

Saltcedar Control and Water Salvage on the Pecos River, Texas

Current Status of Research

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Application Technology



Concerns:

Limiting herbicide contact with off-target vegetation.

Additional application methods presented several problems.

An aerial photograph showing a yellow and white helicopter flying over a dense forest. The helicopter is positioned in the center-right of the frame, moving from right to left. The forest below is a mix of green and yellowish-green trees. The background shows a sandy or light-colored area with scattered green bushes. The text is overlaid in the bottom-left corner.

Spraying at 25-30 mph allows
turning without banking

Trimble GPS Guidance

Variable-Rate
Flow Meter





Three section spray boom

15 – 30 – 45 ft. swath width

controlled from cockpit

9 15 19

Accuflo Nozzle
10 Micron Droplet
g/acre TSV











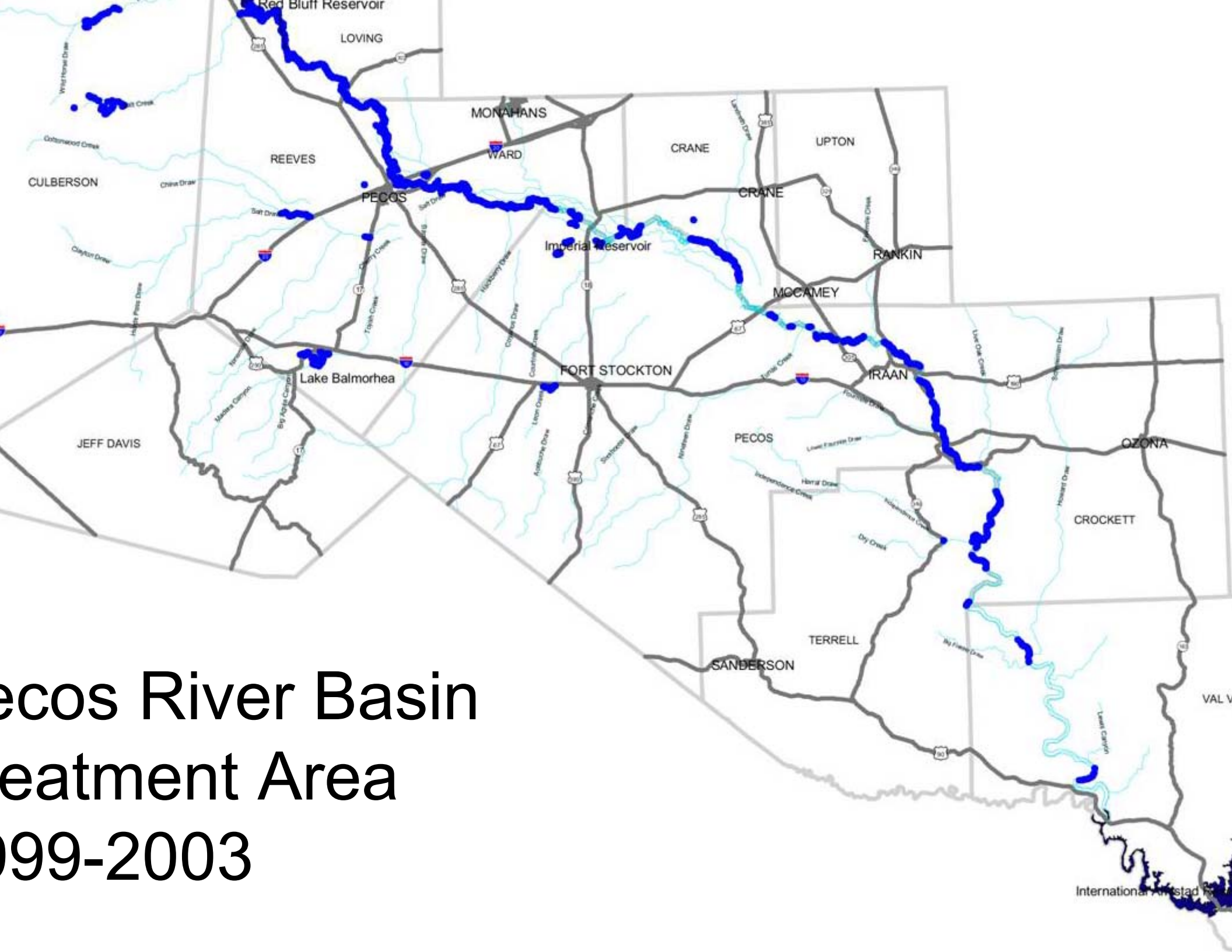




Pecos River Ecosystem Project

Acres Treated 1999-2003

Year Treated	Cost	Acres Treated
1999	\$125,020	658
2000	\$128,535	676
2001	\$263,000	1439
2002	\$660,000	3567
2003	\$820,050	3905
Total	\$1,996,605	10,245



Pecos River Basin Treatment Area 1999-2003

Los River Miles Treated 1999-2003

Segment	Miles	Cumulative	Miles Treated	Miles
Cluff to mentone bridge	40	40	40	0
mentone bridge to barstow	26	66	26	0
barstow dam to I-20	20	87	20	0
barstow to Grandfalls	37	124	37	0
Grandfalls to Girvin	89	213	22	68
Girvin to Iraan	53	266	15	37
Iraan to I-10	19	285	16	3
I-10 to Val Verde Co. line	56	341	18	39
Val Verde Co. to hwy 90 bridge	77	418	5	73
SUM	418		199	219
	Percent of River Miles Treated		47.6%	

Current Research and Monitoring Efforts

Document acreage treated and mortality achieved

Monitor native vegetation recovery

Economics of saltcedar control

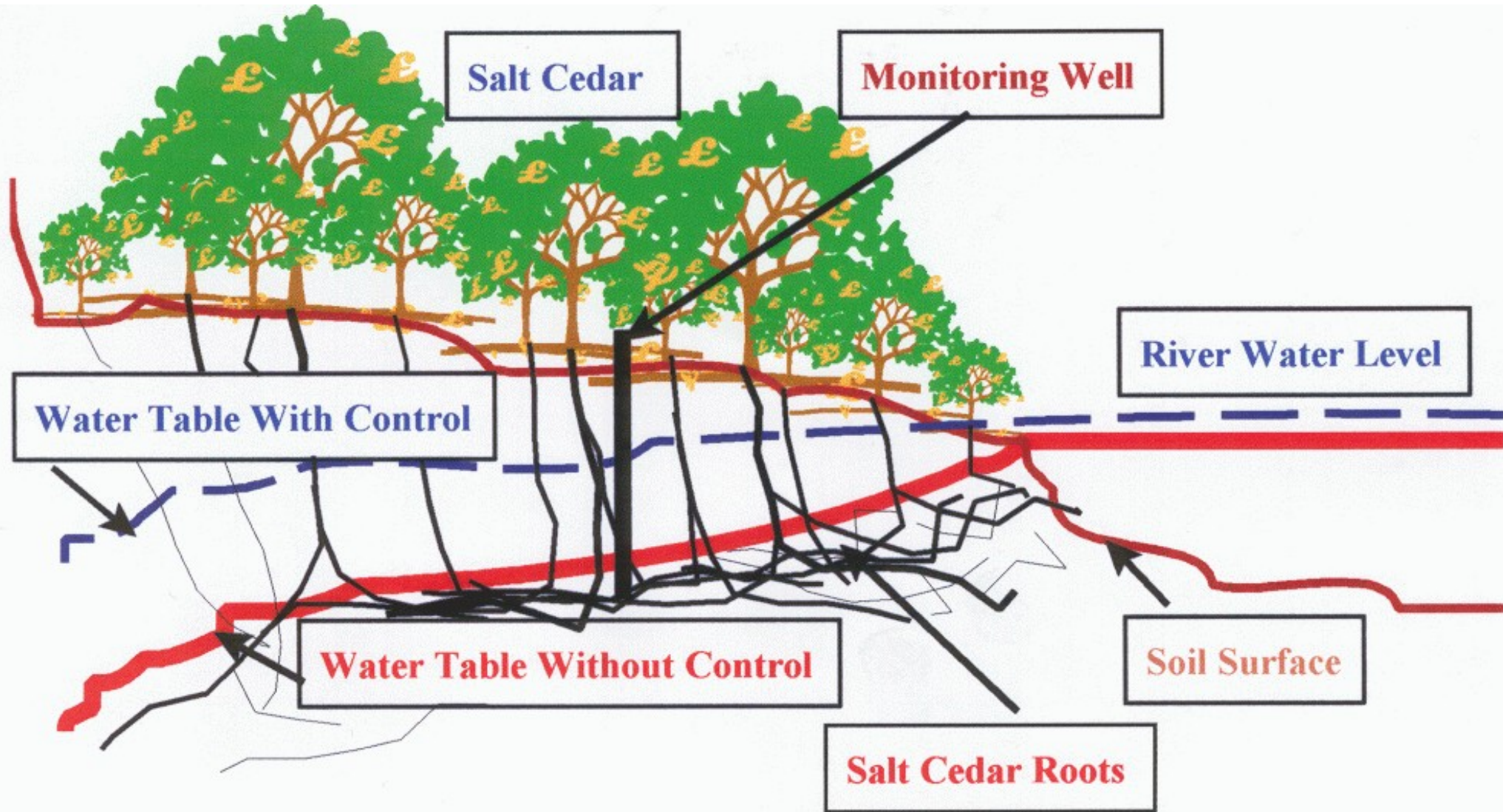
Current vs. historical release/delivery data

Measuring water quality (salinity) changes

Estimating water salvage

- Shallow groundwater wells
- Sap flow measurements
- Seepage runs and flow nets to estimate fate

Measuring Water Loss Using Shallow Groundwater Wells.



Using Shallow groundwater wells with pressure sensitive data loggers for calculating water loss.



Saltcedar water loss study design

Two sites monitored for entire year

Each site contains 5 data loggers

- Three within saltcedar
- One outside saltcedar
- One in river

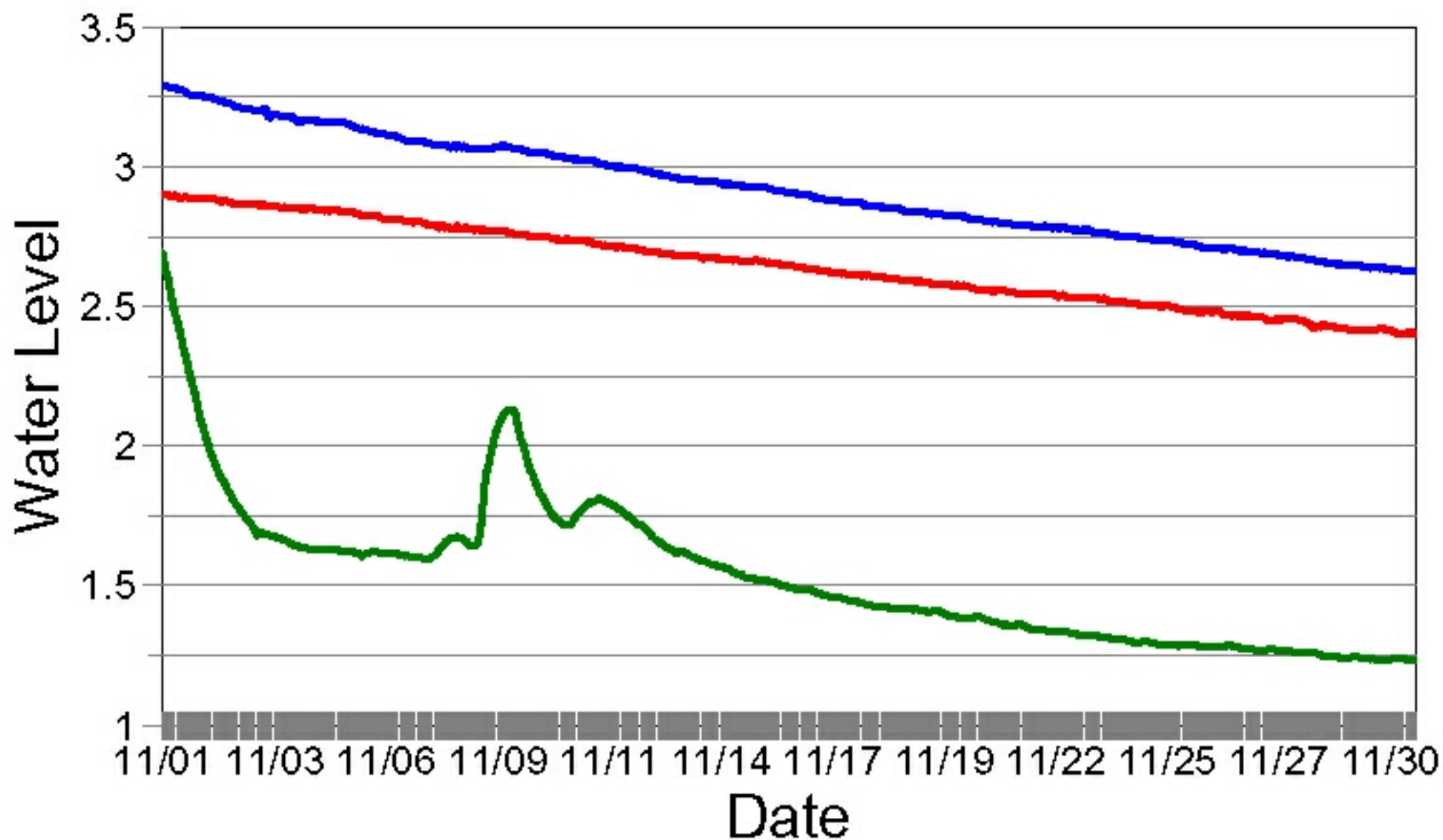
One site treated for saltcedar control after calibration period

Water loss on treated and untreated compared through paired plot analysis.



Pecos River Well Data

November 2000 Site A



Well A1

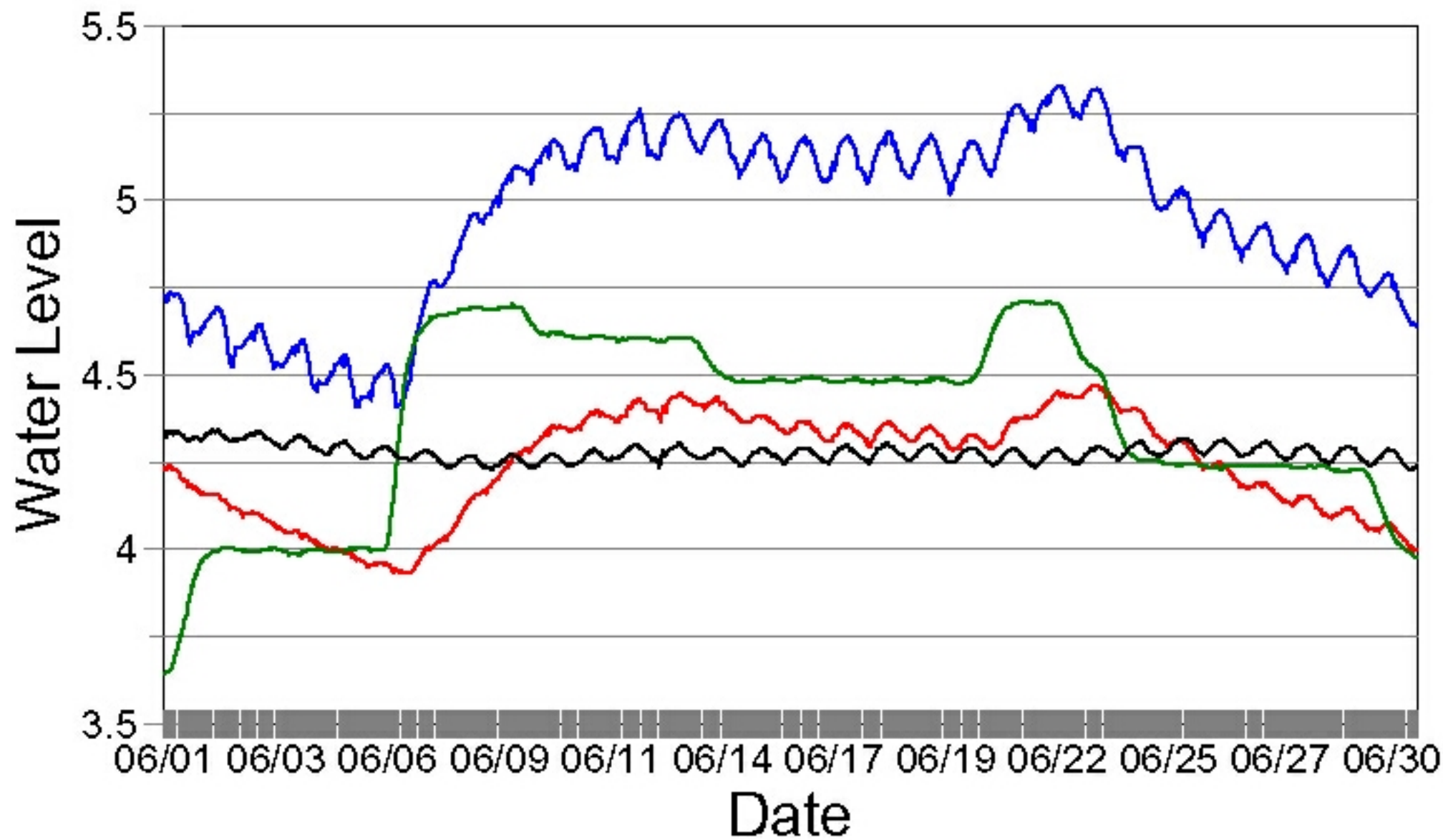
Well A2

Well A3

Well A4 (River)

Pecos River Well Data

June 2001 Site A



Well A1

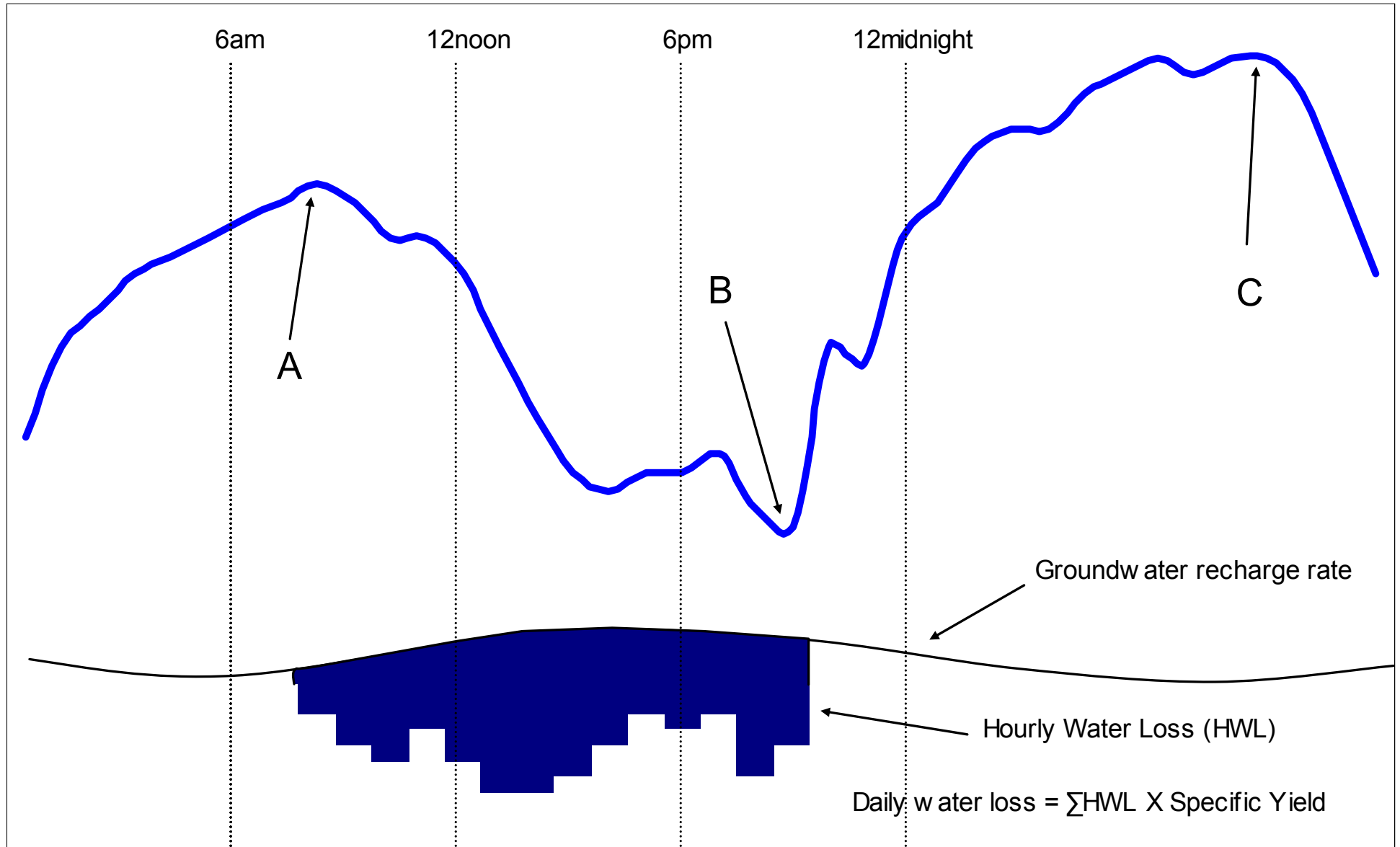
Well A2

Well A3

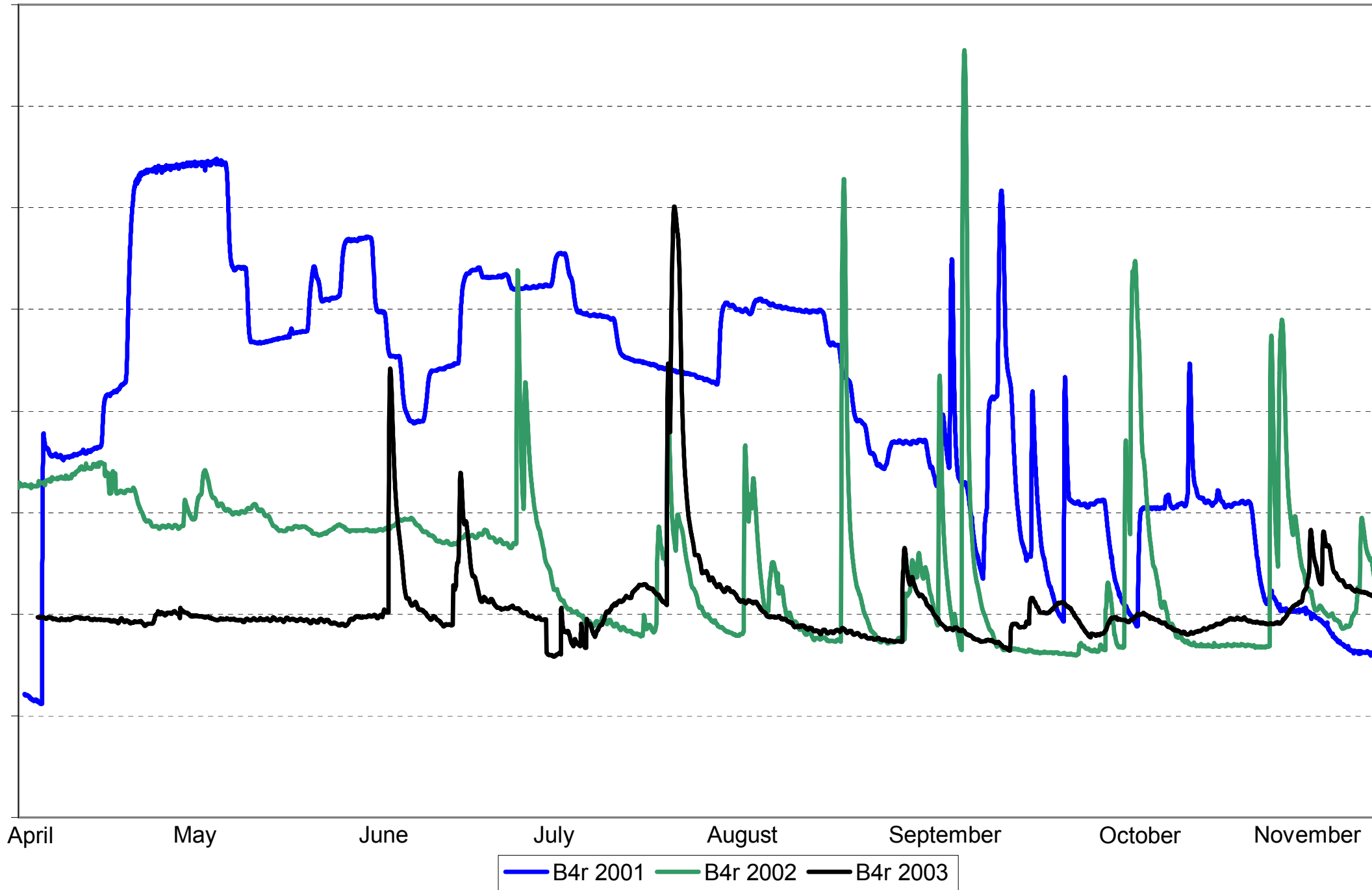
Well A4 (River)

Well A5

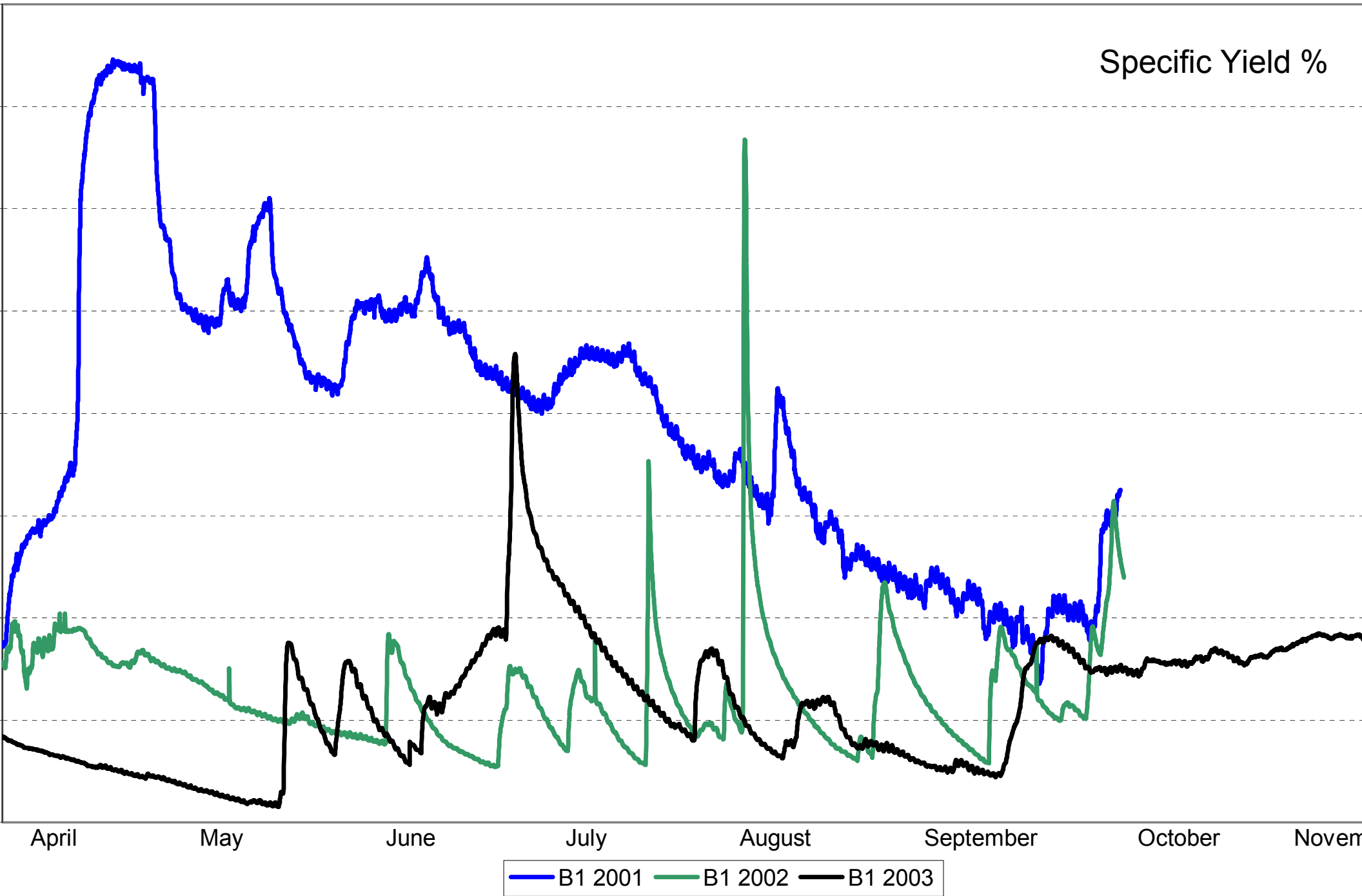
Calculation of Water Loss From Saltcedar Site With Shallow Groundwater Monitoring Wells



Pecos River Level Site B 2001-2003

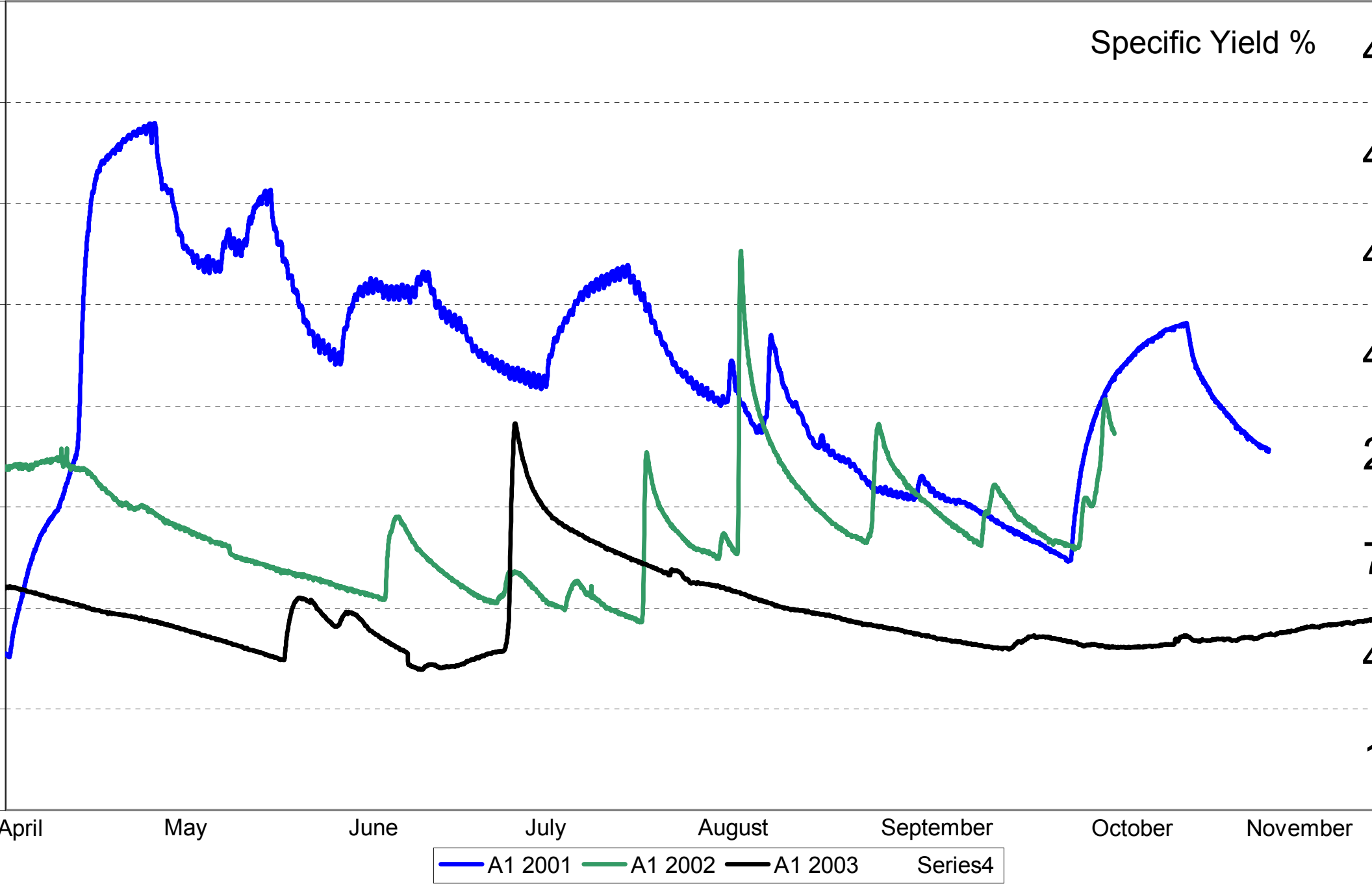


Well B1 2001-2003



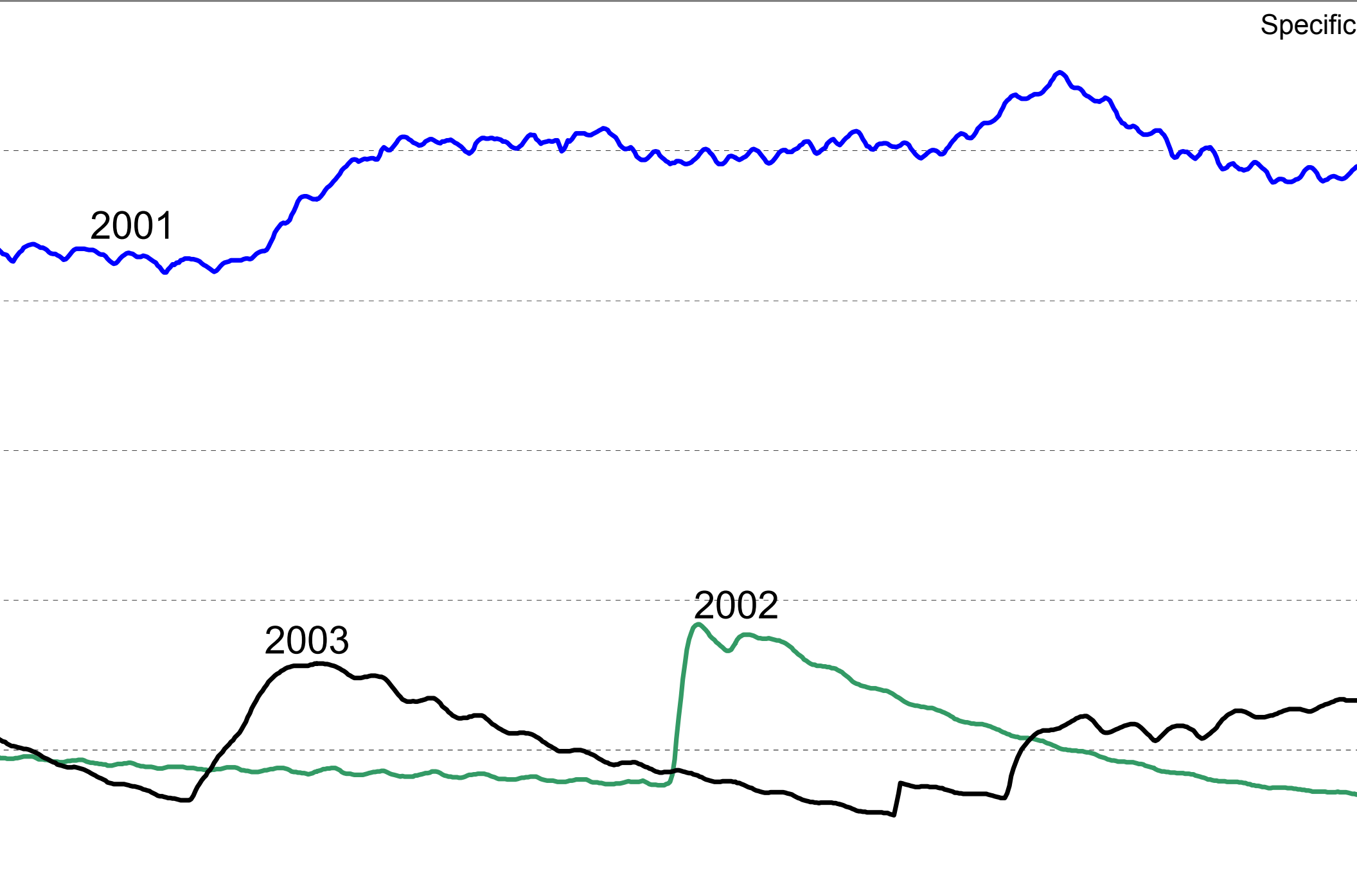
Well A1 2001-2003

Specific Yield %



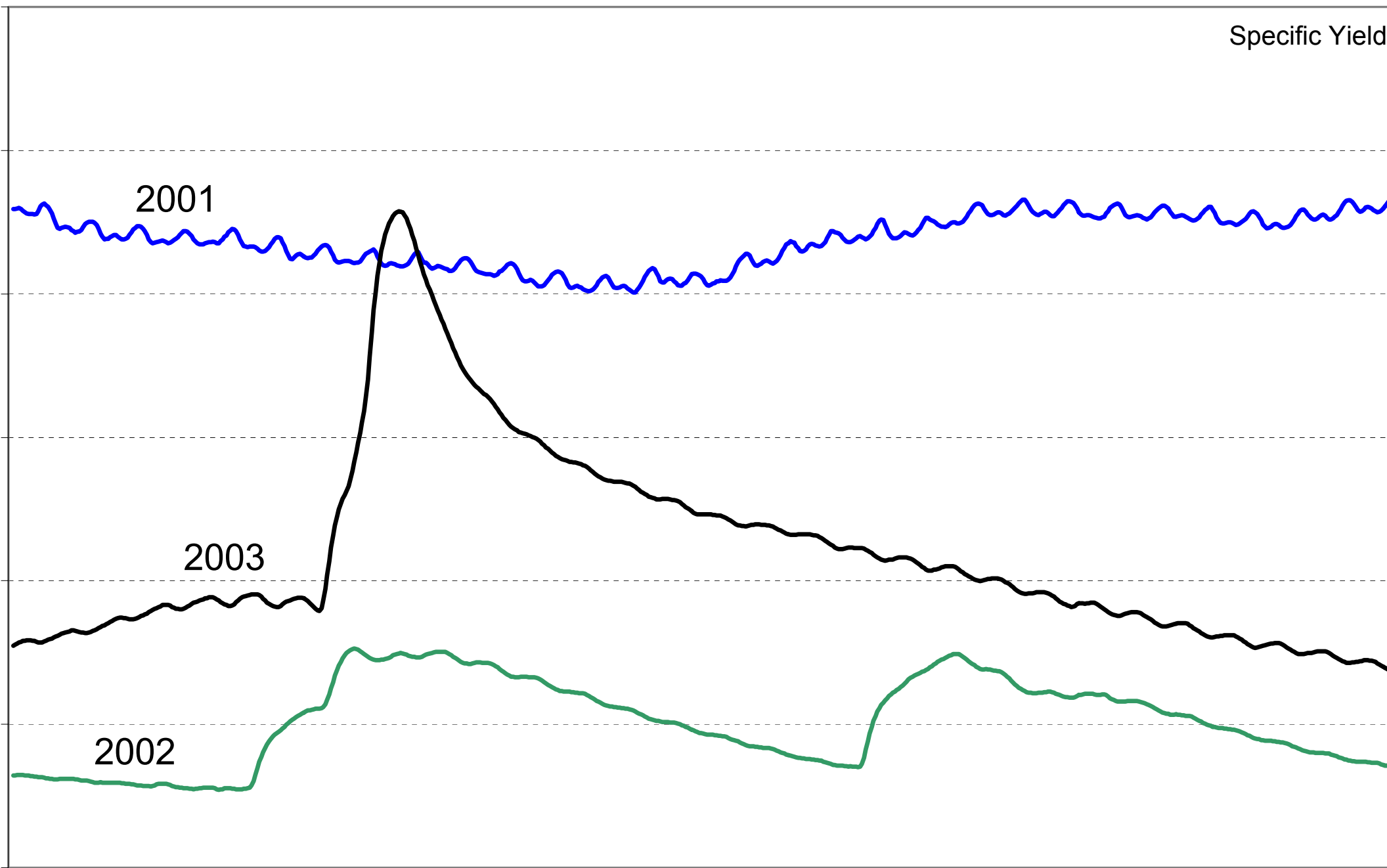
— A1 2001 — A1 2002 — A1 2003 Series4

Untreated Site, June 2001-2003

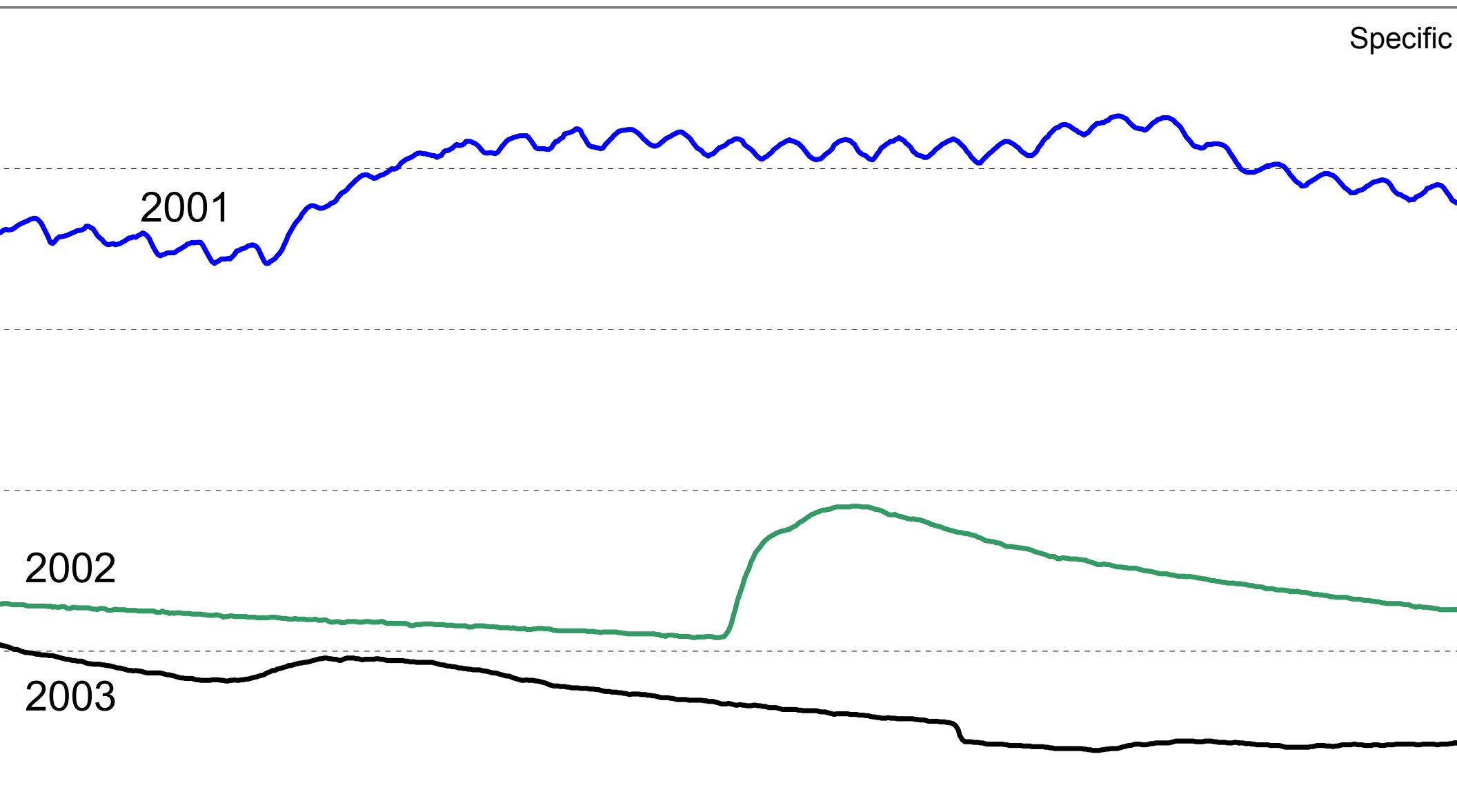


Untreated Site, July 2001-2003

Specific Yield



Treated Site, June 2001-2003



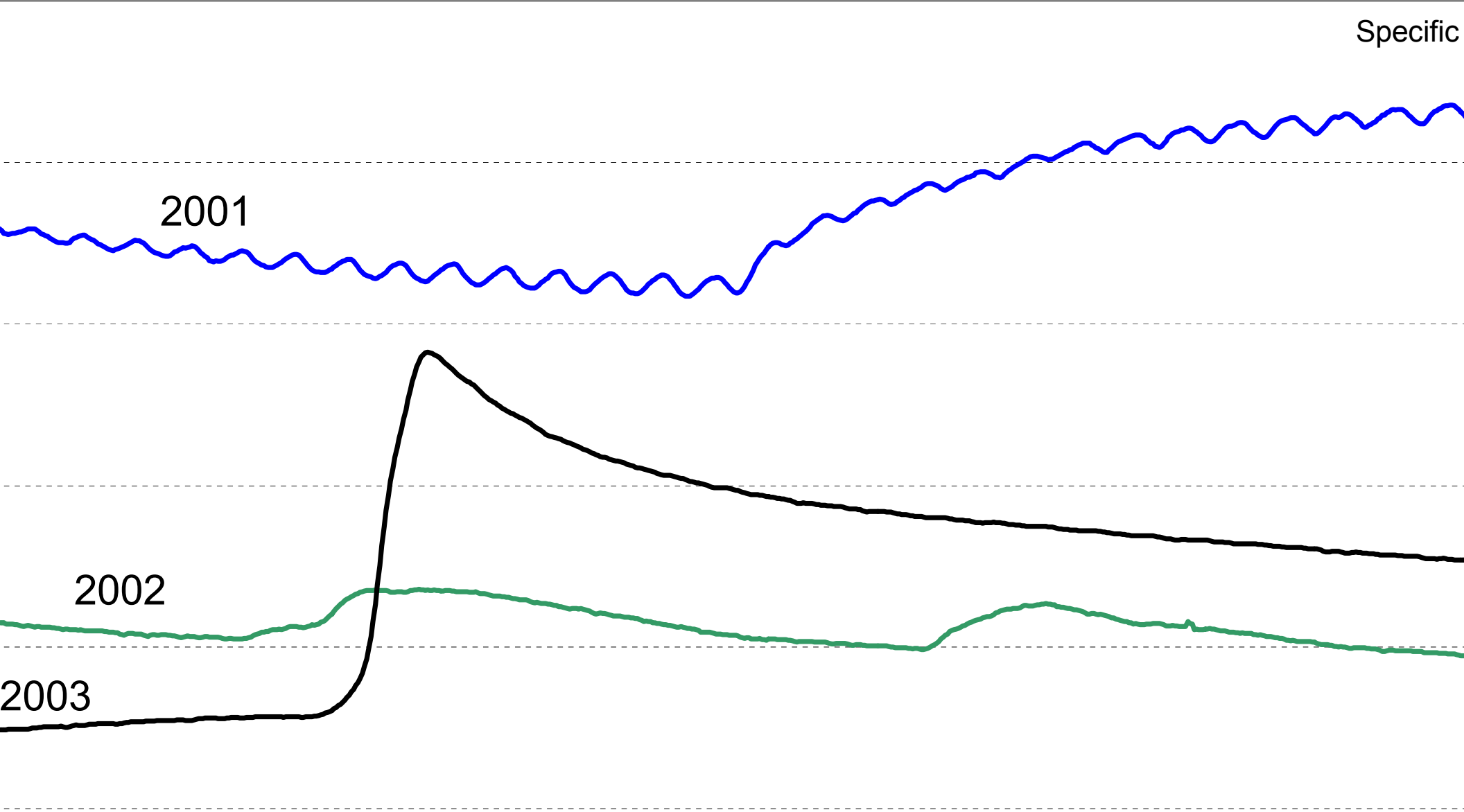
Specific

2001

2002

2003

Treated Site, July 2001-2003



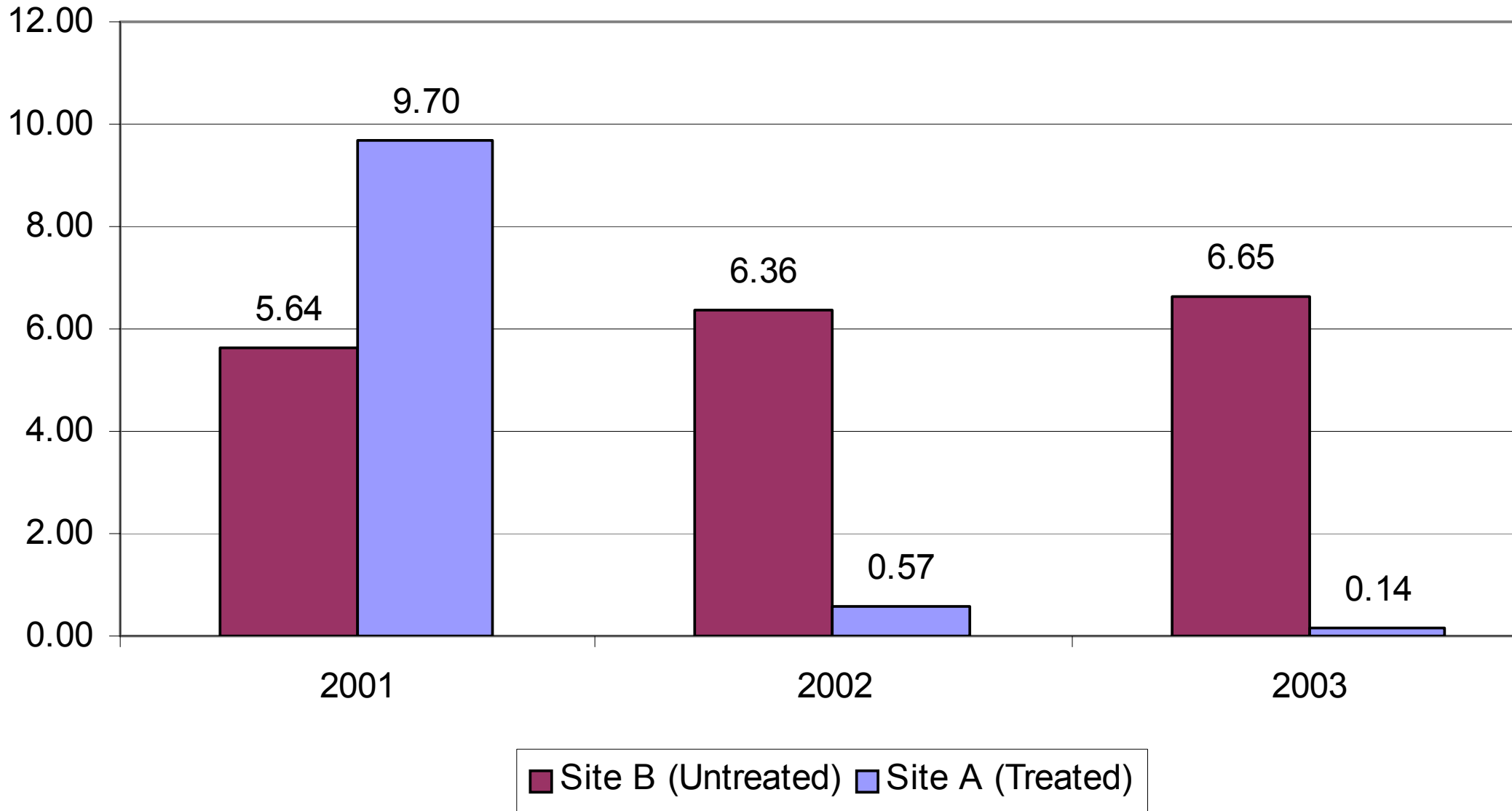
Pecos River Site B (Untreated), Well B1

Month	Total Water Loss (ft.)		
	2001	2002	2003
April	0.17	1.21	0.18
May	0.21	0.81	0.71
June	0.10	0.78	1.07
July	0.09	1.10	1.42
August	0.73	0.93	1.20
September	1.87	0.46	0.99
October	2.47	1.07	1.08
Annual	5.64	6.36	6.65

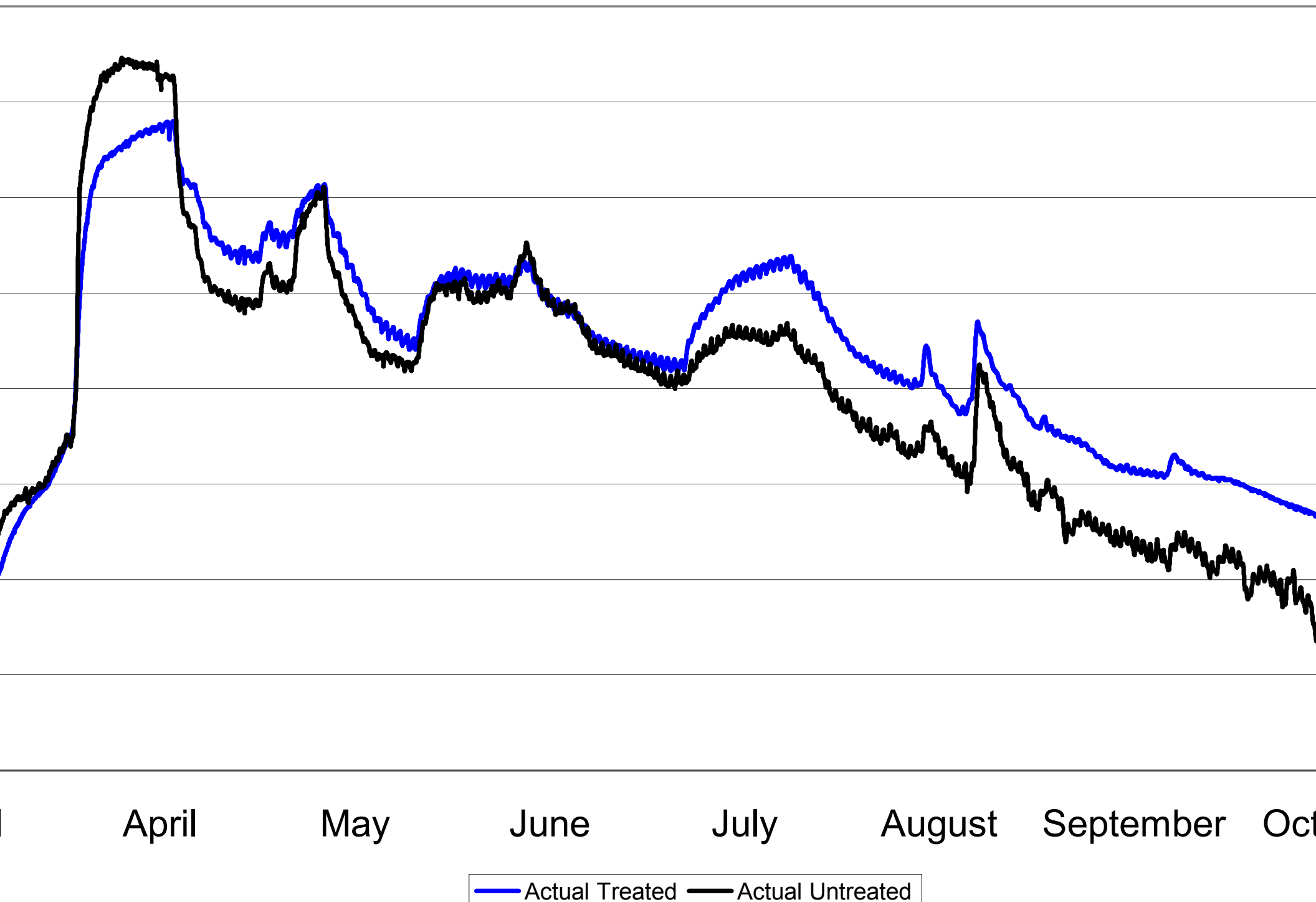
Pecos River Site A (Treated), Well A1

Month	Total Water Loss (ft.)		
	2001	2002	2003
April	0.29	0.16	0.01
May	2.21	0.05	0.01
June	2.43	0.05	0.03
July	2.22	0.06	0.02
August	1.72	0.03	0.04
September	0.69	0.16	0.01
October	0.14	0.06	0.02
Annual	9.70	0.57	0.14

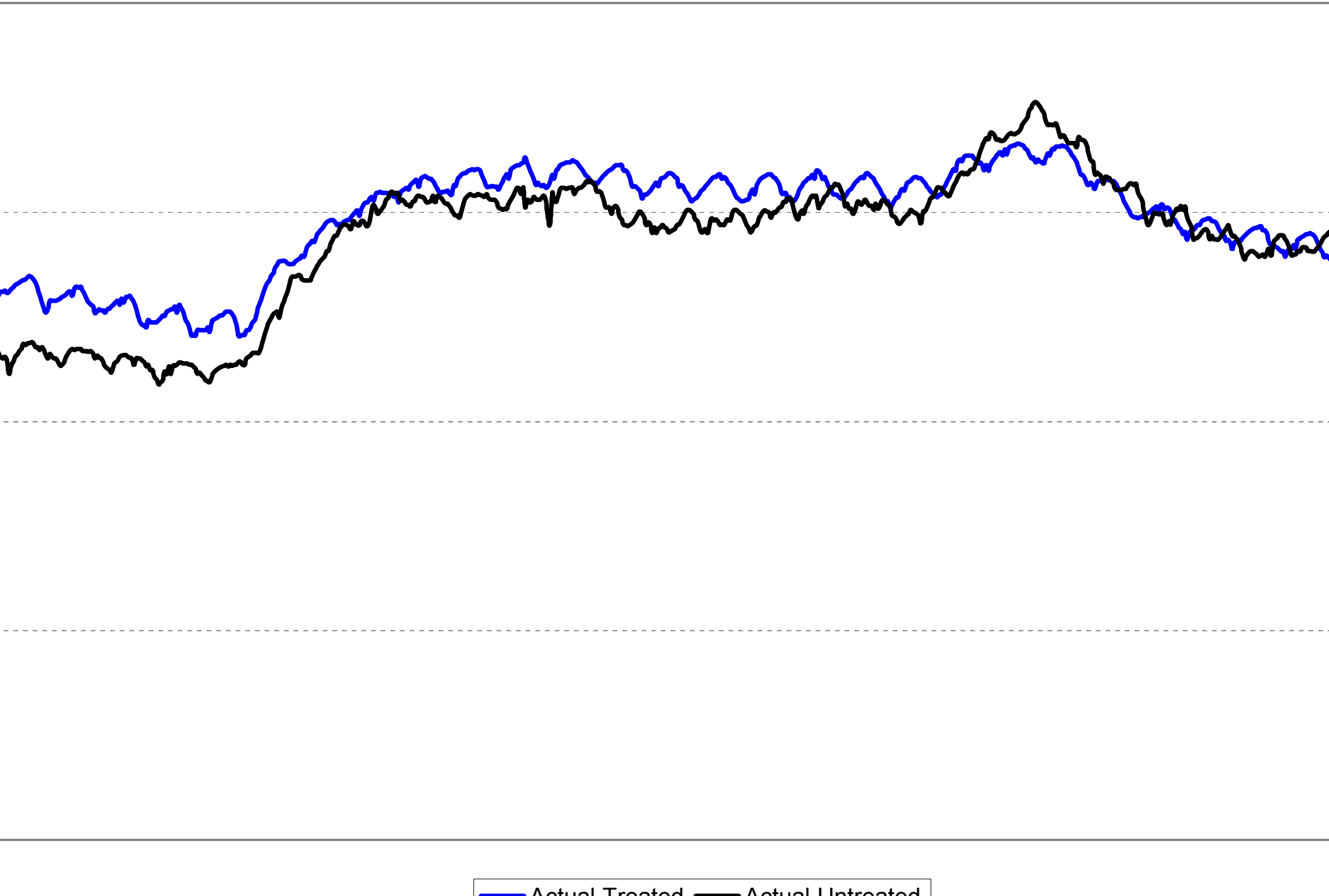
Total Water Loss on Sites A&B from Well 1



2001 Pre-Treatment Comparison



June 2001 Pre-Treatment Comparison



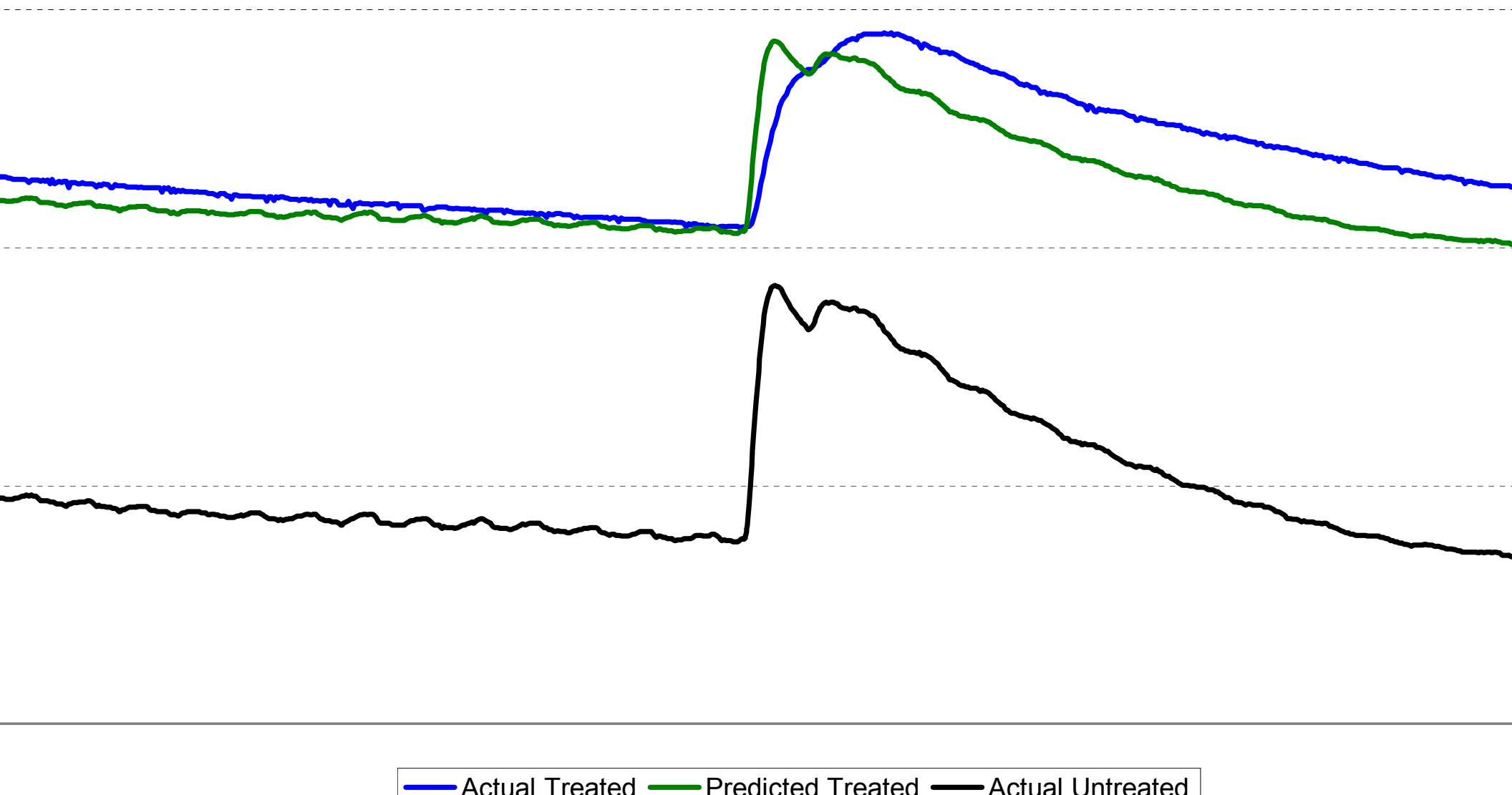
June 2002 Actual vs. Predicted

Total Draw down

Actual Treated = 0.099 ft.

Predicted Treated = 1.863 ft.

Actual Untreated = 2.493 ft.



cos 2002

al Drawdown by month

	Actual Treated	Predicted Treated	Actual Untreated	% Reduction in Drawdown	n
ril	0.683	2.261	3.023	69.8%	16
y	0.773	1.513	2.023	48.9%	27
ne	0.691	1.461	1.953	52.7%	15
y	0.908	2.175	2.745	58.3%	8
gust	0.423	1.736	2.318	75.6%	3
otember	2.275	1.321	1.153	100.0%	2
tober	0.857	1.946	2.601	56.0%	3
tal	6.609	12.414	15.816	46.8%	
r-Jul	3.055	7.411	9.743	58.8%	

ecos River Site A (Treated), Well A1 2002

Month	Total Water Loss (ft.)			% Salvage
	Actual	Predicted	Salvage	
April	0.16	0.15	-0.01	-6.7%
May	0.05	0.11	0.06	54.5%
June	0.05	0.10	0.05	50.0%
July	0.06	0.14	0.08	57.1%
August	0.03	0.12	0.09	75.0%
September	0.16	0.09	-0.07	-77.8%
October	0.06	0.13	0.07	53.8%
Annual	0.57	0.84	0.27	32.1%

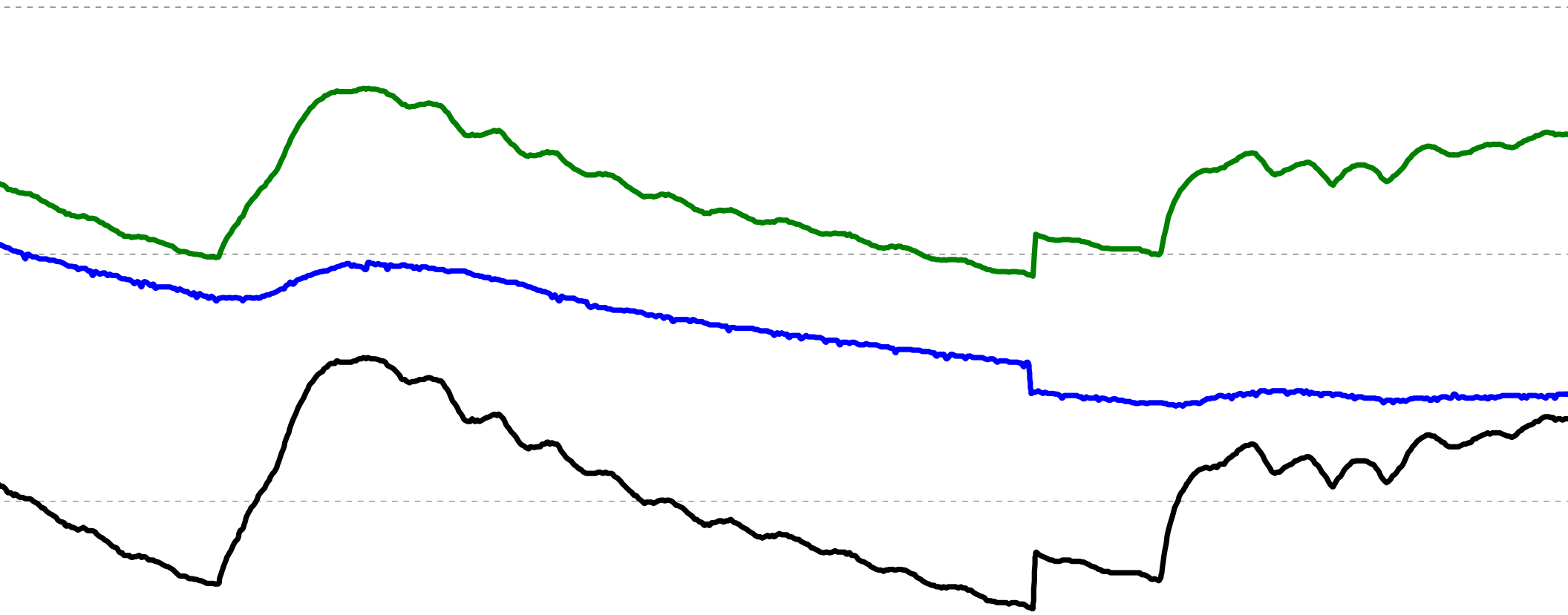
June 2003 Actual vs. Predicted

Total Draw down

Actual Treated = -0.125 ft.

Predicted Treated = 2.281 ft.

Actual Untreated = 3.049



cos 2003

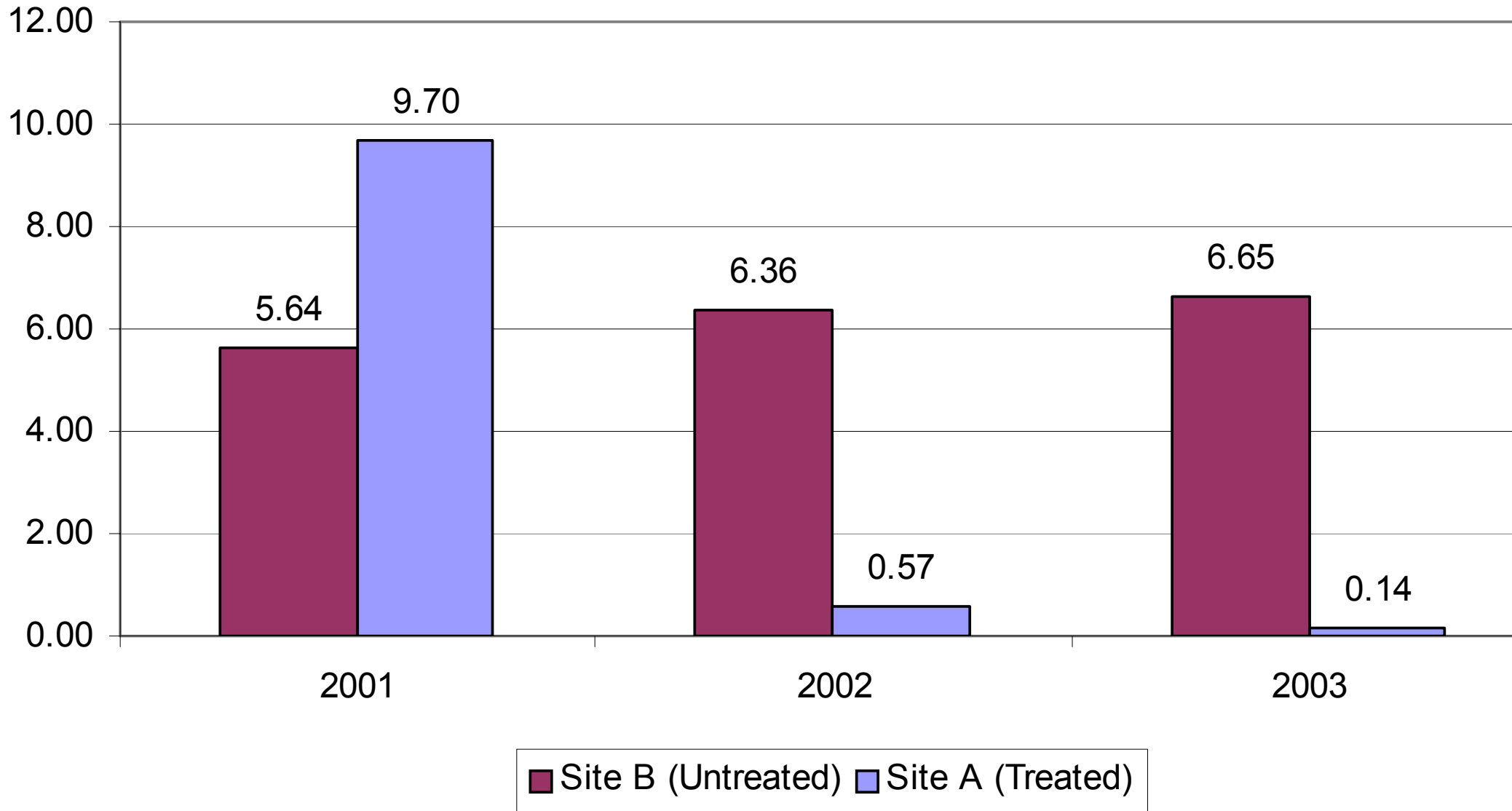
al Drawdown by month

	Actual Treated	Predicted Treated	Actual Untreated	% Reduction in Drawdown	n
il	0.549	0.851	1.524	35.5%	9
/	0.362	1.413	1.782	74.4%	24
e	0.676	2.397	2.682	71.8%	13
y	0.328	2.759	3.718	88.1%	22
just	0.636	2.287	3.005	72.2%	22
ptember	0.358	1.848	2.471	80.6%	27
ober	0.506	1.904	2.546	73.4%	23
al	3.415	13.459	17.727	74.6%	

ecos River Site A (Treated), Well A1 2003

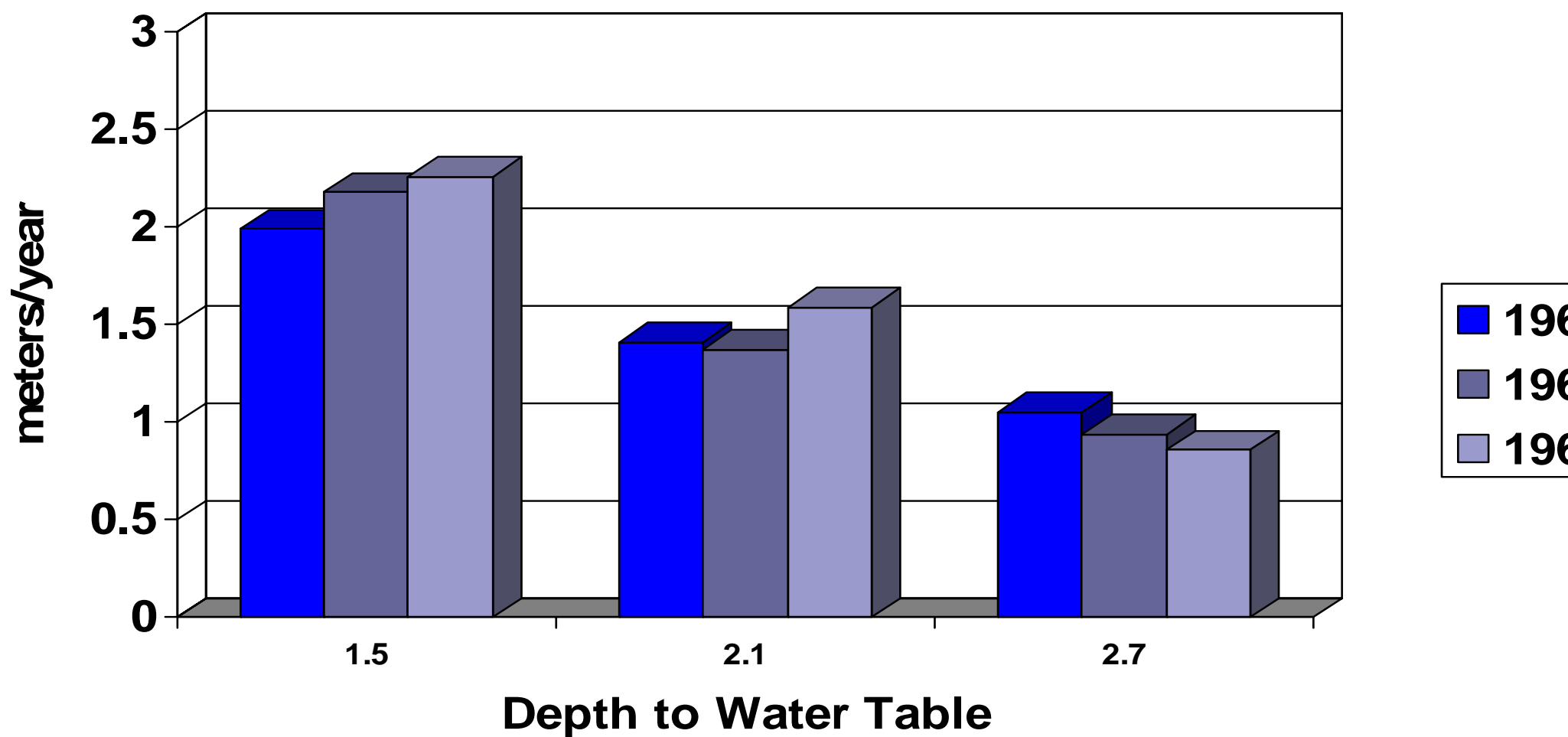
Month	Total Water Loss (ft.)			% Salvaged
	Actual	Predicted	Salvage	
April	0.01	0.01	0.00	0.0%
May	0.01	0.06	0.05	83.3%
June	0.03	0.17	0.14	82.4%
July	0.02	0.36	0.34	94.4%
August	0.04	0.16	0.12	75.0%
September	0.01	0.11	0.10	90.9%
October	0.02	0.12	0.10	83.3%
Annual	0.14	0.99	0.85	85.9%

Total Water Loss on Sites A&B from Well 1

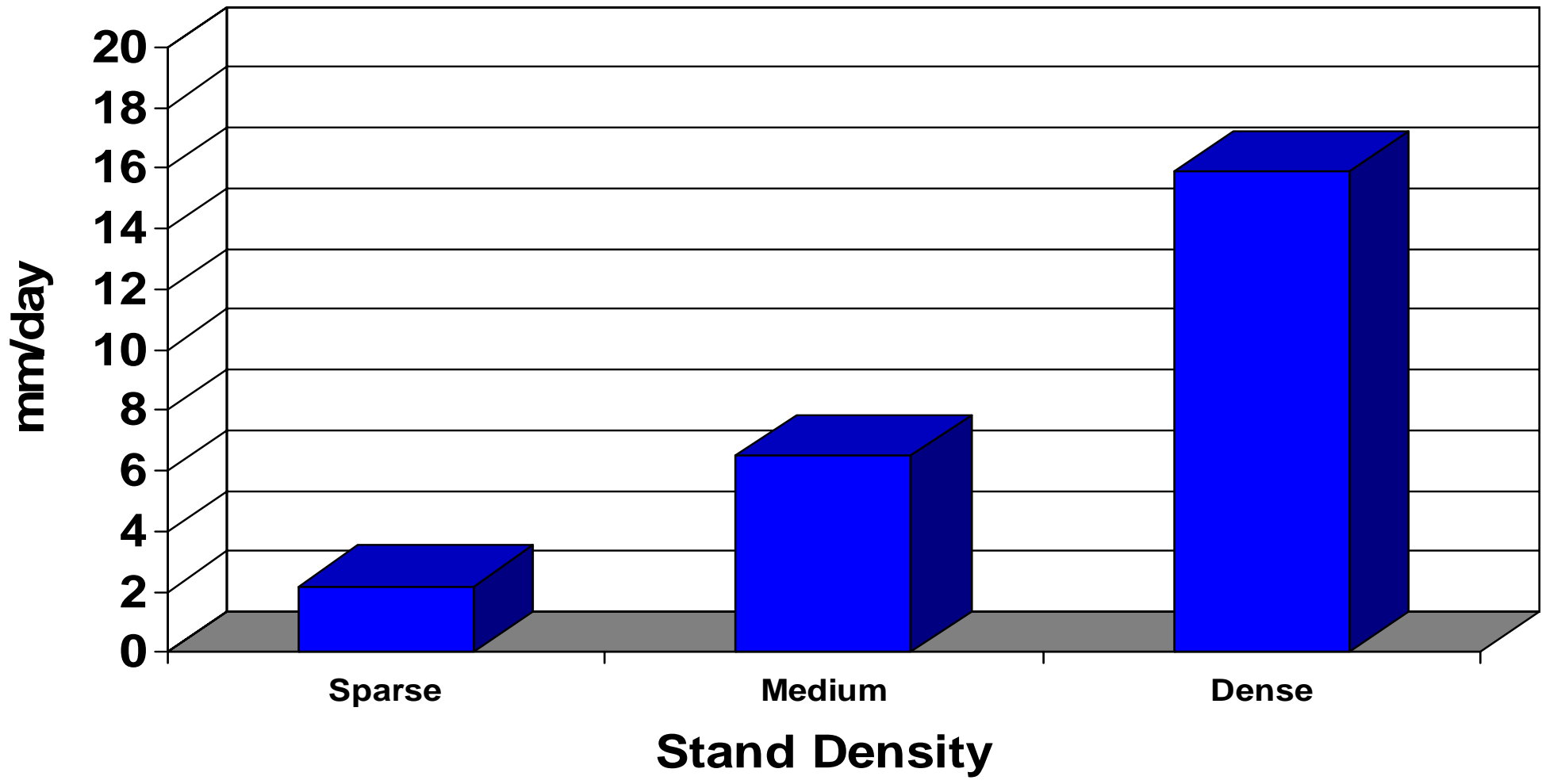




Effects of Depth to Water Table on Saltcedar Water Use



Stand Density Effects on Saltcedar Water Use



Location of Studies



Canadian River

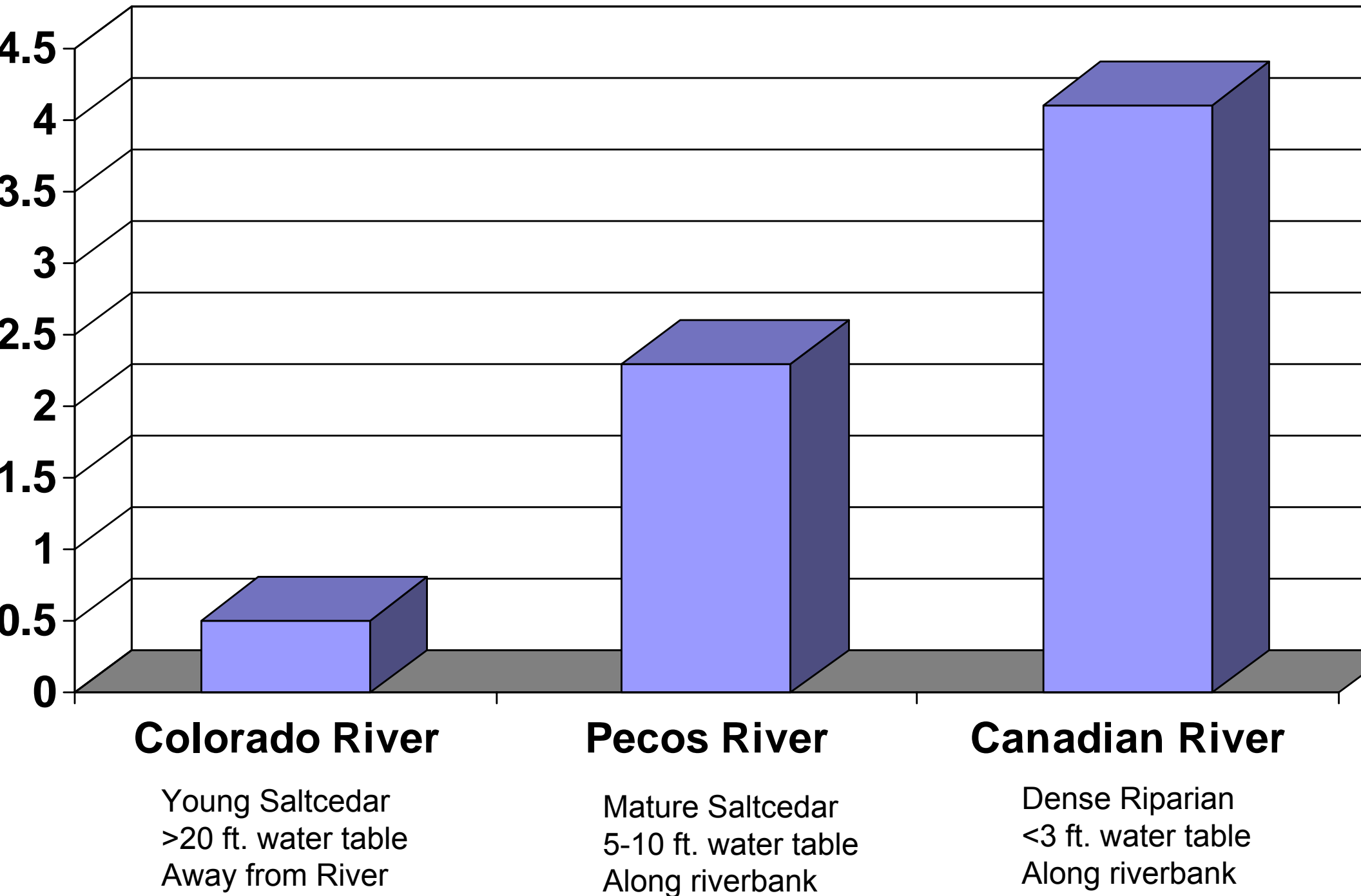
Colorado River

Pecos River

Grande River



Water Loss from 2001



Rio Grande Site D Wells - June 20 to September 19, 2002

