Native Fish of the Lower Dolores River

Status, Trends, and Recommendations

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Native Fish of the Dolores River

- Native Fish Species
- Current Status and Trends
- Comparisons to Other Rivers
- Native Fish Habitat-Flow Relationship
- Conclusions and Recommendations
  - Ann Oliver's Questions
  - Non-Native Fish Control
  - Lower Dolores Working Group Wild and Scenic Alternatives
- Discussion

Native Fish Species of the Dolores River

- Colorado Pikeminnow — FE, ST
- Bluehead Sucker — SS
- Flannelmouth Sucker — SS
- Roundtail Chub — SSC, SS
- Speckled Dace
- Mottled Sculpin
- Colorado River Cutthroat Trout — SSC

- Not Confirmed
  - Razorback Sucker — FE
  - Humpback Chub — FE
  - Bonytail — FE

FE- Federally Endangered
ST- State Threatened
SSC- State Species of Special Concern
SS- BLM Sensitive Species

Native Species Accounts

- Colorado Pikeminnow
  - Large predatory fish (70+ inches and 80 lbs)
  - Naturally lower density, move great distances
  - Habitat generalist but dependent on natural peak flows for habitat and spawning cues
  - Population declines associated with reduced peak flows in Colorado and Gunnison rivers
- Bluehead Sucker
  - Facultative herbivore, forages in riffles for algae, detritus, occasional invertebrates
  - Strongly associated with medi-riffle habitat, dependant on adequate base flows and quality of riffle habitat
  - Currently occupy about 50% of historic habitat

Native Species Accounts

- Flannelmouth Sucker
  - Omnivore consumes algae, detritus, invertebrates
  - Associated with deep semi-swift run habitat, can withstand reduced peak flows but limited by base flows and quality riffle-run habitat
  - Currently occupy about 45% of historic habitat
- Roundtail Chub
  - Opportunistic predator, aquatic insects major prey
  - Habitat generalist more associated with pool habitat, prefer murky water
  - More likely to be limited by food resources than habitat
  - Currently occupy about 45% of historic habitat

Flannelmouth Sucker

Colorado Pikeminnow

Roundtail Chub

Bluehead Sucker

Colorado Pikeminnow in the Dolores River

- Pikeminnow documented in the Dolores from 1950's to 1970's as far up river as Paradox Valley and into the lower end of the San Miguel
- Last sampled in the Dolores in 1992 in Utah and 1973 in CO
- Dolores confluence with the Colorado is an area with documented aggregations of pre-spawn pikeminnow
- 1992 pikeminnow habitat evaluation concluded the Dolores potentially contained habitat to support all life stages of CPM but habitat was severely impacted by low base flows
  - Concluded that base flows of 20 to 40 cfs reduced native fish habitat in the lower 170 miles of the Dolores River through decreased fish holding areas, dewatered nursery backwaters, impeded movement, and enhanced sedimentation

Historic Fish Population Sampling

- 1975 Holden and Stalnacker
  - 11 species, 4 natives: flannelmouth, bluehead, roundtail, speckled dace
- USFWS 1982
  - 16 species, 4 natives: flannelmouth, bluehead, roundtail, speckled dace
- Valdez 1992
  - 19 species, 6 natives: flannelmouth, bluehead, roundtail, speckled dace, mottled sculpin, Colorado pikeminnow
  - Concluded that native fish numbers and distribution were similar to 1982 study

Current Status of Fish Populations

Current Fish Populations

2007 Longitudinal Survey

Catch Per Unit Effort (CPUE) in Fish Per Mile

	Pyramid	Big Gypsum	Slickrock	Gateway
Flannelmouth	0.4	4.5	2.7	2.2
Bluehead	0.1	0.5	0.2	3.9
Roundtail	0.5	18.6	1.8	0.1
3 Native Spp.	1	23.6	4.7	6.2
Native Fish Composition	10%	94%	79%	51%

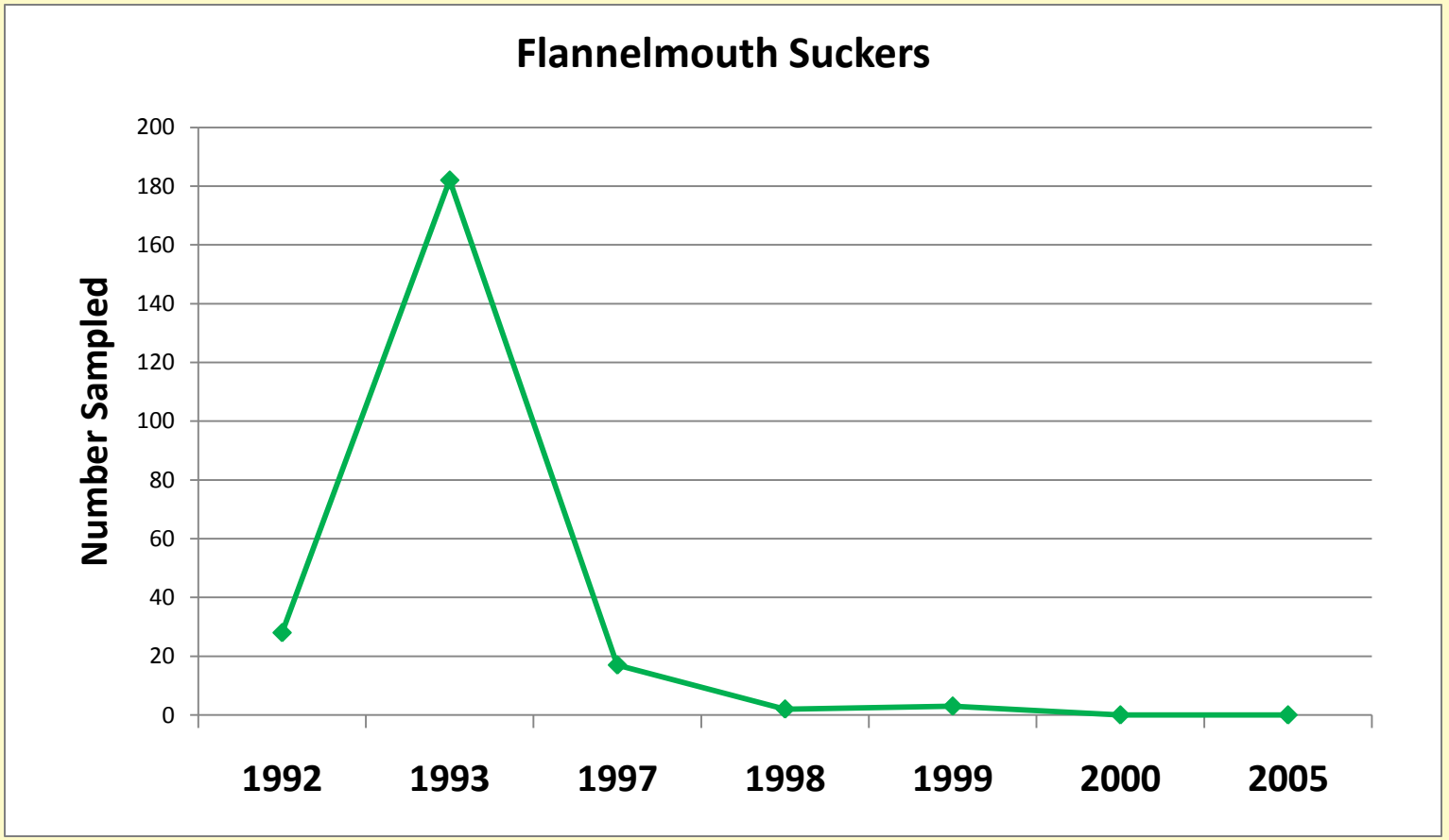
Current Fish Populations

2009 Sampling Below the San Miguel

Species	% Catch	Mean Length (in.)	Length Range (in.)	CPUE (fish/mile)
Bluehead Suckers	33	8.5	4.0-14.2	26.3
Flannelmouth Suckers	33	14.6	4.6-22.1	26.1
Roundtail Chubs	14	7.1	2.7-14.4	11.4
Speckled Dace	9	3.4	2.7-4.4	7.6
Channel Catfish	8	11.1	7.2-21.8	6.3
Common Carp	2	21.3	19.9-22.0	1.6
Red Shiner	1	3.0	2.9-3.1	0.4
Sand Shiner	0	2.8	2.8	0.2

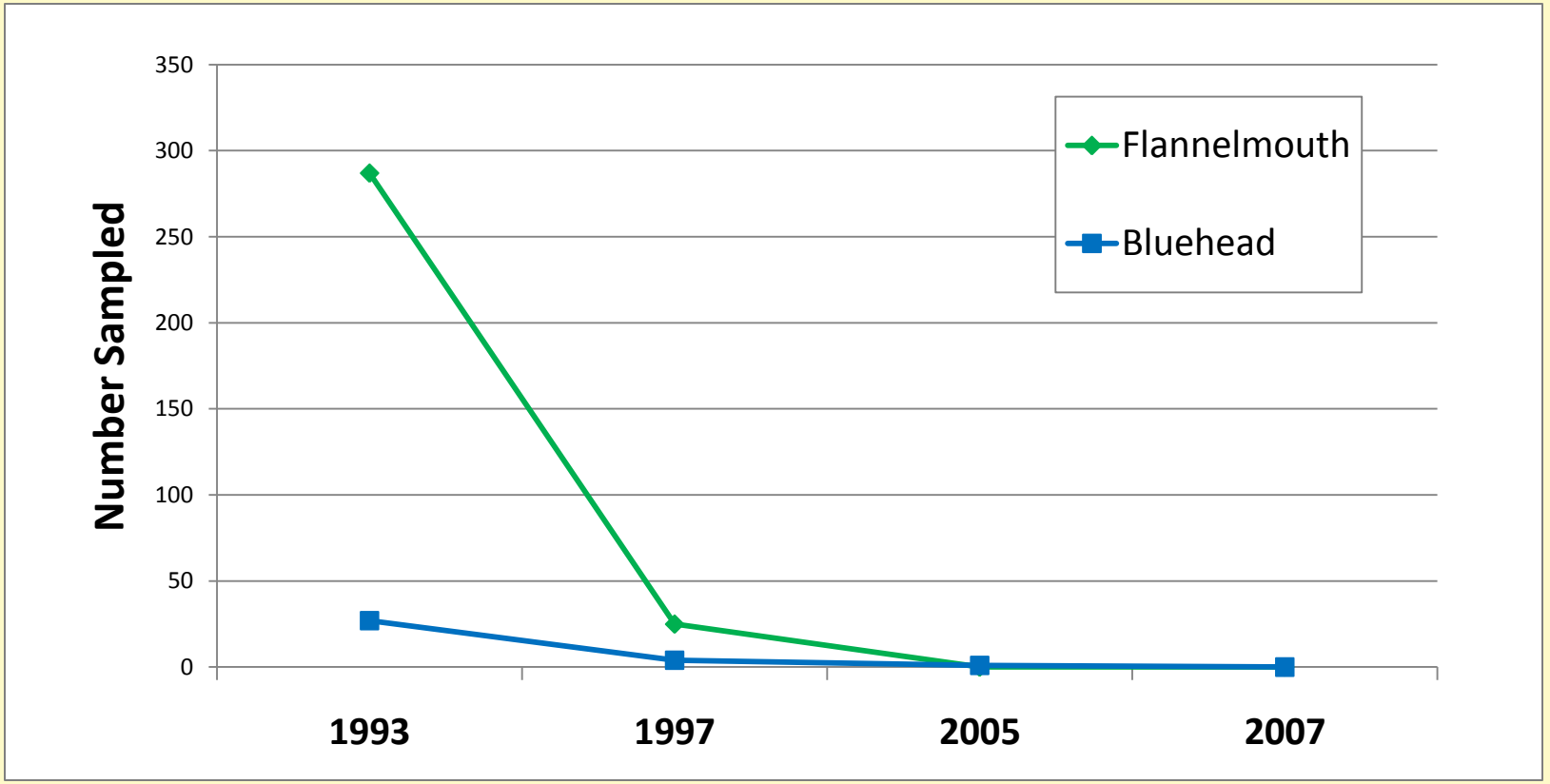
Native Fish Population Trends

Fish Population Trends
Metaska to Bradfield Bridge



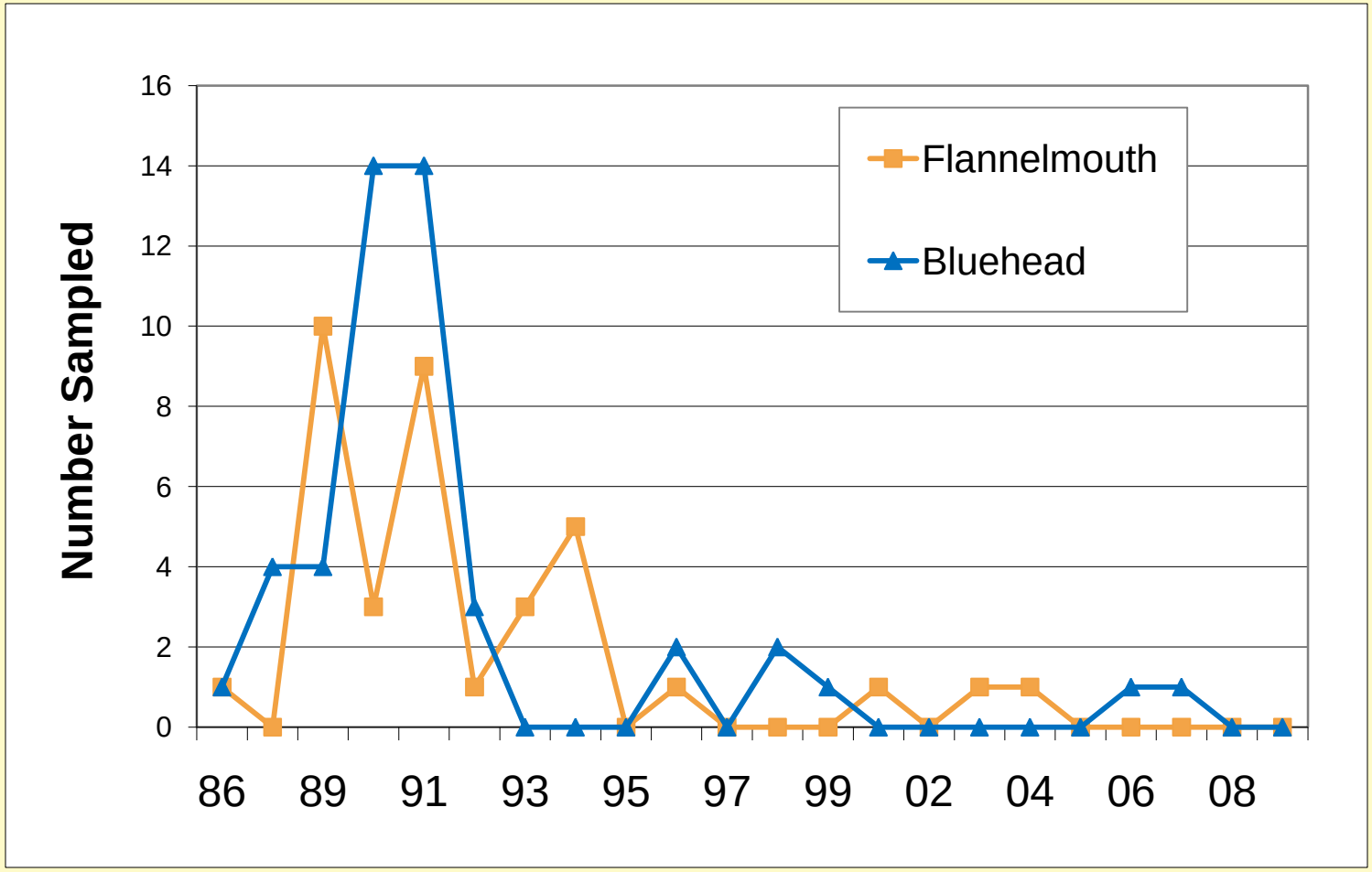
Bluehead suckers were also sampled in low numbers from1992-1997.
Biomass of flannelmouth suckers in 1993 was estimated at 23.1 kg/ha.
Average length of flannelmouths sampled 1992 to 1999 was 415 mm (16 in).

Fish Population Trends
Bradfield Bridge to Dove Creek



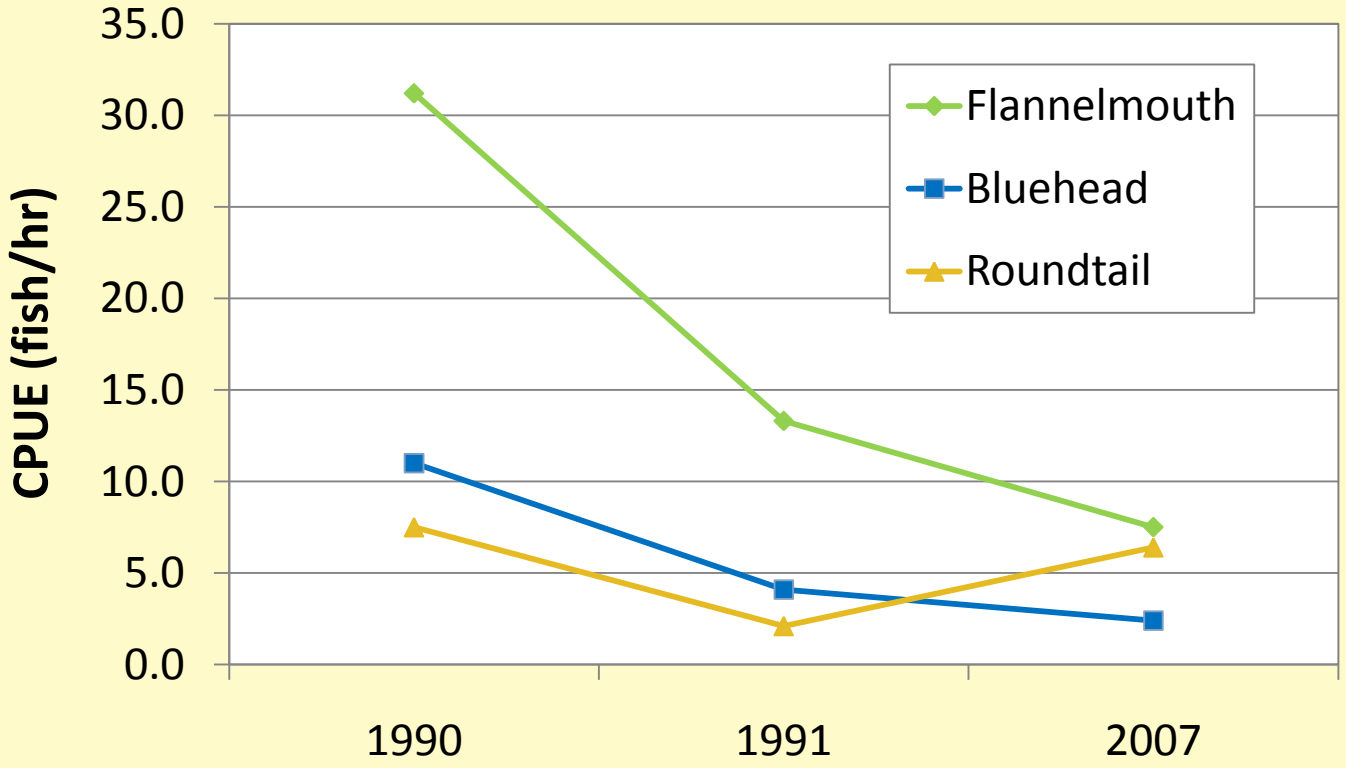
Biomass of flannelmouth suckers in 1993 was estimated at 57.9 kg/ha.
Average length of flannelmouths sampled 1993 to 1997 was 445 mm (17.5 in).

Fish Population Trends
Dove Creek Native Suckers



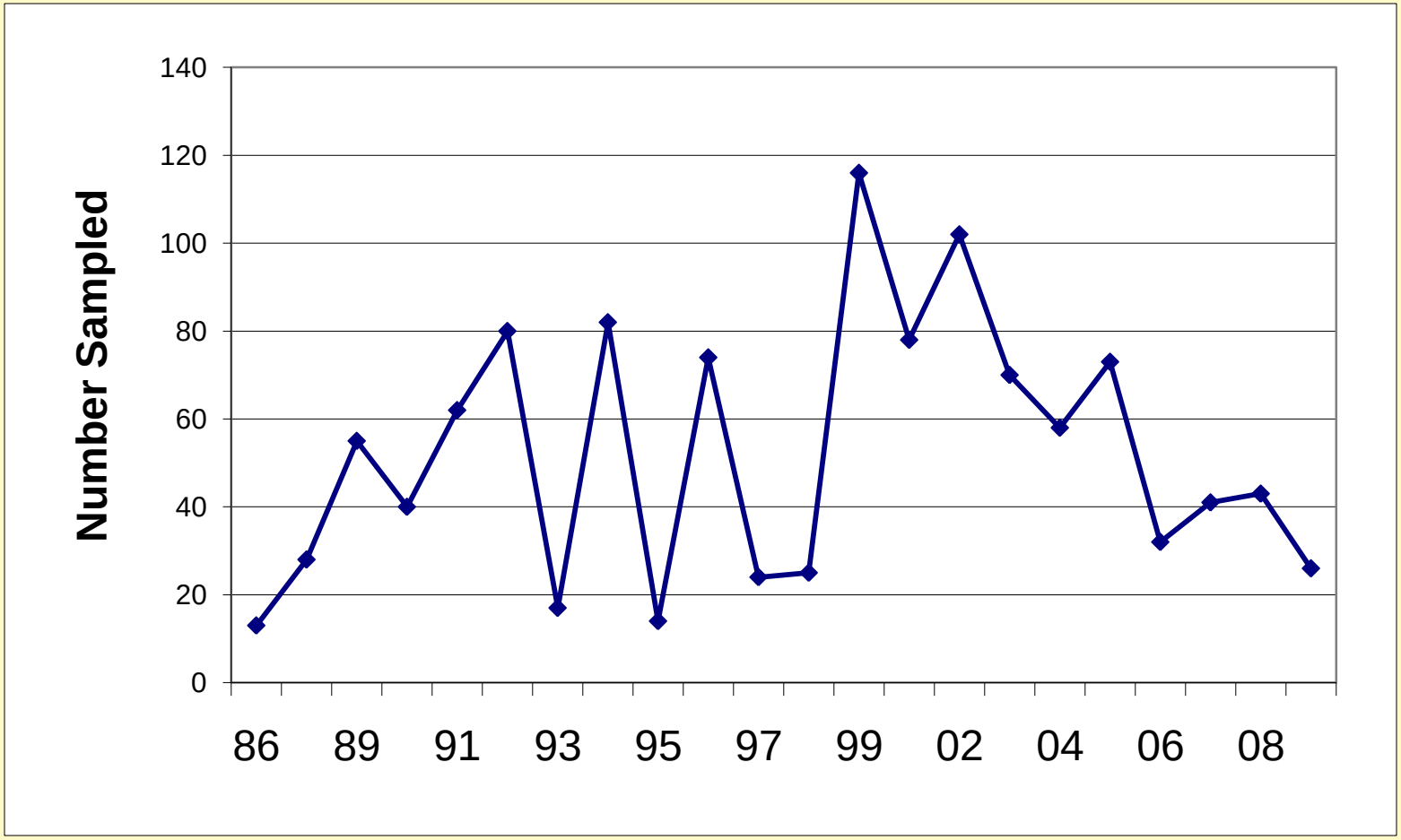
Fish Population Trends

Dove Creek to Gateway

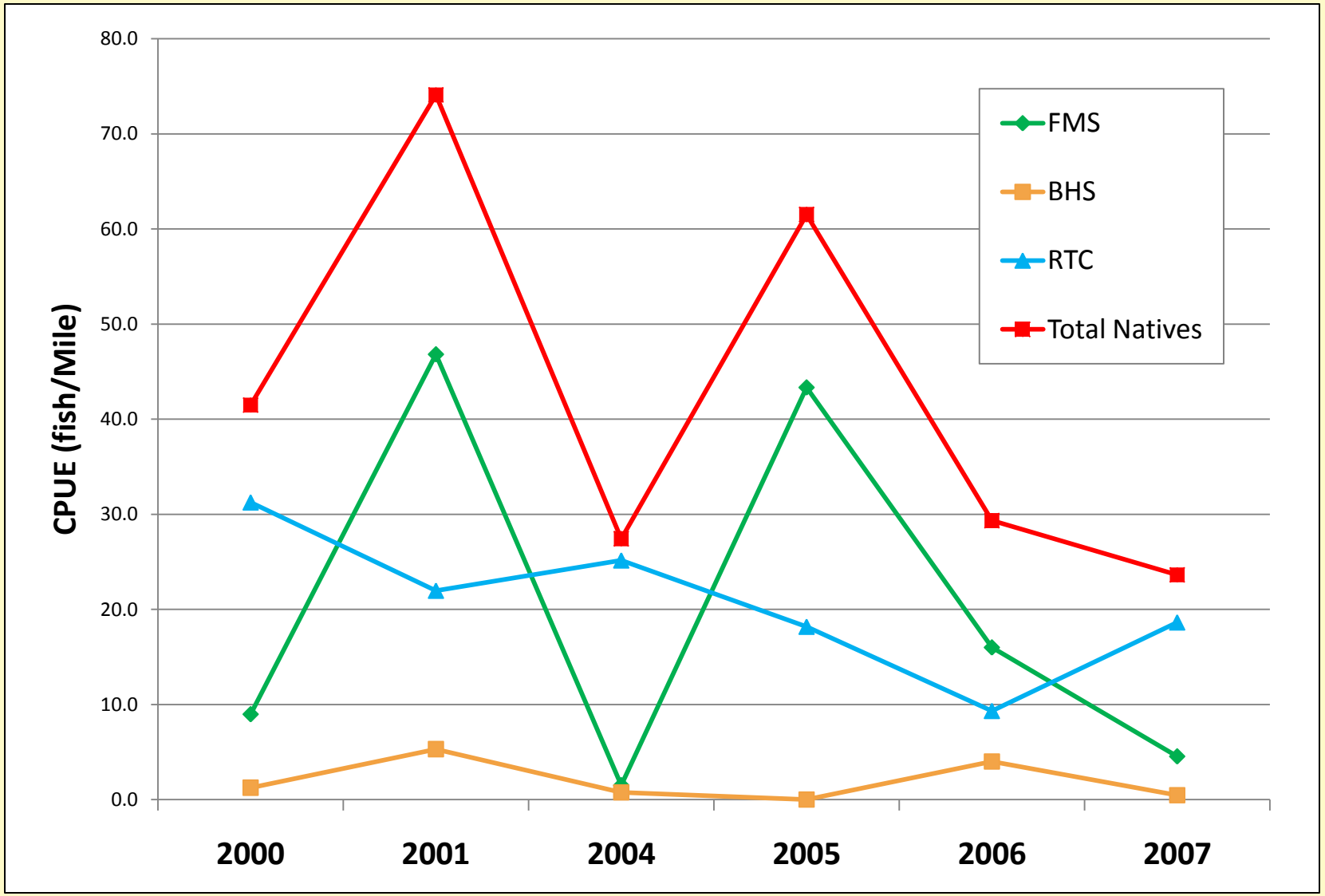


Surveys: 1990, 1991 Valdez, 2007 White and Kowalski

Fish Population Trends
Dove Creek Roundtail Chub



Fish Population Trends Big Gypsum



Native Fish Population Trends

- Native suckers increased in abundance from 1986 to early 1990's and then declined in numbers and range
  - Today native suckers are almost absent from 53 miles of previously occupied habitat above Disappointment Creek and their numbers have declined in the occupied range below
    - Large (>400 mm) adult flannelmouth suckers were common in the late 80's to early 90's up to Bradfield bridge and biomass was estimated between 20 and 60 kg/ha
  - Presently native fish appear no better or worse than pre-dam
  - Colorado pikeminnow has been extirpated from river post-dam
- Trout fishery below dam has followed similar trends

Comparisons to Other Rivers
(Anderson 2002-2006)

	Gunnison (Delta)	Colorado (Clifton)	Yampa (Lily Park)	Dolores (Big Gypsum)
Hydrograph Alterations	**Reduced Peak, Good Base Flows**	**Reduced Peak, Good Base Flows**	**Natural Peak, Reduced base Flows**	**Reduced Peak, Reduced Base Flows**
Mean Annual Flow (cfs)	2,564	2,817	1,546	284
Slope (%)	0.16	0.2	0.2	0.15
Typical Base Flow (cfs)	1000	1000	250	30
Mean Velocity (m/s)	0.69	0.44	0.51	0.28
Mean Width (m)	42	59	57	21
Width/Depth Ratio	52	77	94	46
3 Species Biomass (kg/ha)	422	232	138	0.6*
Native Species Composition	69%	64%	58%	42%

*Dolores River from dam to Dove Creek supported 20-60 kg/ha native suckers in the early 1990's

Dolores and San Miguel River Comparison

	Dolores @ Bedrock	**San Miguel @ Uravan**
Watershed Size (mi^2)	2,024	1,499
Average Annual Discharge (af)	227,186*	262,269
Average Annual Discharge (cfs)	284	347
Native Fish Per Mile	14.2**	45.6

*1985 to present. Pre-dam average annual discharge was 340,526 af

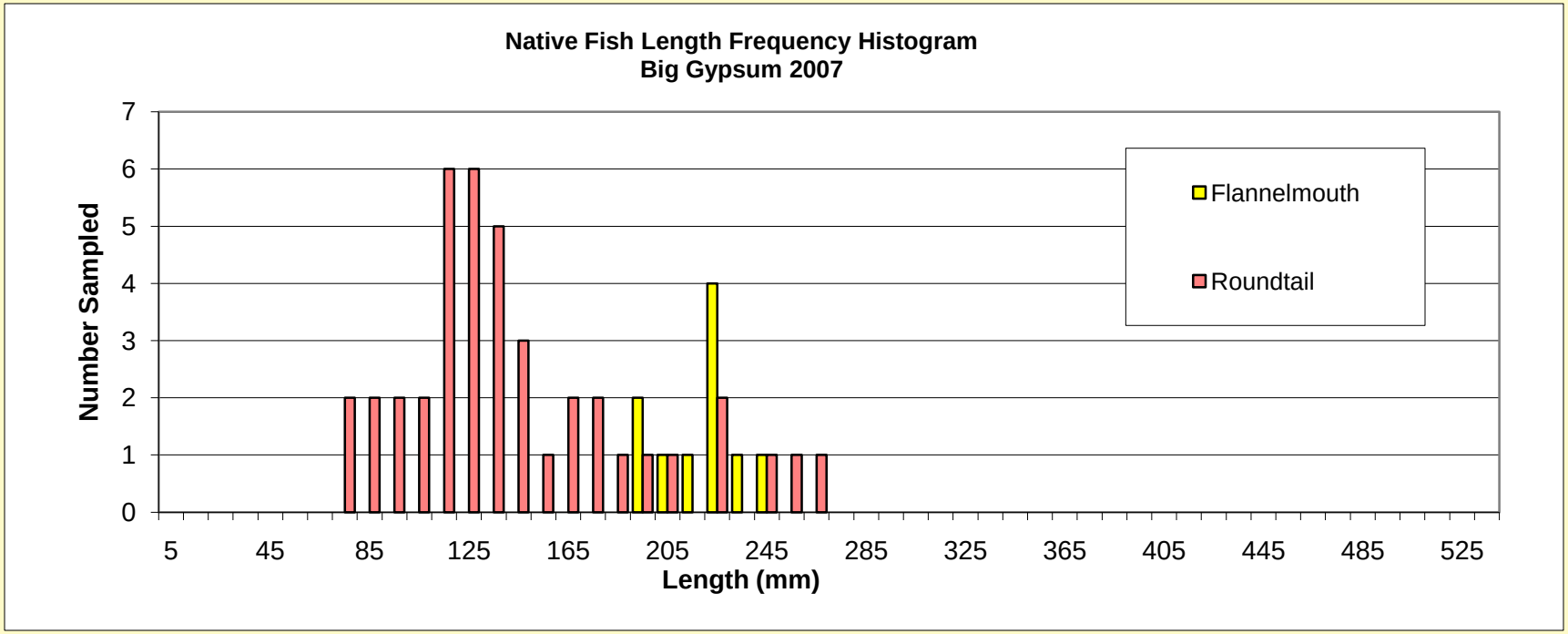
**Average from Big Gyp and Slickrock Canyon data 2007

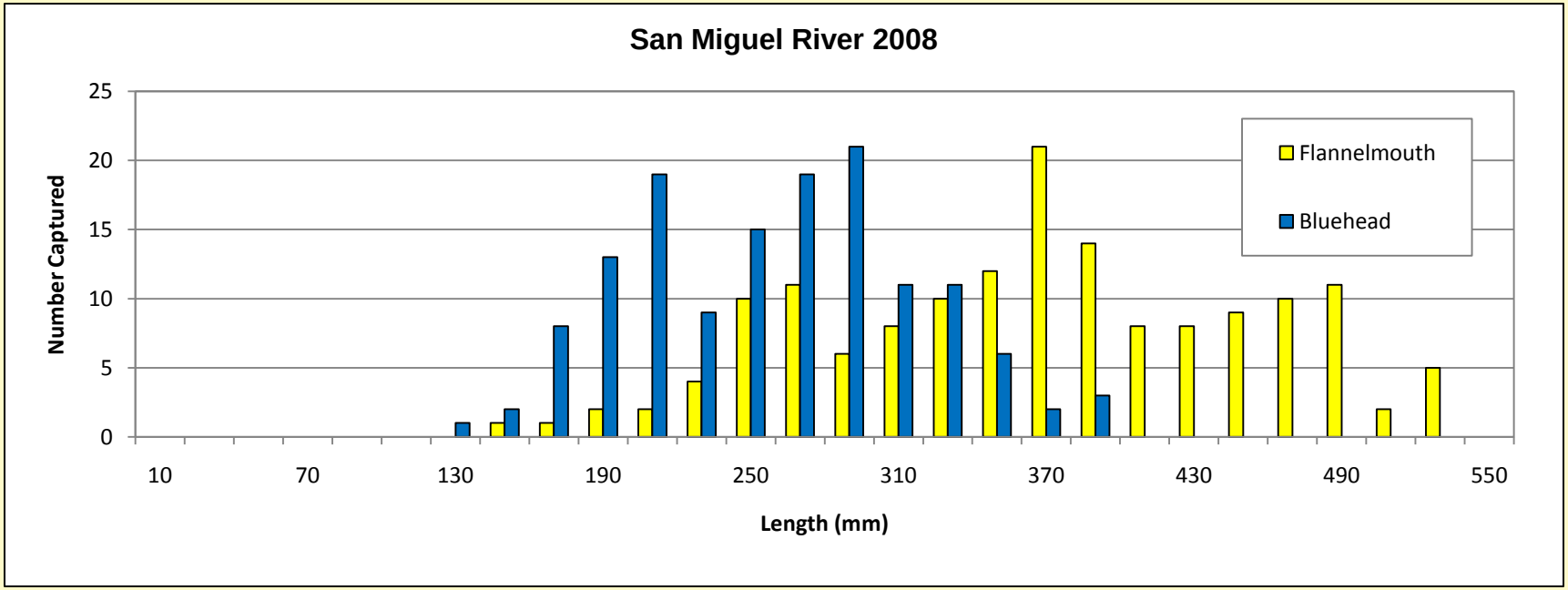
River Comparisons

Average Fish Length (in)

	Big Gyp 2007	San Miguel 2008	Gunnison 2008
FMS	8.6	14.5	13.6
BHS	7.2	10.2	10.7
RTC	5.7	8.2	9.2

- Native fish in the Dolores have a much smaller average size than other populations and sexually mature at smaller sizes
  - FMS usually mature at 4-6 years and 300-400 mm (12-16 in)
  - 2006 Sampling above Disappointment found 182 mm (7 in) FMS ripe with eggs
- Miniaturization could be an adaptation to habitat reductions


Native Fish Length Frequency Histogram
Big Gypsum 2007
Number Sampled
0
1
2
3
4
5
6
7
5
45
85
125
165
205
245
285
325
365
405
445
485
525
Length (mm)
Flannelmouth
Roundtail


San Miguel River 2008
Number Captured
0
5
10
15
20
25
10
70
130
190
250
310
370
430
490
550
Length (mm)
Flannelmouth
Bluehead

Current Native Fish Populations Conclusions

- Native fish have declined significantly in the Dolores in the last twenty years, one species of native fish is functionally extinct from the river
- Dolores River above the San Miguel has one of the poorest native fish population of any large western Colorado river
  - Supports less than 1 kg/ha of native fish compared to 100-400 kg/ha in other rivers and 20-60 kg/ha in Ponderosa Canyon in the late 1980's
  - Supports much smaller average sized fish, smaller size at maturity, and poor year class representation
- Dolores below the San Miguel confluence supports the best populations of native fish in the river

Native Fish Habitat Investigations

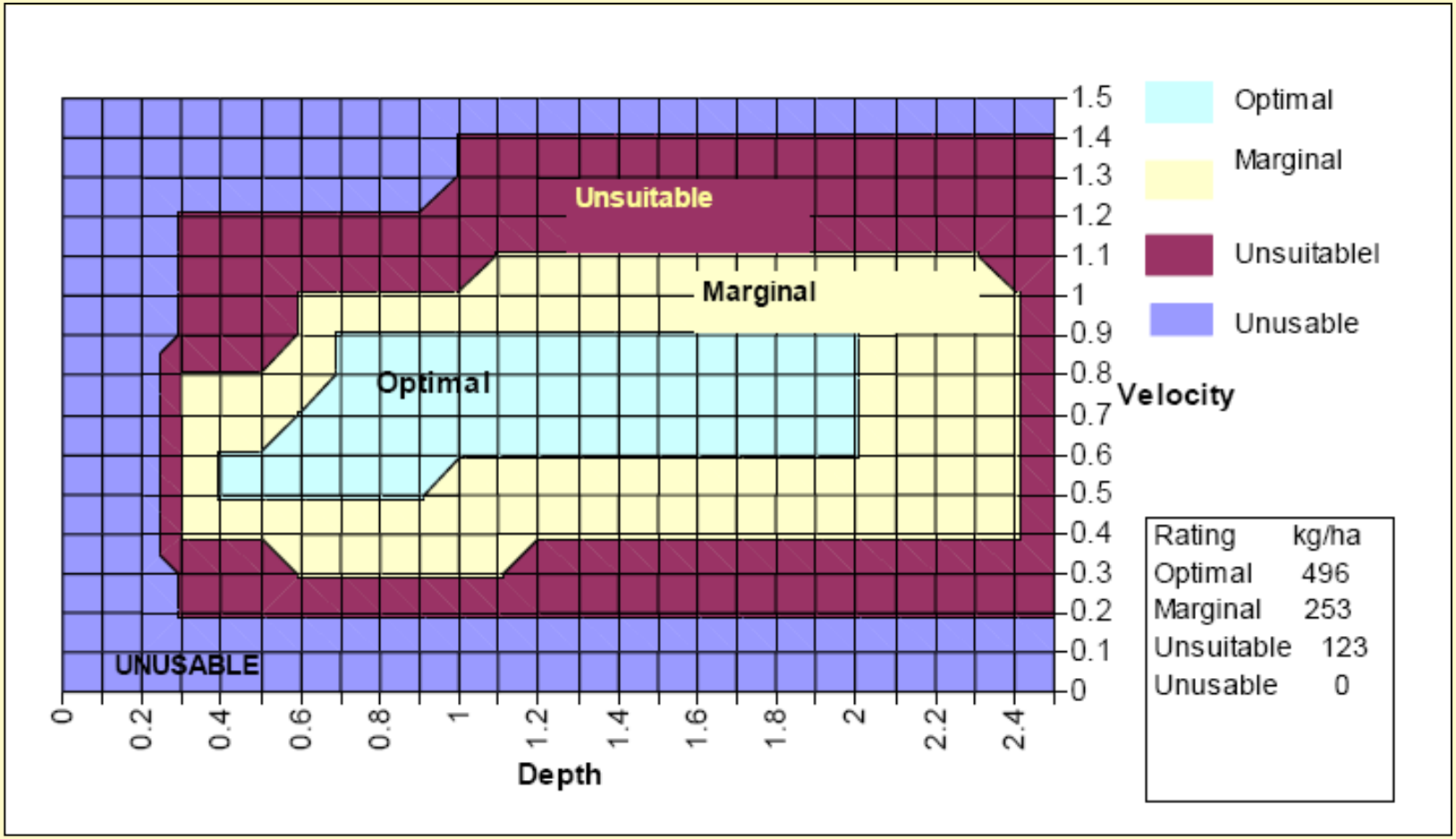
Native Fish Habitat Investigations

- CWCB Instream Flow Recommendation
  - 78 cfs to the San Miguel Confluence
  - R2Cross: 1 dimensional cross section method that focuses on ecological function of rivers indicated by riffle habitat quality
- PHABSIM Habitat Modeling
  - Nehring 1985: 150 cfs below the dam for the trout fishery
  - 1D habitat model that is effective in estimating microhabitat availability and is very useful for coldwater sportfish
- 1992 Pikeminnow Habitat Suitability Study
  - Suitable habitat in Dolores but impacted by low flows
  - Recommended minimum flows of 50-78 cfs for pikeminnow
- 2D Habitat Modeling for Native Fish
  - Anderson 2007

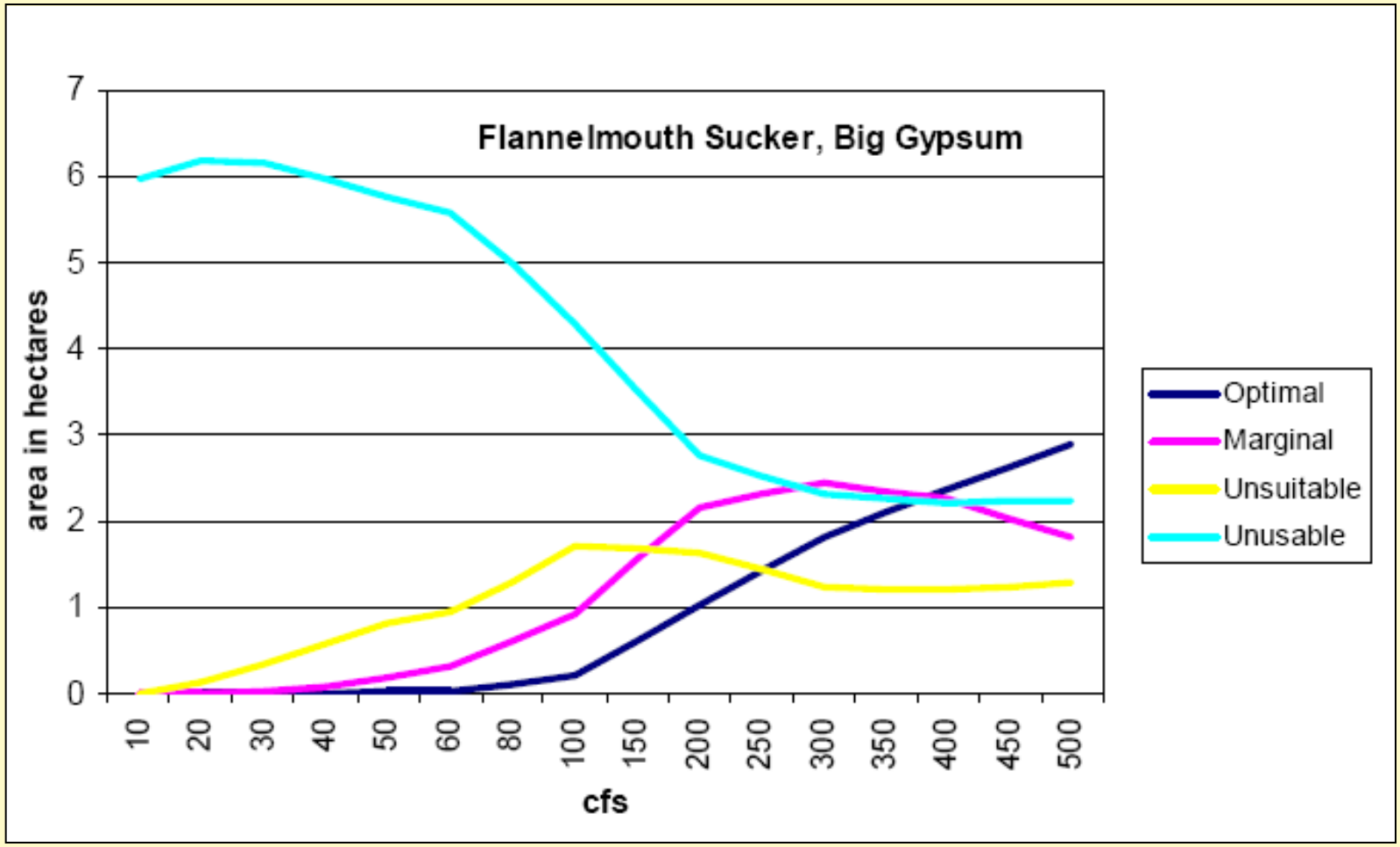
Native Fish Habitat Study 2000-2006

- 2-dimensional habitat modeling used to model fish habitat availability at the micro and meso habitat level
- Research grade sonar and total station GPS was used to survey habitat variables
- Habitat suitability models were developed with site specific electrofishing samples
  - Habitat suitability models were validated and did a good job of predicting observed fish biomass (r^2 of 0.74-0.90)

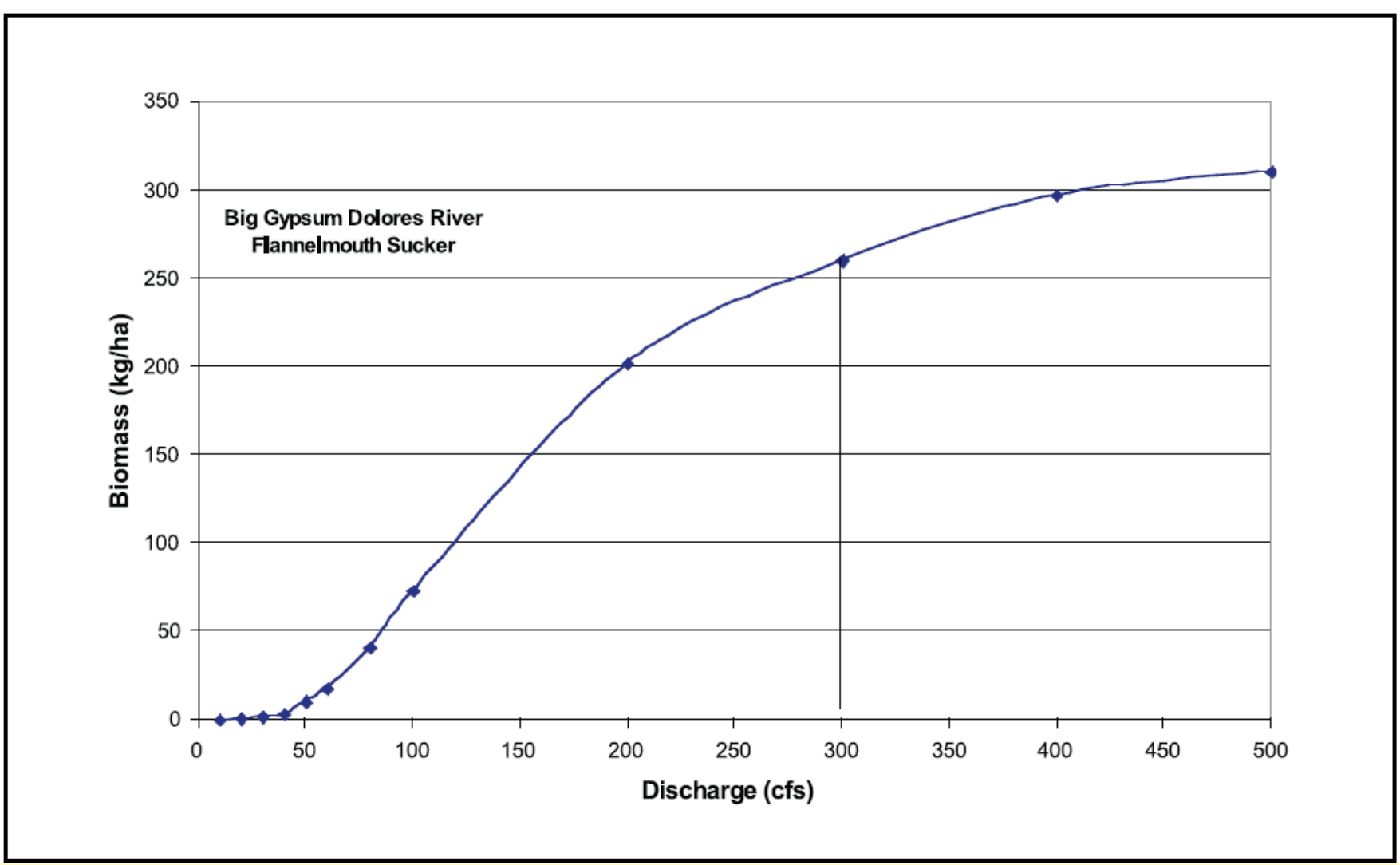
Flannelmouth Sucker Habitat Suitability Modeling



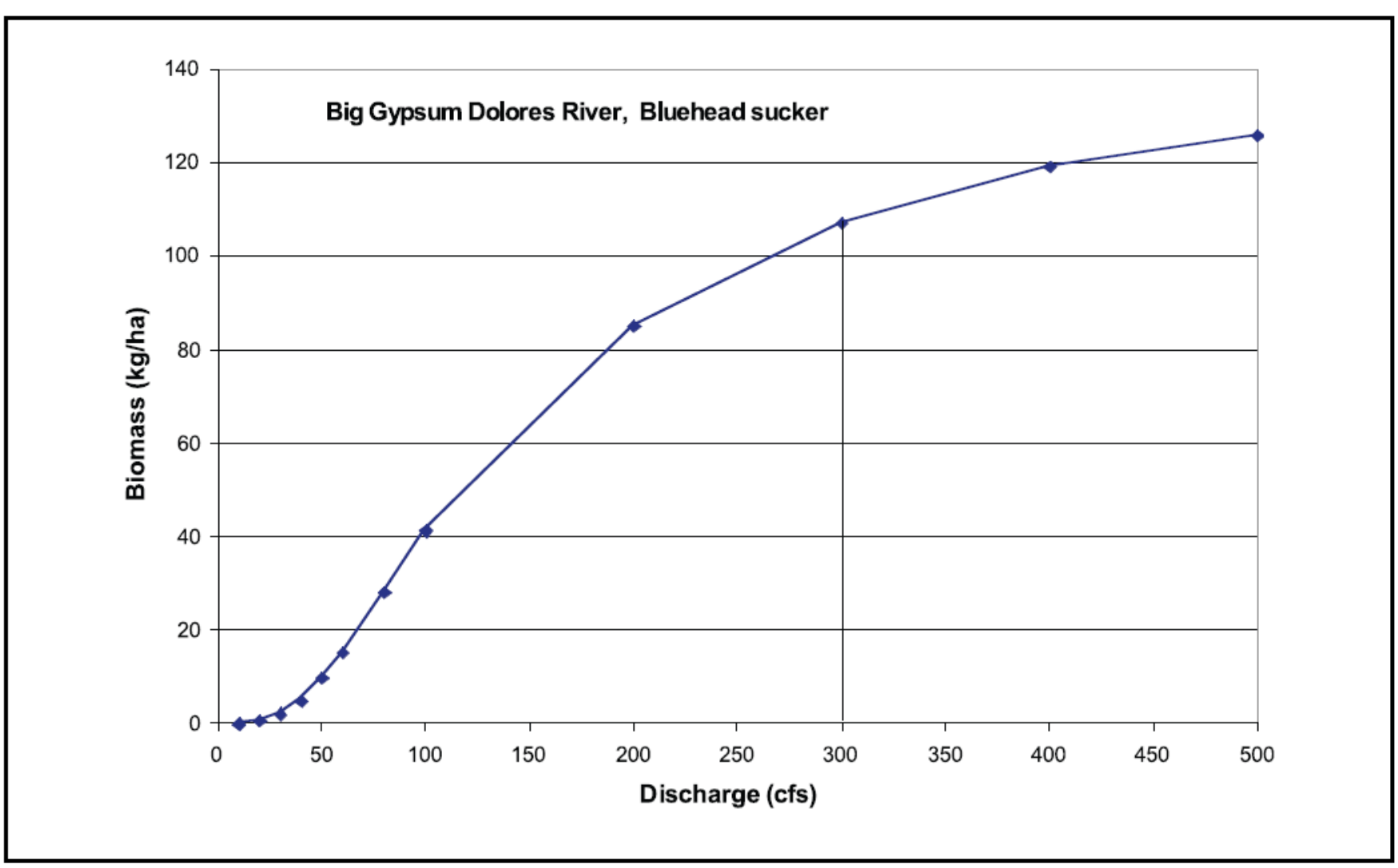
Flannelmouth Sucker Habitat-Flow Relationship



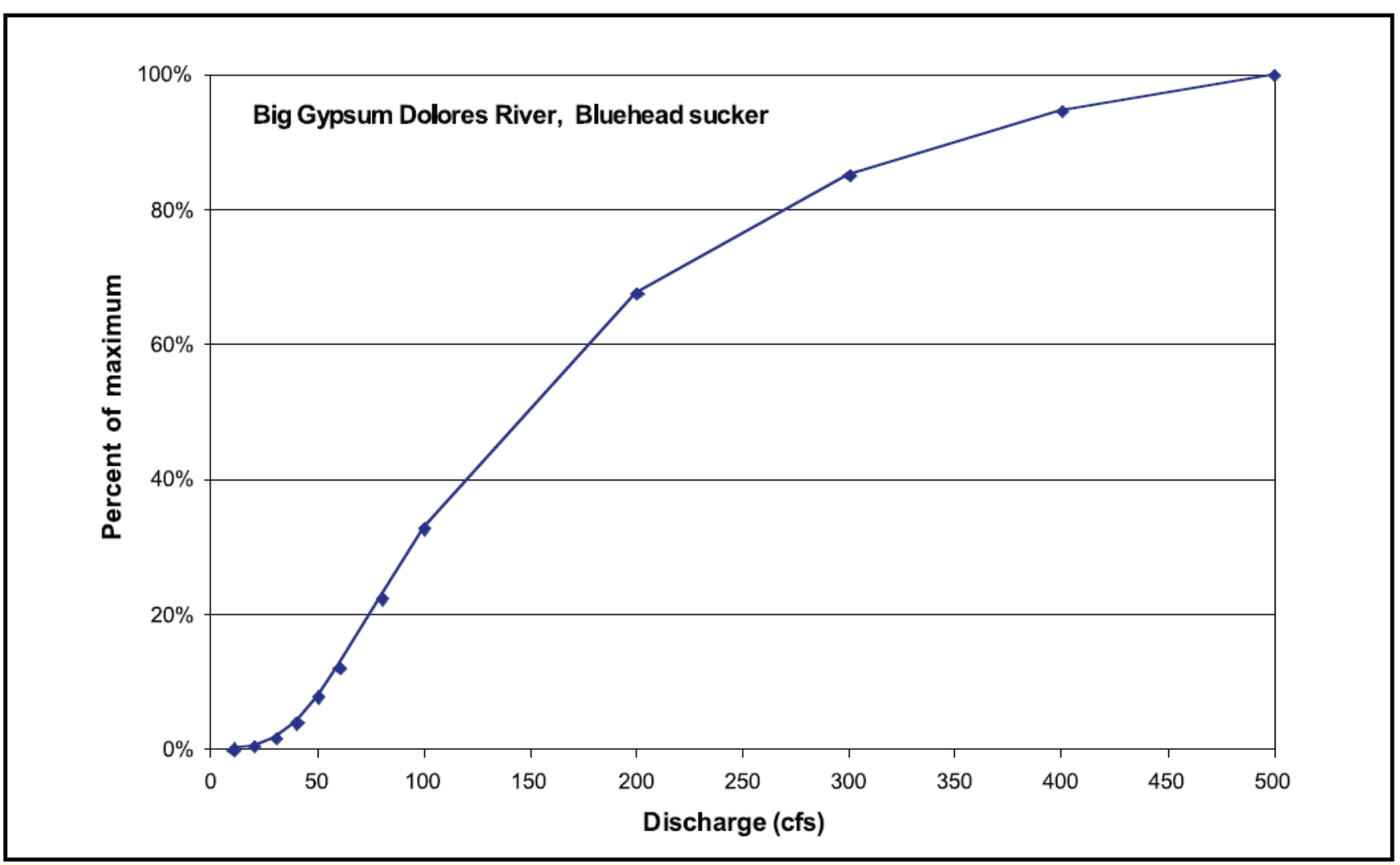
Flannelmouth Sucker Habitat Availability



Bluehead Sucker Biomass-Flow Relationship



Bluehead Sucker Habitat Availability



Summary of Native Fish Flow Study

- Flow of 300 cfs maximizes BHS and FMS habitat in the Dolores
- Concluded that inadequate riffle quantity and quality limited native fish habitat as well as decreased invertebrate productivity
  - Deep, higher velocity riffles were very rare in the Dolores at flows < 60 cfs
- Low flows result in too little velocity and depth in the majority of riffle and run habitats for FMS and BHS
- Poor invertebrate production due to lack of quality riffle habitat limits food resources for roundtail chub
- 80 cfs (60 cfs with spill) minimum flow recommendation at Big Gypsum that would protect 12-22% of maximum native fish habitat

Native Fish Habitat and Non-Native Fish

- Lack of high peak flows have resulted in bank encroachment, decreased width to depth ratio, and increased pool frequency
  - Post dam conditions have altered hydrograph and sediment dynamics
- Unnatural hydrograph, temperature, and sediment regime also creates more favorable conditions for non-native fish
  - NN fish are a problem in Dolores (smallmouth bass, catfish) but impacts pale in comparison to habitat issues
  - NN fish control efforts are not likely to be effective in the Dolores because of species present and available access
    - Extensive experience with fish control for pike, smallmouth, and bass in the Yampa and Colorado Rivers
  - Improving/maintaining native fish habitat is the key in discouraging non-native fish expansion (smallmouth bass)

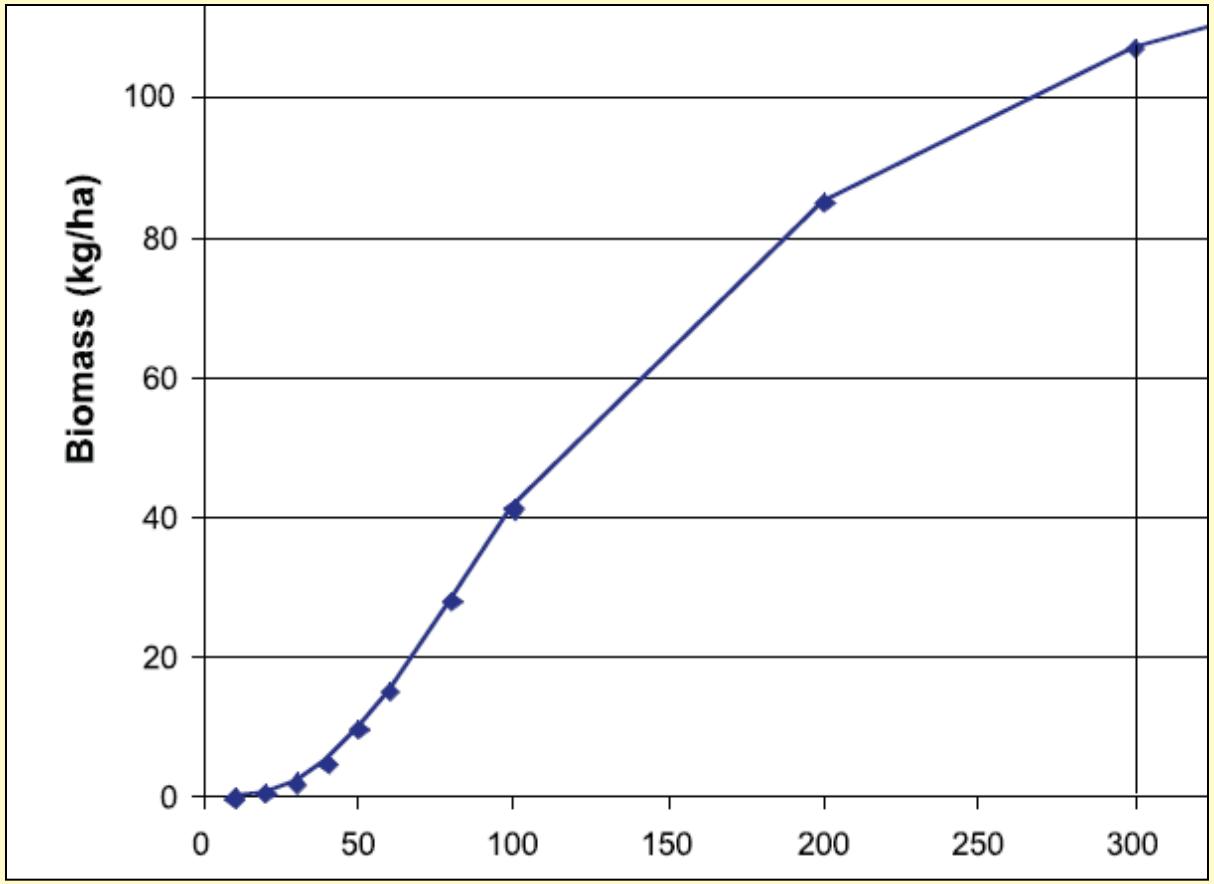
Native Fish Flow Needs

Min Flow Recommendation	Flow (cfs)	Location	Release Necessary (cfs)	Volume (af)	% Max Bluehead Biomass
CWCB Instream Flow	78	McPhee to San Miguel	94	68,037	22
Nehring 1985 (Trout)	150	Below McPhee	150	108,569	33
Anderson 2007 (With Spill)	60	Big Gypsum	72	52,113	12
Anderson 2007 (No Spill)	80	Big Gypsum	96	69,484	22
Current Fish Pool	41 (28 at Gyp)	Below McPhee	41	29,300	3

Current fish pool is 43% of the MINIMUM flow necessary to protect a barely viable fishery and protects less than 5% of native fish habitat

Native Fish Flow Needs

- Bad News: Current fish pool does not provide enough habitat for viable native fish populations
- Good News: Curve is steep, large habitat gains with a little more water



Questions from DRD

- What is known about the status of the 3 natives and the roundtail in particular in the Dolores River? What about the Four Endangered fish?
  - Native fish have declined significantly and are barely viable above the San Miguel
  - Endangered fish have been functionally extirpated from the river since the 1980's
- Is there data on trends? For what time period?
  - Good data on trends from 1986-Present, pre-dam data only spot sampling
- What is the strength of the data - how much certainty/uncertainty is associated?
  - Varies with each data set, sampling is generally CPUE population indices or minimum counts so measures of precision are not possible or necessary
  - High amount of certainty about conclusions due to magnitude of decline, current condition of fish population, and corroboration with habitat modeling studies
- What do we know about the reasons for the trends?
  - Lack of habitat due insufficient flow is the reason for native fish declines

Questions from DRD

- What key data gaps exist with respect to native fish?
  - Age/growth information, spawning ecology of natives, aquatic invertebrate data, temperature and nutrient issues, smallmouth bass age/grown and ecology
  - Data gaps are academically interesting but not necessary for management decisions

- What do we know about the flow needs for the native fish?
  - We have excellent information on flow needs of both native and sport fish, one of the most thoroughly researched subjects with state of the art techniques

- Given the dam, in your opinion, how can we ensure persistence of these fish in the Dolores?

Recommendations

- Increased downstream flows should be first priority
  - Fish pool should at least be at the 36,500 af identified in the 1996 EA with ultimate objective of year round minimum flow of at least 78 cfs
  - Current conditions provide less than 43% of the MINIMUM downstream flow needs and protects less than 4% of potential native sucker biomass
- Spill management is critical with so little water allocated for downstream release
  - Start spill April 1 and extend for as long as possible with clock on fish pool off
  - With 36,500 af fish pool and a 90 day spill would be 85% of minimum downstream flow needs and would protect about 10% BHS biomass

Recommendations

- Alternatives for Wild and Scenic Designations
  - Any alternative that does not increase downstream releases will **NOT** protect the fish ORV in Dolores
  - Status quo produces less than 5% of potential native fish habitat is only about 43% of necessary minimum flows
    - Downstream releases have actually declined and the fish pool has gotten smaller in the last 15 years, the water situation is getting worse not improving
- Protecting flows in the San Miguel River is essential for sustaining viable native fish populations in the Dolores River
  - State instream flow protection and/or Wild and Scenic Designation should be explored to protect San Miguel River flows

Future Plans

- DOW is compiling all Dolores River native fish data into a summary report that will include all historical fish sampling data, current distributions, and population trends
- A range-wide status assessment is also underway to evaluate historical distributions, current distribution, and make specific conservation recommendations
  - Range-wide Conservation Agreement and strategy for Roundtail Chub, Bluehead Sucker, and Flannelmouth Sucker
  - Signatories include Sate of Colorado, BLM, and BOR
- Further monitoring efforts on the Dolores will not be a priority for DOW unless conditions for native fish improve
  - Spill management has not been favorable for fish sampling conditions and fish pool water is way too scarce to used for monitoring

Questions and Discussion