Bird Predation on Juvenile Salmonids of the Yakima River

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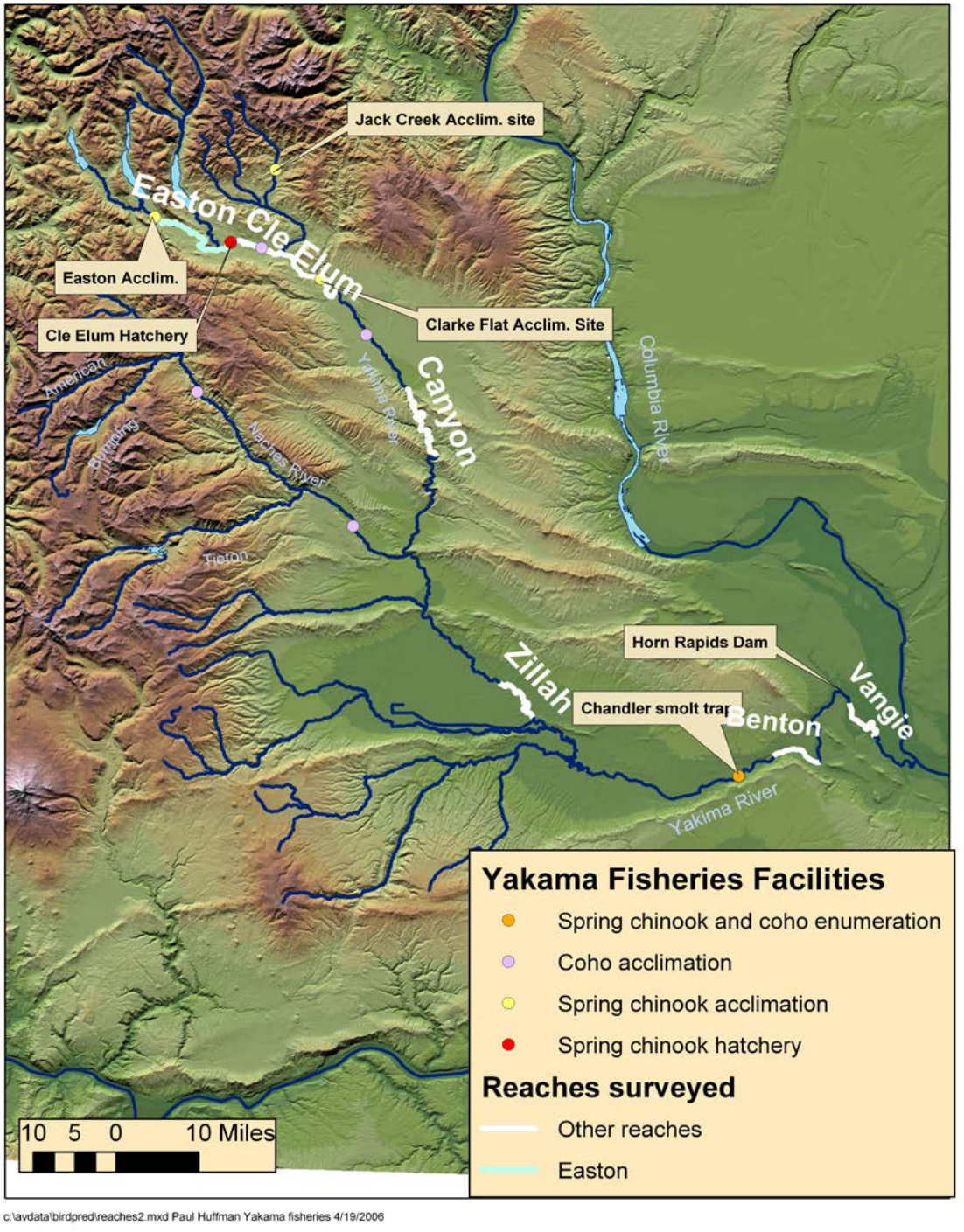
Does avian predation constrain salmon restoration on the Yakima River? How many smolts are consumed by birds?

Surveys since 1997:

River reaches (model)
Hotspots (model)
Acclimation sites

River Reach Surveys:

- All reaches: spring, 2x/month
- Upper/Middle reaches: summer, 4x/month.
- All piscivorous birds counted: birds/km

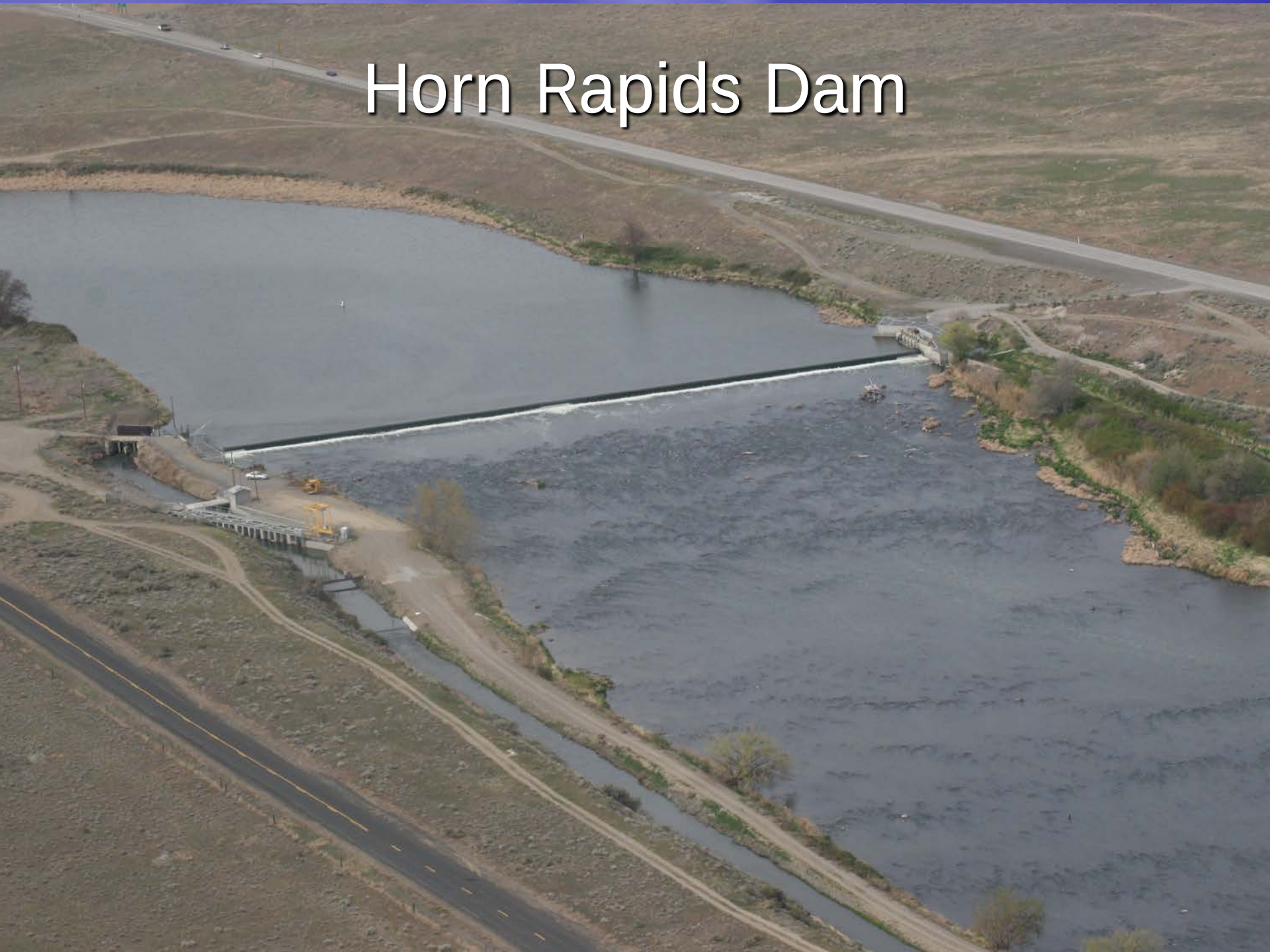


Hotspot Surveys

- 3 x/week: AM/PM
- Monitor gull fishing success:
  - 2 hr windows: 15 minute blocks – feeding intervals.
- Counts of pelicans, other avian piscivores.

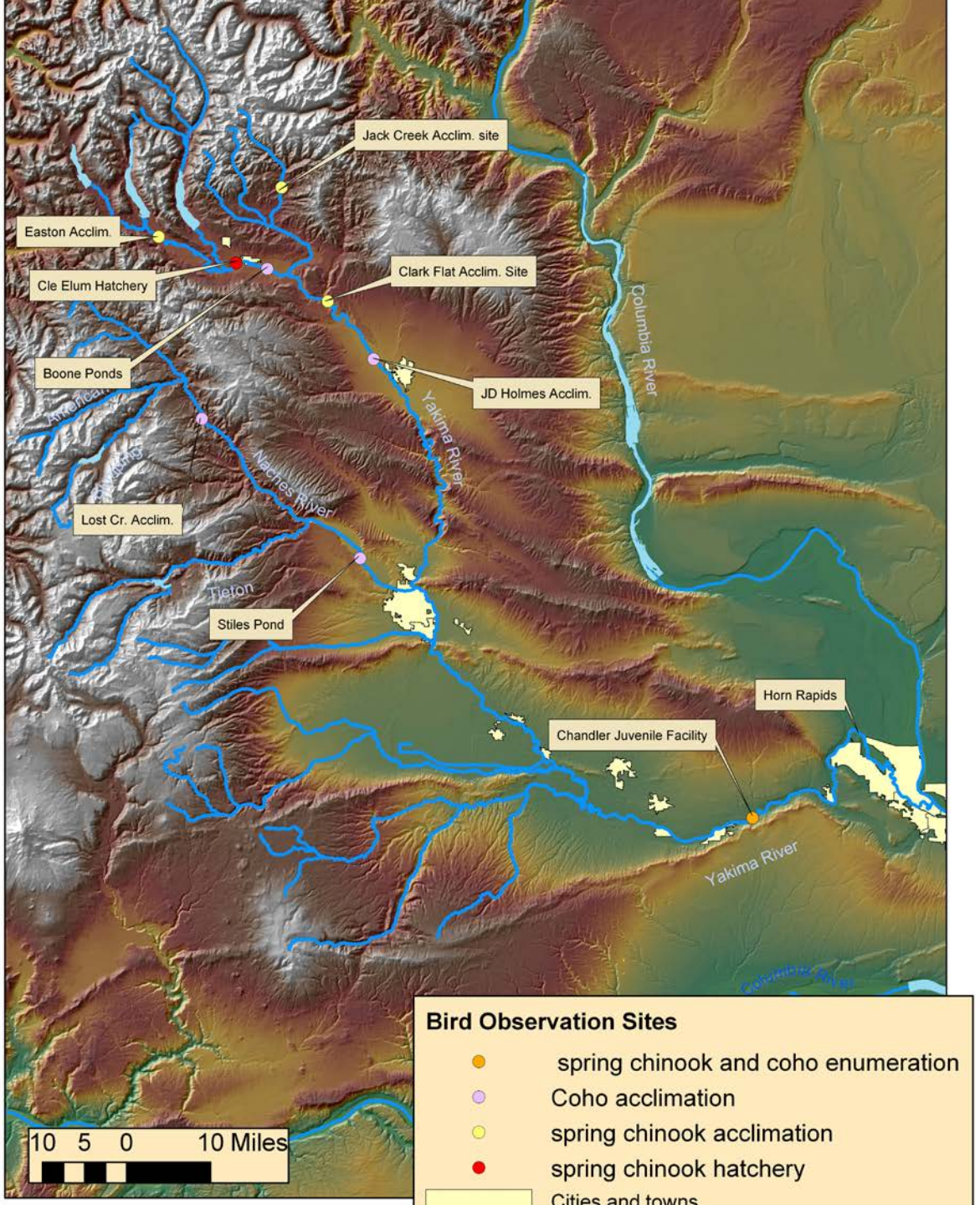

Chandler Fish Bypass

Horn Rapids Dam



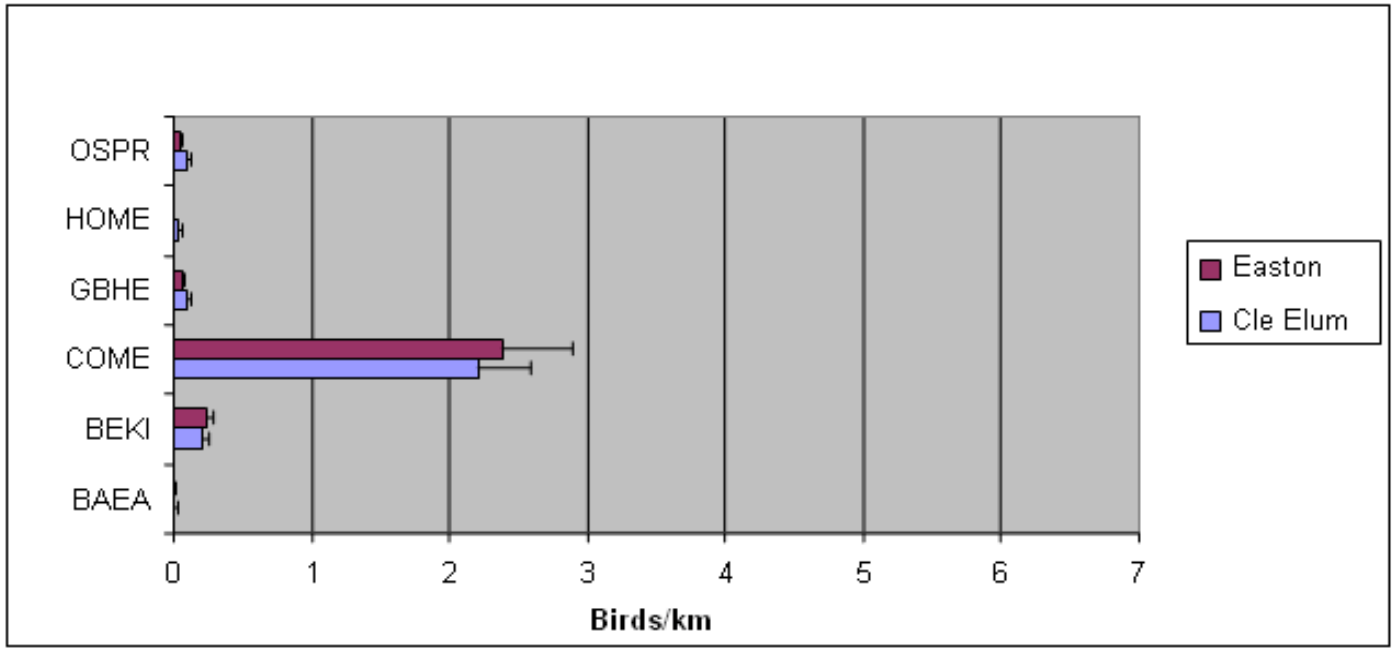
Smolt Acclimation Site Surveys

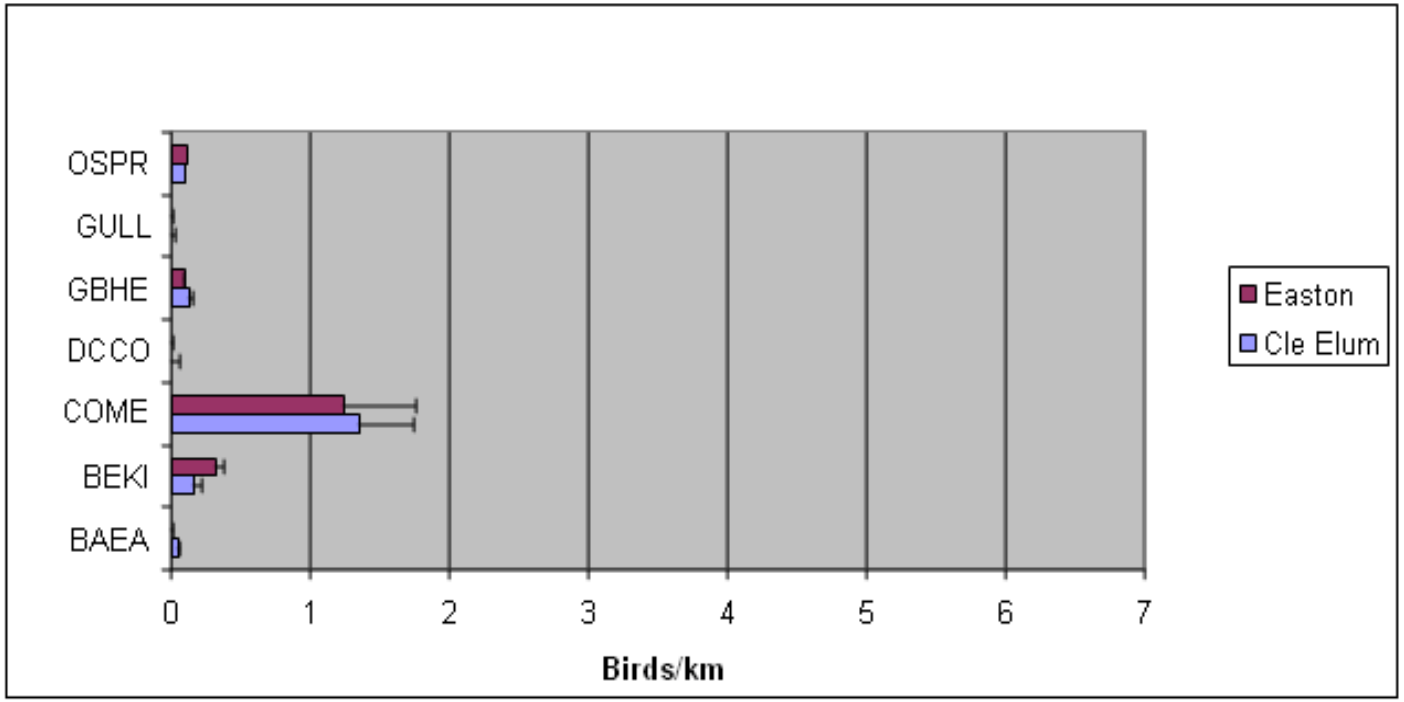
(3 spring chinook, 4 coho)



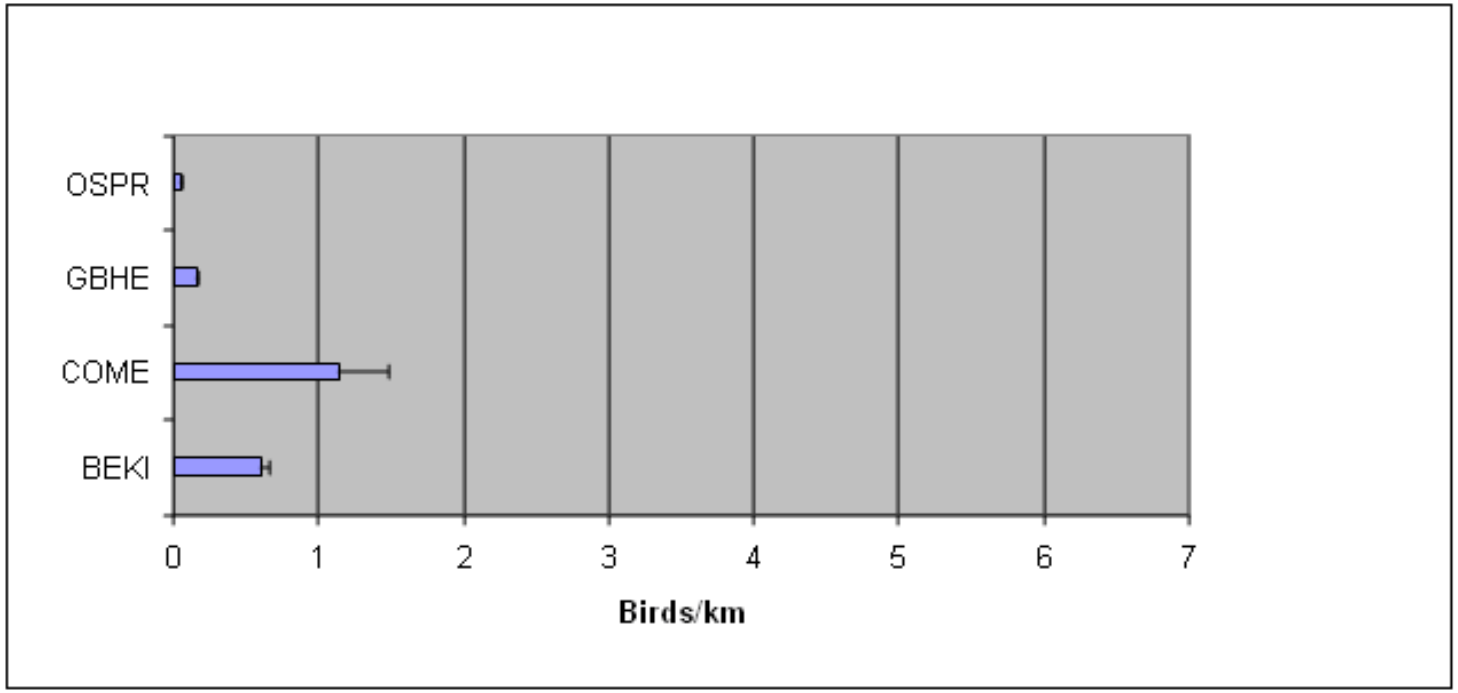
Reach Survey Results:

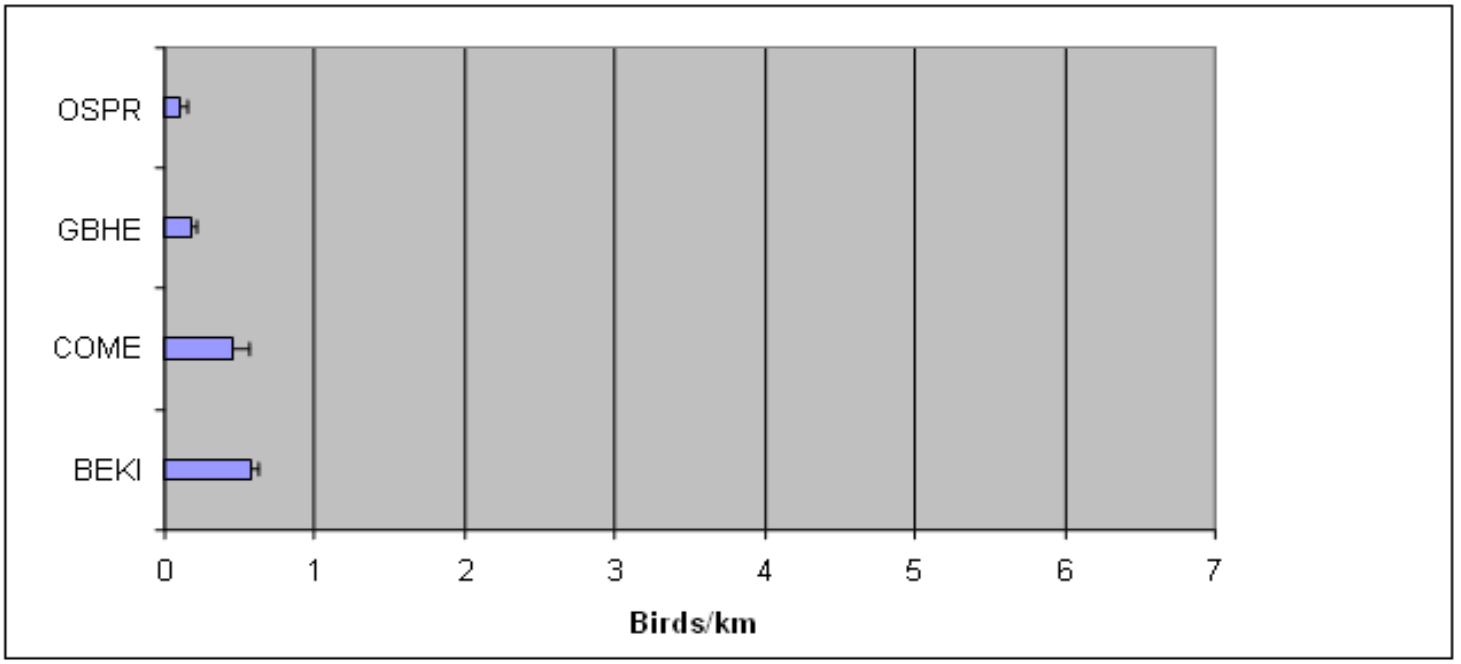
Upper River



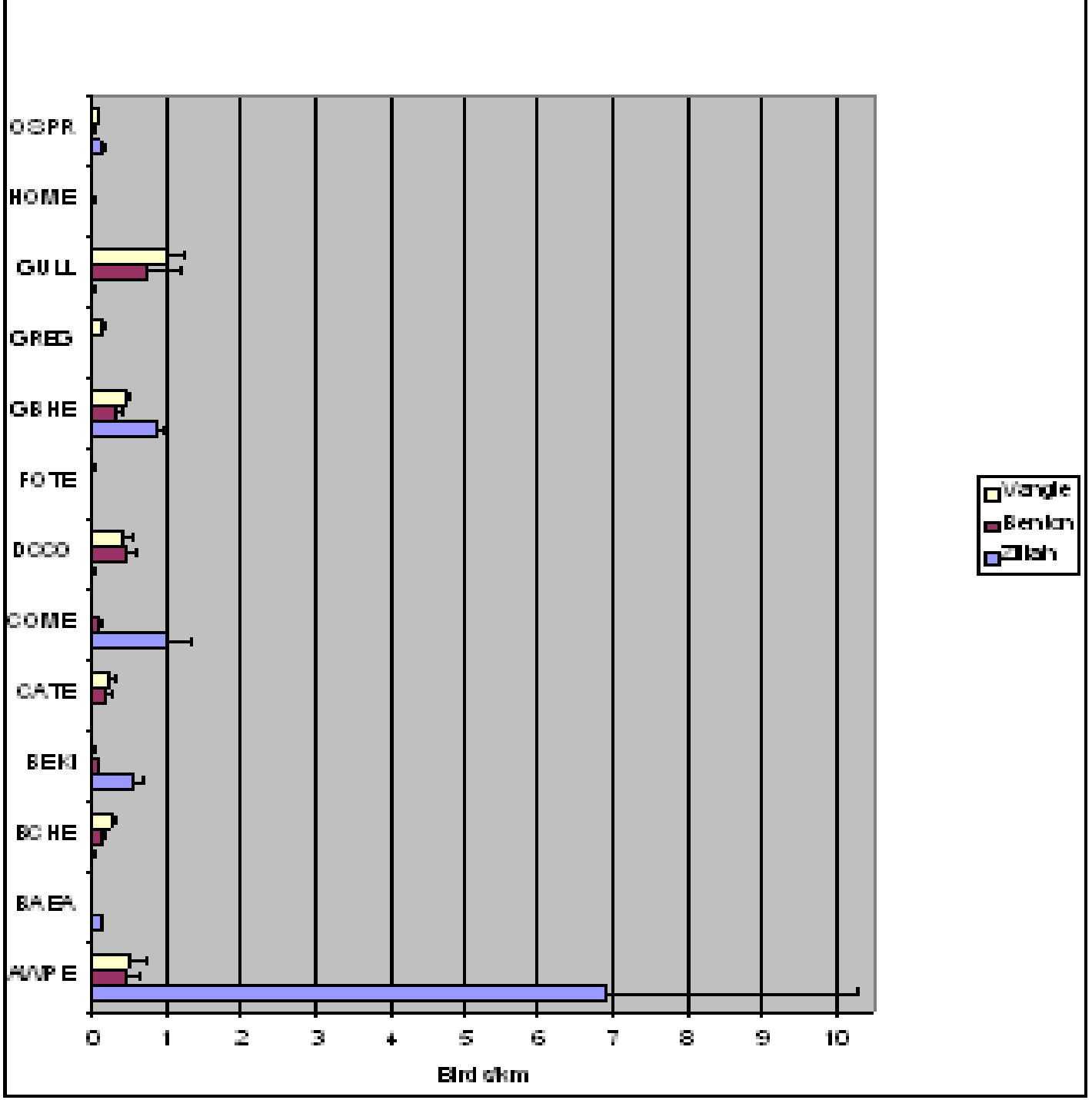


Middle River





Lower River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River Reach Model:

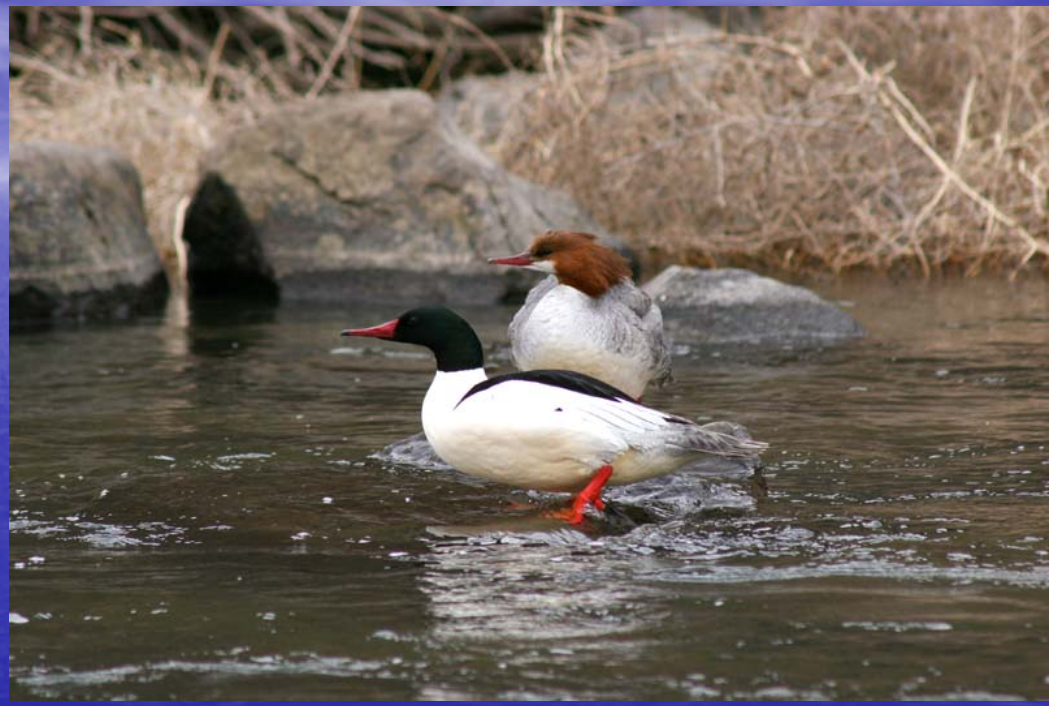
- Mergansers consume:
  - 93% of fish biomass taken by birds in the Upper River in spring, 87% in summer.
  - 84% of fish biomass taken by birds in the Middle River in spring, 56% in summer.
  - <5% of fish biomass taken by birds in the Lower River in spring.
- Pelicans consume:
  - 83% of fish biomass consumed by birds in the Lower River in spring.
  - *73% of total fish biomass taken by all birds in the entire river in spring.*

River Reach Model:

- If Mergansers consumed only smolts they could take:
  - 46% of the hatchery and wild spring chinook and hatchery coho smolt biomass in the Upper and Middle River.
- If Pelicans consumed the entire hatchery production of Lower River fall chinook and coho smolts they would satisfy only:
  - 22% of their biomass requirements.

Challenges to river reach model assumptions:

- Mergansers eat a wide variety of small fish (i.e. sculpin, chiselmouth).



- Pelicans often feed on sucker, carp, and other species.

Smolt Acclimation Site Survey results:

- Belted Kingfisher, Great Blue Heron & Common Merganser – low numbers of fish taken at most spring chinook and coho sites in 2004-2005.

- One exception: Boone – estimated 20,600 and 24,300 coho smolts taken by Common Mergansers in 2004-2005.

Hotspot Survey results:

- Chandler: site dominated by pelicans.
  - 57 birds/day, down from 73 birds/day in 2004.

- Horn Rapids: site dominated by gulls.
  - 6 birds/day, down from 11 birds/day in 2004.

Gull Consumption estimates:

- 672 smolts taken at Chandler, down from 11,977 in 2004.
- 18,436 smolts taken at Horn Rapids, down from 100,873 in 2004.
- Downward trend since 2002 (high of 279,500 total smolts consumed).

Pelican Consumption estimates at Chandler:

- 6,582 kg fish biomass in 2005.
  - Represents 18.5% of the estimated salmon smolt biomass passing Chandler (worst case scenario).
- 9,637 kg fish biomass in 2004.
  - Represents 29.5% of estimated salmon smolt biomass passage at Chandler (worst case scenario).

What would these pelican consumption estimates equate to?

- Nearly 800,000 fall chinook, 30,000 spring chinook, 16,000 coho & 1,300 steelhead in 2005.

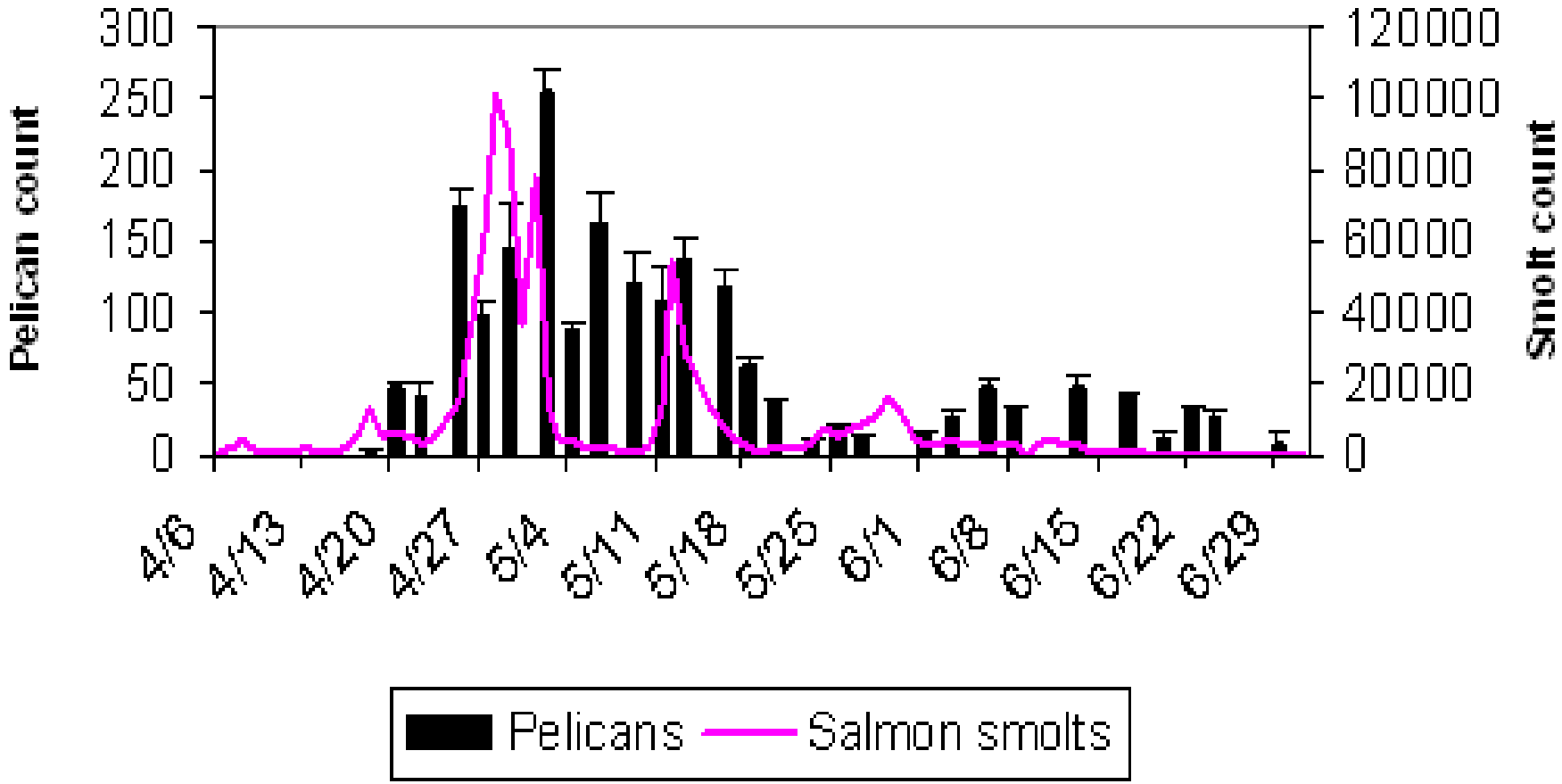
- 1.3 million fall chinook, 63,000 spring chinook, 17,000 coho & 1,700 steelhead in 2004.

Challenges to assumptions of high pelican consumption estimates:

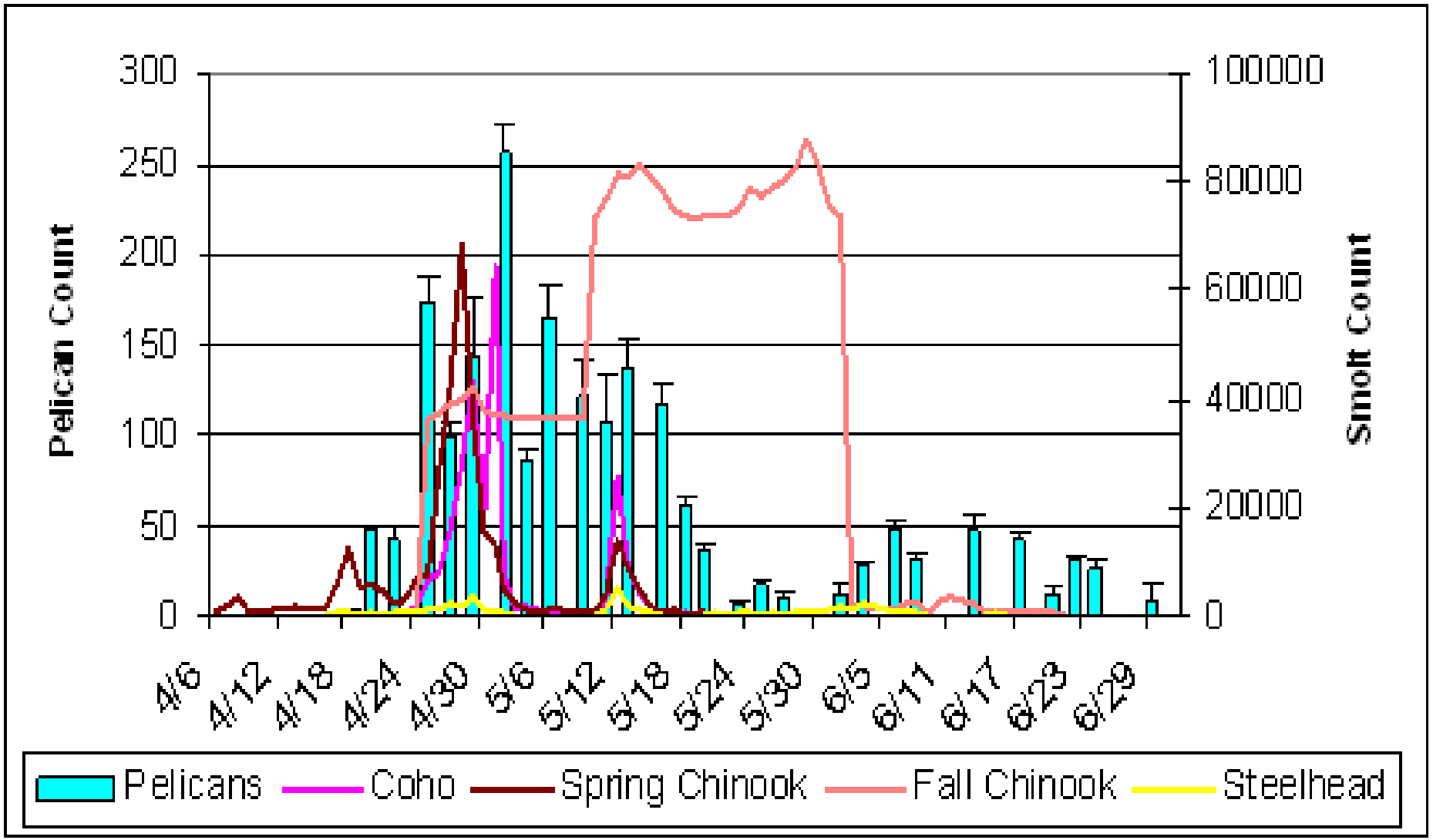
- Fall chinook weighing ~7 g appear to be too small to be readily consumed.

- Observations of pelicans taking large non-salmonids from Chandler pipe.

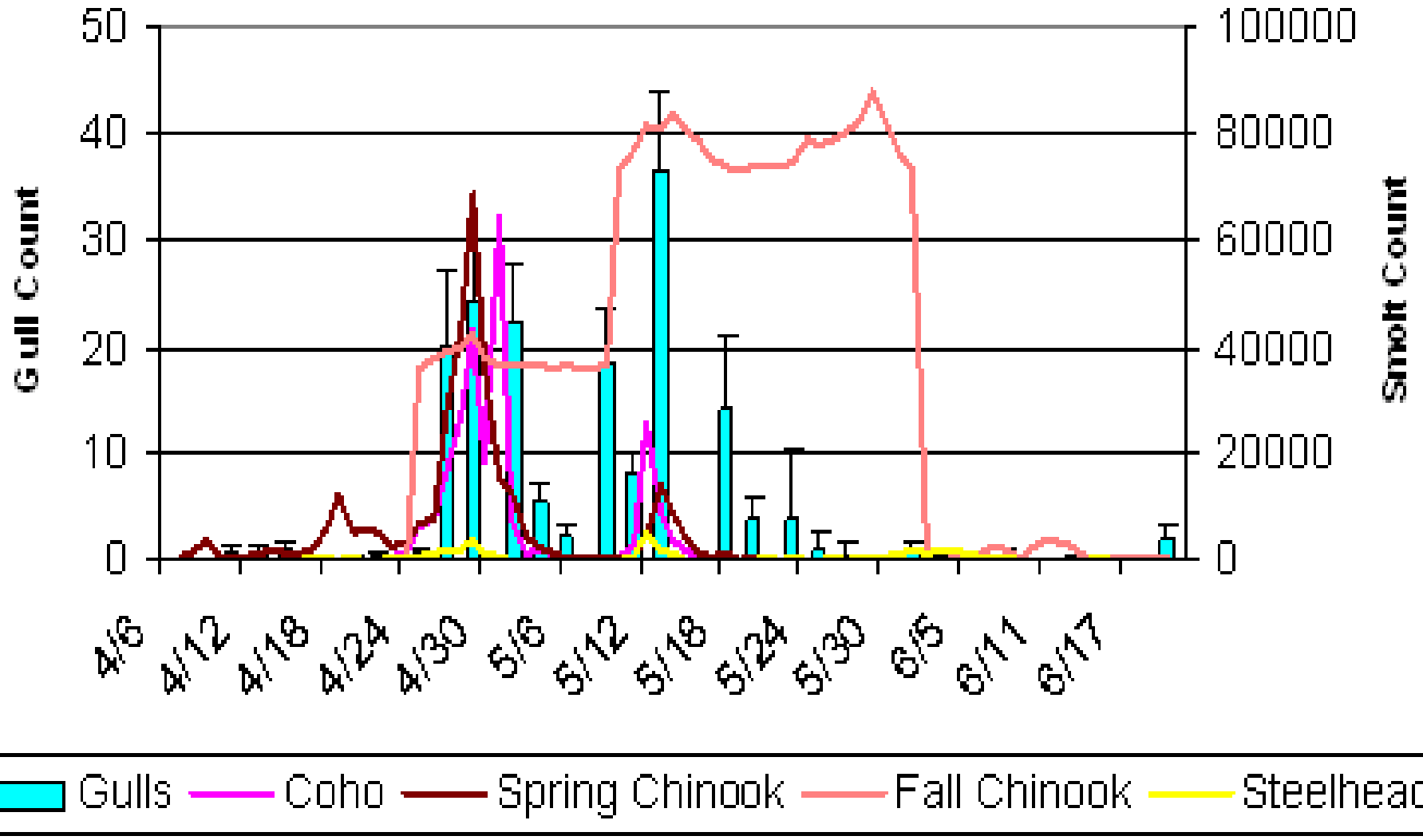
Smolt – Pelican count correlations



Smolt – Pelican count correlations



Smolt – Gull count correlations



	Pelicans (Chandler)	Gulls (Hom
Wild Spring Chinook		
2004	-0.412	-0.198
2005	0.221	0.250
Hatchery Spring Chinook		
2004	0.241	0.235
2005	0.345	0.582
Total Spring Chinook		
2004	0.058	0.132
2005	0.337	0.538
Total Fall Chinook		
2004	0.447	0.442
2005	0.360	0.453
Wild Coho		
2004	0.492	0.716
2005	0.486	0.663
Hatchery Coho		
2004	0.564	0.792
2005	0.466	0.609
Total Coho		
2004	0.564	0.790
2005	0.470	0.617
Steelhead		
2004	0.232	0.322
2005	0.306	0.496
Total Salmonids		
2004	0.482	0.493
2005	0.425	0.650

Conclusions

- Pelican, merganser & gull species dominant fish predators.
- Potentially consuming major proportion of salmon productivity (in 2004-2005: 850,000 – 1.5 million smolts at HS & AS alone). *Major Caveats.*
- Pelicans & gulls are not targeting salmon smolts under natural habitat conditions. Mergansers are not selecting smolts out of proportion to their availability.
- Coho smolts may be targeted at hotspots by pelicans and gulls. Spring/fall chinook & steelhead appear under-utilized.

M/E activities for 2006-2007:

- Continued river reach, hotspot and acclimation surveys.
- More intensive surveys of pelicans in the Middle and Lower River.
- Trapping & radio-collaring of pelicans for analysis of diet and movements.

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