# A brief look at sockeye salmon

Based on material provided by Prof. Megan McPhee University of Alaska Fairbanks College of Fisheries and Ocean Sciences

### What affects the productivity of a sockeye salmon lake system?

#### escapement-limited?

- increasing escapement would help
- enhancement could help<sup>1</sup>
- improving spawning and/or lake habitat would have limited impact

### rearing-limited?

- reducing turbidity could help<sup>2</sup>
- increasing escapement could help<sup>3</sup>
- fertilizing could help<sup>4</sup>
- improving spawning habitat or stocking (enhancement) would have limited impact<sup>5</sup>

#### spawning habitat-limited?

- restoration of spawning habitat would help
- enhancement could help<sup>1</sup>
- improving lake production or increasing escapement<sup>6</sup> would have limited impact



<sup>5</sup>unless enhanced smolts released into marine environment

<sup>6</sup>abundant spawning salmon can improve spawning habitat

### Testing response to current



### Response to current



### Hybrids: intermediate response?



Facts about juvenile biology - Brannon (1972)

- Response to flow depends on stock of origin (upstream vs. downstream migrating fry)
- Intermediate response of hybrids suggests this difference is genetically based
- The big conclusion is genetics matters to the productivity of the stock at several levels

## Why is growth so important?



(data from McGurk 1996)

### Sockeye salmon are visual predators



# The ocean phase

# Ocean Entry timing is important (from hatcher release studies)





**Fig. 1.** A general conceptual model of seasonal distribution and movements of Pacific salmon in the open ocean. Salmon are distributed in both the Bering Sea and North Pacific Ocean in the summer and primarily in the North Pacific Ocean in the winter. Immature salmon generally move to the south and east in winter (black arrows) and to the north and west in summer (grey arrows). Base map showing oceanographic features and approximate current speed (km/d) is from Quinn (2005).

third marine annulus (SW3)



# Genetic Stock Identification



# Sockeye salmon life history...

- Populations need a series of linked, timing-specific events
- Live in lakes
  - Depend on
    - escapement
    - spawning and lake environment
- Live in the ocean
- Controlled by interaction of genetics and environment
- Timing is needed for growth
- Growth is needed for survival

# Global warming?

- Changes in incubation habitat?
  - Effects probably bad (emergence timing tied to plankton bloom)
- Changes in lake habitat?
  - Might be good or bad...
  - If fish get out of sync with plankton bloom, then bad
- Changes in the ocean?
  - Way to complex to fully understand
  - Big changes are probably bad

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