



Highlights of 2003 Mechanical Removal of Non-Native Fishes From the Colorado River

Southwest Biological Science Center

Grand Canyon Monitoring and Research Center

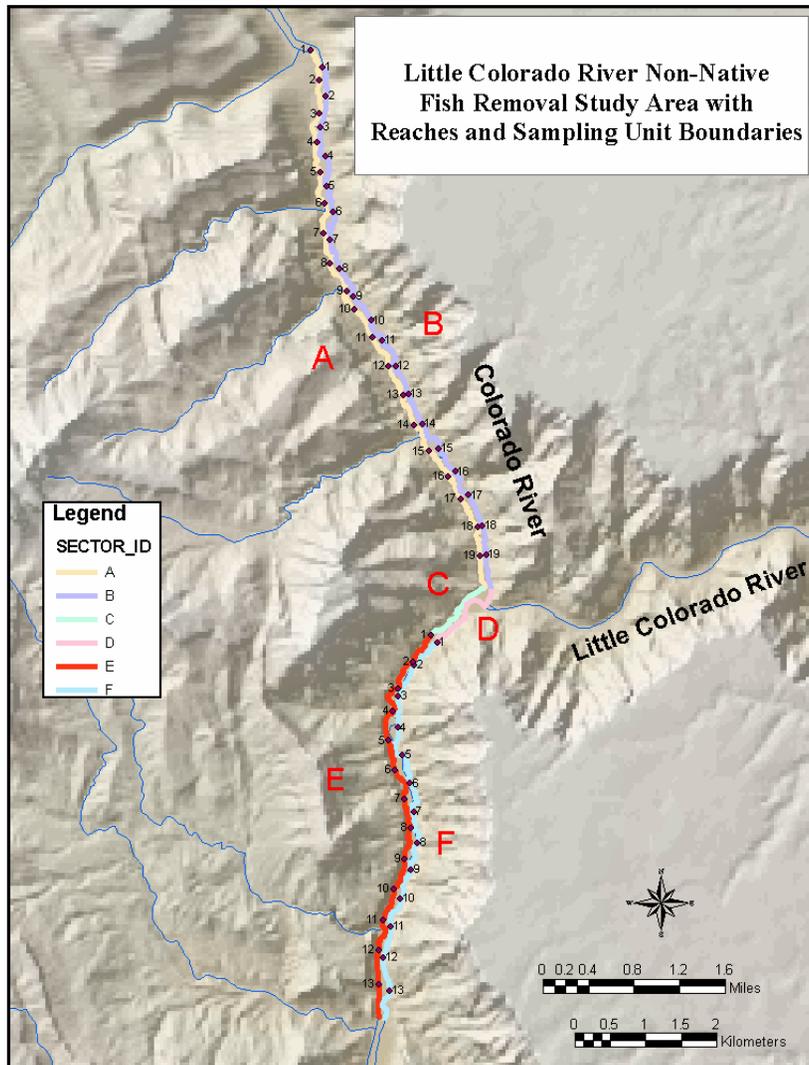
Lew Coggins and Mike Yard

U.S. Department of the Interior
U.S. Geological Survey

Study Objectives

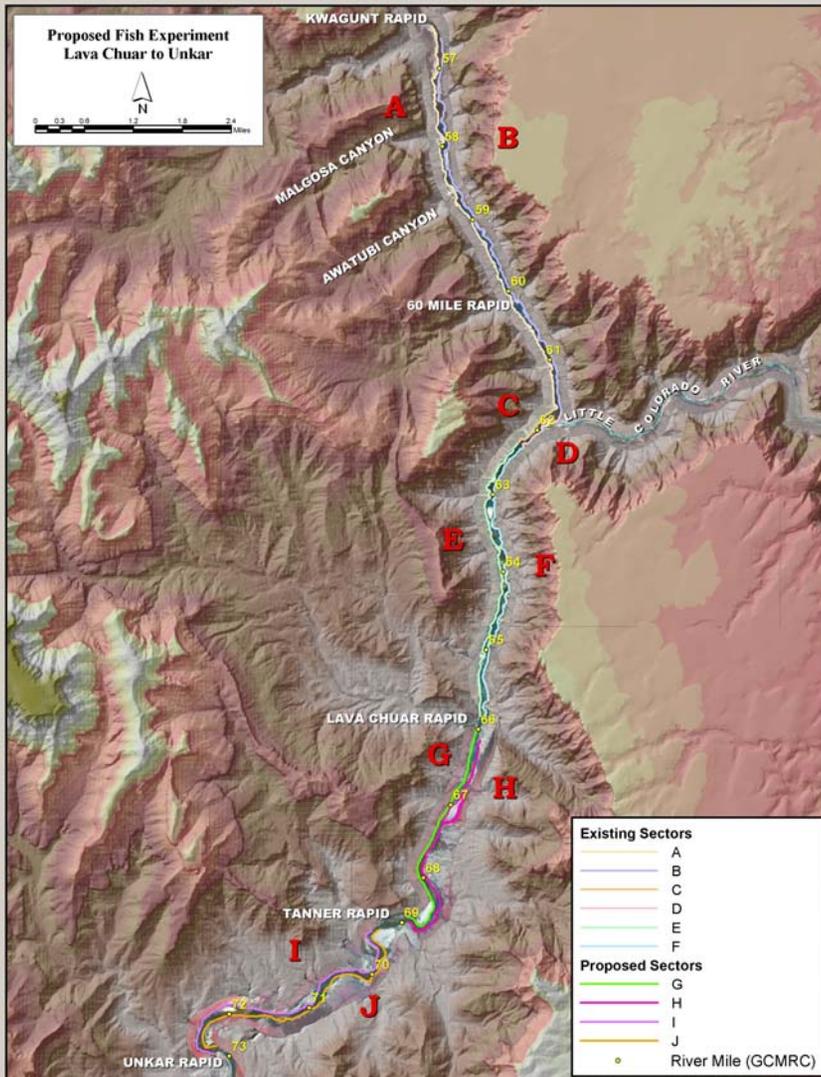
- **Effect of Adult RBT and BNT on the Population Dynamics of the LCR HBC Population.**
 - Will humpback chub recruitment increase as a result of non-native removal?
- **Efficacy of Mechanical Removal of Adult RBT and BNT from the LCR Inflow Reach.**
 - To what extent can we remove non-native fishes from a large reach of the Colorado River?
- **Rainbow and Brown Trout Diet Analysis and Predation.**
 - What are non-native fish eating?

Mechanical Removal Reach: Original Experimental Design



- **January Trip:**
 - 5 pass depletion in original reach (A-F)
- **February Trip**
 - 5 pass depletion in original reach (A-F)
- **March Trip:**
 - 5 pass depletion in original reach (A-F)

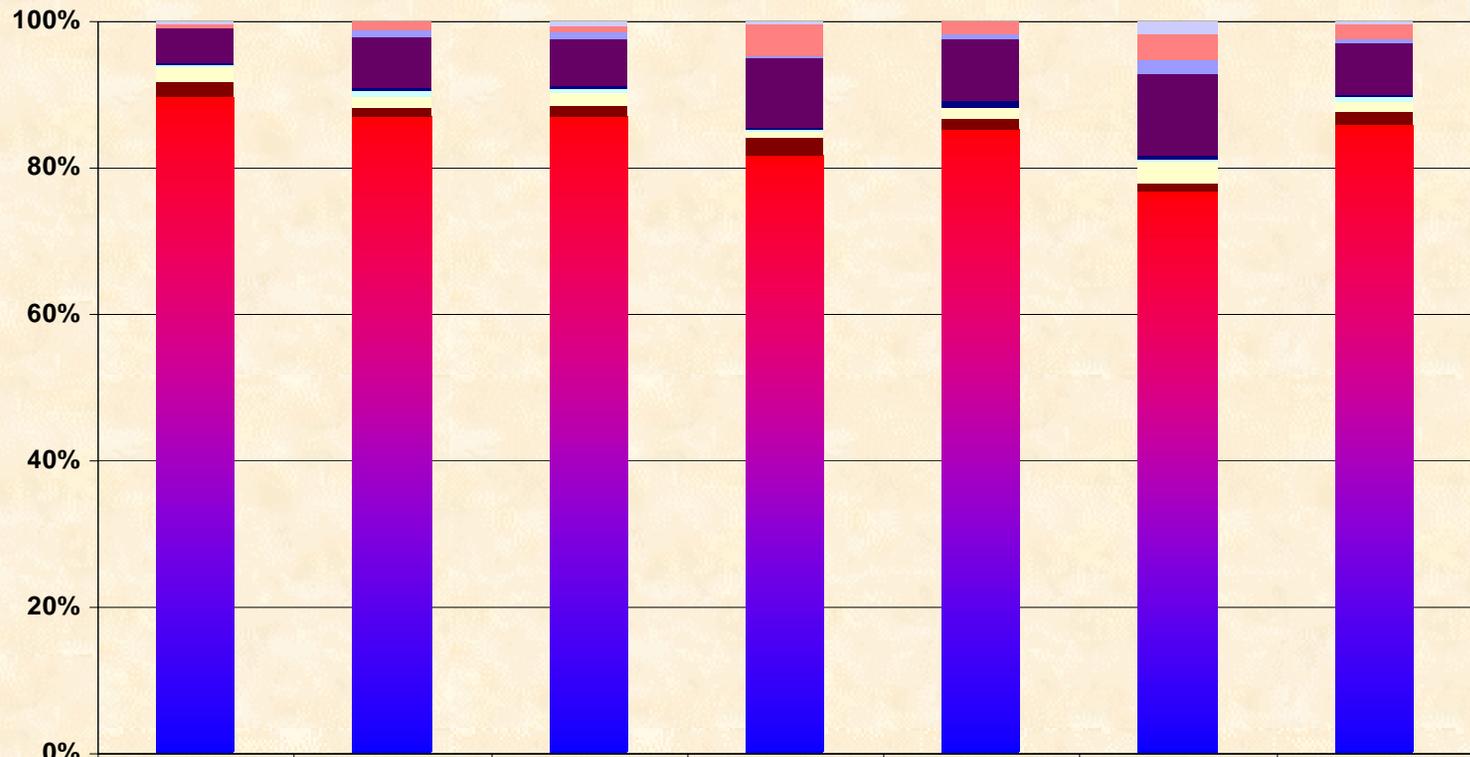
Mechanical Removal Reach: Modified Experimental Design



- **July Trip:**
 - 5 pass depletion in original reach (A-F)
- **August Trip:**
 - 2 pass depletion in original reach (A-F)
 - 3 pass depletion in Lava Chuar to Tanner Reach (G-H)
 - 3 pass depletion in Tanner to Unkar Reach (I-J)
- **September Trip:**
 - 3 pass depletion in original reach (A-F)
 - 3 pass depletion in Lava Chuar to Tanner Reach (G-H).

Little Colorado River Removal Reach Results

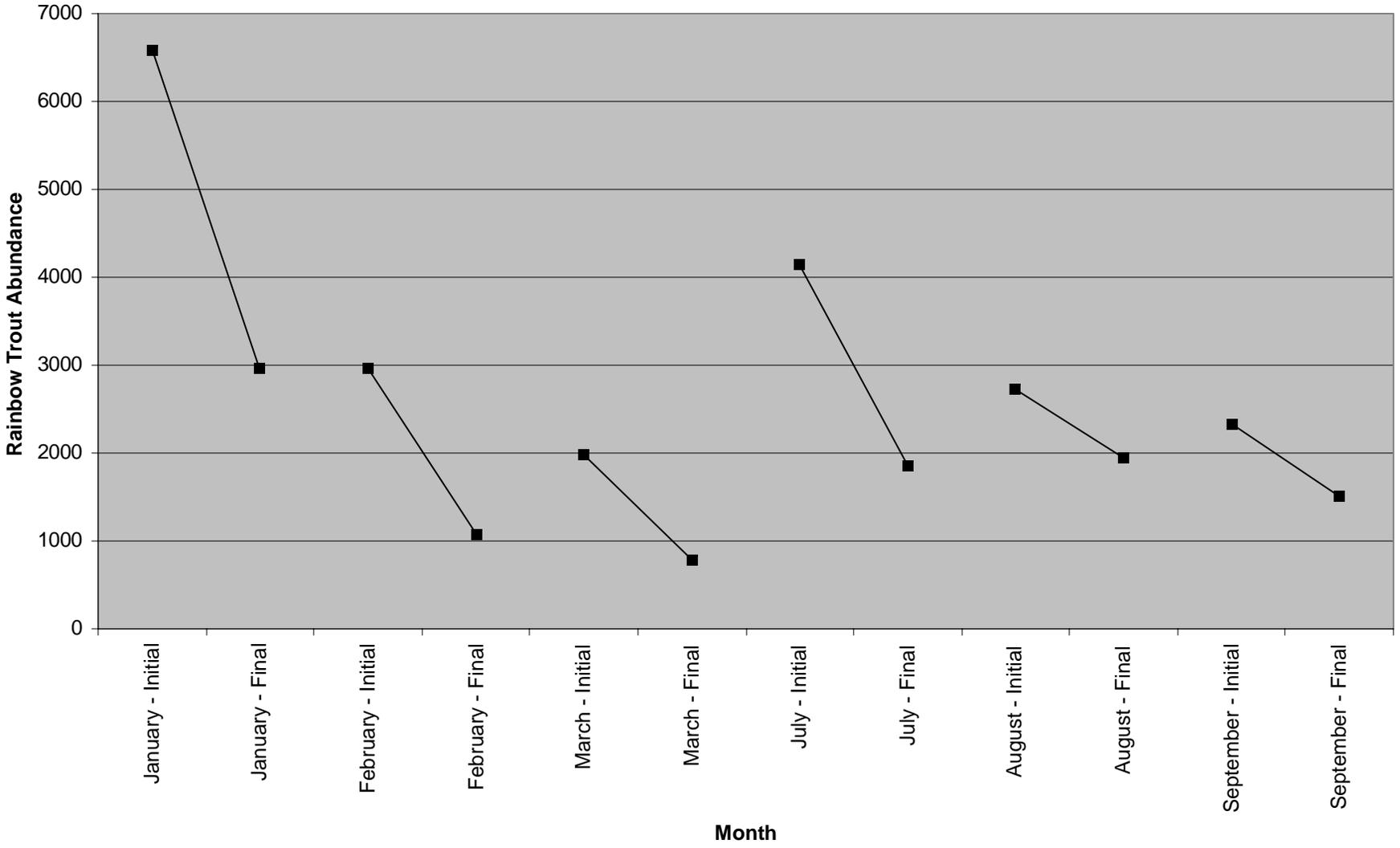
Electrofishing Catch By Month within the LCR Removal Reach (RM 56.2-65.7)



	JAN-123.7 hrs	FEB-118 hrs	MAR-112.6 hrs	JUL-106.1 hrs	AUG-43.8 hrs	SEP-67.8 hrs	Total-572.1 hrs
Speckled Dace	7	2	8	6		18	41
Humpback Chub	26	26	13	123	17	37	242
Bluehead Sucker	8	18	11	12	4	19	72
Flannelmouth Sucker	187	156	89	265	79	119	895
Other	3	1	6	8	7	8	33
Fathead Minnow	17	21	8	4		4	54
Common Carp	80	33	22	29	14	31	209
Brown Trout	87	24	21	63	12	11	218
Rainbow Trout	3,606	1,905	1,195	2,303	779	818	10,606

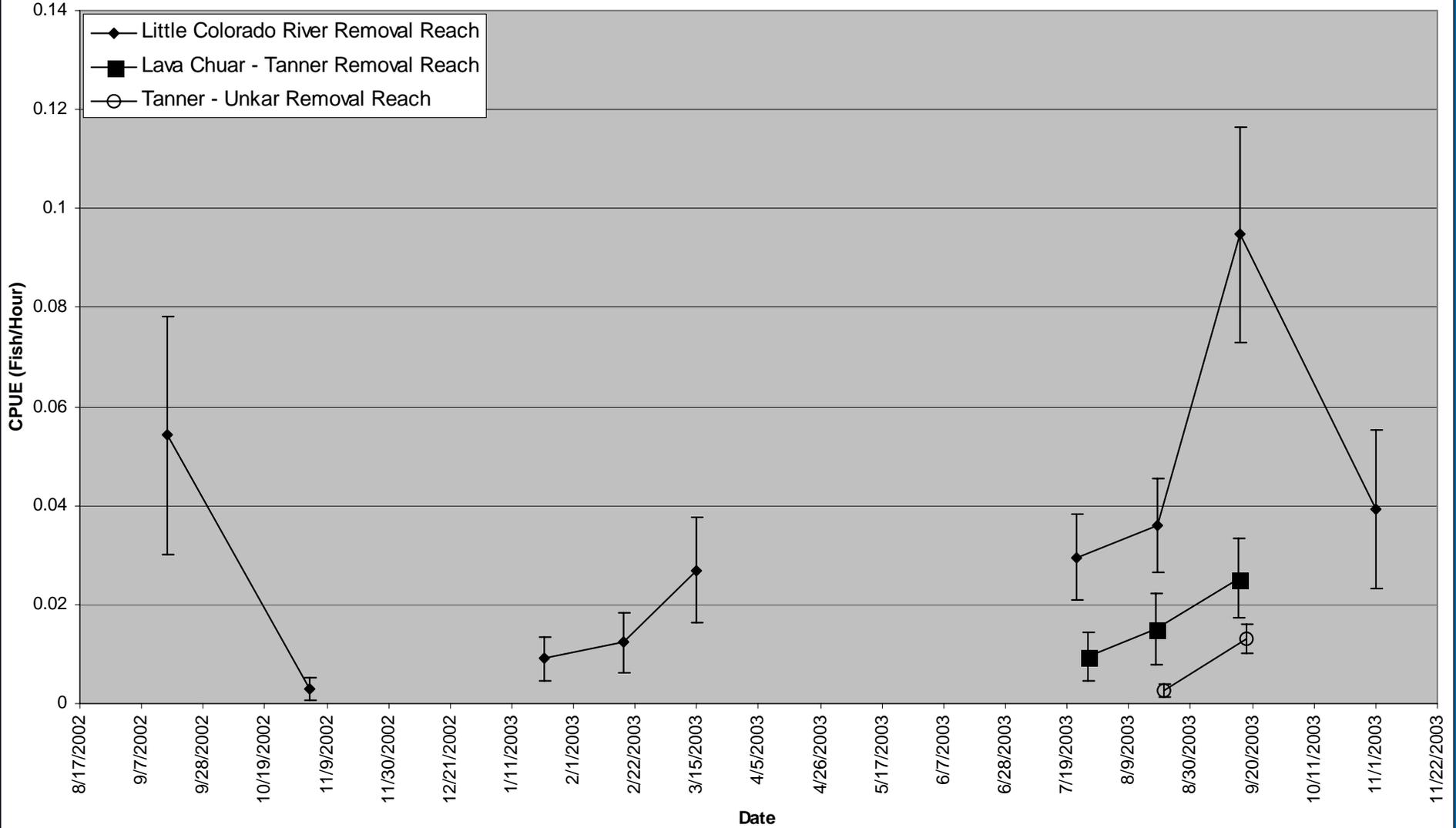
Little Colorado River Removal Reach Results

Timeseries of Rainbow Trout Abundance in the Little Colorado River Removal Reach During 2003



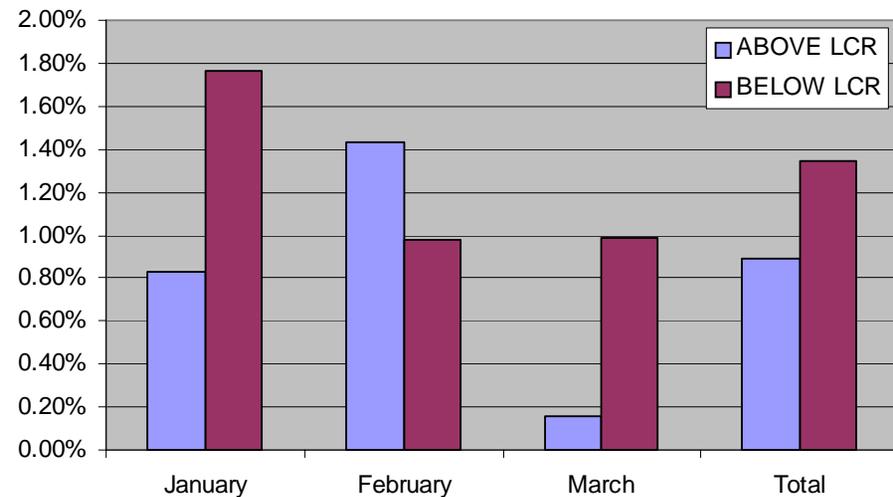
Hoopnetting Results

Humpback Chub Catch Rate in Hoopnets within Removal Reaches



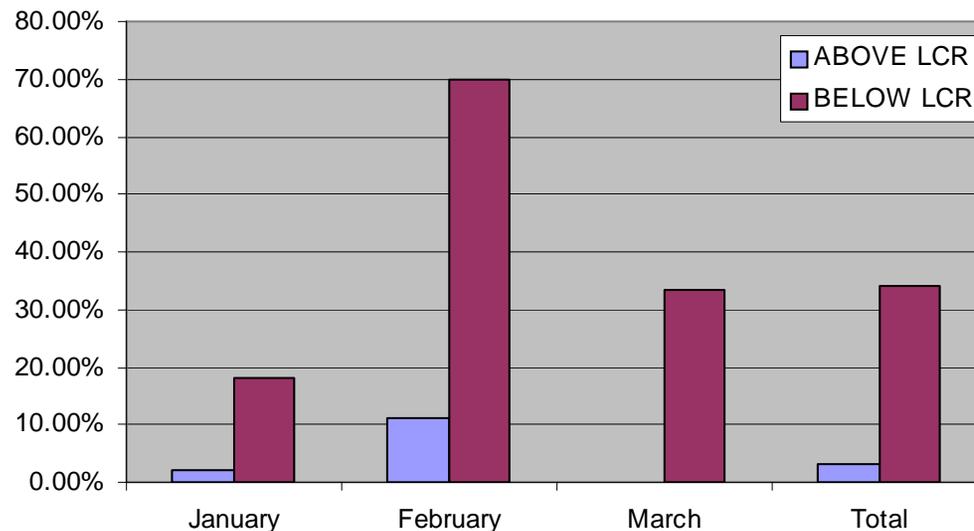
Predation Assessment Results: Rainbow Trout

Rainbow Trout (>250 mm)		Observations		Estimated Parameters			Predator Characteristics		Population Characteristics	
Date	Location	x _p	N	Pred %	SE _p	C _v	Mean TL _{PREP}	Median TL _{PREP}	Mean TL _{POP}	Median TL _{POP}
JANUARY	Above LCR	18	2177	0.83%	0.094%	0.235	346	337	334	336
	Below LCR	9	510	1.76%	0.338%	0.330	344	339	330	333
FEBRUARY	Above LCR	16	1120	1.43%	0.178%	0.248	350	353	335	337
	Below LCR	1	205	0.98%	0.579%	0.704	315	-	286	324
MARCH	Above LCR	1	637	0.16%	0.157%	0.999	340	-	333	334
	Below LCR	1	101	0.99%	0.988%	0.995	470	-	329	330
COMBINED	Total	46	4750	0.97%	0.055%	0.147	342	338	334	335
	Above LCR	35	3934	0.89%	0.062%	0.168	340	338	330	332
	Below LCR	11	816	1.35%	0.222%	0.299	350	337	334	336



Predation Assessment Results: Brown Trout

Brown Trout (>250 mm)		Observations		Estimated Parameters			Predator Characteristics		Population Characteristics	
Date	Location	x_p	N	Pred %	SE_p	C_v	Mean TL_{PRED}	Median TL_{PRED}	Mean TL_{POP}	Median TL_{POP}
JANUARY	Above LCR	1	49	2.04%	2.03%	0.990	414	414	304	295
	Below LCR	4	22	18.18%	6.11%	0.452	376	395	312	286
FEBRUARY	Above LCR	1	9	11.11%	10.79%	0.943	407	437	386	356
	Below LCR	7	10	70.00%	12.04%	0.207	434	457	394	357
MARCH	Above LCR	0	6	0.00%	-	-	-	-	378	295
	Below LCR	3	9	33.33%	13.21%	0.471	385	384	340	297
COMBINED	Total	16	105	15.24%	1.83%	0.230	409	426	329	302
	Above LCR	2	64	3.13%	1.84%	0.696	426	-	322	303
	Below LCR	14	41	34.15%	4.25%	0.217	407	415	338	298



2003 Results Highlights

- Non-native removal efforts more effective than anticipated. > 50% efficiency for Rainbow Trout with 5 passes.
- Immigration rate >800 fish/month in the LCR Inflow Reach.
- Hoopnet catches of HBC may indicate a habitat/survival response by HBC following non-native removal.
- Brown Trout much more piscivorous than Rainbow Trout. Both species more piscivorous below the LCR Confluence.
- Rainbow Trout dominant prey item are simuliids. Dominant prey items for Brown trout are fish, gammarus, and simuliids.

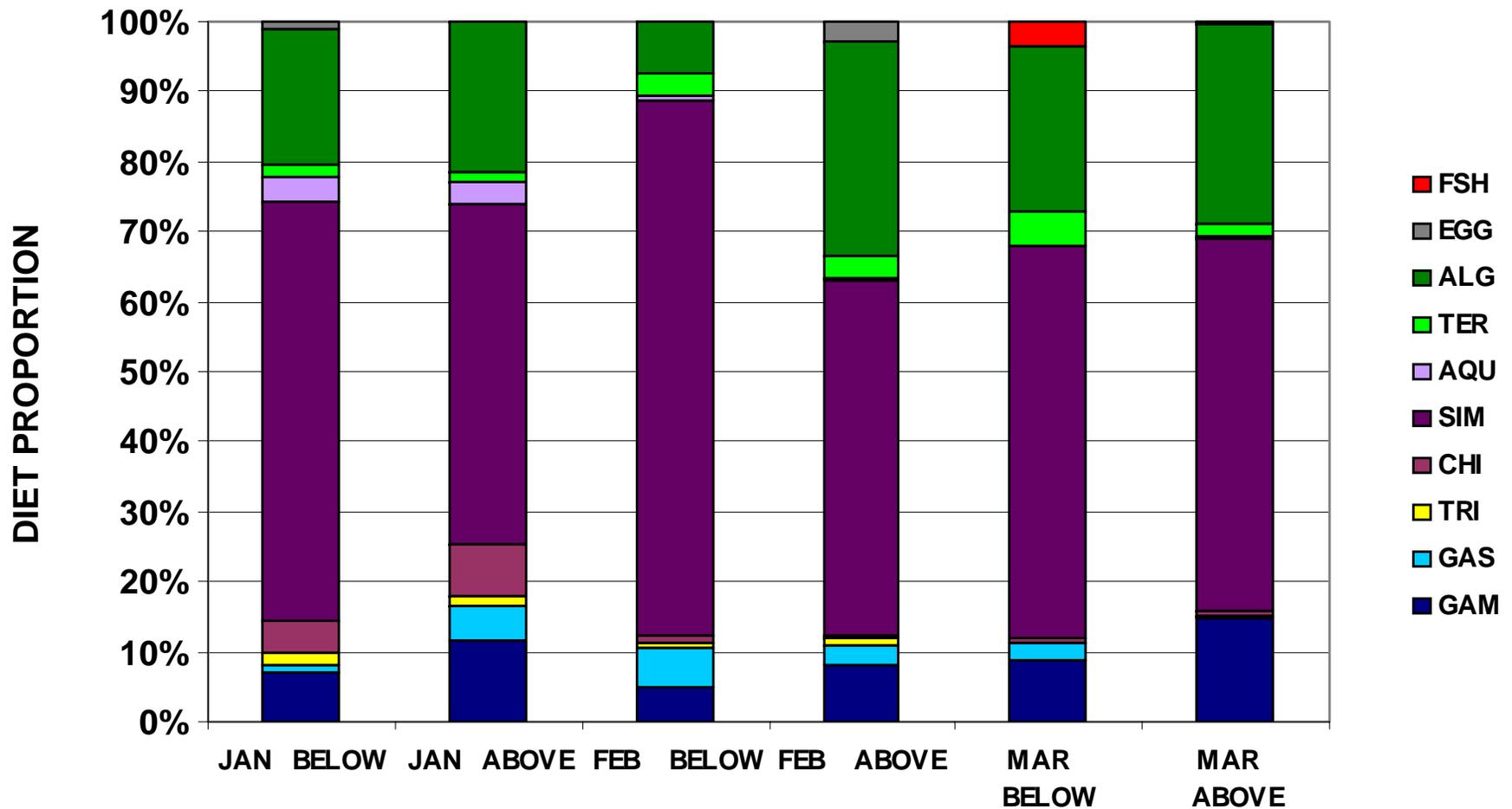
2004 VERY Preliminary Results

- 2 of 6 trips completed. 4 passes in the LCR and Lava Chuar to Tanner Removal Reaches.
- Catch of rainbow trout for 4 depletion passes during January 04 (1,325) less than catch during January 03 (3,159) and February 03 (1,692).
 - Suggests persistent affect of 03 removals.
- Catch of brown trout during January 04 (93) more than catch during January 03 (75).
 - Does not suggest persistent affect of 03 removals.
 - Warmer water affect?
- LCR Reach Hoopnet catch of humpback chub during January and February 04 (20) half of January and February 03 (39) .
 - Does not suggest increased overwinter survival/retention.
 - Recruitment?



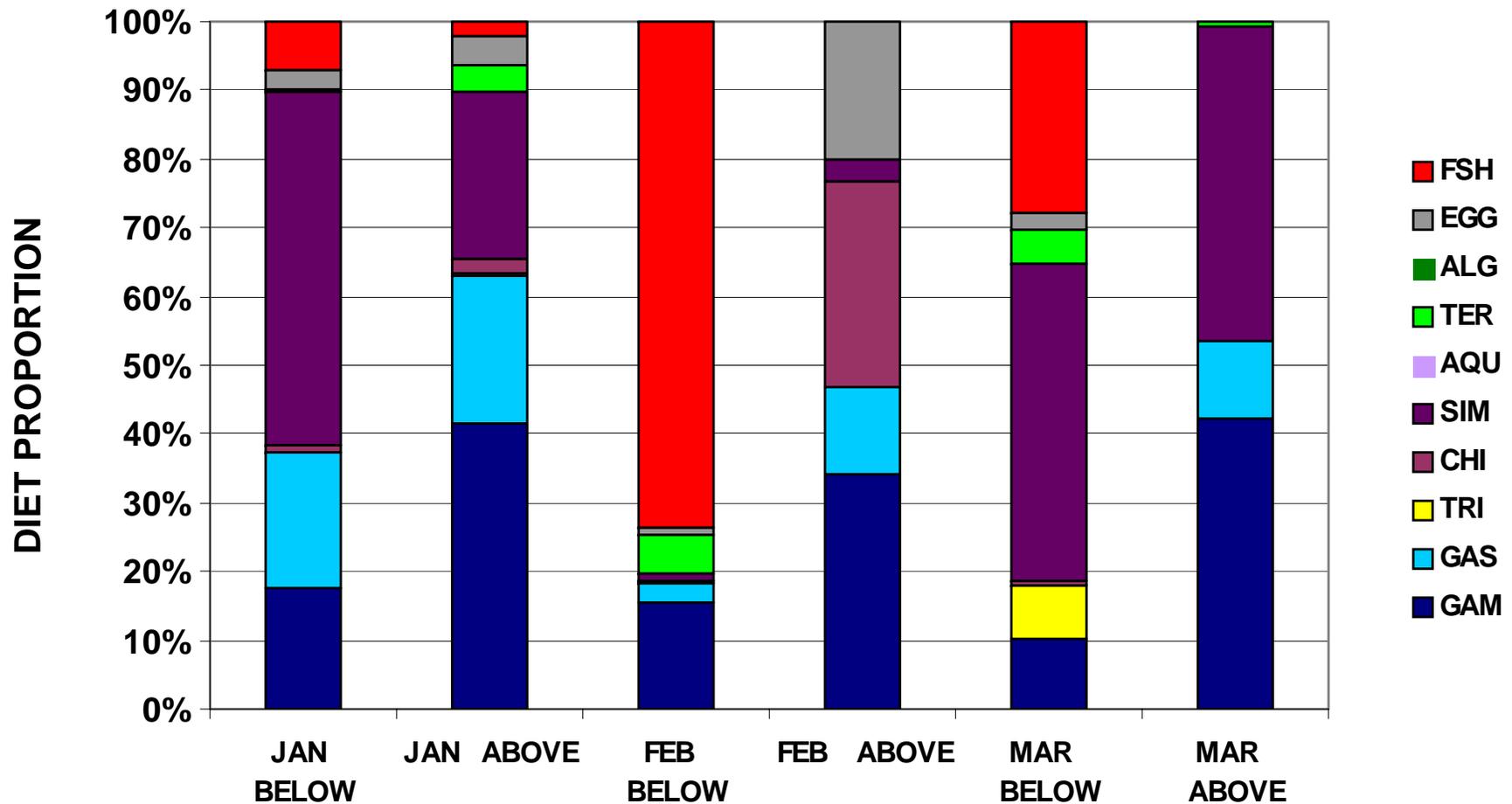
Diet Assessment Results: Rainbow Trout

Rainbow Trout (> 250 mm)



Diet Assessment Results: Brown Trout

Brown Trout (> 250 mm)



Power Analysis for Estimating a Binomial Proportion

