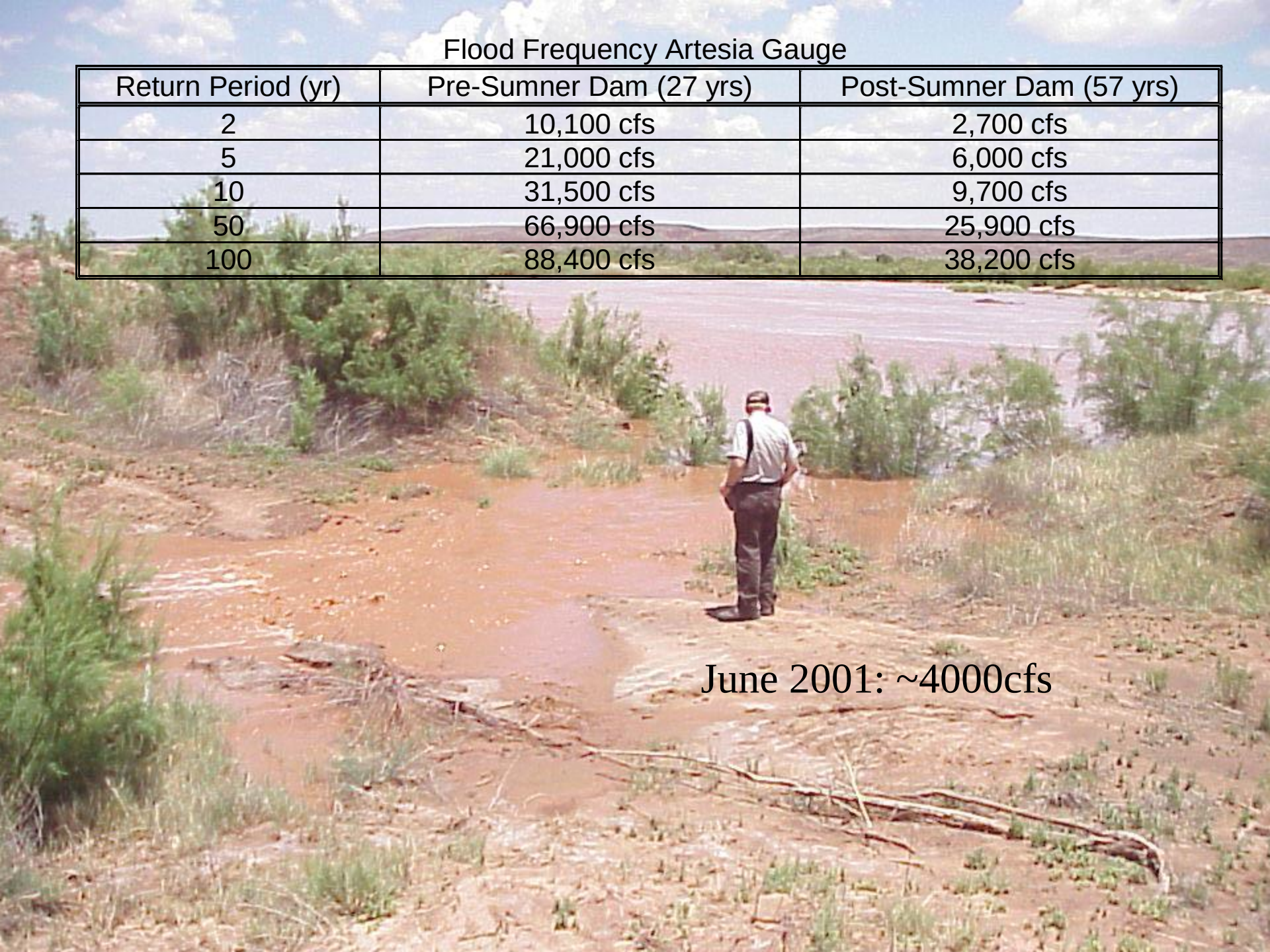


Pecos River at Acme
1984 Hydrograph

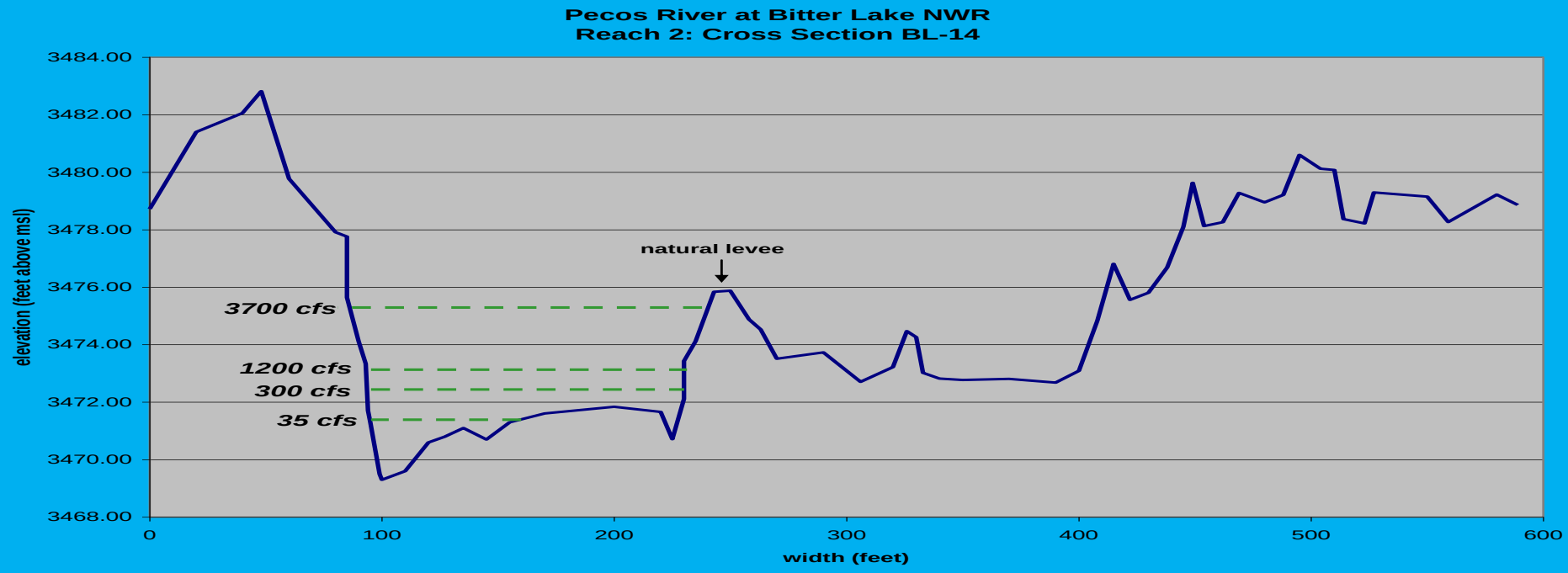


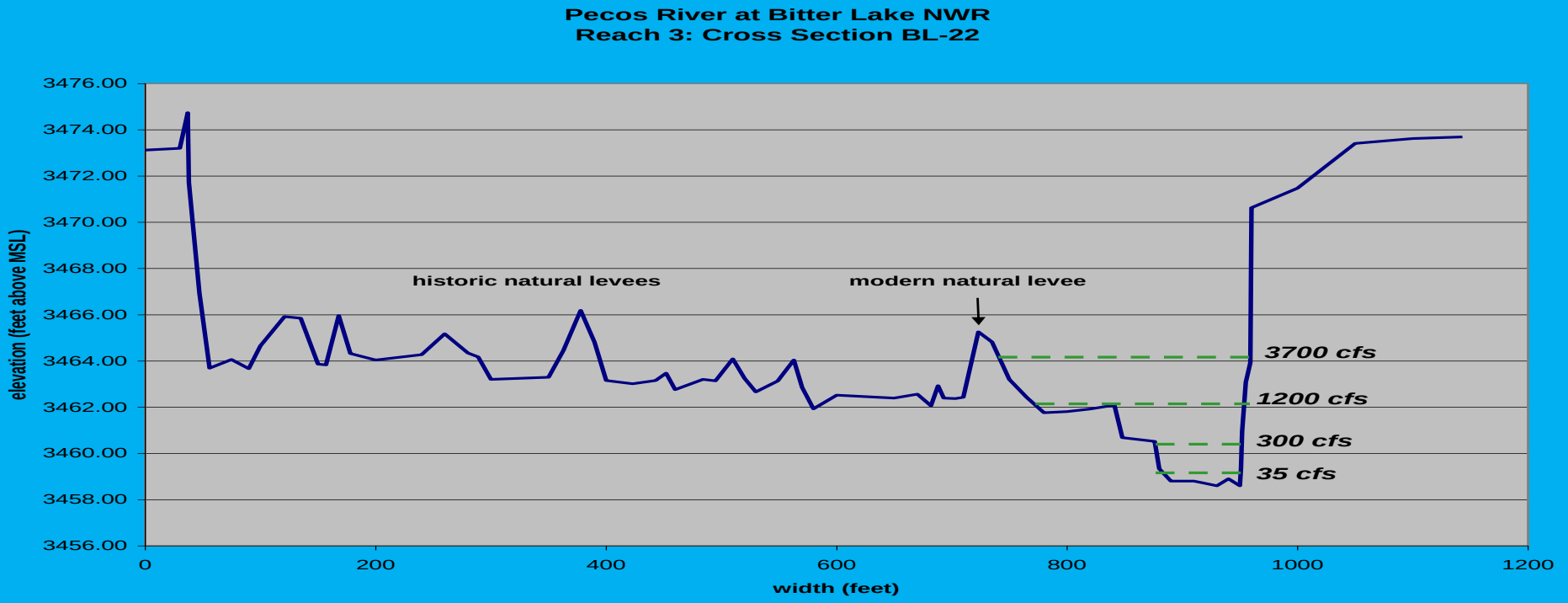
Flood Frequency Artesia Gauge

Return Period (yr)	Pre-Sumner Dam (27 yrs)	Post-Sumner Dam (57 yrs)
2	10,100 cfs	2,700 cfs
5	21,000 cfs	6,000 cfs
10	31,500 cfs	9,700 cfs
50	66,900 cfs	25,900 cfs
100	88,400 cfs	38,200 cfs



June 2001: ~4000cfs


Pecos River at Bitter Lake NWR
Reach 2: Cross Section BL-14
elevation (feet above msl)
3484.00
3482.00
3480.00
3478.00
3476.00
3474.00
3472.00
3470.00
3468.00
0
100
200
300
400
500
600
width (feet)
natural levee
3700 cfs
1200 cfs
300 cfs
35 cfs


Pecos River at Bitter Lake NWR
Reach 3: Cross Section BL-22
elevation (feet above MSL)
3476.00
3474.00
3472.00
3470.00
3468.00
3466.00
3464.00
3462.00
3460.00
3458.00
3456.00
0
200
400
600
800
1000
1200
width (feet)
historic natural levees
modern natural levee
3700 cfs
1200 cfs
300 cfs
35 cfs

Challenges…

- **Water budget: concern over increasing evaporative depletions**
  - **Many thanks to NMISC for 2007 cooperative approach!**
- **Status Quo; resistance to large scale restoration**
  - **Outreach to CID and Chaves County**
- **NEPA gridlock**
- **Many design, technical and contractual snags all along the way…**
  - ***Rely on partnerships; eyes on the prize!***

Planning into Action: *Partnerships!*

- **Partnership between USFWS and WWF (Beth Bardwell)**
- **Partnership with USFWS ,WWF and NMISC**
- **Partnership between Bureau of Reclamation and USFWS**
  - **BOR skills: design, river maintenance team from Socorro, project management**
- **Partnership between USFWS and contractors**
  - **Finding the right contractor is critical!**

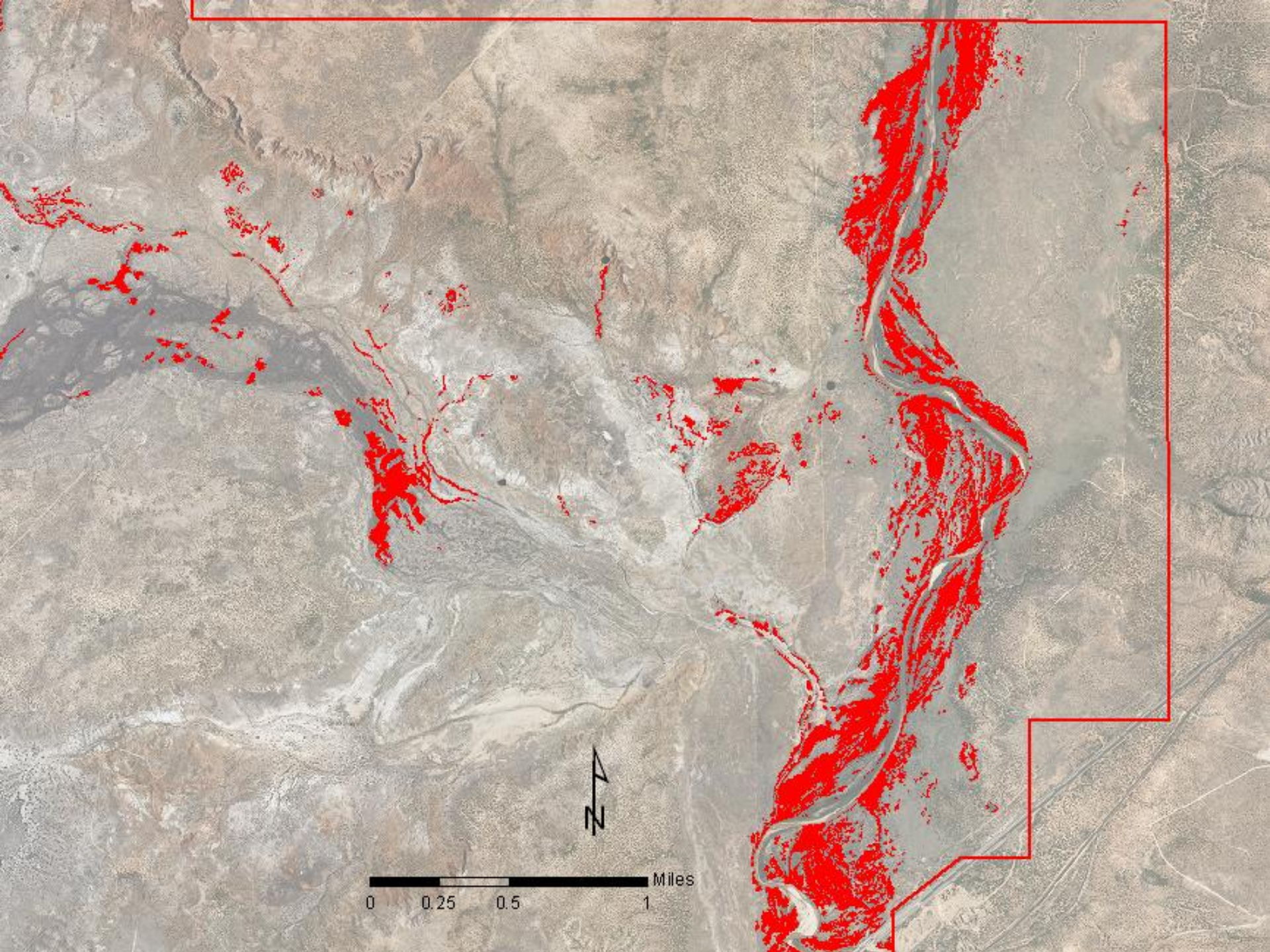
Photo: Ken Stinnett

Status of Restoration Project of the Pecos River at Bitter Lake NWR

- **Phase I: Reconnection of Oxbow 4: 1.5 river miles**
  - **Completed June 2009**
- **Phase II: Reaches 2 and 3: 6.5 river miles**
  - **Winter 2009: remove tamarisk and initial bank lowering**
  - **Fall 2009: bank lowering, floodplain reconnection, spot treatment of tamarisk**
  - **2010-2011; spot treatment of tamarisk regrowth and floodplain connections, re-vegetation**
- **Phase III: Pecos River on North Tract; 4 river miles, 800 acres of tamarisk infestation**
  - **initial work completed September 2010**
- ***12 river miles in total!***

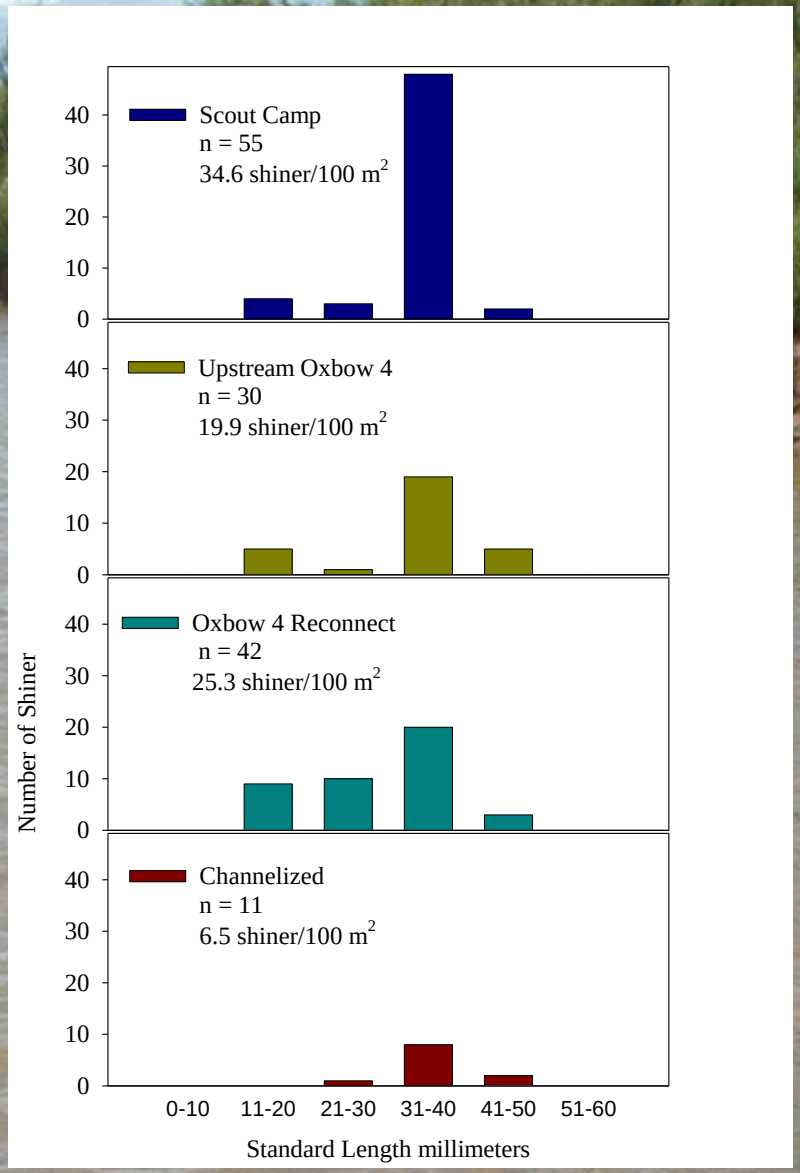
oto: Ken Stinnett

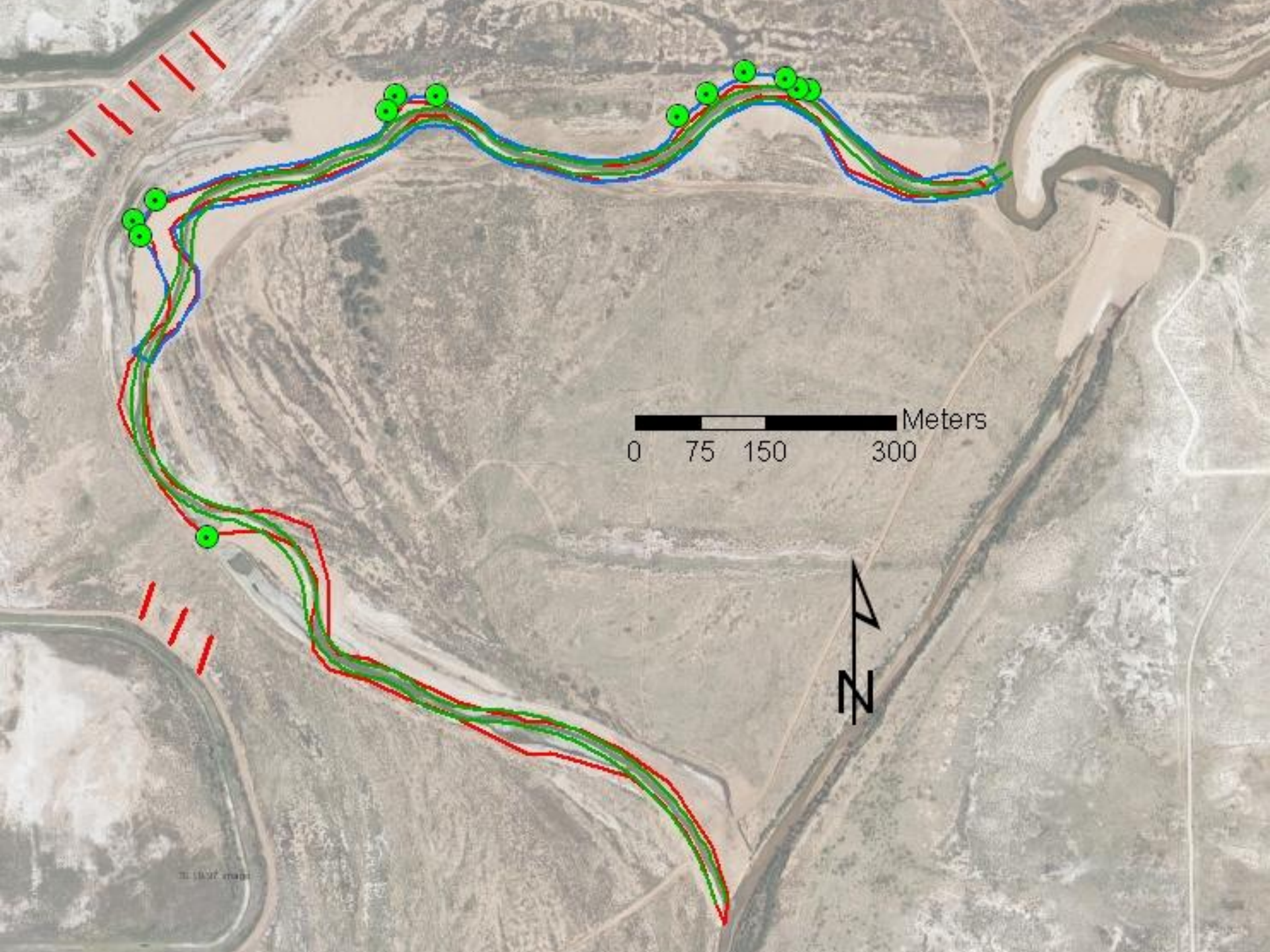

KOMATSU


N
Miles
0
0.25
0.5
1

Monitoring Components

- Geomorphology
- Fish habitat
- Fish community structure
- Migratory bird use
- Water budget
- Vegetation
- Photography


Scout Camp
n = 55
34.6 shiner/100 m2
Upstream Oxbow 4
n = 30
19.9 shiner/100 m2
Oxbow 4 Reconnect
n = 42
25.3 shiner/100 m2
Channelized
n = 11
6.5 shiner/100 m2
Number of Shiner
0
10
20
30
40
0-10
11-20
21-30
31-40
41-50
51-60
Standard Length millimeters


Meters
0 75 150 300
N

Lessons learned so far…

- **Without outreach and partnership, the project would never have happened.**
- **Rely on historic conceptual process models; understand modern limitations and potential.**
- **River restoration is reach specific!**
- **Expect weeds *(real and allegorical)*, be pleasantly surprised when they don't show up… Keep on pushing!**
- **Monitoring plan design; lean and mean. Test questions.**
- **A restoration project is never "completed"!**

Thanks to many partners!

Agencies: *Bureau of Reclamation, NMED, World Wildlife Fund, NMISC, USACE, NMDGF, Carlsbad Irrigation District, Chaves County*

Beth Bardwell (WWF) , Melvin Gonzales and crew (BOR), Emile Sawyer (NMISC), Gary Dean (BOR), Marsha Carra (BOR), Kevin Doyle (Tetra Tech), Karen Menetrey (NMED), Walt Kuhn (Tetra Tech), Jimmy O'Brien (Tetra Tech), Ross Coleman, Todd Caplan

Contractors: *Boss Reclamation, Hydra Aquatics Inc., SWISCO, Tetra Tech, Parametrix*

USFWS: *Refuge staff, NMFRO, NMESO, Budget and Administration, DNR, Fire*

Stephen Davenport, Marilyn Myers, Jeff Sanchez, Joe Saenz, Larry Ulibarri, Steve Alverez, Liz Trujillo, Todd Annes, Tom Harvey, Patrick Donnelly, David Lindsey, Darrell Kundargi, Steve Cullinan, Mark Kaib, Chris Hoagstrom, Bill Radke, Kenneth Butts, Jeff Howland


Emulate!