Science, Service, Stewardship

A Method for the Design of Fixed Time-Area Closures to Reduce Salmon Bycatch

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Outline of talk

- Overview of optimization method
- Comparison of “costs” of different closures
- Select potential closures
- Discussion

Walleye pollock

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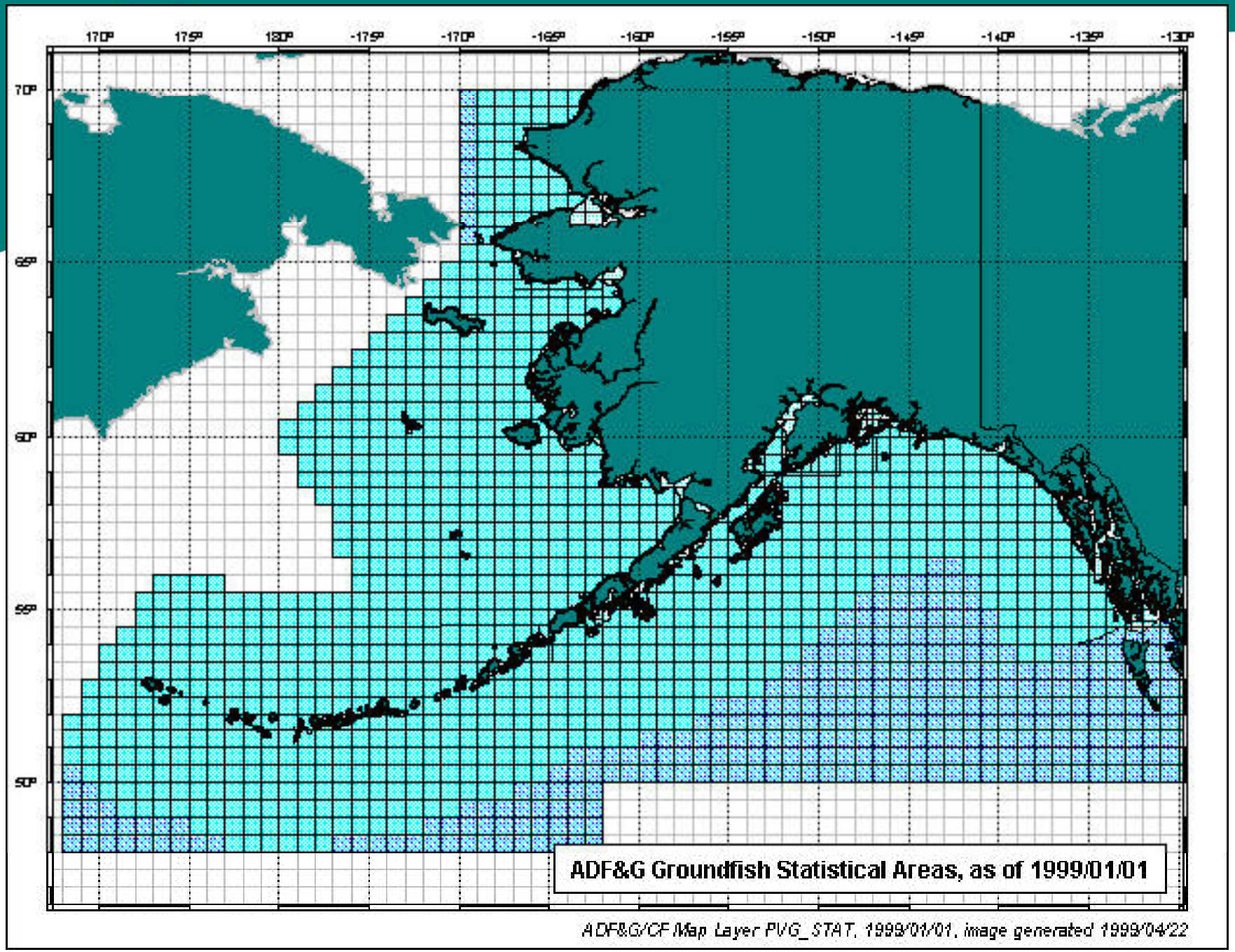
General Idea

Are there closures that based on historical data would lead to a reduction in bycatch?

What's the trade-off of the time-length and size of closures in terms of salmon avoided and pollock effort displaced?

KEY ASSUMPTION: Displaced pollock effort has to go somewhere else so we need to account for this redistribution in designing closures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ADF&G Groundfish Statistical Areas, as of 1999/01/01
ADF&G/CF Map Layer PVG_STAT, 1999/01/01, image generated 1999/04/22

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How method works

Data from 2001-2006 used in analysis

Potential closures considered for all 2, 4, 6, and 8 week periods during the year

Closures from 1-10 statistical areas are considered

Neighbor 1	Neighbor 2	Neighbor 3
Neighbor 8	**Base Cell**	Neighbor 4
Neighbor 7	Neighbor 6	Neighbor 5

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Details

- For each base zone, inter-annual area bycatch and that of all of its neighbors is ranked
- The base zone is closed and the pollock effort is redistributed proportional to other effort
- Each of the neighboring zones is closed beginning with the highest bycatch zone
  - If more bycatch is reduced with a zone closure, an additional neighboring zone is closed until bycatch stops improving
- After all time periods and areas are considered, the amount of bycatch reduced by a closure and impact on pollock effort are compared and graphed.

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Details

- Data from NOAA Fisheries North Pacific Observer Program taken from Oracle to MS Access for data grooming
- ArcGIS used to determine the statistical area and the statistical areas that are neighbors to each statistical area
- Matlab employed to sum and rank each possible combination of weeks and areas and to graph the results

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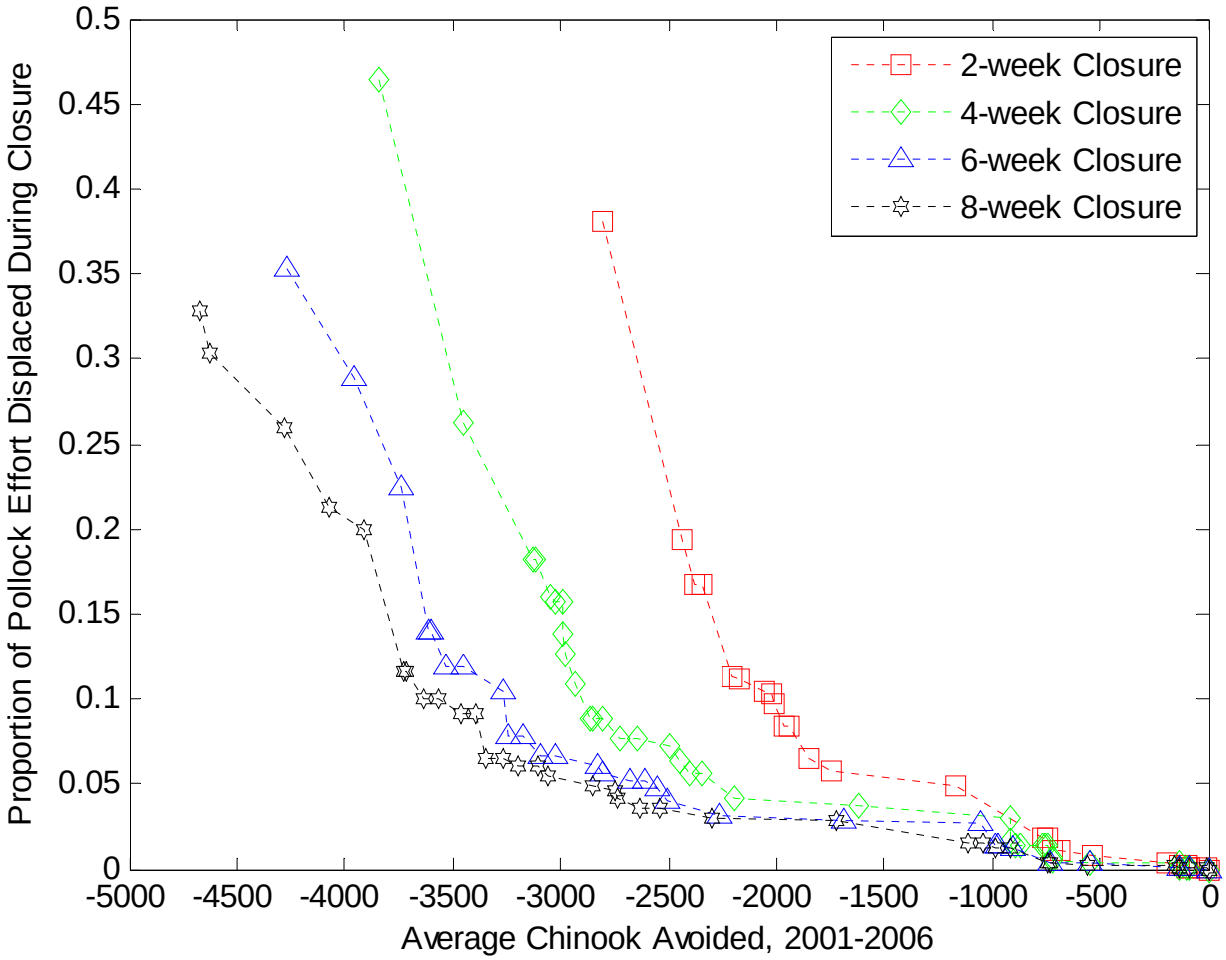
Winter Chinook Reduced vs Pollock Effort Displaced



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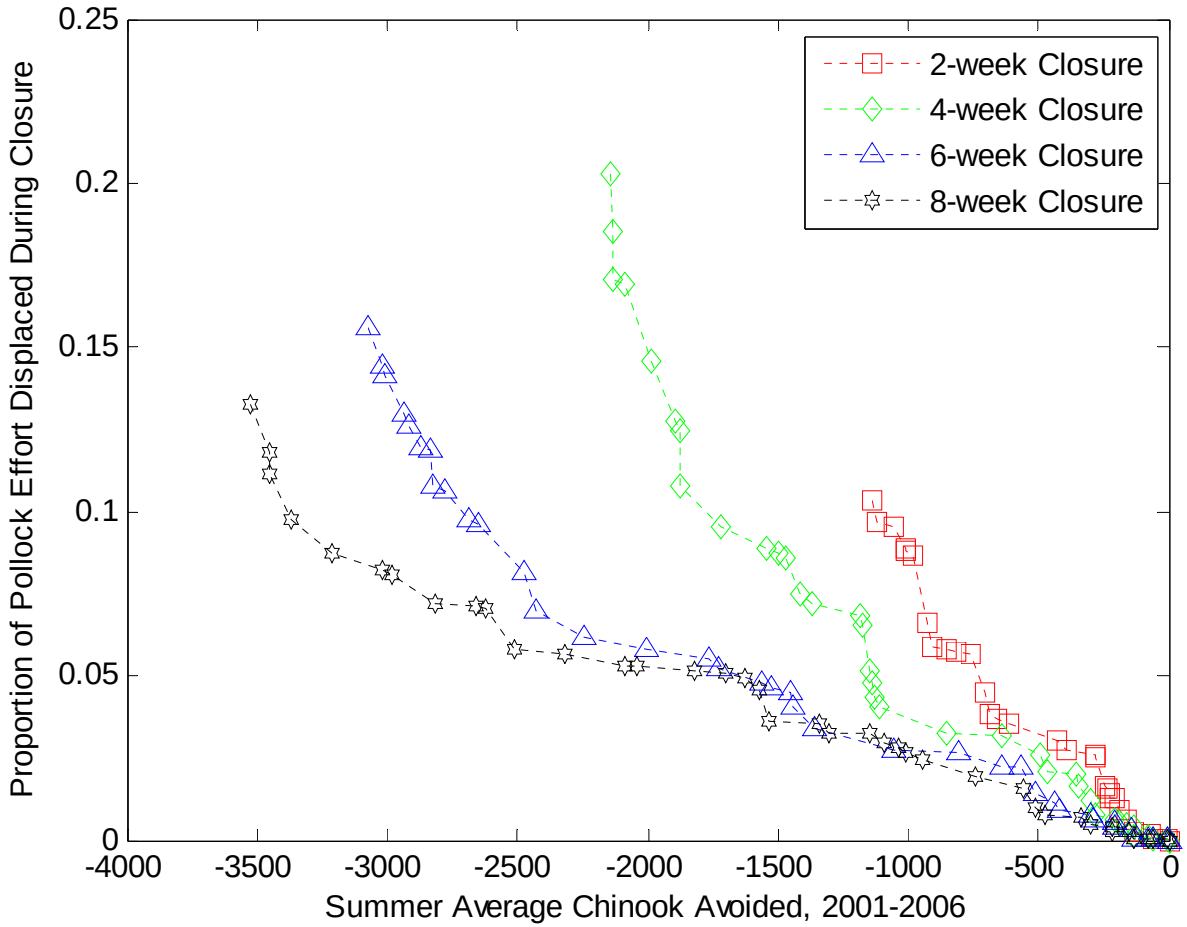
Summer Closures: Chinook Reduction vs Pollock Effort Displaced



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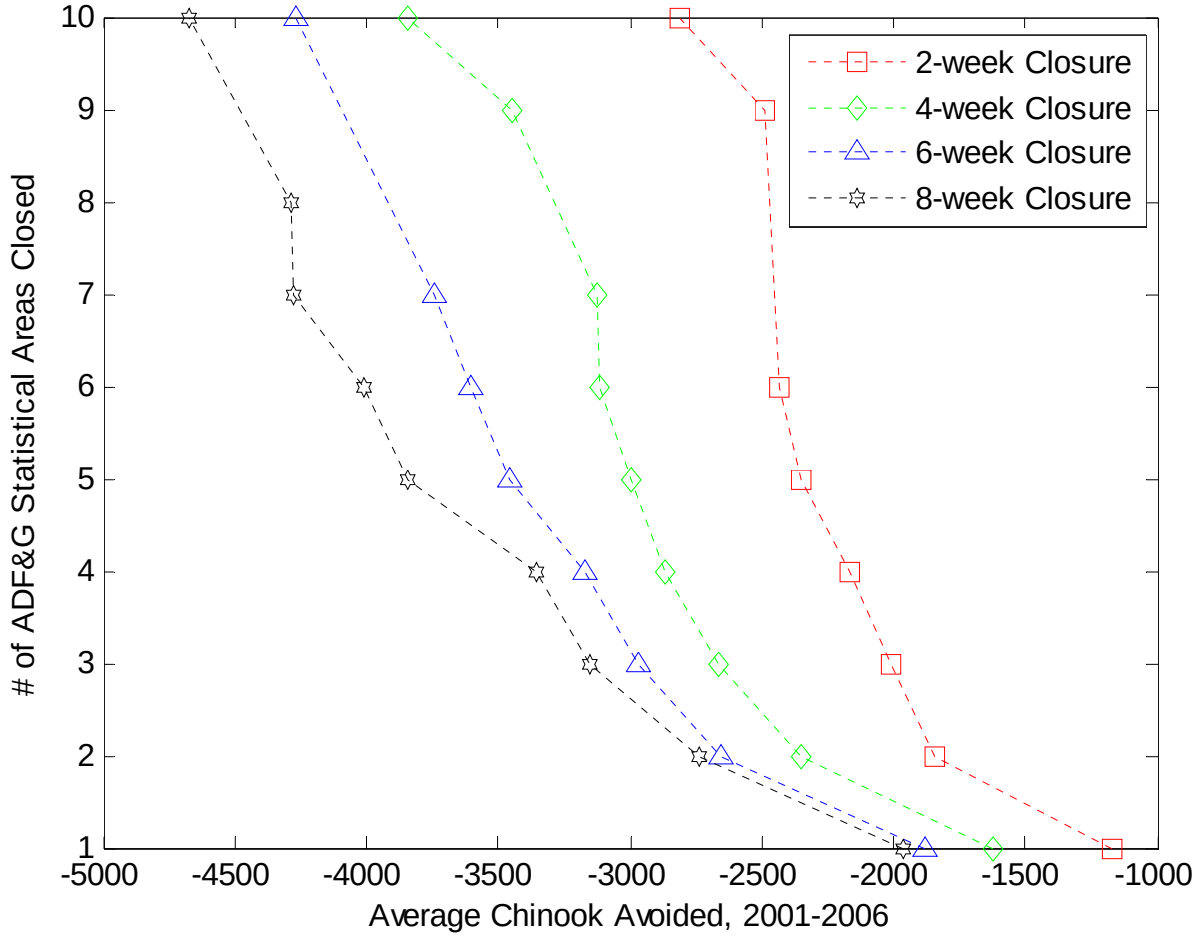
Average Annual Salmon Avoided, 2001-2006 for Different Sized Closures (Winter)



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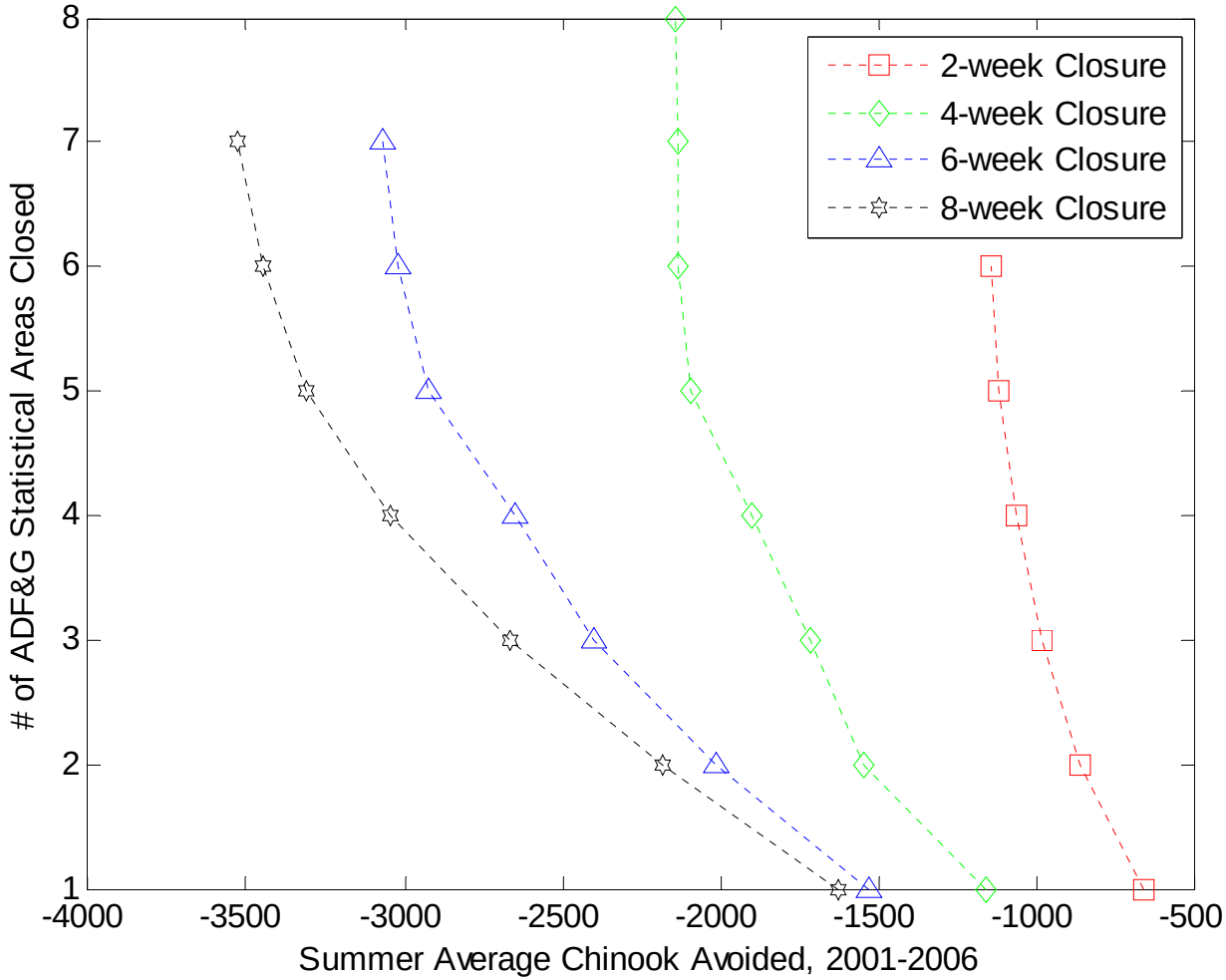
Average Summer Salmon Avoided, 2001-2006 for Different Sized Closures



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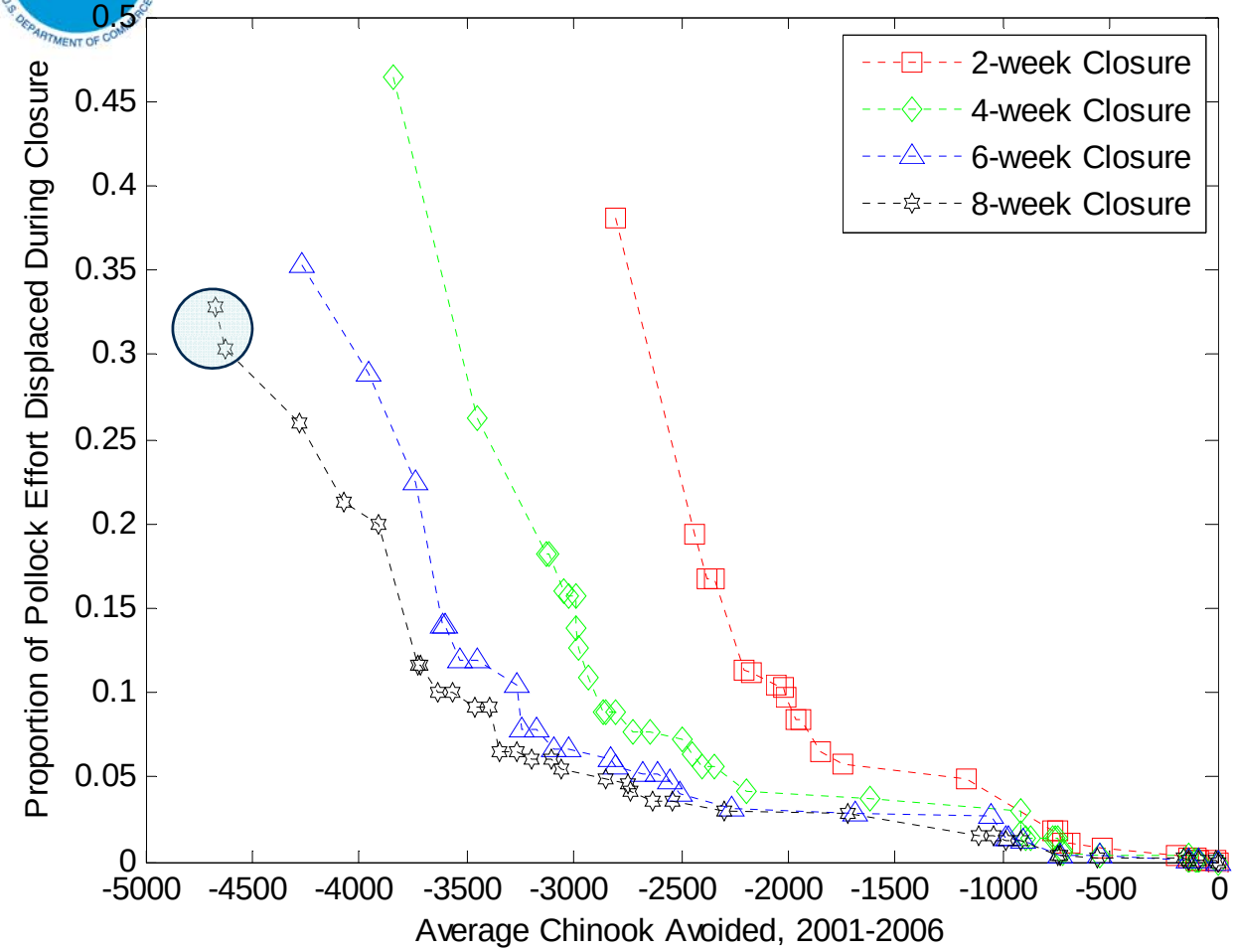
Example Closure 1: Winter Chinook Reduced vs Pollock Effort Displaced



First closure is the area represented by the two closures in the circled area– the 2 are the same area, but with a different time-period.

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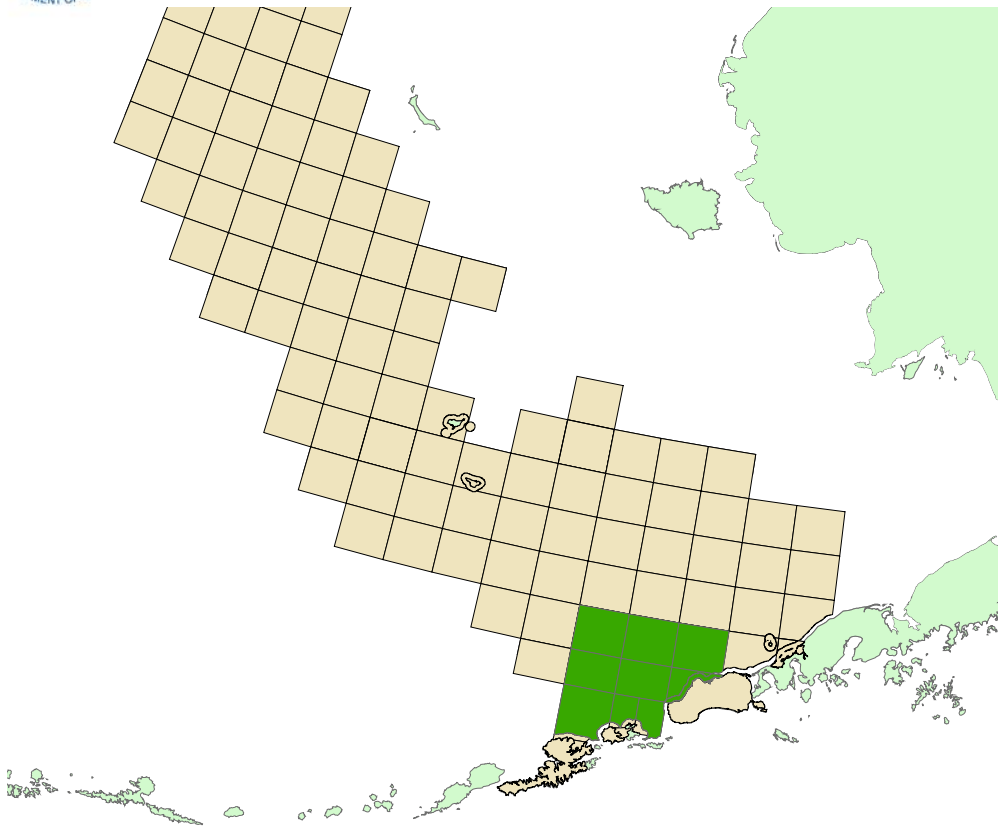
Example Closure 1: Winter



<u>Greatest reduction:</u>
8 weeks beginning Week 1 – 4,675 Chinook per year (average)

<u>*Very* slightly lower reduction:</u>
8 weeks beginning Week 2 – 4,626 Chinook per year (average)

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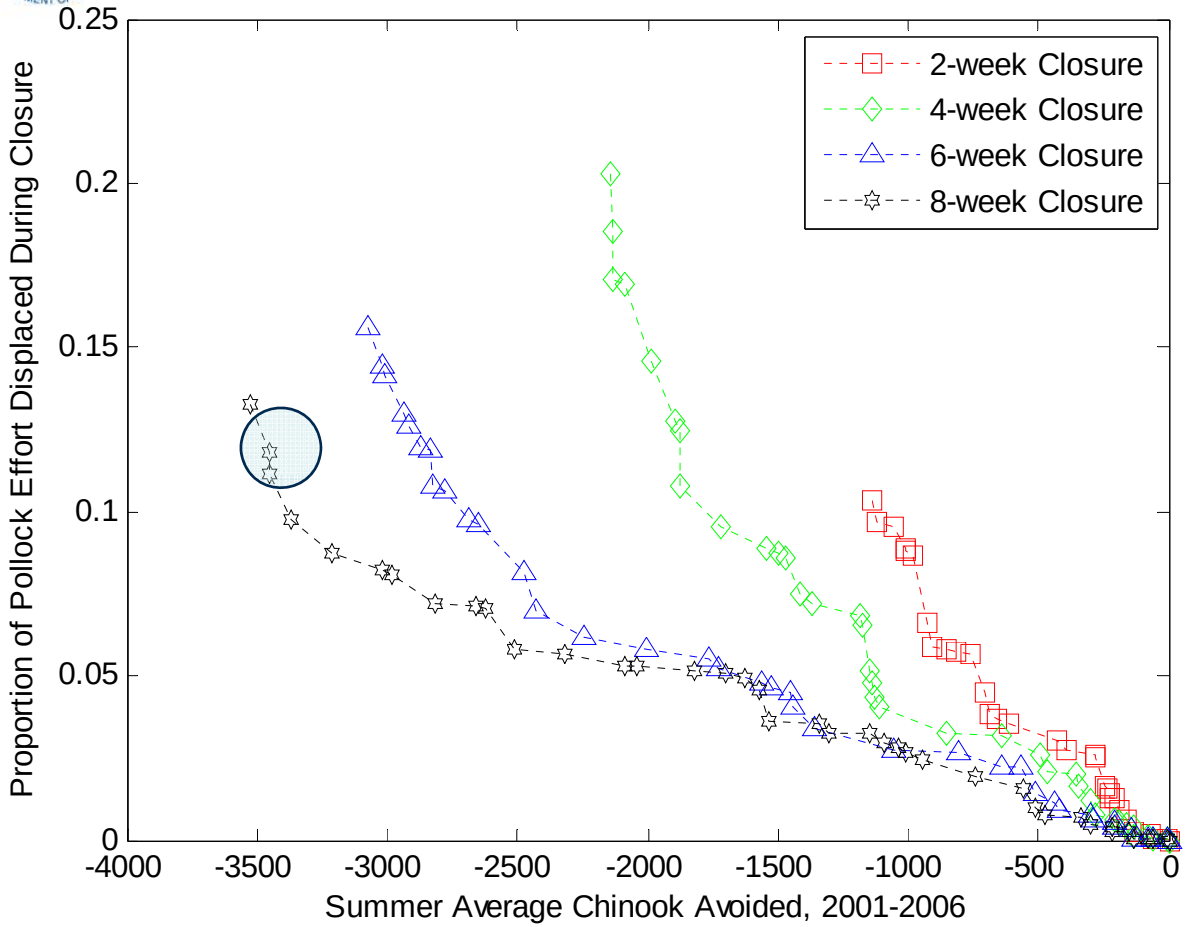
Summer Closures vs Pollock Effort Displaced



Second closure is the area represented by the closure in the circled area– this area might be preferable to areas above it because the cost rises significantly with additional salmon reduction.

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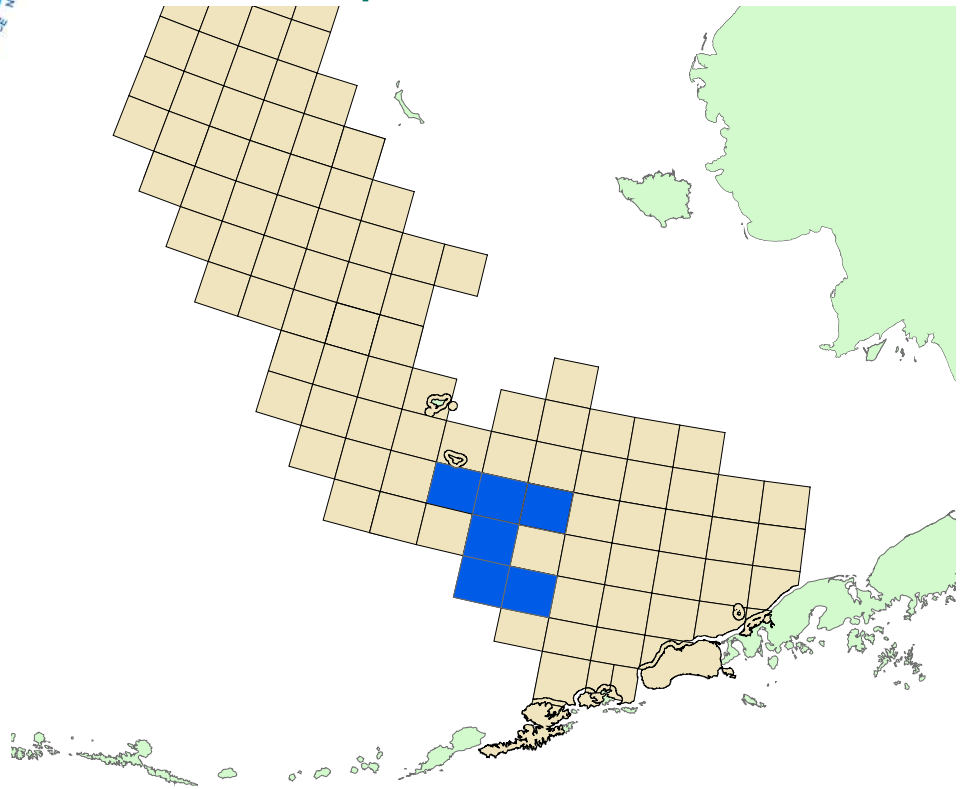
Example Closure 2: Summer



Greatest reduction:
8 weeks beginning Week 32 (late summer) –

3,372 Chinook per year (average)

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Discussion

Can choose other sized closures

—Method can be used to assess any proposed closures

Can incorporate any metric for the “trade off” of pollock effort being reallocated

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Main Points

- Trade-offs between larger and longer closures
- Benefits of large, long term closures may be less than anticipated because of inter-annual spatial variability
- Less displaced effort with longer period closures, but it remains an open question if this is worth it due to the higher value catch in the winter roe season
- Current work compares a variety of effort reallocation mechanisms (logit, etc.).