**UNCERTAINTIES:**

PLUME/ OCEAN CONDITIONS AND FOOD WEBS

* Are there predictable patterns in forage fish abundance in the plume?
* Can food abundance in the plume be measured? Is food abundance an issue for wild salmonids?
* Why do some juvenile salmonid species spend more time in the plume while others move north quicker? Is fish health a factor in this?
* Can we predict year-to-year variations in ocean/plume/estuary conditions? And the impacts on fish?
* What are the major predators in the ocean? What are the major predators in the plume? How do these vary by species? What are predation rates in the plume/ocean?
* Where and when does density dependence occur in the estuary and nearshore?
* Could hatchery releases be adjusted to consider poor ocean years, predator migratory patterns, etc?
* Can we measure carrying capacity in the ocean? Is it an issue for wild salmonids?
* What is the role of the ocean in population dynamics?

HATCHERY/ MAINSTEM/ RELEASE TIME

* Does hatchery fish diet have an effect on in-river and ocean survival?
* How good are hatchery fish as a proxy for wild fish?
* What are the on-site and off-site effects on the condition of fish as they exit the river and enter the ocean? How does this compare to data on survival in the first year?
* How can release times, transport times be optimized to benefit juvenile salmonids?
* What are the mechanisms of survival?
* How might alternative storage and flow release schedules impact fish?
* What is the role of large woody debris in the estuary and ocean? What is the effect of lower LWD input due to dams on the mainstem?
* Are hatchery fish having an impact on wild fish in the plume/ocean?

CLIMATE CHANGE IMPACTS ON OCEAN CONDITIONS

* How will acidification and hypoxia impact the survival of salmonids and their food sources?
* How do salmon and other anadromous species function in changing ocean conditions?
* How does hypoxia impact the migratory patterns of salmon and their predator and prey species?
* Are the impacts of hypoxia and acidification just as prevalent in the plume?
* Why does upwelling not work anymore?
* Are there things we can be doing to alter or mitigate for acidification/ hypoxia? Can we predict the rate of progress of these climate related ocean issues?
* How can we offset the impacts of climate change?

QUESTIONS FOR MANAGERS:

* How would management methodologies change with real-time information on ocean conditions?
* How are we going to translate science into a practical tool for management?
* For every fish benefit and potential management application, how do we evaluate risk of changing the current methodology?
* How can we shift management to focus at the ecosystem scale? While also looking at individual species and population variations?
* How much leeway do managers need to shift their management methodologies? And can scientists turn round ocean condition data to fit this need?