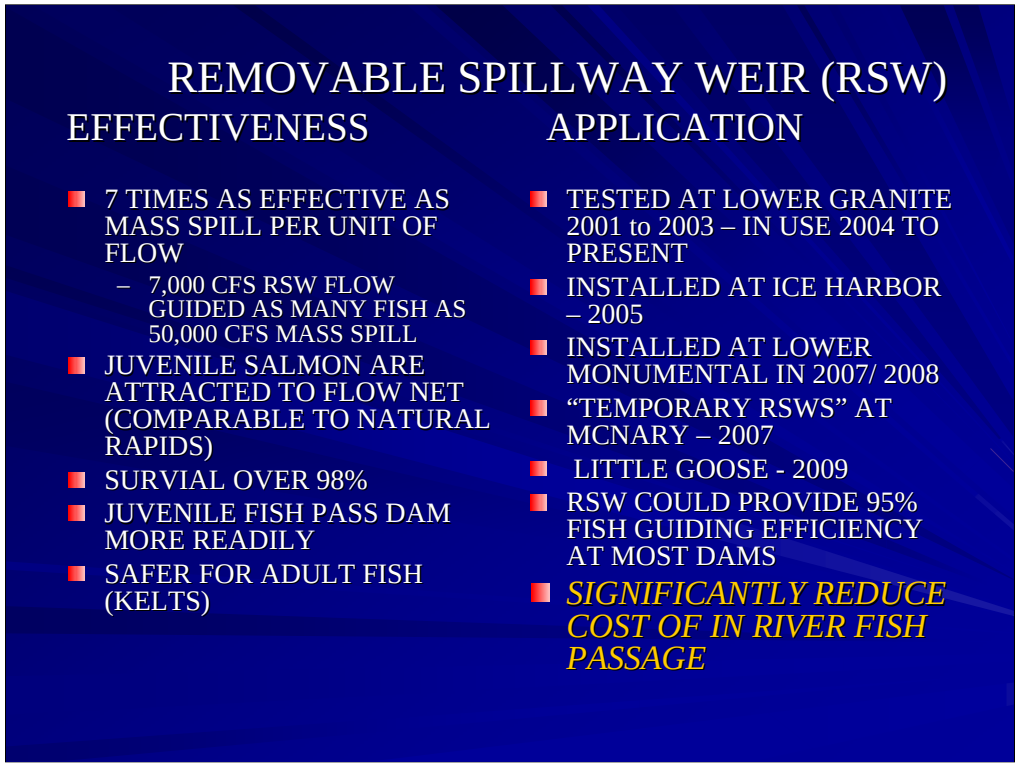
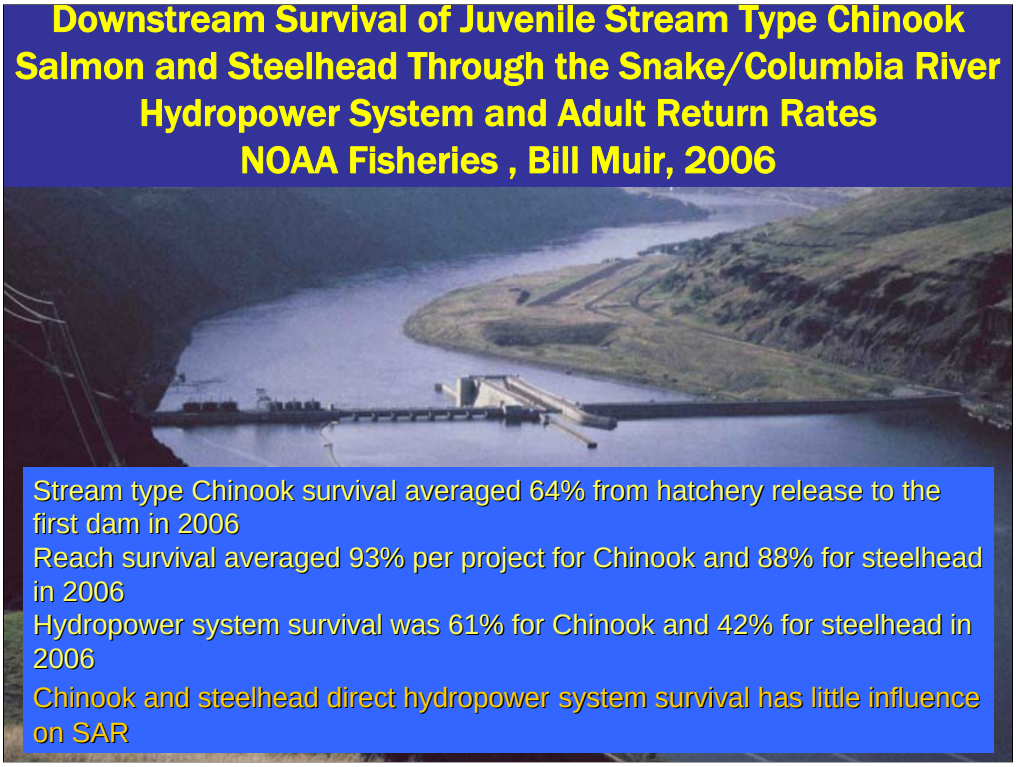
Good morning. My name is John McKern. For 30 years I was a fisheries biologist for the Walla Walla District, US Army Corps of Engineers. For the past 6 years, I have been a fisheries consultant dealing with Columbia River fisheries issues. My 36-year career has centered around one goal – increasing the survival of the Columbia River salmon runs effected by the Corps of Engineers dams.



In 1999, the Corps realized that the fishery agencies and tribes would demand spill whether or not it was the safest rout of passage for fish. At all eight Corps dams, water spills under spillway gates at 40 to 50 feet in depth and shoots into the stilling basin at over 35 mph. The water is instantly depressurized about 1.5 atmospheres, and entrains air as it expands. Air becomes supersaturated in the water, an effect that is harmful to fish. In addition to the supersaturation, juvenile fish that may have supersaturated air in their blood are instantly depressurized. This can cause the air to "boil out of solution" injuring or killing the fish. Adult fish that fall back through the spillway may suffer similar gas supersaturation effects. Also, adult fish may strike the spillway gate as they pass under, for "headburn" or scalping is common when spill is prevalent.

Recognizing that spill would pass significant numbers of fish, the Corps developed a modification to make the spillways safe for fish. The RSW is up to 7 times as effective at passing fish than the standard spillway. It is natural for salmon to follow flow "over" a rapids, not to dive down through a hole or slot. Survival over the RSW is as high as the best spillway survival (at least 98%), and juvenile fish pass the dam more readily because they it is more natural than diving under the spillway gates. RSWs have been installed at Lower Granite and Ice Harbor dams, temporary RSWs have been installed at McNary Dam, and an RSW is ready for installation at Lower Monumental Dam this fall. An RSW will be installed at Little Goose Dam in 2009.

If used as intended (as a juvenile fish bypass), the RSWs could save millions of dollars each year. By using a RSW at 7,000 cfs flow instead of the mass spill of 50,000 cfs, enough water would be available to run two 135 megawatt turbines. Court ordered mass spill was estimated to cost $63 million in 1006 alone.

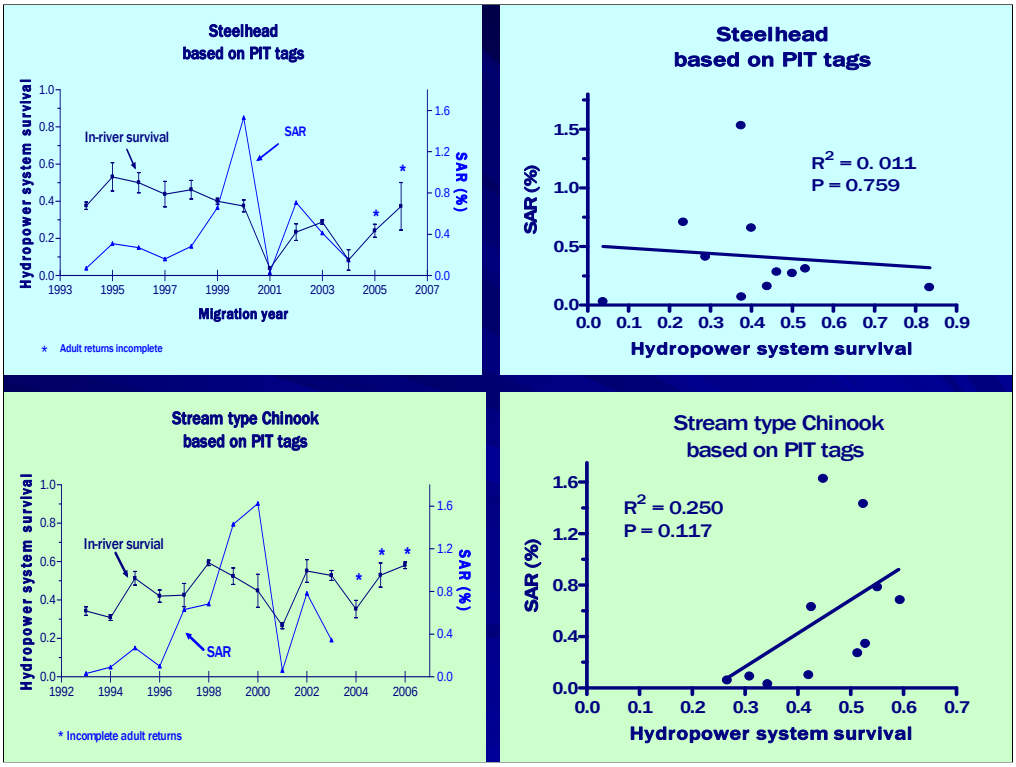


At the Corps' Anadromous Fish Evaluation Program review in November 2006 Bill Muir (NOAA Fisheries) reported on their inriver survival studies. Mortality from point of release to Lower Granite Reservoir averaged 36% before the fish reached the dam system (mortality ranged from about 20 to 80% depending on how far it was from the release site).

If the reach survival averaged 93% (it varied by reach) for Chinook, and reservoir survival was 96%, then dam survival was 96% . This comports with other research that indicates dam survival is usually around 95 to 96% depending on turbine survival, bypass efficiency, bypass survival, and spillway survival at each project.

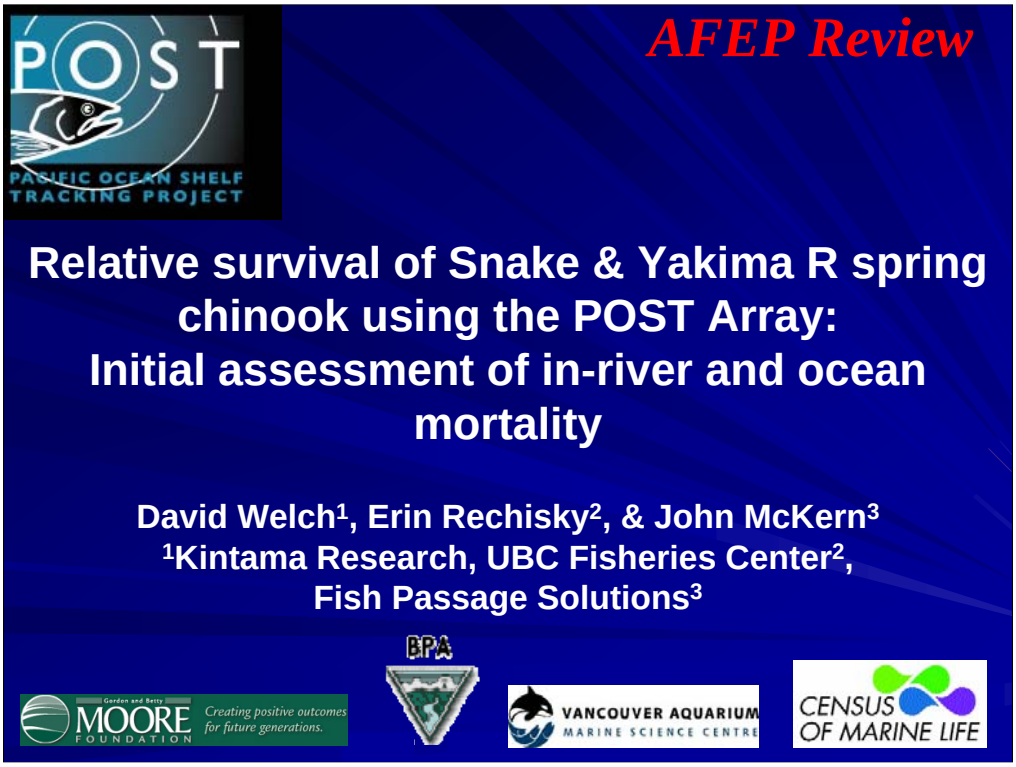
At 61%, Chinook system survival was "the highest ever recorded." Muir concluded that freshwater survival had little influence on smolt to adult return rates (in other words, ocean survival over shadows freshwater survival in determining SARs).

This information is now available for review as "Survival Estimates for the Passage of Spring-Migrating Juvenile Salmonids through Snake and Columbia River Dams and Reservoirs, 2006," by James R. Faulkner, Steven G. Smith, William D. Muir, Douglas M. Marsh, and John G. Williams.



Muir's showed results that indicated little or no correlation between system survival and smolt to adult return rates (SARs). With an R^2 of 0.011, the chance that freshwater survival controlled the SARs would be 11/1000 for steelhead, while for Chinook, the chance would be 25/100. In other words, mortality in the ocean is the over riding factor in how many adult salmon return.

These figures are especially relevant when we consider that over $160 million is being spent annually to determine the problems with the dams when the vast majority of the problem is in the ocean.

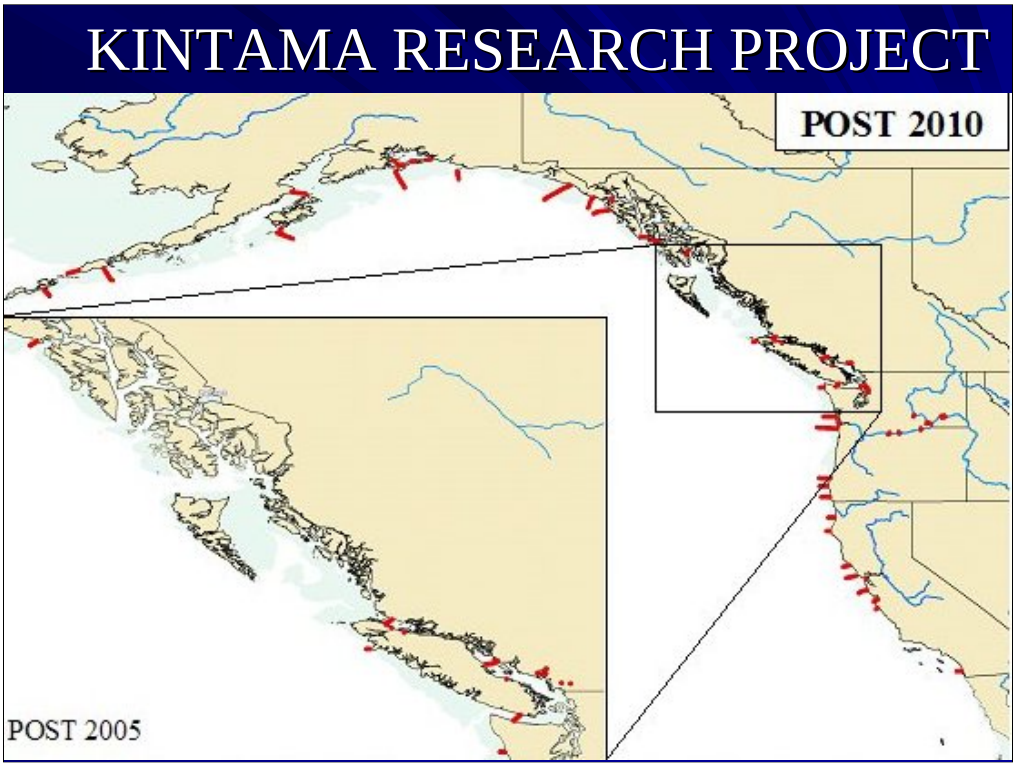


Kintama Research has developed acoustic tag technology that can track the movement and survival of juvenile salmon down the Columbia River and in the ocean. This is the only fish tracking technology currently in use that can track fish survival in the ocean. This research, funded by the Bonneville Power Administration, is part of larger programs including the Pacific Ocean Shelf Tracking Project and the Census of Marine Life.

•The Census of Marine Life is a decade-long program to promote and fund research assessing and explaining the diversity, distribution and abundance of species throughout the world's oceans.

•POST is one of 13 major field programs within the Census of Marine Life.

•The Census promotes a new era of marine research around the world, with a strong international commitment and unique regional efforts.



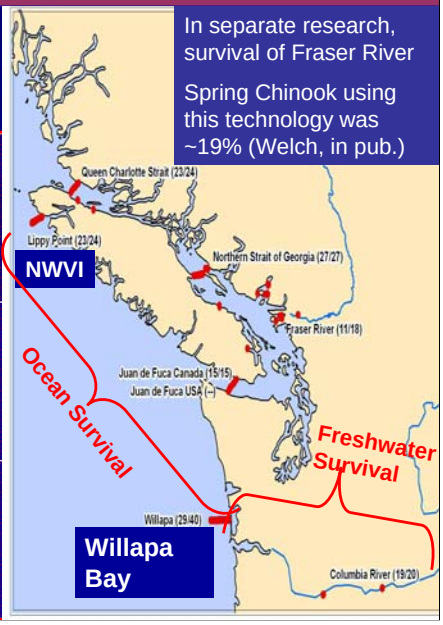
Kintama envisions placement of arrays of acoustic receivers along the continental shelf from California to Alaska. Juvenile salmon equipped with acoustic tags could be traced up or down the coast, and problem areas in the ocean could be identified. For example, if Snake River Chinook migrate to a section of the British Columbia coast where there is an extensive herring fishery, they will lack food and not survive well to adulthood.

Receiver arrays were established in Little Goose Reservoir, McNary Reservoir, The Dalles Reservoir, and below Bonneville Dam in the Columbia Basin in 2006. Arrays were also placed at Cascade Head (OR), Willapa Bay (WA) and the west tip of Vancouver Island (BC). Under POST funding, additional arrays were placed in the Fraser River, the Straight of Juan de Fuca, Straight of Georgia, and off Sitka (AK).

In 2006, Clearwater River fish marked at Kooskia Hatchery (ID) and Yakima River fish marked at Chandler Fish Facility (WA) were released to migrate inriver. The Clearwater fish passed through 8 dams and reservoirs while the Yakima fish passed only through the lower 4 dams and reservoirs. Clearwater fish were also transported to Lower Granite Dam where they were put on a fish barge for transport around 8 dams to compare with inriver passage and survival.

SURVIVAL COMPARISONS - 2006

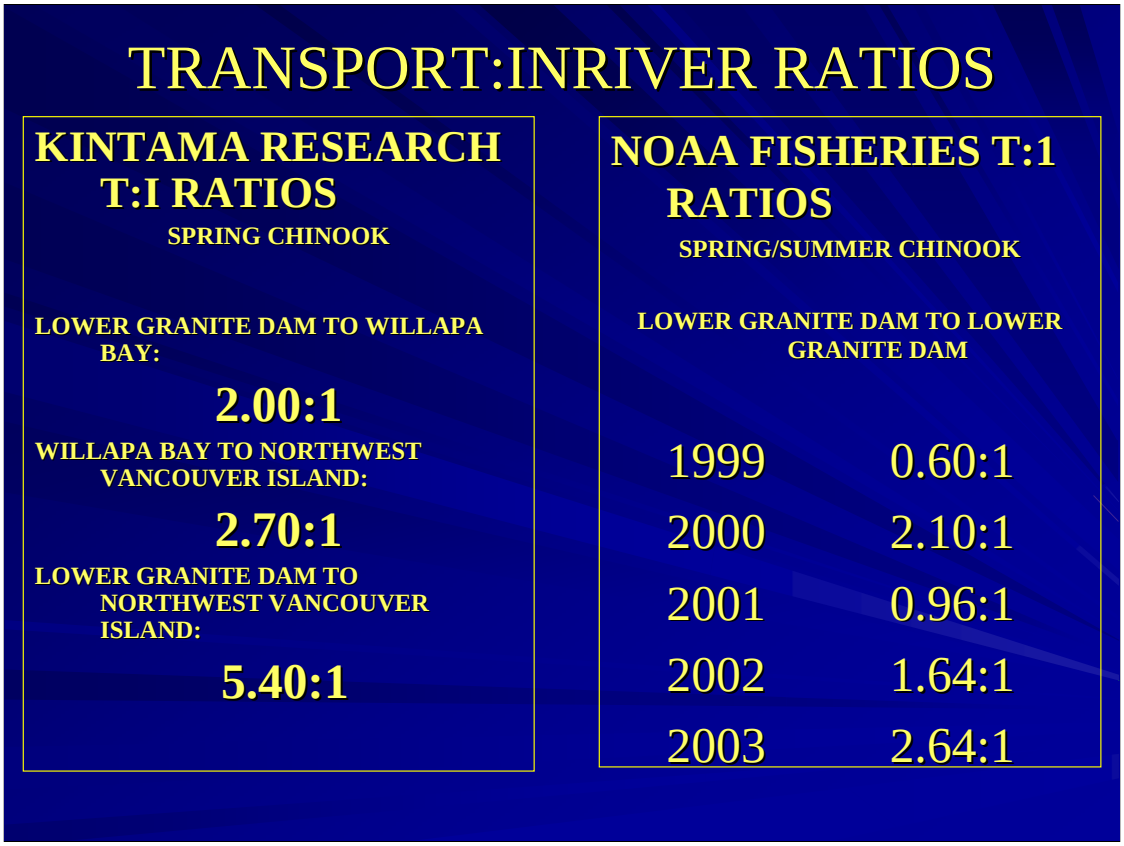
	Yakima ROR	Snake ROR	Snake Barged
"FW" Survival (to Willapa Bay)	19.8±2 %	18.9±2 %	37.9±3 %
Ocean Survival (Willapa Bay to NWVI)	2.5±1.8 %	5.3±2.6 %	14.3±4 %
Net Survival from Release to NWVI	0.5±0.4 %	1.0±0.5 %	5.4±1.6 %



Freshwater survival was measured from the hatchery of origin down the river (past the freshwater arrays) to the acoustic receiver array extending from the coast to the edge of the continental shelf in the ocean at Willapa Bay, WA. Therefore, freshwater mortality for this study included that which occurred from the hatchery to the first dam, through the 4 or 8 dam series, through the estuary, and a short distance up the coast. Freshwater survival was approximately 19% whether the fish passed through 4 or 8 dams. In other words, **passing through the 4 lower Snake River dams caused no appreciable increase in mortality**.

Compared with inriver survival of 18.9%, fish transported from Lower Granite Dam below Bonneville dam survived to Willapa Bay at 37.9%. This is what you would expect if inriver migrants suffered about 50% mortality passing the 8 projects. From Willapa Bay to the northwest tip of Vancouver Island (NWVI), the inriver (5.3%) to transport (14.3%) survival ratio favored transport even more. From the hatchery of origin to NWVI, the inriver (0.5%) to transport (5.4%) ratio became even more dramatic, though sample sizes were very small. These result do not support the assumption that transport causes some latent or differential mortality that is expressed after the fish are released from the barge.

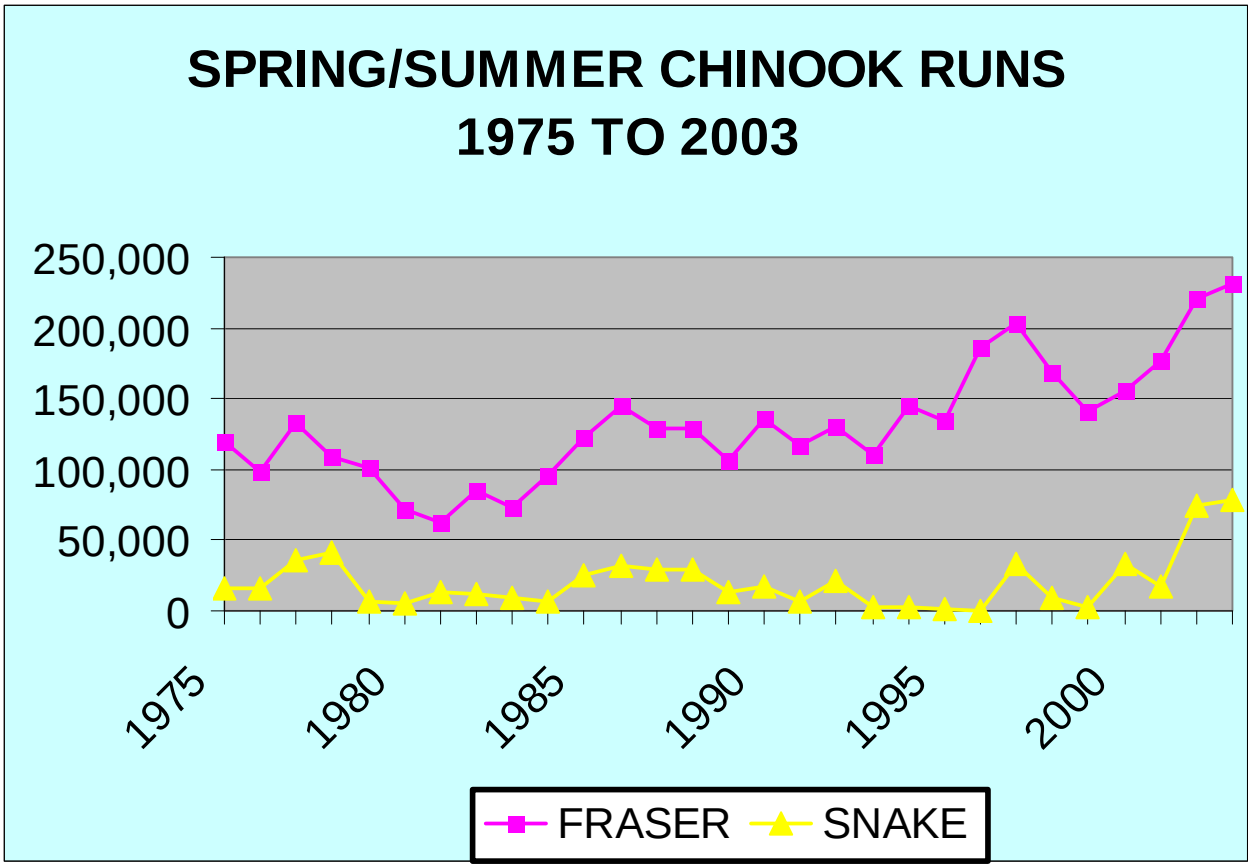
In separate research, Kintama is measuring the survival of spring Chinook from the Fraser River into the ocean. Preliminary results show that their survival is also approximately 19%. However, their migration is only about ½ the distance traveled by Snake River fish, therefore their survival rate per kilometer traveled is about ½ that of the Snake River fish. **There are no dams on the Fraser River.**



NOAA Fisheries has conducted fish transport studies off and on since the 1960s. Earlier studies were conducted by marking groups of fish that were allowed to migrate inriver and comparing adult returns with adult returns of fish marked and transported around the dams. Since 2000, they have compared SARs of PIT tagged transported fish with SARs of non-detected PIT tagged fish presumed to have passed downriver over spillways or through turbines. Juvenile fish marked in the test year with PIT tags return as adult fish 1, 2, and 3 years later, so the T:I for any given test group cannot be computed until adult fish have returned for 3 years. Tisa for wild Snake River spring/summer chinook marked from 1999 through 2003 and transported from Lower Granite Dam by NOAA Fisheries were based on adult returns of PIT tagged fish to Lower Granite Dam.

SARs vary within year depending on when fish entered the ocean, and what ocean survival conditions were when they entered. SARs also vary between years depending on varying survival conditions in freshwater (flow volumes over the season) and in the ocean (El Niño or La Niño conditions), fluctuations in ocean productivity, availability of food, and prevalence of predators.

Kintama Research's results are based on very limited data, but they do not support the assumption (*D* or differential mortality) that transport causes added mortality when the fish reach the ocean. More research and more groups of marked fish are needed to verify these findings.



Fraser River (BC) spring Chinook runs, like those of the Snake River, have fluctuated in response to changing ocean conditions. Many salmon and steelhead runs in southern BC have declined precipitously in the past three decades.

CONCLUSIONS

- Court ordered spill program is killing millions of juvenile salmon
- NOOA Fisheries reported that inriver survival of juvenile Chinook in 2006 was higher than ever recorded, but said it has little to do with adult returns
- Technology is now available to measure movement and survival of juvenile salmon down the river for day by day decisions
- Technology is now available to measure survival in the ocean
- Millions of dollars are being wasted looking to improve juvenile salmon survival at the dams where it is already high
- Ocean survival is the limiting factor on salmon survival and improving ocean survival is the key to saving the salmon

Spill is not the savior of fish the court and the plaintiffs believe it is. RSWs should be installed at all the dams if fish are to be kept inriver. Inriver survival is high (probably as high as it was before the Snake River dams were built).

New technology is available to measure movement and survival of juvenile fish in the river and in the ocean. We could test spill versus no spill or less spill and have the answers within days.

Millions of dollars are being spent each year (in 2006, the Corps Anadromous Fish Evaluation Program was $60 million and the BPA spent another $100+million) on research to fix the dams. When all the RSWs are in, they will be about as fixed as they can get. With survival at the dam at 96% now, each additional percent increase becomes increasingly more expensive.

Knowing where juvenile salmon go in the ocean and what is reducing their survival (over harvest of forage fish, over harvest of salmon, other manmade causes, or natural conditions) is the key to increasing fish survival and restoring the Columbia River salmon runs.