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Update on 2003 and 2004 Mechanical Removal of Non-Native Fishes From the Colorado River

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Grand Canyon Monitoring and Research Center

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Preliminary Data Subject to Review and Revision 3/3/2005

Objectives

- 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?
- 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?

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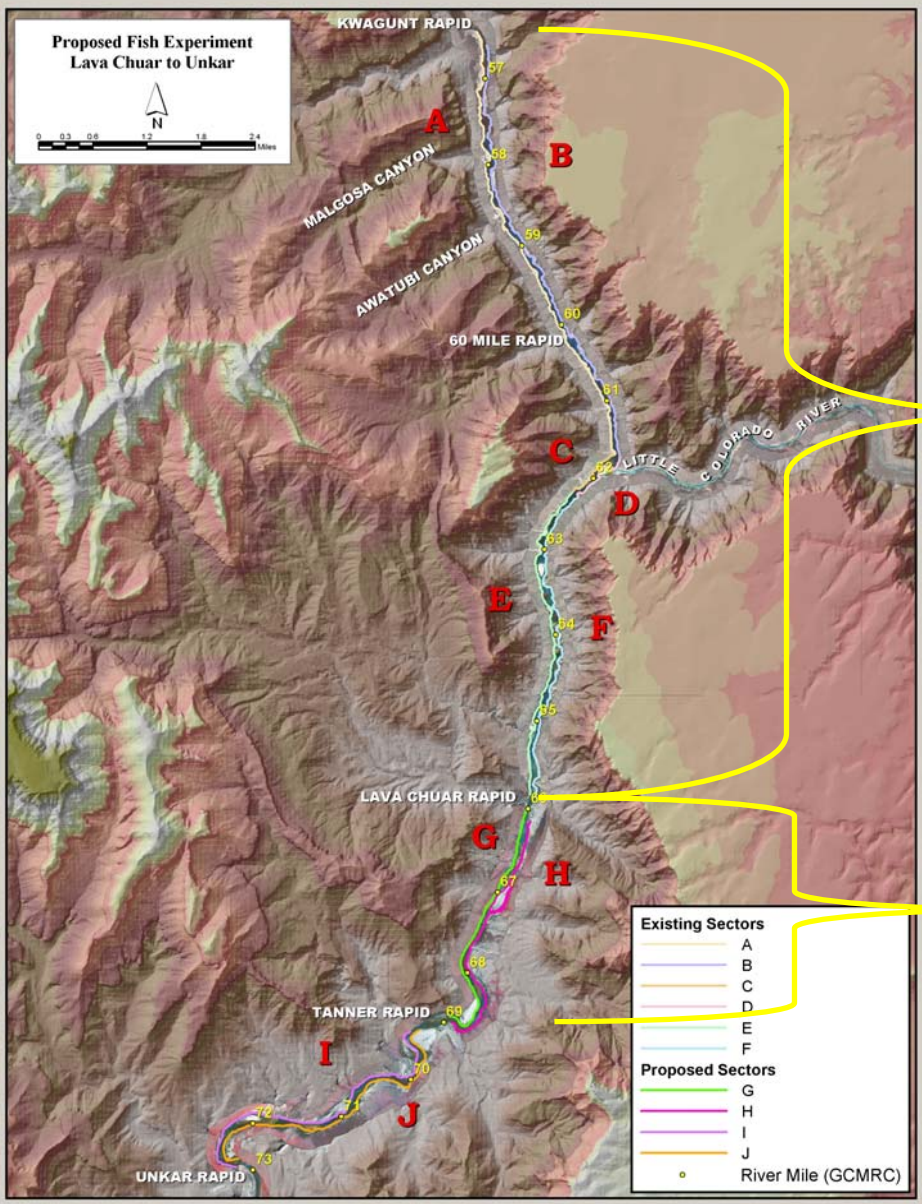
Mechanical Removal Reaches



Little Colorado River Removal Reach (Kwagunt Rapid to Lava Chuar Rapid, 9.5 miles)

Lava Chuar to Tanner Removal Reach, 2.8 miles

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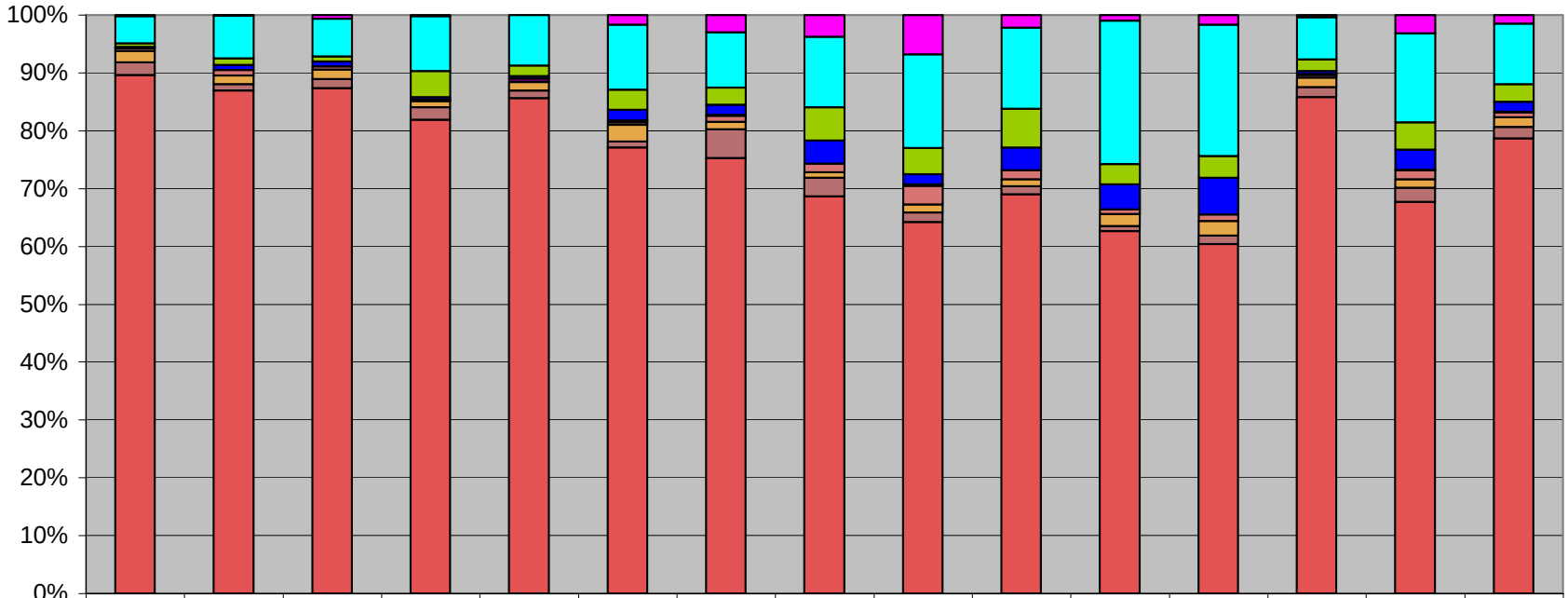
Little Colorado River Removal Reach Results

Electrofishing Catch by Species and Month within the Little Colorado River Removal Reach



	Jan-03	Feb-03	Mar-03	Jul-03	Aug-03	Sep-03	Jan-04	Feb-04	Mar-04	Jul-04	Aug-04	Sep-04	Total 03	Total 04	Total 03-04
Speckled Dace	7	2	8	6		18	53	34	92	47	7	19	41	252	293
Flannelmouth Sucker	188	161	89	266	79	119	169	110	218	296	190	258	902	1241	2143
Humpback Chub	26	26	13	126	17	37	51	52	61	142	27	43	245	376	621
Bluehead Sucker	8	18	11	12	4	19	32	37	24	84	33	72	72	282	354
Unidentified Sucker	2	0	0	3	5	4	3	0	3	0	0	0	14	6	20
Fathead Minnow	17	21	8	4	0	4	18	13	44	32	6	13	54	126	180
Common Carp	80	33	22	29	14	31	23	9	18	26	16	29	209	121	330
Brown Trout	87	24	21	63	12	11	88	29	22	29	7	17	218	192	410
Rainbow Trout	3605	1900	1195	2298	779	818	1330	622	867	1464	480	687	10595	5450	16045

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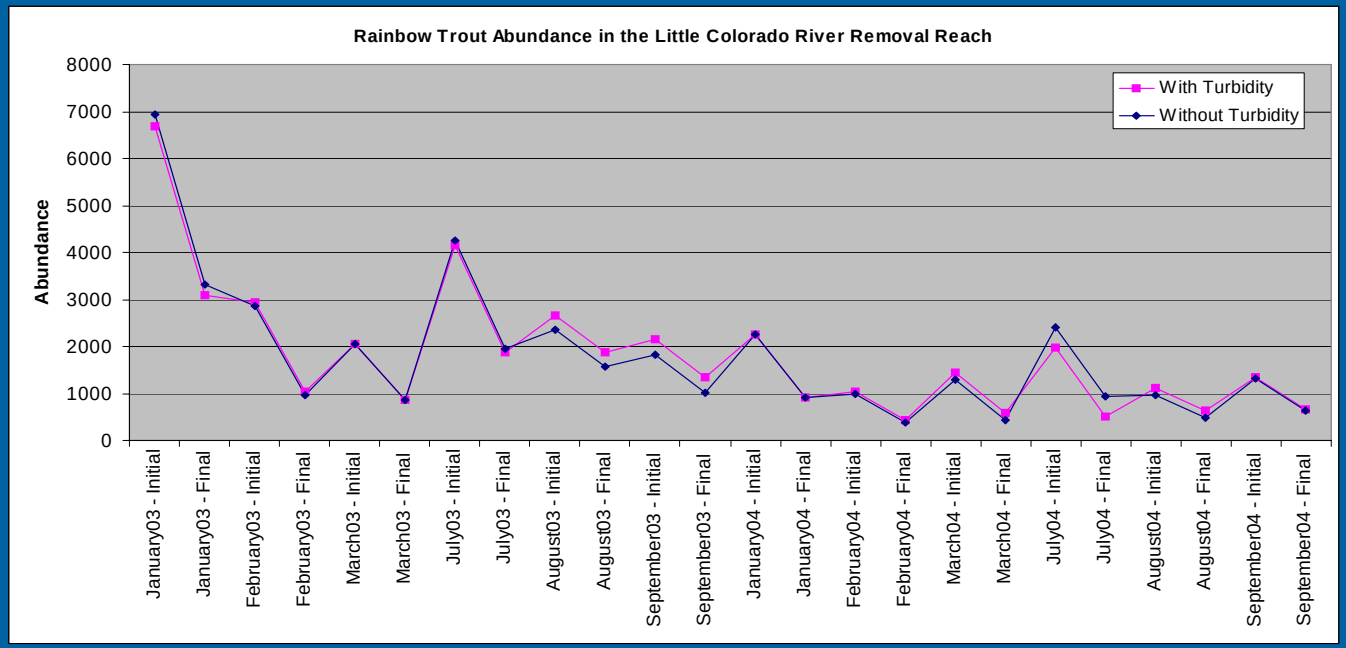
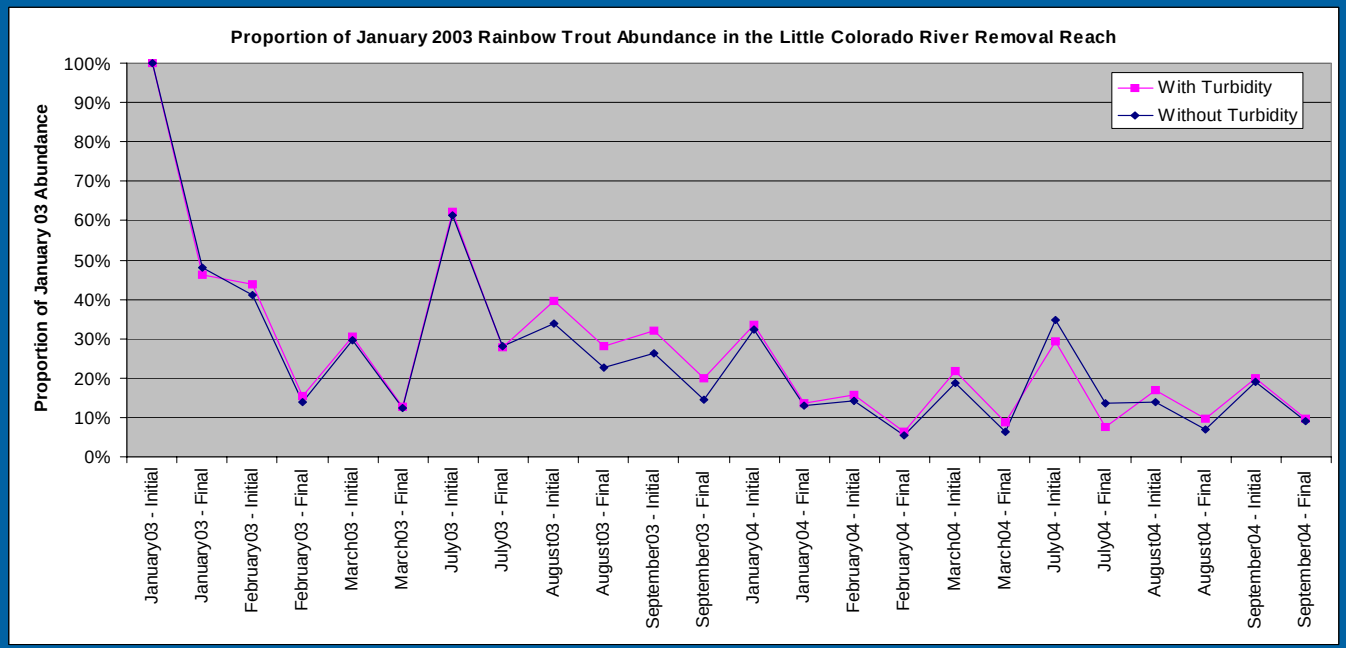
Little Colorado River Removal Reach Rainbow Trout Abundance





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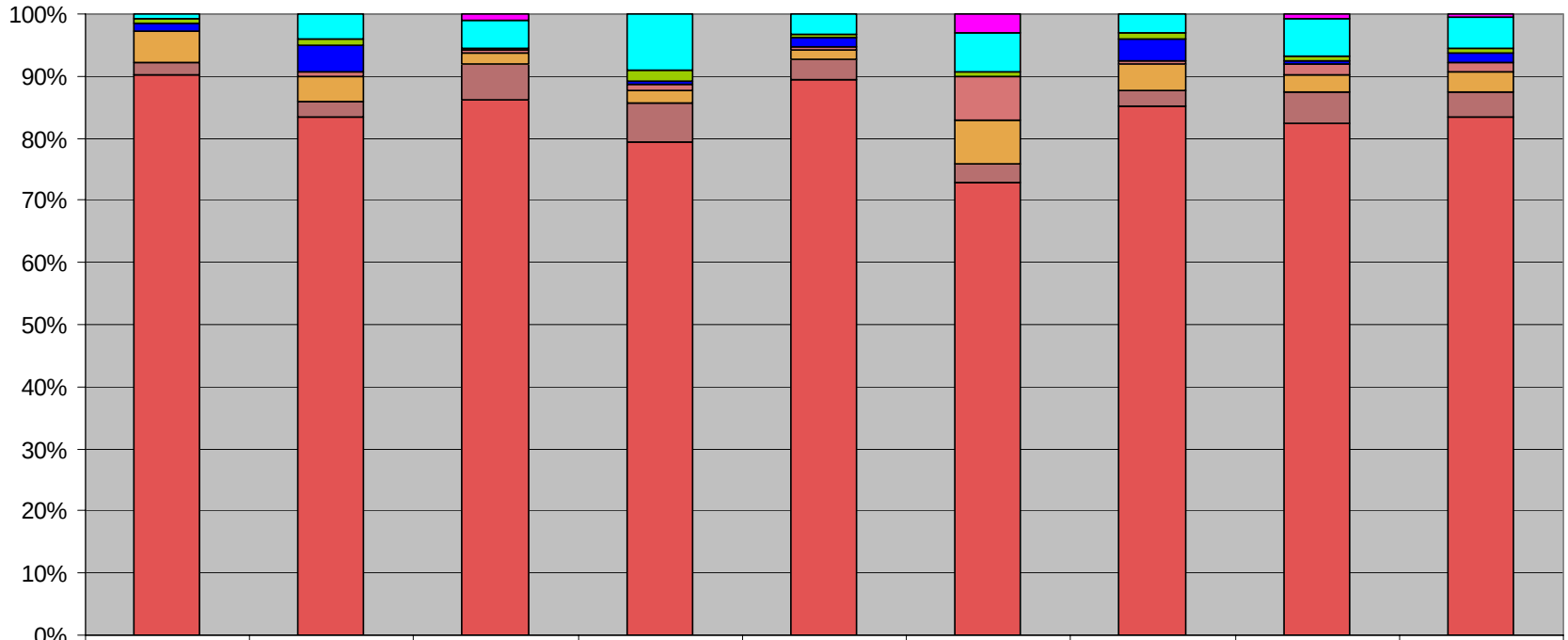
Lava-Chuar to Tanner Removal Reach Results

Electrofishing Catch by Species and Month within the Lava Chuar to Tanner Removal Reach



	Aug-03	Sep-03	Jan-04	Feb-04	Aug-04	Sep-04	Total 03	Total 04	Total 03-04
Speckled Dace			3			5	0	8	8
Flannelmouth Sucker	1	15	14	25	6	11	16	56	72
Humpback Chub	1	4	1	5	1	1	5	8	13
Bluehead Sucker	2	16		1	3		18	4	22
Fathead Minnow		3	2	3	1	12	3	18	21
Common Carp	7	15	5	6	3	12	22	26	48
Brown Trout	3	9	18	17	6	5	12	46	58
Rainbow Trout	128	312	271	220	169	124	440	784	1224

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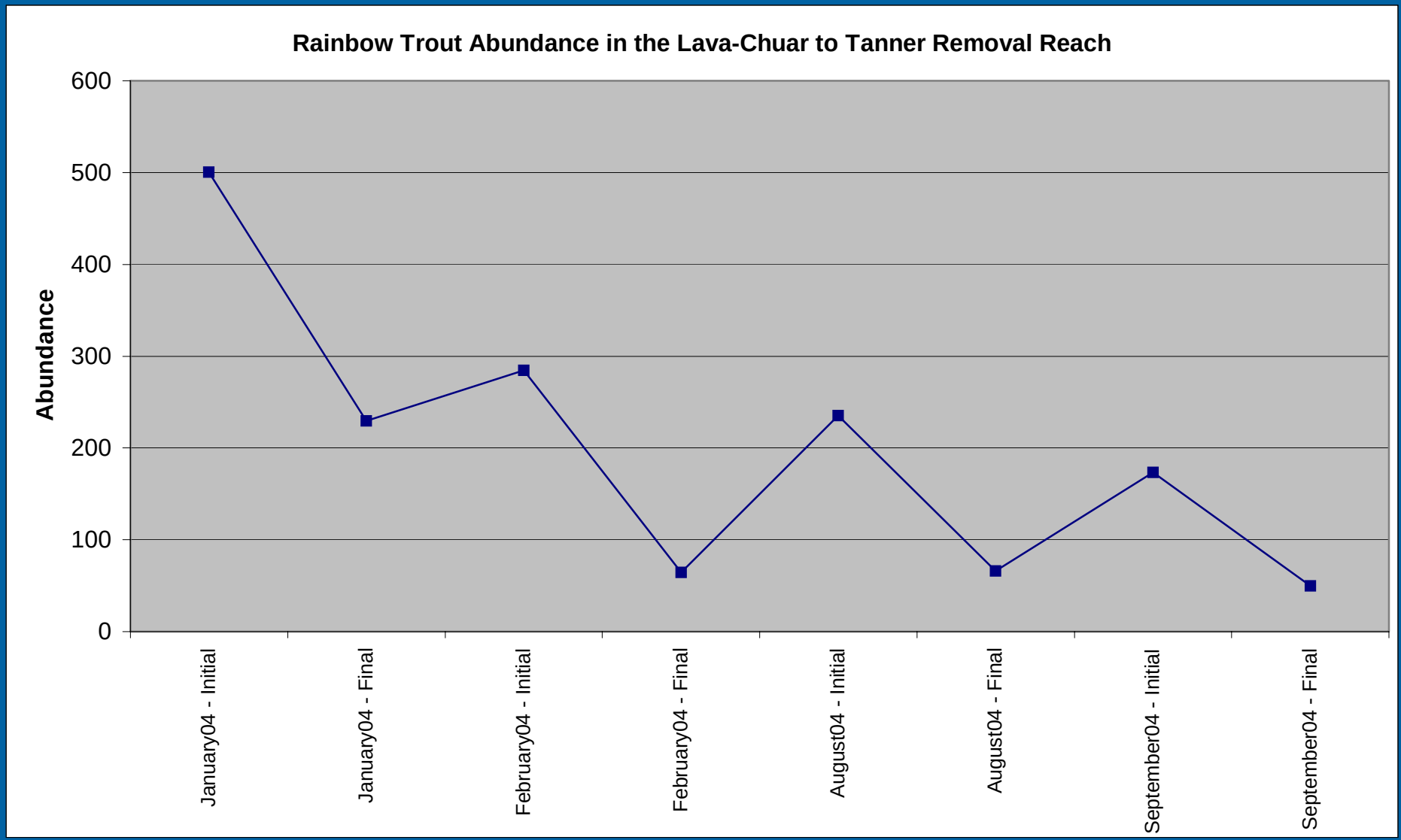
Lava Chuar to Tanner Removal Reach Rainbow Trout Abundance



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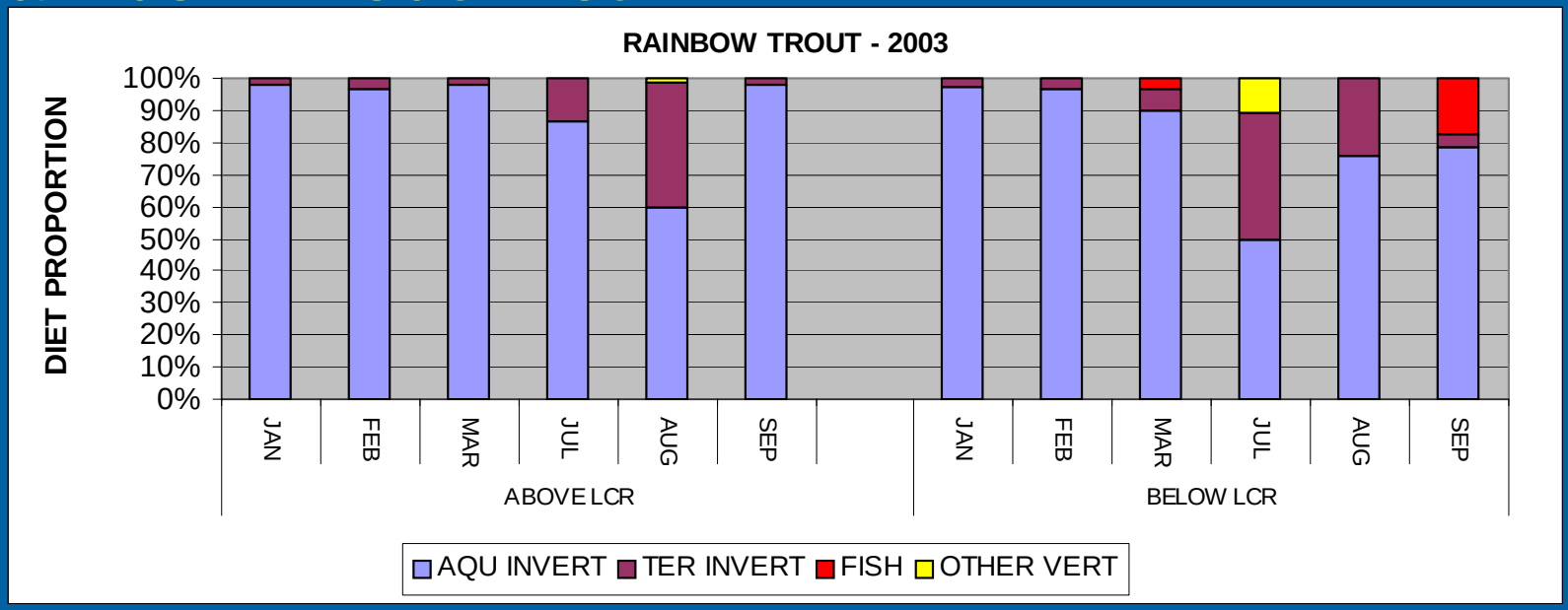
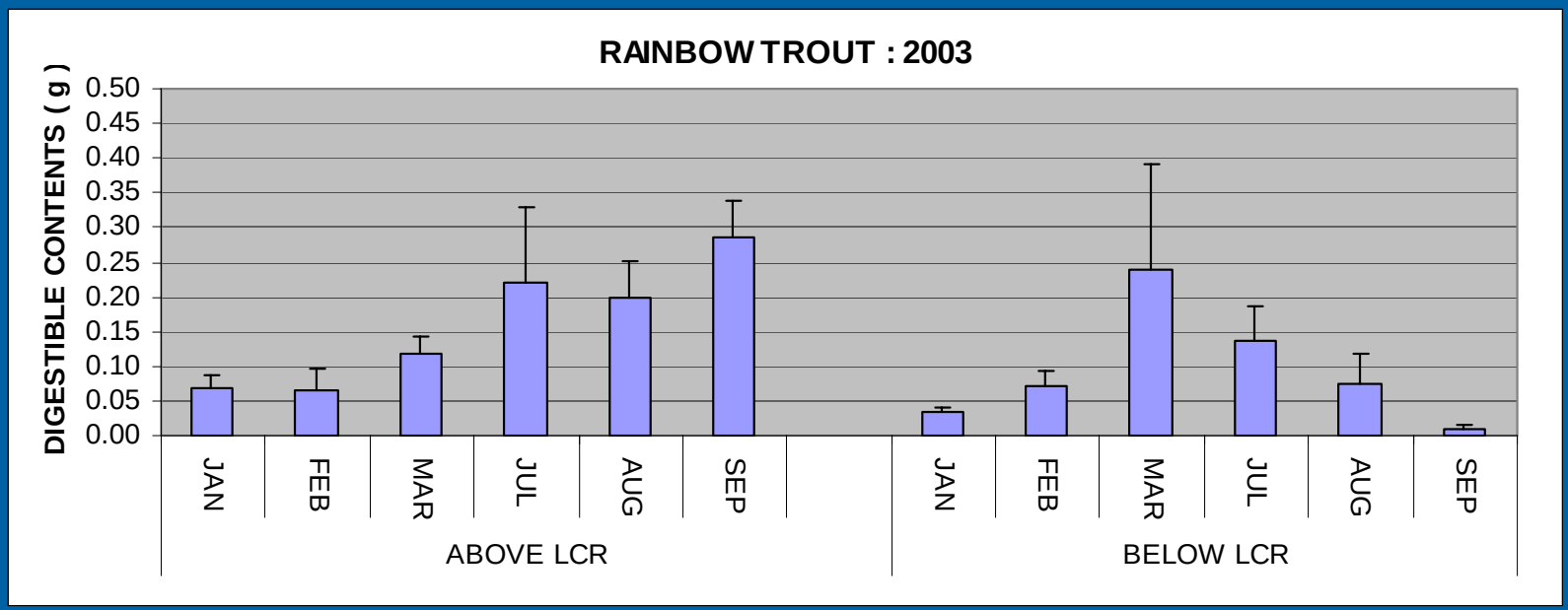
Rainbow Trout Diet





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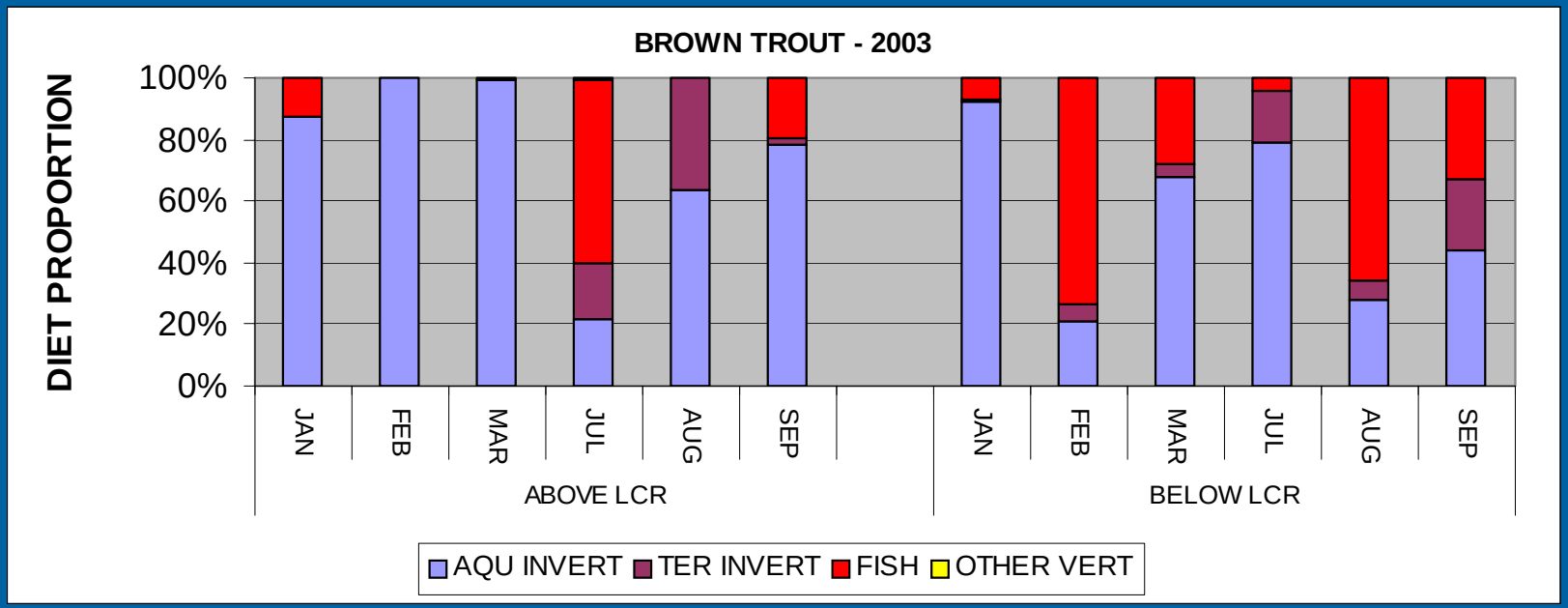
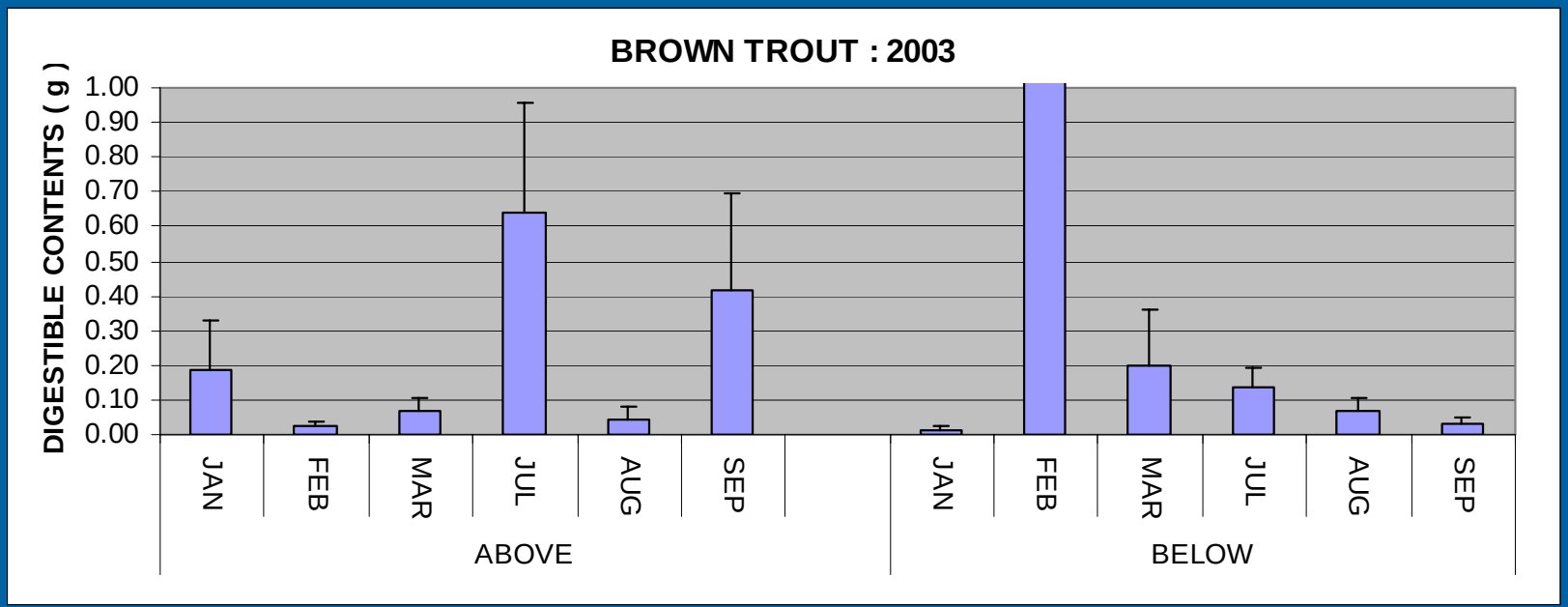
Brown Trout Diet





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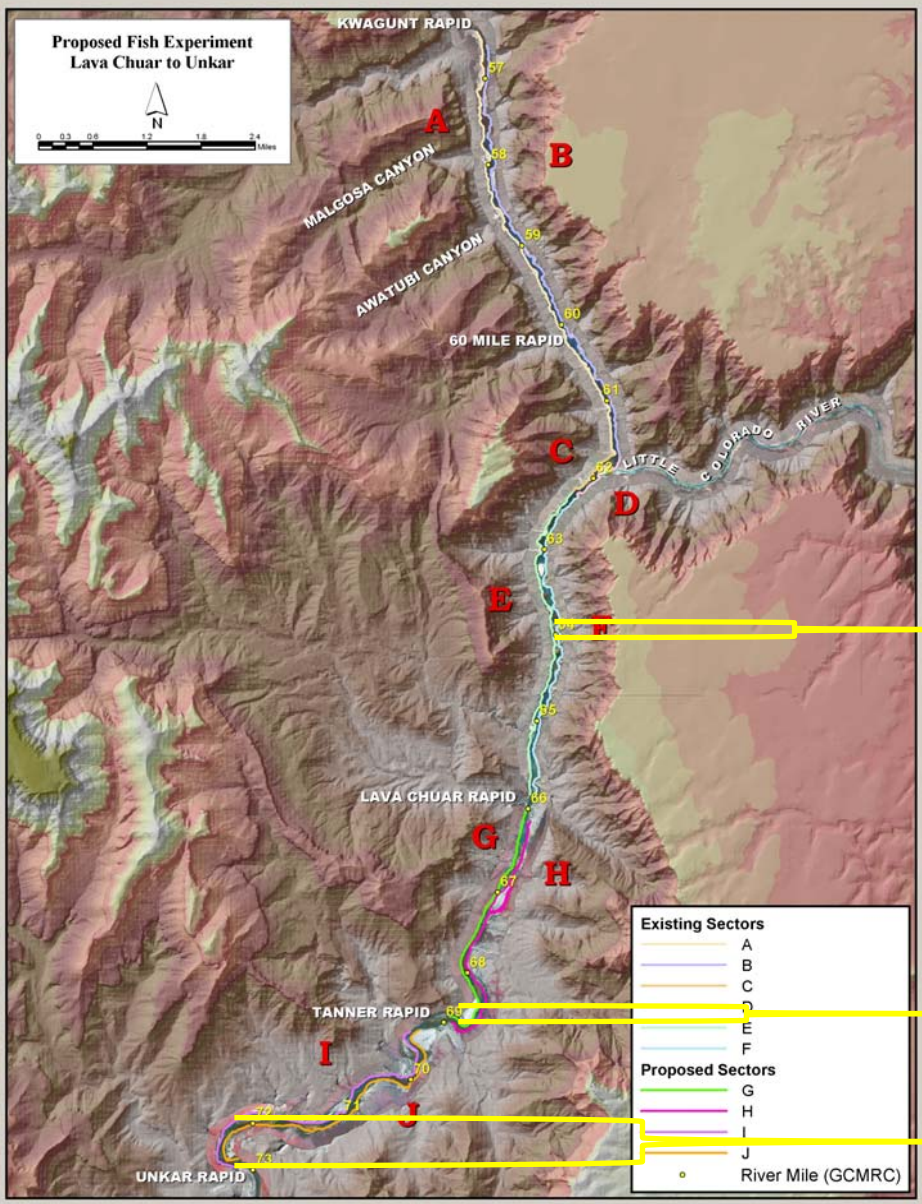
Hoopnet Sampling Reaches



Little Colorado River Inflow Hoopnet Sampling Reach

Tanner Hoopnet Sampling Reach

Unkar Hoopnet Sampling Reach

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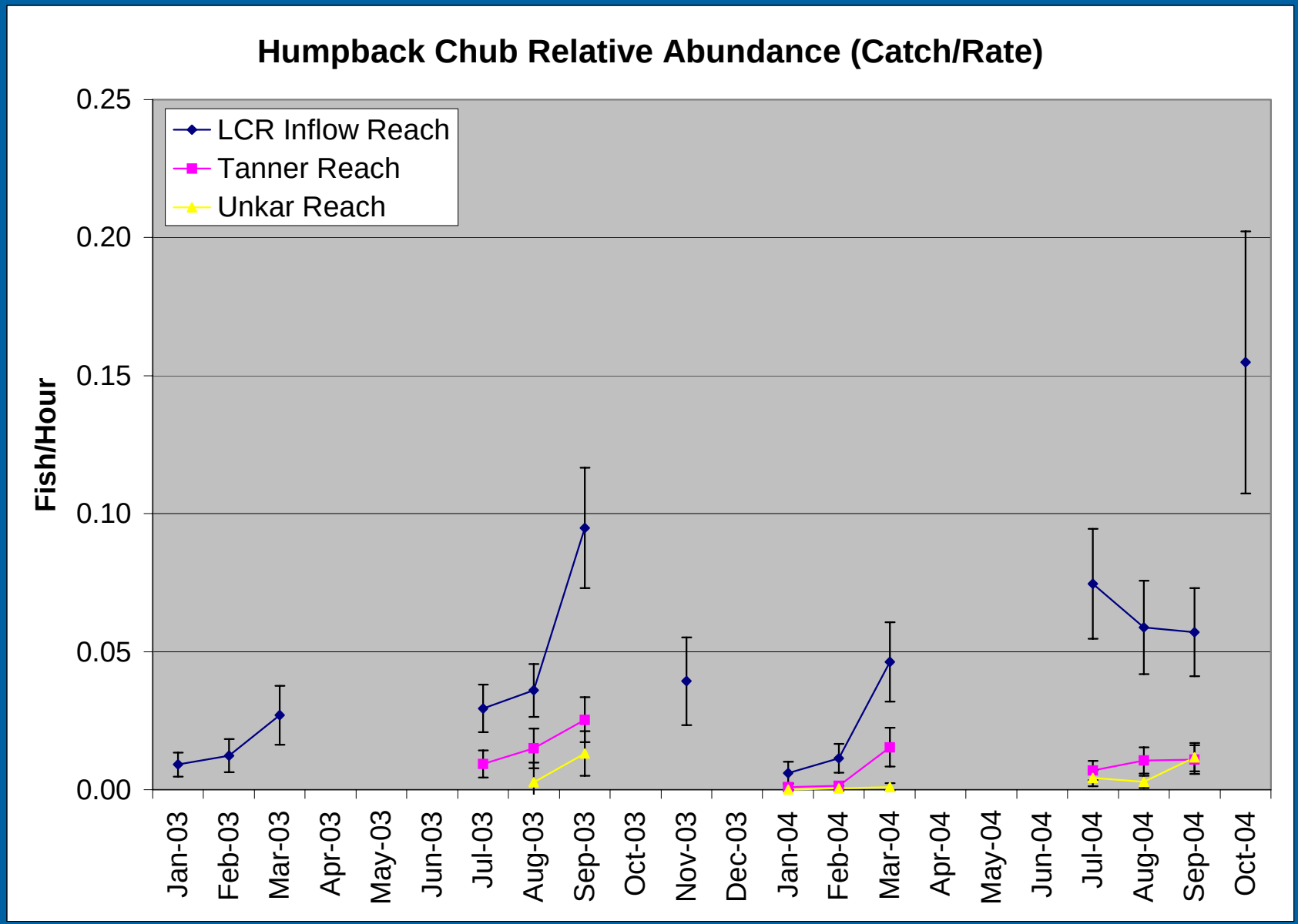
Hoopnet Sampling Results



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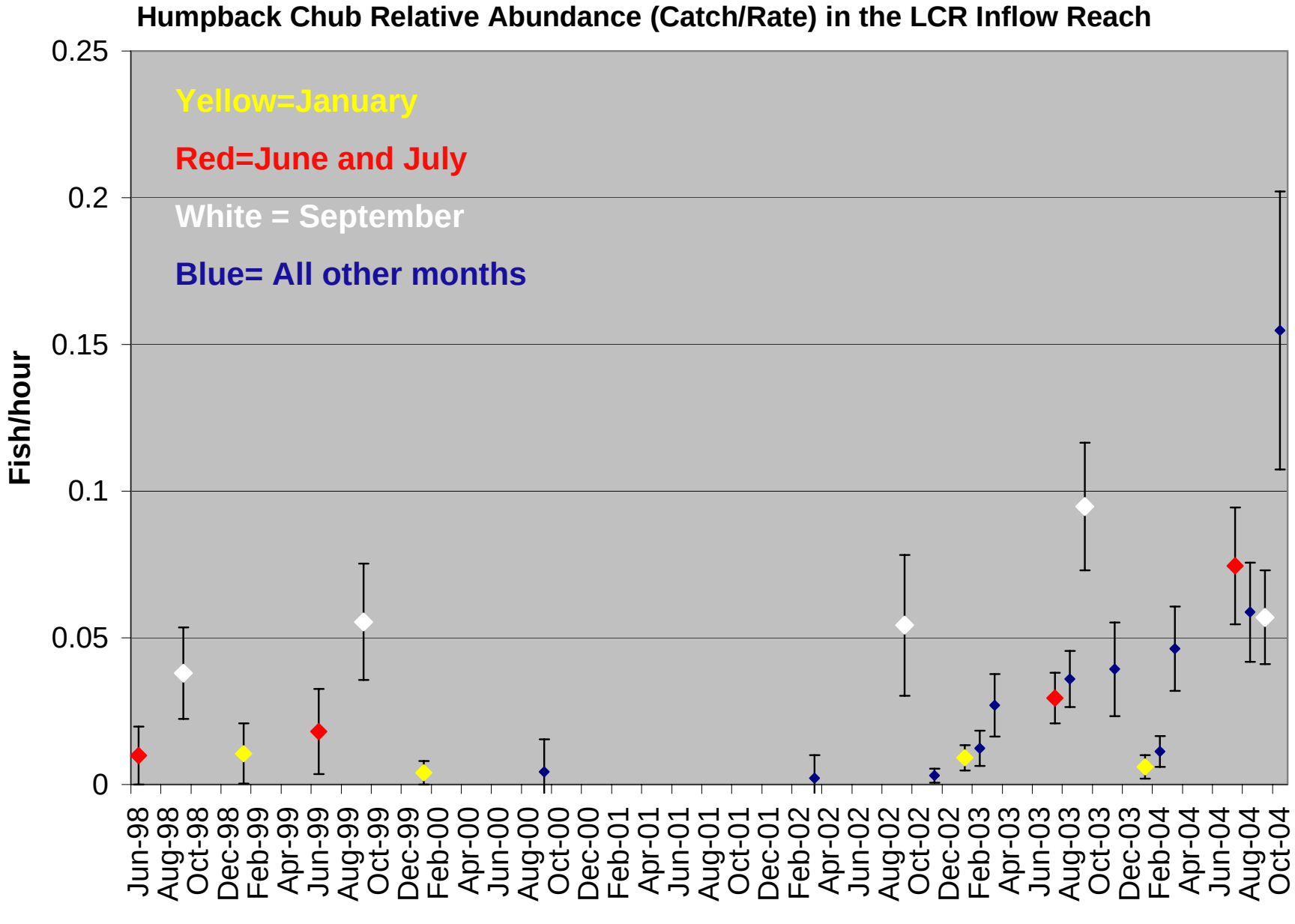
Hoopnet Sampling Results



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Additional Work

- Continue development of abundance estimator to incorporate turbidity
- Construct Jolly-Seber abundance estimator in Control Reach
- Complete Diet and Predation sample processing and analyses for 2004

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2003-04 Preliminary Conclusions

- Non-native Removal Efficacy
  - Reduction of non-native catch composition proportion from ~95% to ~65%
  - Continued persistent reduction of RBT to between 10% and 30% of January 2003 abundance.
- Diet and Predation
  - RBT Dominant Prey item aquatic invertebrates (Simulids, Black Flies)
  - Temporal and spatial changes in RBT diet
    - Increased terrestrial component in summer
    - Increased biomass consumed above the LCR
  - BNT dominant prey item variable (aquatic invertebrates and fish)
  - Temporal and spatial changes in BNT diet
    - Increased terrestrial component in summer
    - Less piscivorous above the LCR (likely related to native fish abundance below the LCR)
    - Highly variable total biomass consumed related to composition of fish

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2003-04 Preliminary Conclusions

- Effect of Non-Native Removal on Humpback Chub Population Dynamics
  - Relative abundance assessments (hoopnetting catch-rate) no substitute for stock assessments to determine recruitment. Assessment of 2003 cohort will require 2006 and 2007 monitoring data.
  - However, largest relative abundance of juvenile humpback chub observed in last 6 years occurred in Fall 03 and Fall 04. Additionally, FMS and BHS displaying overall positive trends in relative abundance.
  - Biggest hurdle in ultimately determining cause of any possible recruitment signal in native fish is lack of a long term experimental design. We must adopt a design that utilizes contrasting treatments associated with non-native control, dam operations, and water temperature.
    - Examples of Confounding Factors:
      - Unanticipated increase in water temperature associated with low reservoir level
      - Variability in LCR juvenile HBC production
      - Variability in timing, magnitude, and duration of LCR flooding
      - Potential adverse affect of 2004 experimental high flow (see next talk)

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