

## A Natural Laboratory

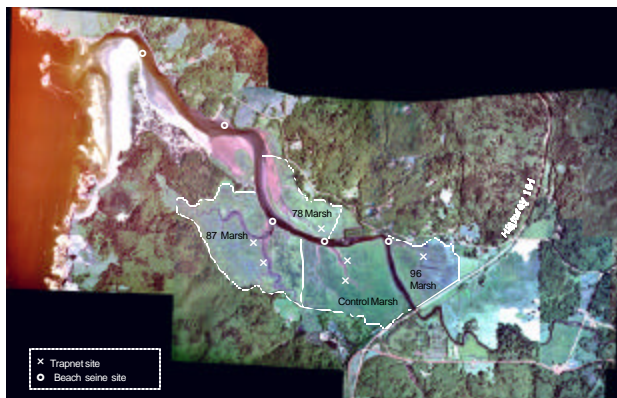
Salmon River estuary offers a one-of-a-kind natural laboratory to evaluate the benefits of marsh restoration to salmon:

- Protected status as part of the Cascade Head Scenic Research Area.
- A unique series of dike removal "experiments" in various stages of recovery (1978, 1987, 1996).
- More than two decades of wetland studies monitoring vegetative and channel recovery.
- Population data for adult salmon runs since 1986.



## Research Goal :

Determine the use of recovering and natural marshes by salmon and other fishes and evaluate whether marshes of different recovery ages provide interim benefits as fish habitat.



## Questions

- Do dike removal projects in estuaries restore the ecosystem functions and fisheries benefits of undiked high marshes?
- How long does it take for these functions and benefits to be restored?
- What specific restoration designs are most likely to yield fishery and ecosystem benefits?

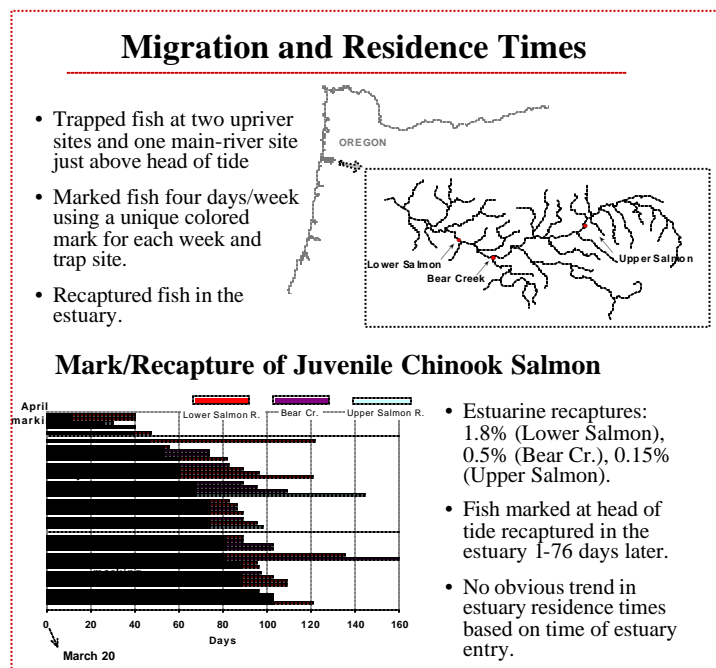
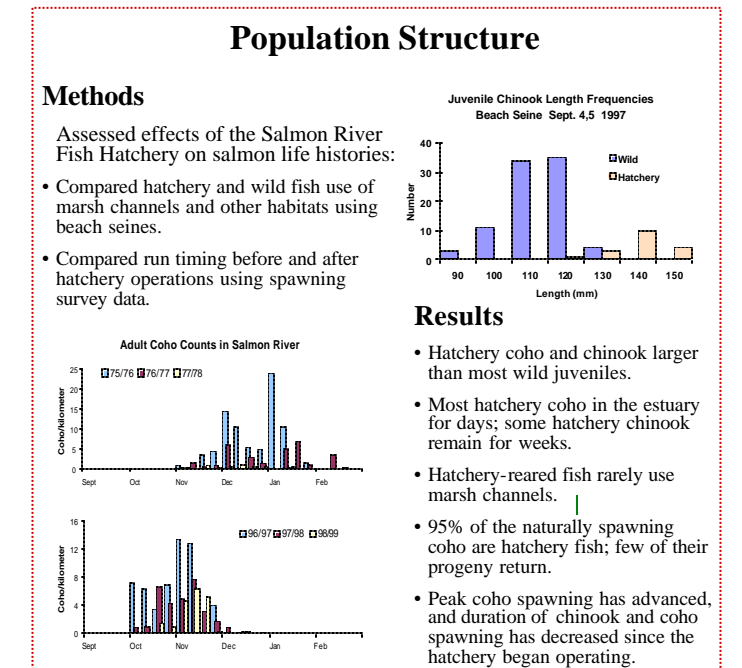
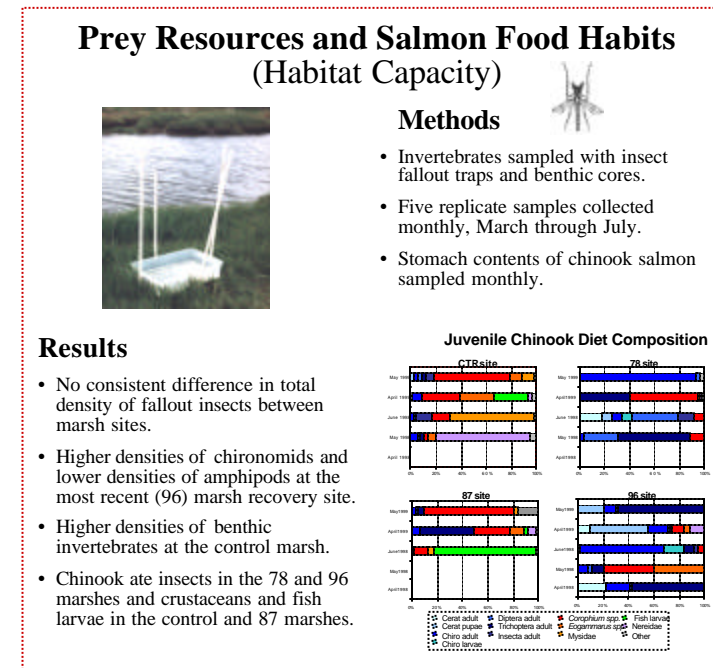
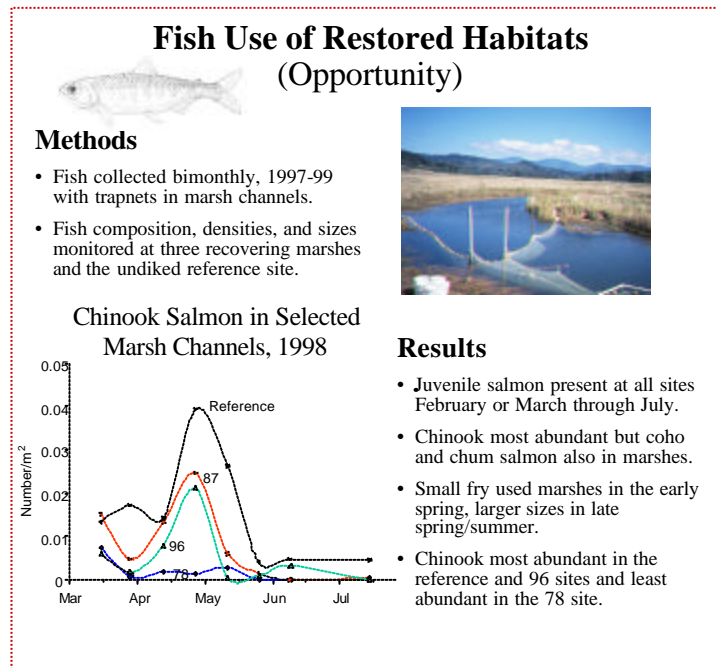
# The Salmon River Estuary Study: Lessons in Restoring Wetlands for the Sake of Salmon



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## Factors Affecting Rearing Capacity



## Conclusions

- Naturally spawned juvenile salmon use recovering marsh channels as rearing habitats.
- Potential fish benefits of restored marshes vary with recovery age, accessibility and location of each marsh along the tidal gradient.
- Salmon may benefit from increased prey production after dike breaching, but habitat quality may dampen these effects.
- Shifts in coho run timing related to hatchery operations may affect juvenile survival and estuarine rearing patterns.
- Changes in life history related to hatchery operations could limit the capacity of salmon to take full advantage of restored estuarine habitats.
- Some chinook salmon spend up to 11 weeks in the estuary.

## Future Studies

- Compare growth and residence of salmon in recovering marshes from mark/recapture studies and otolith microchemistry.
- Mark juveniles upriver to describe migrations into and through the estuary.
- Evaluate contributions of different chinook life history types to adult returns.
- Assess hatchery effects on salmon life histories and implications for estuary restoration.
- Develop a bioenergetic model to compare salmon growth potential of recovering marshes.

