Humpback chub in the Colorado River: Status and Trends of Aggregations, Changes in Range

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OUTLINE:

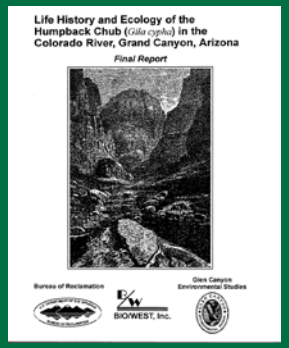
- Aggregation criteria
- Aggregation locations
- Chub with eggs
- Translocations
- Trends in relative abundance
- Long term monitoring

USGS

Aggregation:

"a consistent and disjunct group of fish with no significant exchange of individuals with other aggregations, as indicated by recapture of PIT-tagged juveniles and adults and movement of radio-tagged adults"

(Valdez and Ryel, 1995).



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What characterizes an aggregation?

1. No significant exchange of individual chub with other aggregations.
2. Persistence of the same individuals within an aggregation (site fidelity).
3. Presence of chub in spawning condition.

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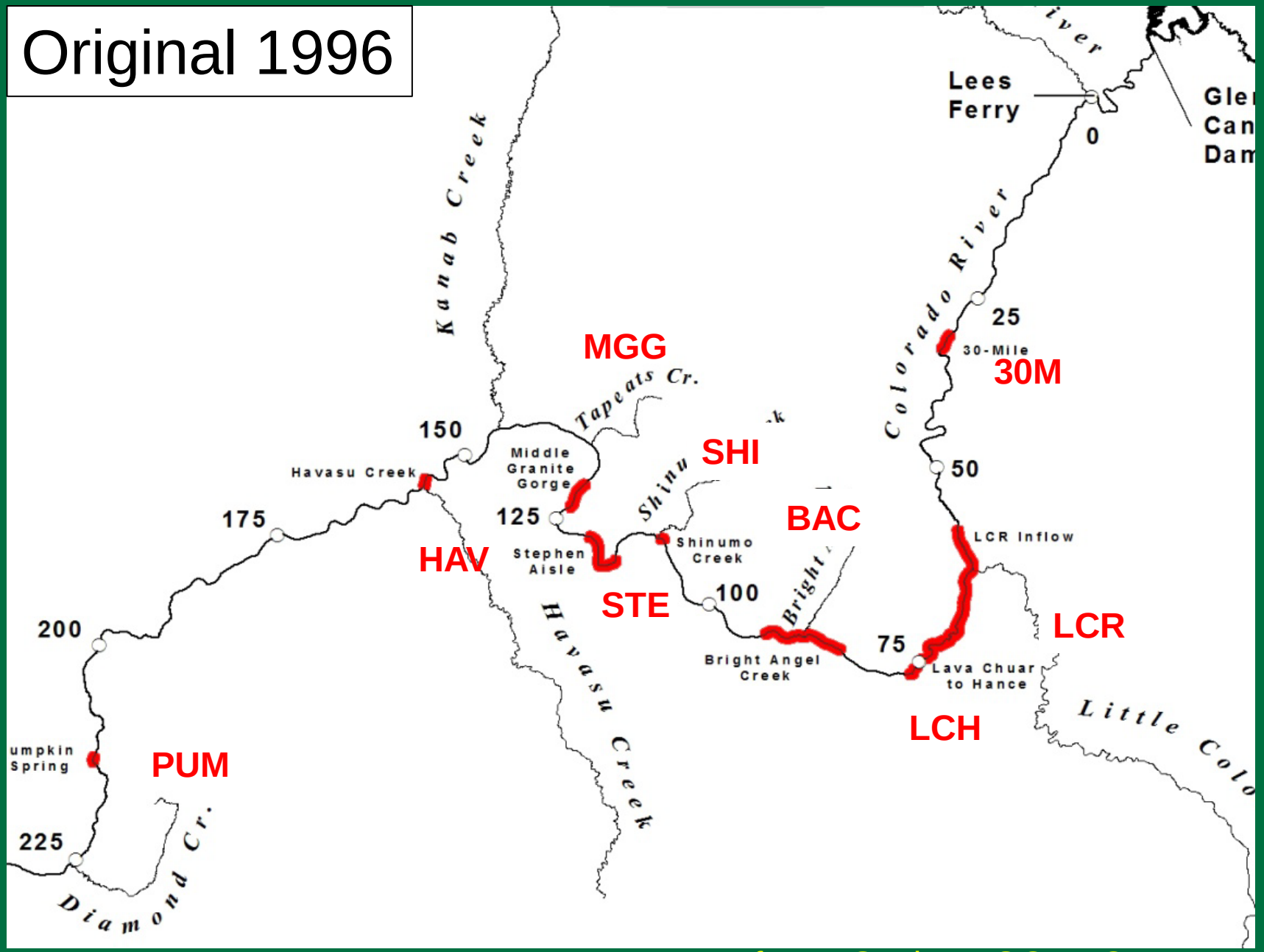
Original 1996



Map courtesy of Tom Gushue, GCMRC

Humpback chub exchange 1989-2014

		LOCATION RECAPTURED									
Location Marked	N Marks	30M	LCR -In	LCR	BAC	SHI	STE	MGG	HAV	PUM	Site Fidelity
30M	162	**43**	0	1	0	0	0	0	0	0	89%
LCR-Inflow	6250	7	**1417**	2449	0	0	1	1	1	0	40%
LCR	48941	4	1815	**21413**	1	1	1	1	3	0	91%
BAC	33	0	3	5	**0**	0	0	1	0	0	0%
SHI	1233	0	2	8	0	**139**	3	6	0	0	93%
STE	98	0	0	1	0	1	**1**	1	0	0	19%
MGG	370	0	1	8	0	2	2	**68**	0	0	85%
HAV	1492	0	3	5	0	0	0	1	**64**	0	91%
PUM	41	0	0	0	0	0	0	0	0	**3**	100%
Total	58620	54	3241	23890	1	143	8	79	68	3	

PRELIMINARY DATA, SUBJECT TO REVISION, DO NOT CITE

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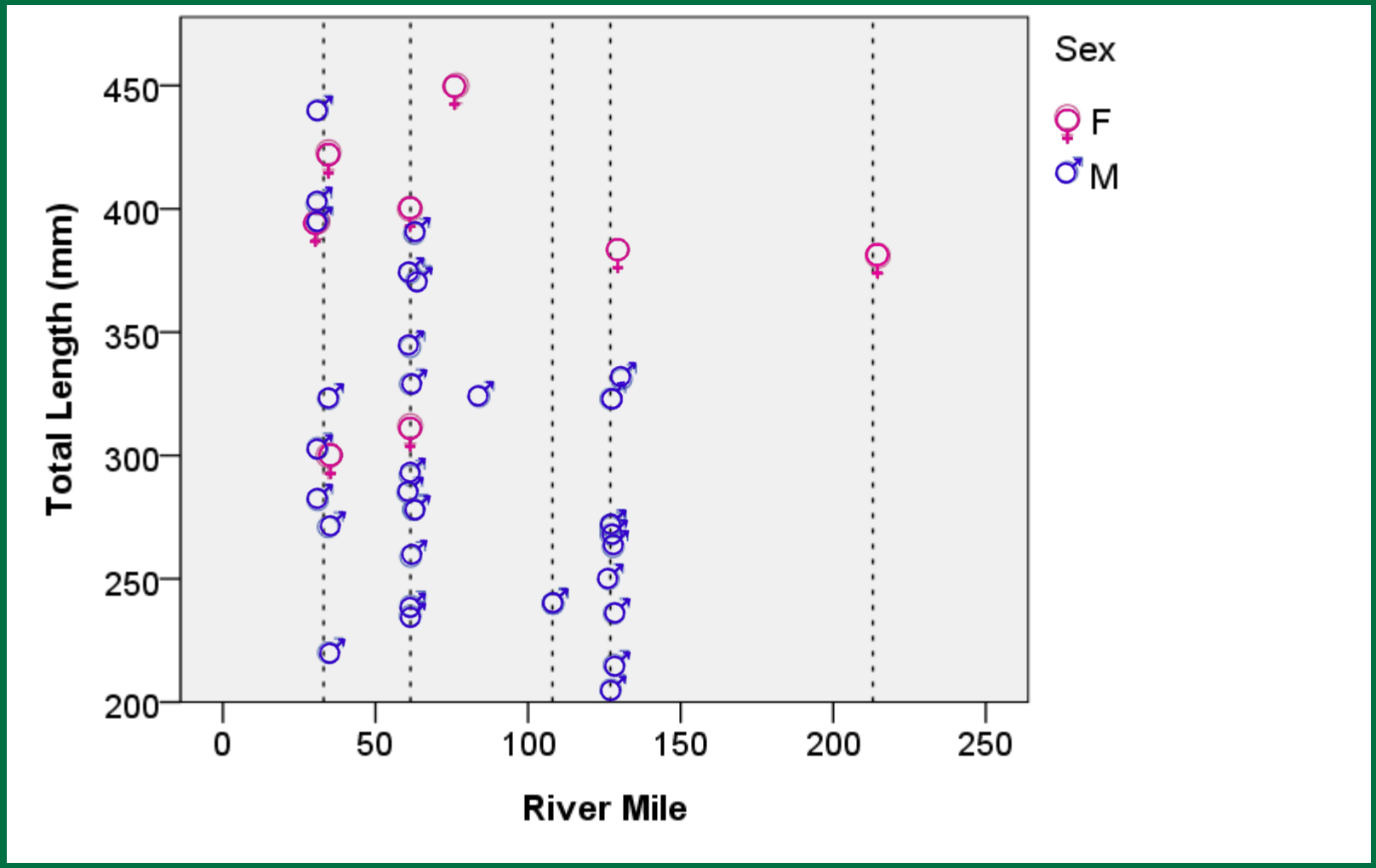
Gravid humpback chub locations



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Scorecard

Location	No significant exchange	Site fidelity	Ripe Adults	
30M	✓	✓	✓	
LCR	✓	✓	✓	
BAC	✗	✗	✓	
SHI	✓	✓	✓	
STE	✗	✗	✗	
MGG	✓	✓	✓	
HAV	✓	✓	✓	
PUM	✓	✓	✓	

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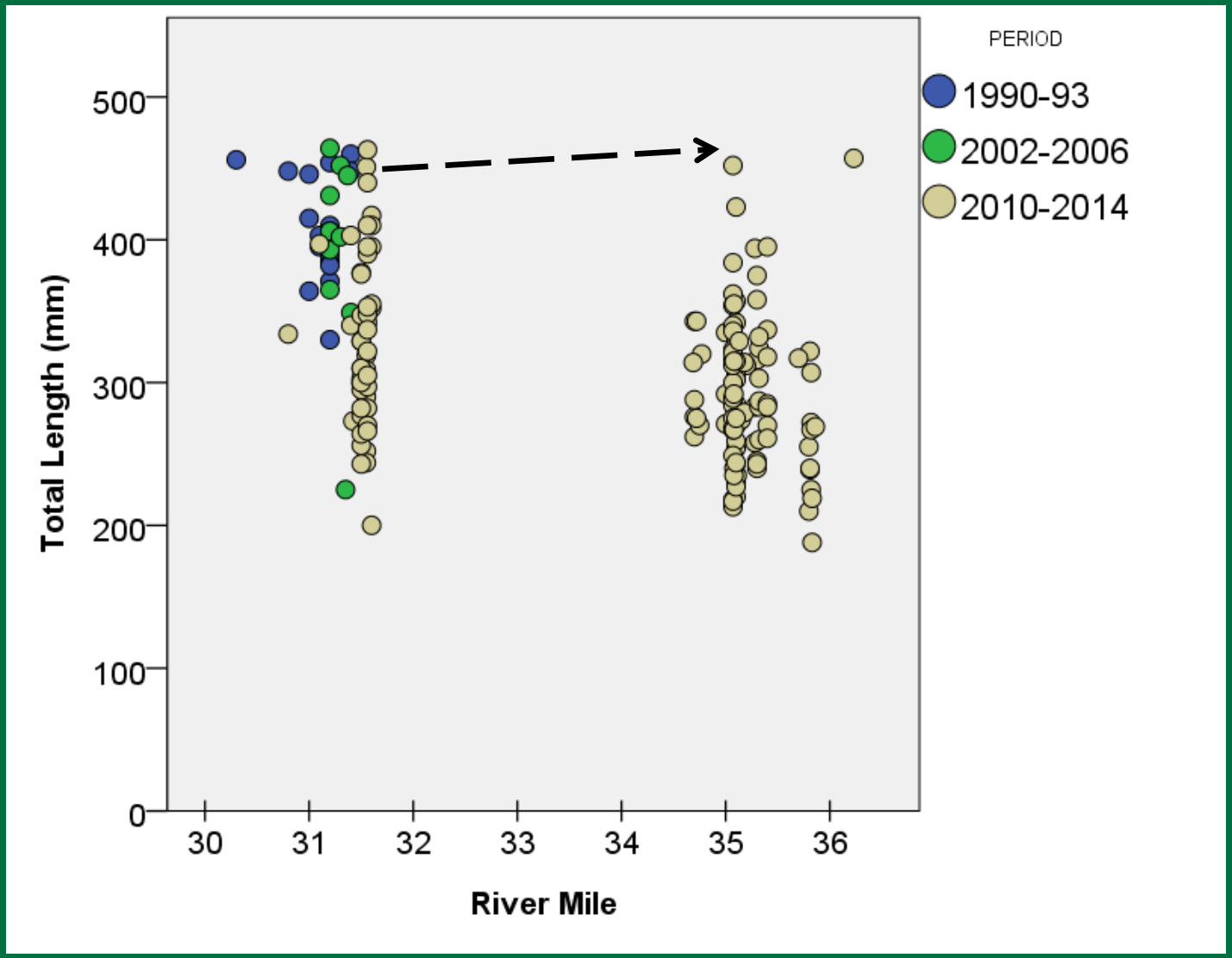
30 Mile: expansion/discovery



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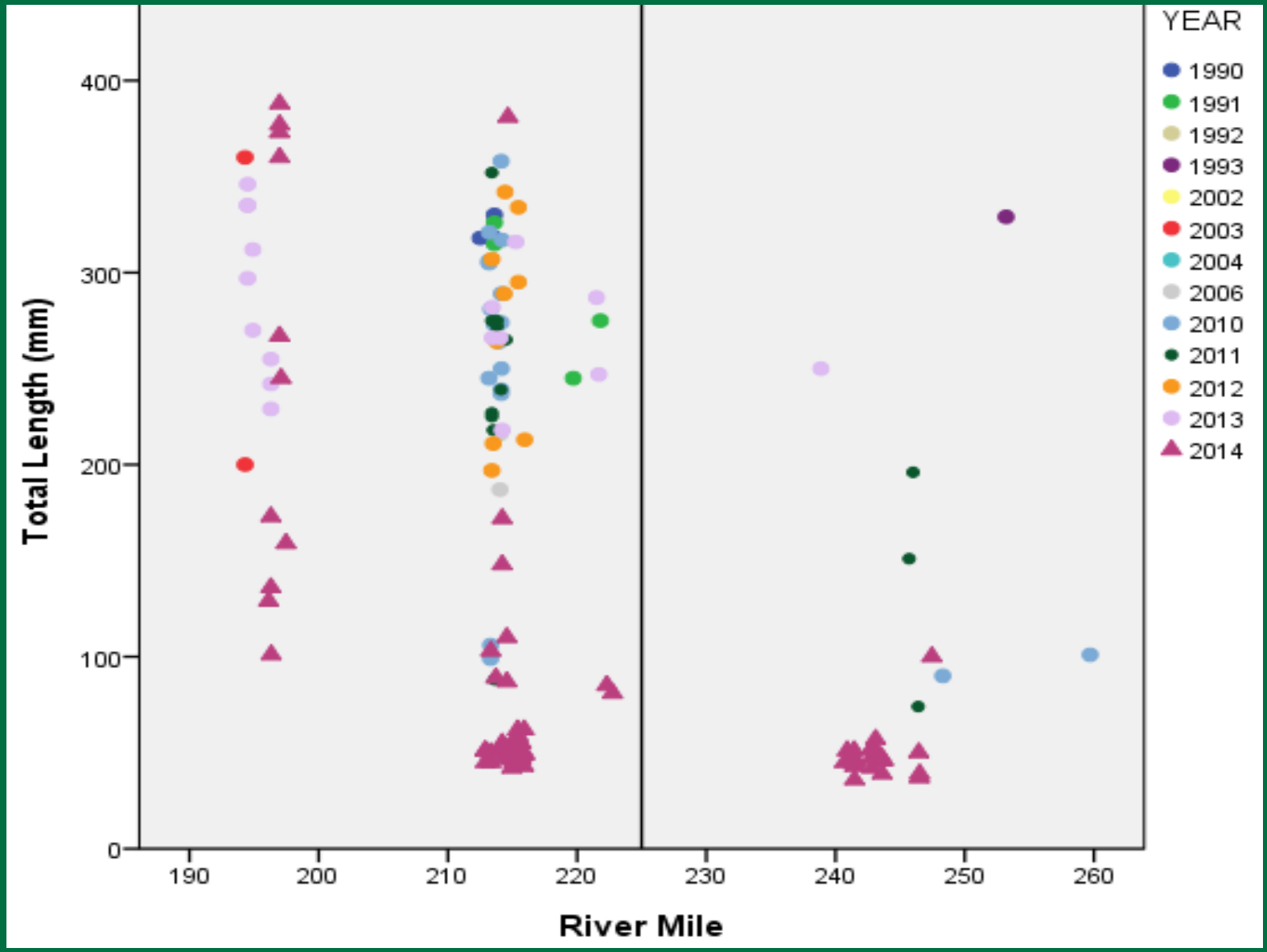
Diamond Down Expansion



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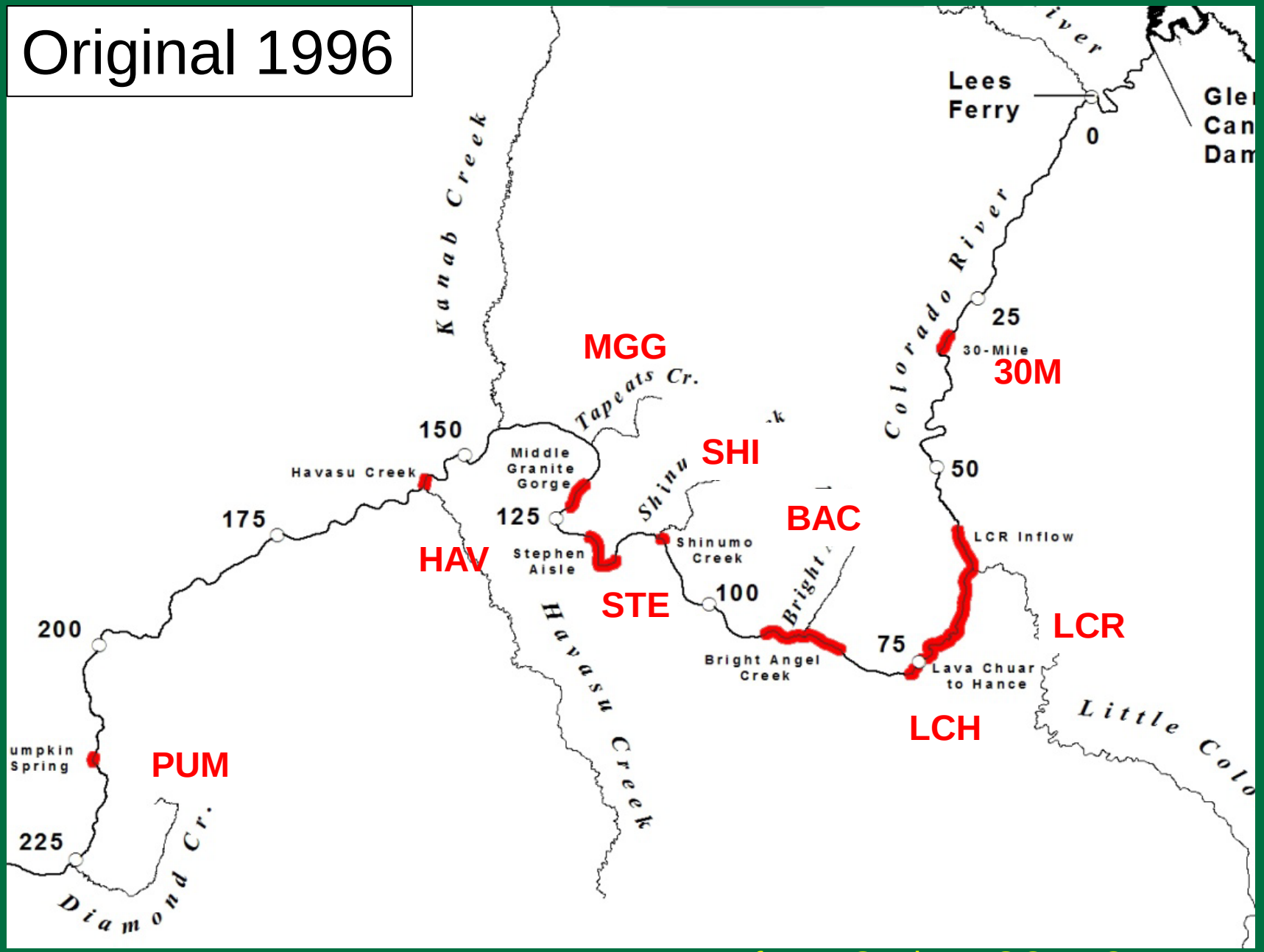
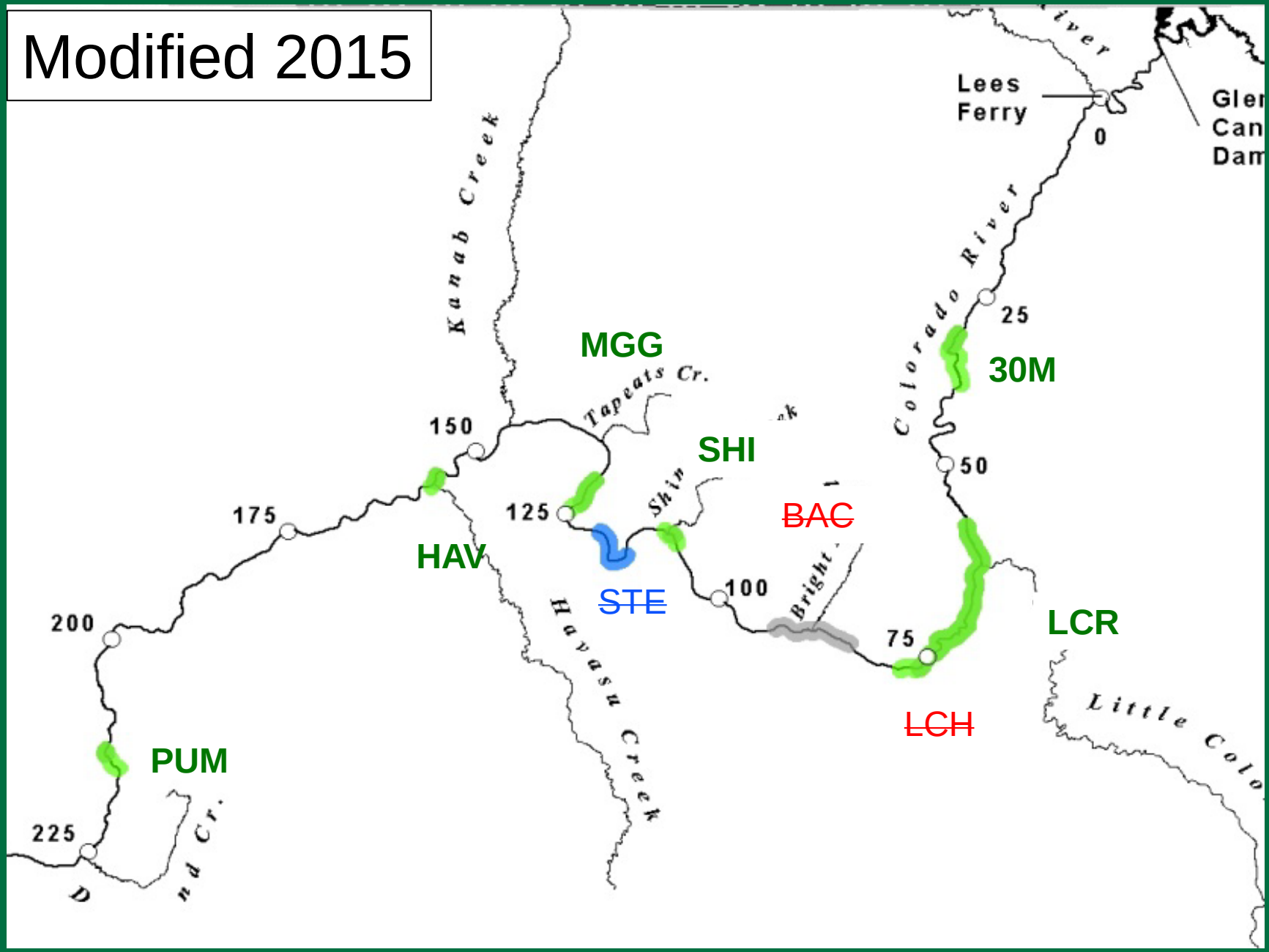
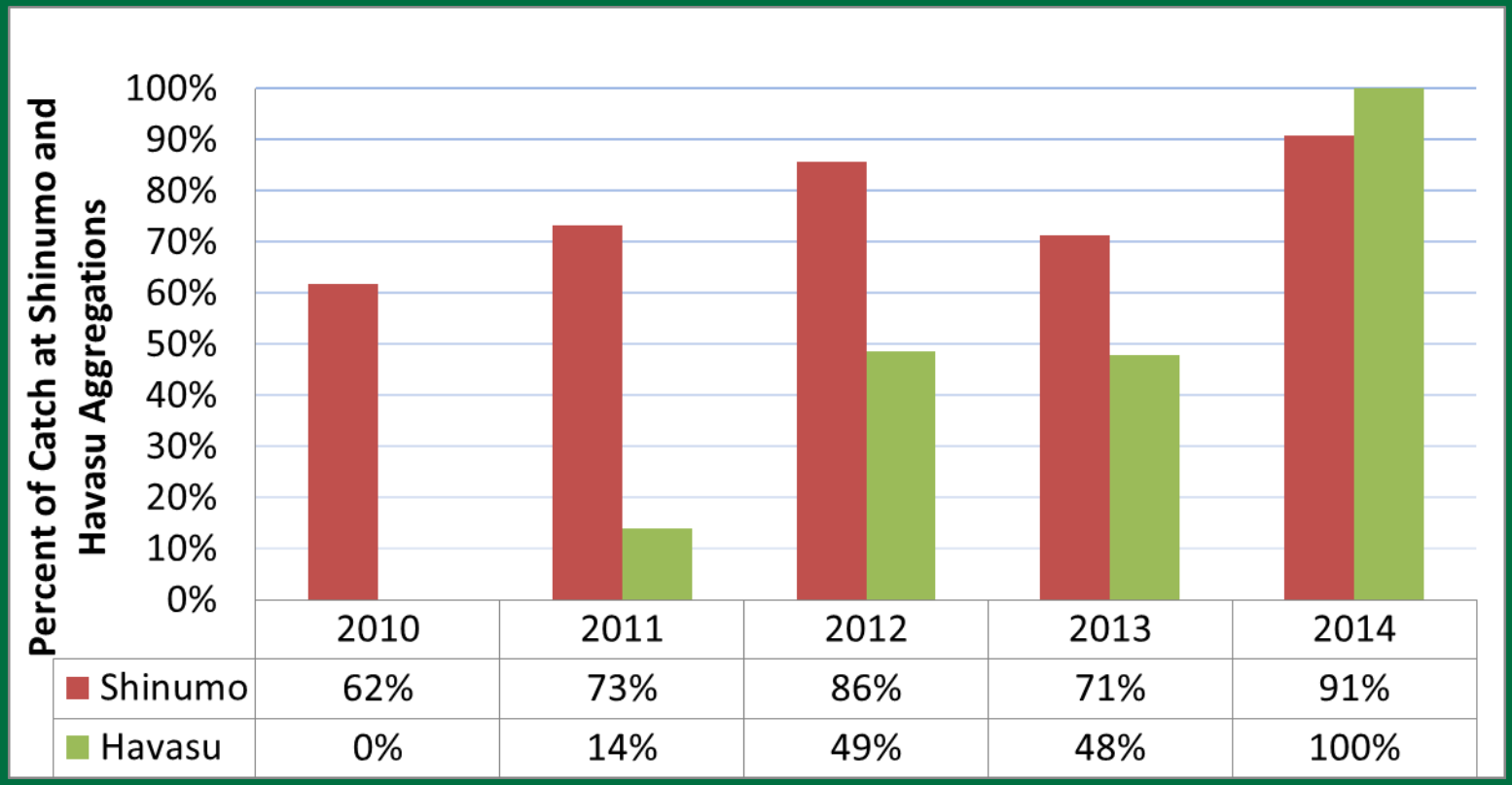
Original 1996



Map courtesy of Tom Gushue, GCMRC


Modified 2015
Lees Ferry
0
25
50
75
100
125
150
175
200
225
Kanab Creek
Tapeats Cr.
Shinumo Creek
Havasu Creek
Colorado River
Little Colo
MGG
30M
SHI
BAC
HAV
STE
LCR
LCH
PUM

Translocations contribute to mainstem



	2010	2011	2012	2013	2014
Shinumo	62%	73%	86%	71%	91%
Havasu	0%	14%	49%	48%	100%

Cumulative number of fish translocated

Shinumo	599	899	899	1099	1099
Havasu	0	243	541	841	1350

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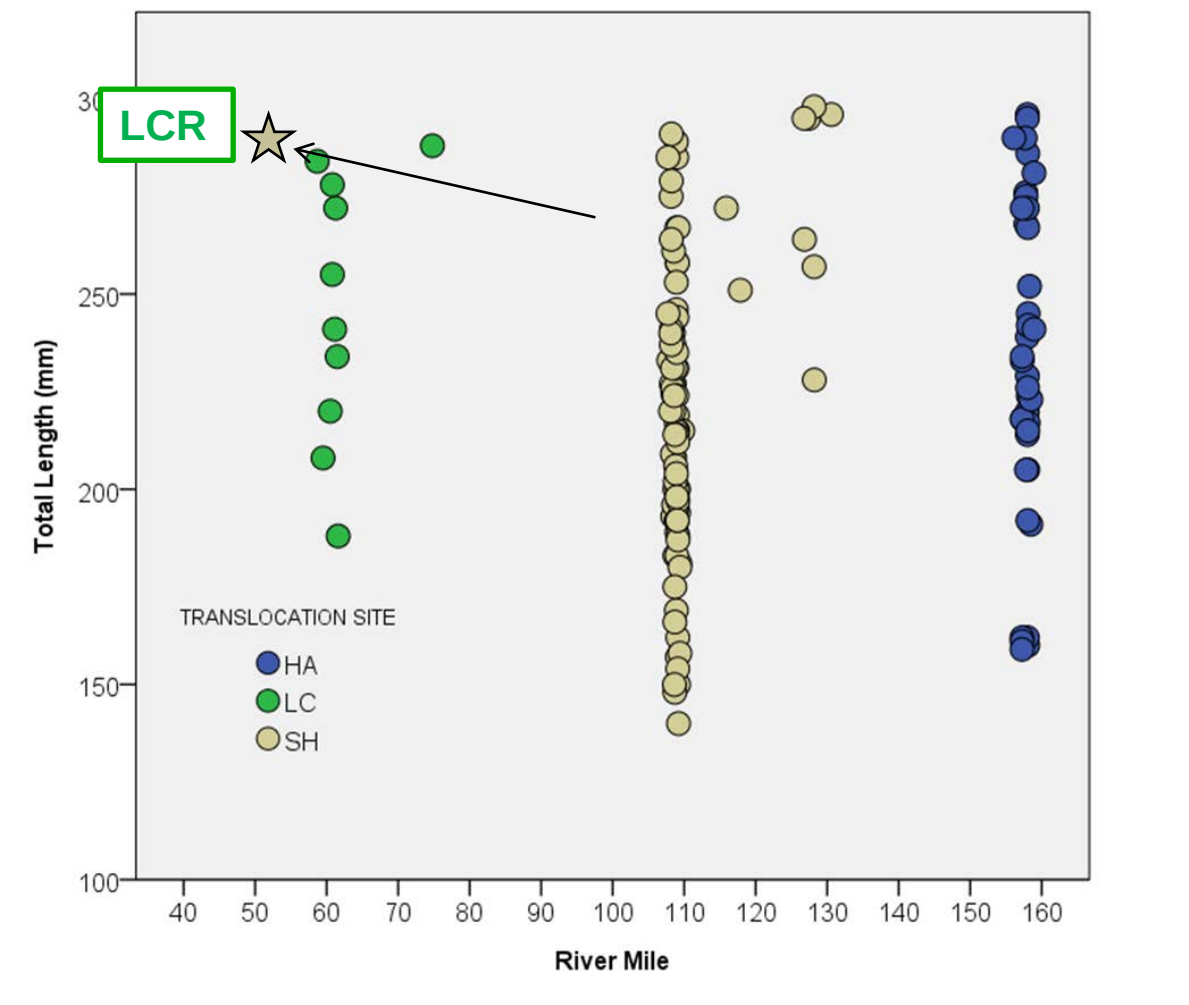
Where do translocated fish go?



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Modeling CPUE with GLMs

- Generalized Linear Models (GLMs)
  - Handle catch (count) and effort data
  - Allow for model comparison with AIC

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Modeling CPUE with GLMs

- Generalized Linear Models (GLMs)
  - Handle catch (count) and effort data
  - Allow for model comparison with AIC

- **Period:** (1991 – 1993), (2002 – 2006), (2010 – 2014)
- **Location:** 5- mile sections of river
- **Aggregation:** Is a location an aggregation?
- **Year:** Sampling year

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Modeling CPUE with GLMs

Model	ΔAICc	K
Gear + Period + Location + LCR Inflow : Period	0	23
Gear + Period + Location	4.24	21
Gear + Year + Location	12.84	31
Gear + Period + Aggregation + LCR Inflow	18.32	7
Gear + Year + Aggregation + LCR Inflow	27.2	17
Gear + Period + Aggregation	32.94	6
Gear + Year + Aggregation	40.46	16
Gear + Location	64.66	19
Gear + Aggregation + LCR Inflow	74.39	5
Gear + Aggregation	80.17	4
Gear + Period + LCR Inflow	116.07	6
Gear + Year + LCR Inflow	132.61	16
Gear + LCR Inflow	173.61	4
Gear + Period	177.26	5
Gear + Year	191.11	15

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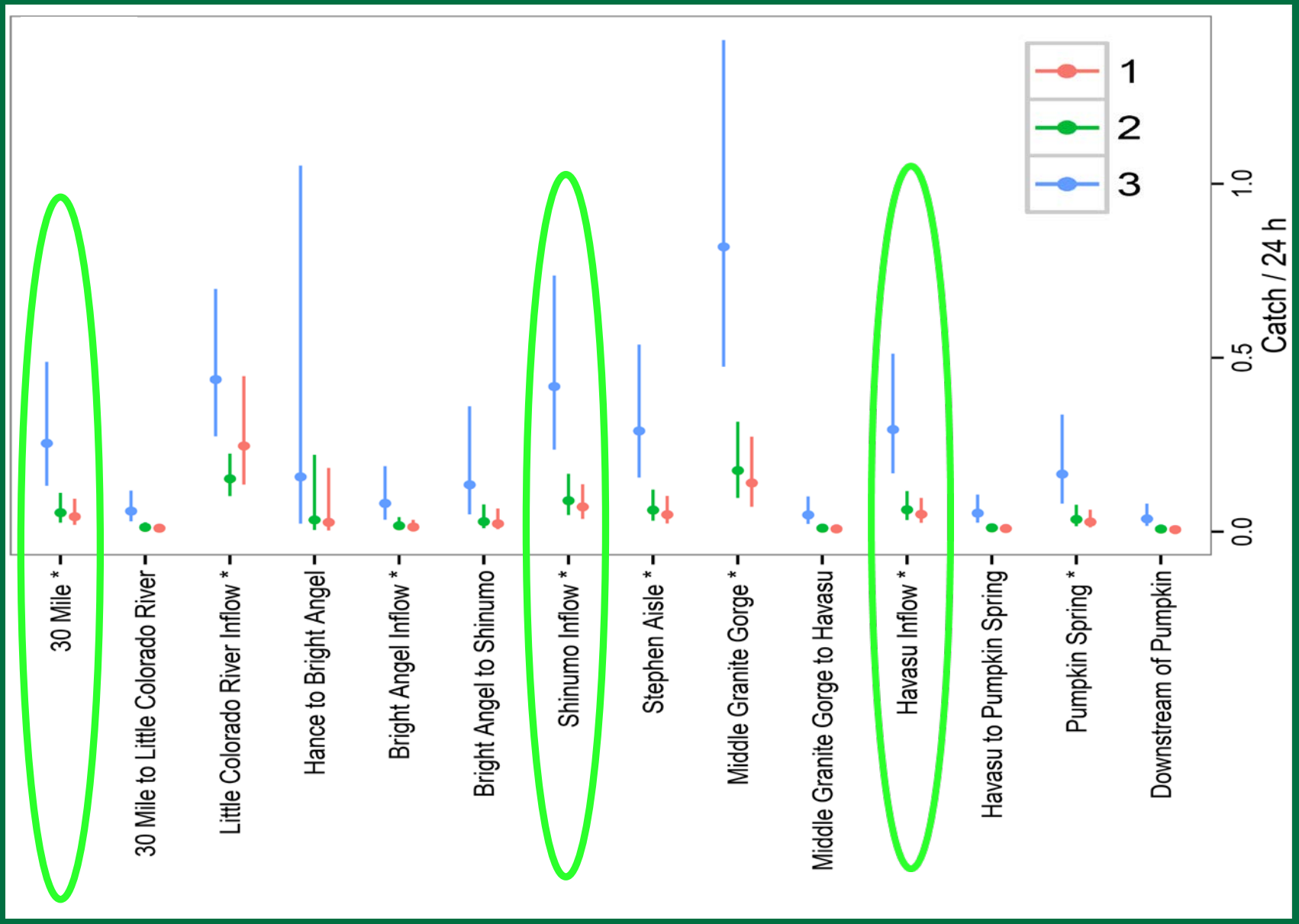

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Antennas

Pilot Project 2014

Trip	Chub
July	73
September	98

- @ $2,400
- 6 - 7 d battery life
- >10-in read range

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Increasing abundance and distribution:

- Warmer than normal water during 2004, 2005, 2011, 2014
- Translocations
  - Shinumo and Havasu Creeks
- Mechanical trout removal at LCR confluence 2003-2006, 2009
- Good production of humpback chub from Little Colorado River
- We find humpback chub where we look for them

USGS

Long term monitoring

Baited hoop nets

Seines

Antennas

Sample widely

USGS

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