Public Hearing (3/20/13)
Bay-Delta Plan SED
Deadline: 3/29/13 by 12 noon

CA WATER BOARD ...READ & Enter into HEARING RECORD March 22, 2013

1720 Angelene Drive
Modesto, CA 85355-4312

RECEIVED
3-27-13
SWRCB Clerk

To: State Water Resources Control Board
c/o Jeanine Townsend, Clerk of the Board
P.O. Box 100
Sacramento, CA 95814-0100

Subject: Here are my COMMENTS, Questions, and Recommendations to Board to Discontinue Discussion/Hearings and/or please Board Vote Against adopting any 'Bay-Delta SED Plan'. DO NOT take any presumed available 'excess water' from Central Valley Reservoirs, or from Central Valley rivers 'feed streams' to presumptuously increase and/or enhance the Salmon population!

Instead, concentrate on URGENT! ...PREVENTION of SFPUC, EBMUD, Merced, and Los Banos water treatment plants annual injection of TONS of 'man-made pollutants [e.g. Silicofluoride - an US-EPA 'regulated pollutant' classified by CA-EPA as 'Hazardous Waste'], and Chloramine .... millions of pounds injected annually by SF-PUC Water Dept & EBMUD Water Treatment facilities into 'For Sale' drinking/tap water. Eventually, majority of this illicitly treated & delivered water ends polluting SF-Bay when discharged by 30+-WWTP's located around SF-Bay. Reference descriptions of the above 'water treatments' in detailed 15 page scientific meta-study/typed report I submitted to March 20, 2013 Hearing record as regards how these two 'polluting' chemicals injected cause 'fingerlings'/SALMON swimming disorientation and/or Death from 30+ SF-Bay WWTP's discharging 'fluoride' and 'Ammonia' byproducts to SF-Bay.

If subject SED proposal requiring the Merced, Tuolumne, and Stanislaus rivers to dedicate 35 percent of unimpaired flow to fish and wildlife, this would devastate San Joaquin, Stanislaus and Merced Counties! Our region is struggling to regain its economic footing after a lingering recession, and we cannot afford to fallow our land, lose hundreds of jobs, and weather a $187- million hit to agricultural income in dry years. Many personal small farms/ranches would be shut down or lost because of impractical water sourcing [e.g. prohibitive COSTS for new wells, or deeper wells, or just no water available]. NO WATER ... NO FOOD, produced!

Most importantly, this ill-conceived plan is based on immeasurable ASSUMPTIONS, like: "it will help restore the Delta's native fisheries". These assumptions are not supported by science or evidence. Rather, the proposal presents unilateral demands without quantifying the benefits, or goals to be achieved.

Before imposing a plan that carries such serious consequences for our region, the Board must first implement non-flow measures; especially eliminate manmade pollution as describe above and in my 15 page report previously submitted. Besides SF-Bay POLLUTION, list and address all the other reasons for SALMON DECLINE! Invite USGS-Menlo Park SF-Bay Pollution Scientists to your Hearings!

Sincerely, Danny M. G.

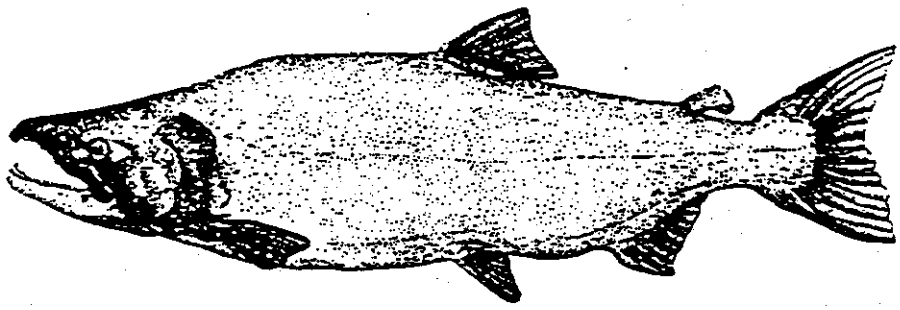
Danny M. Gottlieb Agriculturalist/Food Technologist – Emeritus 209 529-8832

Attached: Book: "The Case Against Fluoride" by Paul Connett, PhD, et.al. How 'Hazardous Waste' Ended Up In Our Drinking Water and etc. etc. ....."

Video/DVD: "Professional Perspectives on Water Fluoridation"

CHINOOK SALMON

(Oncorhynchus tshawytscha)



Although chinook salmon in the Stanislaus River once numbered in the thousands, today only about 500 adult salmon return each year to spawn. Because the number of salmon returning to the Stanislaus River each year is at a dangerously low level, many concerned parties are currently working together in an attempt to increase the number of salmon that return to spawn each year.

This is the site of research being conducted on juvenile salmon to identify ways we can help restore their populations. This research is being conducted by S.P. Cramer & Associates, Inc. (SPCA), a consulting firm specializing in salmon and trout management. SPCA has conducted research on many different species of salmon and trout in California, Oregon, Washington, Idaho and Alaska. SPCA is currently conducting research on chinook salmon in the Stanislaus River under contract to both public and private entities. This research is a cooperative effort between water rights holders, the US Fish and Wildlife Service and the California Department of Fish and Game.

Three rotary-screw traps are currently fishing in the river to catch downstream migrating juvenile chinook salmon. Each day captured fish are counted and measured, and biological data recorded. All fish are released unharmed back to into the river. By collecting this information, we can begin to determine how and what environmental factors influence the survival of young salmon.

To help determine what factors influence juvenile chinook migration and survival, mark-recapture experiments are also conducted. By releasing marked fish upstream and recapturing them downstream, we can determine how long it took them to migrate from the release point to the recapture location and how many survived.

Help protect the salmon. Please do not disturb any fish sampling devices found in the river. Immediately report vandalism and poaching to the Army Corps of Engineers or the Oakdale Police Department. For answers to additional questions please feel free to approach our uniformed staff or an Army Corps of Engineers employee.

Army Corps of Engineers	**881-3517**	
Oakdale Police Department	**847-2231**	**In an Emergency call 911**

Other fish species commonly found in the Stanislaus River:

Rainbow Trout	Onchorhncus mykiss	Pacific Lamprey	Lampetra tridentata
Sacramento Squawfish	Ptychocheilus grandis	Bullhead	Ictalurus spp.
Golden Shiner	Notemigonus crysoleucas	Catfish	Ictalurus spp.
Laegemouth Bass	Micropterus salmoides	Crappie	Pomoxis spp.
Smallmouth Bass	Micropterus dolomieui	Carp	Cyprinus carpio
Sacramento Sucker	Catostomus occidentalis		

Chinook Salmon Life History Characteristics

Chinook salmon generally spend 1 to 3 years growing in the ocean before they return to the Stanislaus River to spawn. They enter the river in the fall and begin spawning soon after arrival. Chinook salmon lay eggs in nests, called redds, excavated by the female. An average redd will measure 15 square feet. Females dig their redds in gravel that ranges in size from 1 to 6 inches in diameter. It is important that the gravel is clean and free of silt and sand, which may prevent oxygen from reaching the eggs and result in their death. Water depths in which chinook spawn range from shallow riffle areas to deep pools. After a female salmon lays eggs in the redd, one or more male salmon may fertilize the eggs. After fertilization, the female buries the eggs by displacing gravel upstream of the redd onto the eggs. Although the average female salmon lays about 5,000 eggs, some large females produce as many as 8,000.

The time required for the eggs to hatch depends on water temperature, but is generally 40 to 60 days. When the eggs emerge, they are referred to as "alevins" or yolk-sac fry. Alevins remain in the gravel where they survive by absorbing the nutrients in their yolk. As the baby salmon grow, they become fry. Fry wiggle out of the gavel and move to areas with little current near shore. Fry feed on small insects and crustaceans.

Young salmon migrate downstream to the estuary anytime from immediately after they emerge from the gravel to after rearing over 1 year in the river. The length of time they spend in the river depends on factors including river flow, water clarity, water temperature, genetics and interactions with other fish. The majority of young salmon migrate out of the Stanislaus River in March, April and May. After salmon leave the river, they arrive in the Delta estuary. There they may spend from weeks to over a year preparing to enter the ocean.

As young salmon prepare to enter the ocean they go through a physiological process called smolting. During smolting, many physiologic processes prepare them for life in the marine environment. The most obvious change during smolting is the growth of scales, which serve to protect them from parasites and disease.

After chinook enter the ocean, they grow rapidly on a diet of fish. Stanislaus River salmon may travel thousands of miles while in the ocean, venturing as far north as Alaska and Asia. Eventually, as fully grown adults, they find their way back to the California coast and the San Francisco Bay. After entering the bay, they instinctively navigate through thousands of miles of Delta channels to arrive at the mouth of the Stanislaus River. Once back in the Stanislaus, salmon will migrate upstream to an area very near where they were born 3 to 5 years ago. When home, salmon will find a suitable location to lay their eggs. Salmon die after spawning.

All salmon in the Stanislaus River today are referred to as fall-run, based on the time of year they enter the river. Historically, however, there was also a spring-run. Spring-run salmon would enter the river during spring when flows were high and it was possible to reach the upper river. Spring-run salmon would spend the summer resting in deep, cold pools in the upper reaches of the river before spawning in the fall. Although these fish were once the most abundant type of salmon in the Stanislaus River and the San Joaquin Basin, they are now extinct.

Virtually all human activity along rivers affect salmon. Dams, municipal and agriculture water withdrawals, water pollution, habitat degradation, ocean harvest, sport fishing and poaching are all factors which have contributed to shrinking salmon populations. There are now only about 500 adult fall-run chinook salmon that return to the Stanislaus River to spawn each year. It is our job to ensure that these fish not only continue to survive in the Stanislaus River but that their numbers increase to a point where we are no longer in danger of losing a valuable resource.

This is your COPY of a 15 page COMMENTS with Questions as relates to 'available waters' in/for Delta Water System to California Agricultural 'Yields', and Fish populations to SF-Bay 'pollution prevention'.

~~Copy to Each at: Ammonia Workshop March 8, 2009~~

Questions & Background References for CALFED Science Program 03/10-11/2009 Workshop concerning Ammonium and Ammonia within the Sacramento-San Joaquin Delta (Delta) and Suisun Bay (Bay) ecosystem.

QUESTIONS:

1. Since Sacramento County had started so called 'fluoridation' since Sac County voted in year 2000 for it; question is, how many TONS of Silicofluoride, and possibly chloramine is discharged to the Sacramento River, annually? [Read scientific References below to see why an accounting to prevent Sac River 'toxic pollution' should be made.]

2. Considering there are around 57 'registered' Waste Water Treatment Plants, or around 30 cities surrounding the SF-Bay discharging waste water to the SF-Bay; has a study been done to determine if each WWTP is accomplishing 100% DECHLORAMIZATION [e.g. removal of Ammonia] before pumping waste water in the SF-Bay? Are there now 'waivers' reluctantly allowing residual Chloramine to be discharged to the SF-Bay? [Read discussion & see MAPS below.]

3. What studies have been done by SFPUC-Water Dept. to determine if Chloramine and Silicofluoride drinking/tap water treatment has increased the LEAD intake of school Children from school drinking fountains? This has been a major problem for schools in Washington DC, and Seattle, specifically.

4. Since Silicofluoride [EPA 'regulated pollutant' classified by ATSDR as 'Hazardous Waste'] used to treat Sacramento & San Francisco plus 29 other cities [e.g. SF-Water Dept Wholesale Customers ... see MAP below] surrounding the SF-Bay drinking waters with it's inherent 'trace toxics' [e.g. Arsenic, Lead, radionuclide's, ...has anyone in California government studied whether residuals of Silicofluoride and/or Chloramine discharged by WWTP's into our SF-Bay and incoming Rivers affected our SF-Bay and San Joaquin Delta SALMON COLLAPSE?

See science report about Silico'fluoride' 0.25 ppm affect on Northwest Salmon, below.

Add'l Ref. http://www.fluoridealert.org/ATSDR-Fluoride.pdf

Suggestion: In conjunction with CA Fish & Wildlife, hire SF-Bay Scientists at USGS located in Menlo Park to do studies:

- A 'material balance study' to determine the Annual TOXIC loading of residual Chloramine & Silicofluoride 'toxics' by 57 WWTP's around SF-Bay, and Sacramento River. Find out how much TONNAGE in these chemicals are purchased per year, how much is used by the water treatment plants annually.

- In field sample in SF-Bay estuary and Sacramento River WWTP discharge points for Ammonia 'water & vegetation evidence', and fish collapse evidence. Report to be issued by USGS with meaning scientific conclusions!

Excerpt Ref 1., "...combination of Chloramine [e.g., Chlorine & Ammonia] & fluorsilicic acid, especially with extra amounts of ammonia leaches lead from meters, solder & plumbing systems, ..."

"A combination of chloramines and fluorosilicic acid, especially with extra amounts of ammonia, leaches lead from meters, solder and plumbing systems, according to Richard P. Maas, PhD and Steven C. Patch PhD, co-directors of the Environmental Quality Institute at the University of North Carolina, Asheville.

Chloramine, a **combination of chlorine and ammonia**, is a water supply disinfectant. Fluorosilicic acid, the chemical used by over 91% of U.S. fluoridating communities, attempts to improve dental health in those who drink it. About 2/3 of U.S. public water supplies are fluoridated but tooth decay remains a national epidemic, according to the U.S. Surgeon General. (b)

Maas said, "Tests showed lead levels three and four times higher in water with that combination of chemicals ...About 500 systems, across the country, have switched to Chloramine treatment since 2001...and most also use fluorosilicic acid," according to the North Carolina newspaper, the News & Observer."

Ref. 1. at: http://www2.fluoridealert.org/Alert/United-States/National/Fluoride-Chemicals-Leach-Lead-Into-Water-Supplies

Add'l Ref. 2.: "Effects of fluoridation and disinfection agent combinations on lead leaching from leaded-brass parts.

Maas RP, **Patch SC**, **Christian AM**, **Coplan MJ**.

Environmental Quality Institute, The University of North Carolina-Asheville, One University Heights, Asheville, NC 28804, United States.

Ref. 2. at:
http://www.ncbi.nlm.nih.gov/pubmed/17697714?ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_DefaultReportPanel.Pubmed_RVDocSum

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EPA Union career employees petition EPA 'politically appointed mgm't for a 'moratorium' on fluoridation; especially if Silicofluoride is combined with Chloramine. Excerpt the EPA Union employees' letter:
"Another reason for a Congressional review of fluoridation is the recent work of

Dr. Richard Maas of the Environmental Quality Institute, University of North Carolina-Ashville, which shows that use of chloramine disinfectant and silicofluoride fluoridating agents with excess ammonia increases lead concentrations in public water supplies. This may explain at least some of the increased lead levels seen in the District of Columbia's water supplies and in the blood of children drinking water fluoridated with silicofluorides. The Centers for Disease Control and Prevention says that ninety four percent of fluoridated water systems use silicofluorides." Ref link: http://www.fluoridealert.org/epa-unions1.pdf

Add'l public announcement of the "moratorium request"; excerpt:

"EPA UNIONS CALL FOR NATIONWIDE MORATORIUM ON FLUORIDATION, CONGRESSIONAL HEARING ON ADVERSE EFFECTS, YOUTH CANCER COVER UP"

http://www.world-wire.com/news/0830050001.html

Ask your utilities dept. for AWWA Standard for **Fluorosilicic Acid** B703-06, the foreword notes page ix: "The transfer of contaminants from chemicals to processed water or the residual solids is becoming a problem of greater concern." Then **page 13 is an entire page of contaminants ranging from heavy metals as arsenic, lead and more down to Radionuclide's as Uranium and Radium 226-228 and Alpha and Beta particles. All low levels, but can be cumulative in the body.** Chlorine will evaporate when heated in water, but fluorine and compounds will accumulate, adding to the levels in beverages and foods.

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URGENT! ... Know that the AWWA [American Water Works Association] has reported in one of their 'Water Conservation pamphlets' that "Less than 1% of utilities treated water is ever consumed [e.g. swallowed] by human beings." The rest goes to landscape watering, washing uses, and down drains.
So, think of this analogy to the AWWA statement...Would anyone purchase a bottle of 100 EXPENSIVE 'medicant' pills, take just one and throw the rest away into our habitats only to pollute our environments? Of course NOT!

Millions of Dollars are spent to install 'Fluoridation' equipment & Systems and Billions per year are spent for purchasing phosphate mining industry Silicofluoride [e.g. EPA classified "hazardous waste"] and in the daily operations of delivering a 'medicant' via public water systems for falsely proclaimed 'Better Oral Health'....

'Fluoridation' is the Worlds Most economically Wasteful, 'dose uncontrolled', illicit, illogical 'medicant' delivery system on the face of this Earth!

AGAIN, "Fluoridation" is the Worlds Most Wasteful, thus NOT Cost Effective, reported "Ineffective" if swallowed [Ref 3.], Entrenched Error 'Medicant' Delivery System on this Earth!

Major dental researchers concede that fluoride's benefits are topical not systemic (*Fejerskov 1981; Carlos 1983; CDC 1999, 2001; Limeback 1999; Locker 1999; Featherstone 2000*).

"[L]aboratory and epidemiologic research suggests that fluoride prevents dental caries predominately after eruption of the tooth into the mouth, and its actions primarily are topical for both adults and children" *(CDC, 1999, MMWR 48: 933-940).*

Ref. 3. "the major anticaries benefit of fluoride is topical and not systemic." SOURCE: National Research Council. (2006). Fluoride in Drinking Water: A Scientific Review of EPA's Standards. National Academies Press, Washington D.C. p 13.
http://www.nap.edu/catalog.php?record_id=11571

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Second read the label on fluoridated toothpaste. With variable wording it says, "drug facts," "use a pea size," "do not swallow," "if more than brushing is swallowed contact the poison control center." Very serious warnings. **A "pea" size of toothpaste has 0.25 mg of fluoride, the same as one 8 oz glass of fluoridated water.** The Food and Drug Administration has serious concerns about a very small amount of fluoride. Fluoridation is an unapproved drug and unapproved for fluoridation and considered by the FDA to be one of thousands of illegal drugs. Remember the CDC does not test the safety of drugs, the FDA does.

It makes no sense to force everyone to swallow what the FDA warns not to swallow.

'Fluoridation' is only a phosphate mining lobbied, 'illicit' means to dispose of hundreds of thousands of TONS of 'Hazardous Waste' accumulated because EPA actively this 'regulated pollutant' chemical waste. In the above instances, certain big corporations practice and Profit in the Millions of $$$'s by applying the old adage of:

"The Solution to Pollution is Dilution!" ...in selling the 'Hazardous Waste', instead of paying millions to dump in Class 1 hazardous waste land fills.

And, cumulative Silico-fluoride with it's toxic contaminants discharged by WWTP's into USA waters, stream, rivers and bays is an environmental nightmare that needs to be seriously addressed and solved.

NEVER SWALLOW ANY FLUORIDE !

San Francisco Public Utilities Commission [SFPUC] Water Treatment Utilities switched from Chlorine to Chloramine in February 2004. Details from SFPUC viewpoints: Ref. 4
http://sfwater.org/mto_main.cfm/MC_ID/13/MSC_ID/166/MTO_ID/399

For decades prior, SFPUC Water treatment utilities have been adding hundreds of millions of TONS of Silicofluoride to drinking_tap water; for which current Science has cast positive doubt as to effectiveness to meet intended goal to meet a dental industry claim that 'swallowing drinking water with added fluoride' will meet their dental claim "it's for Better Oral Health!" References:
http://www.fluoridealert.org/health/index.html

See MAP - SFPUC-Water Dept. wholesales Chloramine & Silicofluoride treated Source Waters to a listed 29 SF-Bay located cities water treating/distributing utilities. See MAP Ref. 5 at:
http://sfwater.org/mto_main.cfm/MC_ID/13/MSC_ID/166/MTO_ID/358

Excerpt USGS Study/Reports: "San Francisco Bay receives effluents from 46 publicly owned wastewater-treatment plants, 65 large industrial discharges, and as much as 40,000 tons of at least 65 contaminants each year. Many of these contaminants are toxic to plants or animals or pose threats to human health." Ref. 6 http://water.usgs.gov/wid/html/sfb.html#toxic

Excerpt: "In terms of water supply, the Master Contract provides for a **184 million gallon per day** (mgd, expressed on an annual average basis) "Supply Assurance" to the SFPUC's wholesale customers, subject to reduction in the event of drought, water shortage, earthquake, other acts of God, or rehabilitation and maintenance of the system. The Master Contract does not guarantee that San Francisco will meet peak daily or hourly customer demands when their annual usage exceeds the Supply Assurance. The **SFPUC's wholesale customers have agreed to the allocation of 184 million gallons/day Supply**
Assurance among themselves, with each entity's share of the Supply Assurance set forth on a schedule adopted in 1993. This Supply Assurance survives the termination of the Master Contract in 2009." Ref. 7:
http://www.redwoodcity.org/publicworks/water/pdf/UWMP/draft/Draft%20UWMP%20Chapter%203.pdf

Since SFPUC water treatment utilities treat around 184 million gallons per day, an estimated 'Material balance' of how much TONNAGE of Chloramine and Silicofluoride are added daily to the 184 million gallons should be attained, and verified with comparison with the SFPUC purchasing Contracts.
Thus, an estimate of how much Chloramine & various trace amounts of toxic chemicals are being discharged by ALL WWTP's, in Total, to the SF-Bay.

Hypothetical ... to be confirmed with SFPUC Water Dept. & EBMUD: My rough estimate is that over two (2) railcars of Silicofluoride [containing approx. 43,000 lbs per railcar] per day are metered into SFPUC and East Bay Municipal Utility District [greater Oakland, CA Water utility] Water systems, and eventually around 90% plus of 86,000 lbs / day finds its way to near 40+ Waste Water Treatment Plants surrounding the SF-Bay. Over 75,000 lbs per day of Silicofluoride residual 'contaminants' from so called 'fluoridation' is discharged by the many SF-Bay located WWTP's into the San Francisco Bay per day, or worse yet ... over 27 million lbs of SiF residual per year! More than needed for causal affect of a 'Salmon & other SF-Bay aquatic Life Collapse'

Read below, "**IMPACT OF ARTIFICIAL FLUORIDATION ON SALMON SPECIES IN THE NORTHWEST USA AND BRITISH COLUMBIA, CANADA**

Ref. 11 ***Fluoride*** *Vol.27* No.4 220-226 1994

Prior to Chloramine use by WWTP's around the SF-BAY, Excess chlorine was went through a 'dechlorination' stage by adding sulfur dioxide, sodium bisulfite, sodium sulfite, or sodium metabisulfite. Thus, theoretically no- chlorine would then be discharged & thus Not POLLUTING the SF-Bay estuary w/chlorine.

It appears over 50 WWTP dischargers to the SF-Bay need to have a different process of 'DeChloramination' in place and operating 100% 24/7-365 days/yr. It's doubtful this 'dechloramination program' is optimal! What WWTP do not have adequate dechloramination process around the SF-Bay? Which WWTP's around SF-Bay have 'waivers' until their promise to comply with optimum dechloramination? And, accidental discharges of Chloramine to SF-Bay can and do occur, excerpt: "A high volume direct discharge of chloraminated water to the environment can result from pipeline breaks or flushing fire hydrants. As with chlorinated water, this needs to be avoided because chlorine residual in the chloraminated water may pose a direct acute health risk to fish in creeks and streams. Water companies use dechlorinating agents to remove chloramine from the water during high volume discharges and while flushing fire hydrants." – Ref 8.
http://sfwater.org/Files/FAQs/Animals_environment.pdf

Finally, go figure this about the imported supply source Silicofluoride from China. Most USA Chemical suppliers of Silicofluoride don't want Water Treatment plants to know their source of Silicofluoride is imported by them from China.
In years past, majority of Silicofluoride came from Central Florida [Polk County] until hurricane Katrina, and other hurricanes put one of 4-5 suppliers out of business, and a real domestic supply shortage from Phosphate ore mining & processing companies ensues. Reference the 'China Import' data Ref. 9
http://www.sriconsulting.com/CEH/Public/Reports/739.1000/

U.S. IMPORTS FOR CONSUMPTION OF FLUORSPAR, BY COUNTRY AND CUSTOMS DISTRICT1, Ref. 10
http://minerals.usgs.gov/minerals/pubs/commodity/fluorspar/myb1-2007-fluor.pdf

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IMPACT OF ARTIFICIAL FLUORIDATION ON SALMON SPECIES IN THE NORTHWEST USA AND BRITISH COLUMBIA, CANADA

Ref. 11 ***Fluoride*** *Vol.27* No.4 220-226 1994

Presented at the XXth Conference of the International Society for Fluoride Research, Beijing, China, September 1994.
by Richard G Foulkes and Anne C Anderson
Abbotsford BC, Canada, and Bellingham WA, USA

SUMMARY: A review of 1iterature and documentation suggests that concentrations of fluoride above 0.2 mg/L have lethal (LC_{50}) effects on and inhibit migration of "endangered" **salmon** species whose stocks are now in serious decline in the US Northwest and British Columbia. Fluoride added to drinking water,"to improve dental health", enters the fresh water eco-system, in various ways, at levels above 0.2 mg/L. This factor, if considered in "critical habitat" decisions, should lead to the development of a strategy calling for a ban on **fluoridation** and rapid sunsetting of the practice of disposal of industrial fluoride waste into fresh water.

Key words: British Columbia; Fluoride; Toxicity; **Salmon** species; US Northwest.

"Salmon Collapse" problem is enormously complex-biologically, administratively and economically". His article and reports in the media have stressed the problems with harvesting; loss of habitat through poor forestry practices, livestock and human settlement; and dams built for power and irrigation. Little emphasis is placed on the effects of pollution of water by toxic substances such as fluoride.

The aluminum industry is the chief beneficiary of power dams on the Columbia River System, and it is the fluoride wastes from smelters that first come to mind as sources of fluoride pollution. However, there is another potential source of contamination - the artificial **fluoridation** of community water supplies for the avowed purpose of improving dental health.

Fluoride and "critical habitat"

In discussions of "critical habitat" for endangered **salmon** species, all of the possible components must be evaluated. This study examines the possibility that artificial **fluoridation** of drinking water in communities along the course of **salmon** rivers is a factor to be included.

The POLLUTION of SF-Bay, the Sacramento River, the Merced River with Silicofluoride discharges & Chloramine...research that indicates there is "No Safe level":

"The US Environmental Protection Agency (EPA) (1) and the Province of British Columbia (BC) (2) adhere to a "permissible level" of 1.5 ppm (1.5 mg/L) for fluoride discharged into fresh water. BC's "recommended guideline" is currently **0.2 mg F/L**; but this does not have the force of legislation. Neither the Minister of the Environment nor the Washington State Department of Ecology requires fluoride estimations for sewer effluent permits as it is considered fluoride is not significantly toxic to aquatic life in concentrations expected in discharges (3,4).

A review of the literature and other documents, such as court transcripts reveals that levels below 1.5 mgF/L have been shown to have both lethal and other adverse effects on **salmon**. "Evidence" presented by the EPA and other government bodies responsible for the environment suggests that harm can come to aquatic life only at concentrations that far exceed those in discharges from fluoridated cities. Both Groth (5) and Warrington (6) point out that many factors influence susceptibility of fish to fluoride: temperature; water hardness;

pH; chloride concentration; and, the strain, age and physiological and reproductive condition of the fish.

Groth points out that there are serious problems with "laboratory" experiments as opposed to "field" studies. In the former, "... many of the organisms tested for fluoride toxicity did not experience effects until levels of fluoride higher than those which might realistically be encountered in the environment were attained." Groth concluded that the finding can be misleading: the techniques of measurement may be inadequate to detect effects, and these may be at the population rather than individual level (5).

There are studies showing the effect of temperature and hardness. Angelovic and others (7) showed lethal effects on rainbow trout related to temperature. Using sodium fluoride at the same degree of hardness (estimated at 44 by Warrington (6)), the 240-h LC_{50} at 7.2 degrees C was found to be 5.9-7.5 mgF/L; at 12.8 degrees C, 2.6-6.0; and, at 18.3 degrees C, 2.3-7.3 mgF/L. Neuhold (8) reported the same result for 12.8 degrees C and the same degree of hardness. Pimental and Bulkley (9), using a constant temperature of 12 degrees C, found that the 96-h LC_{50} for rainbow trout with hardness levels, in mg/L, of 17, 49, 182 and 185 was associated with fluoride levels, in mg/L, of 51, 128, 140 and 193 respectively.

Warrington (6) in British Columbia, where the softness of major salmonid watercourses is the rule, combined the findings of Angelovic (7), and of Pimental; and Bulkley (9) to calculate that the chronic threshold for rainbow trout at 12 degrees and water hardness of 10 mg/L (calcium carbonate) is 0.2 mgF/L.

In a field study, Damkaer and Dey (10) demonstrated that high **salmon** loss (Chinook and Coho) at John Day Dam on the Columbia River, 1982-1986, was caused by the inhibition of migration by fluoride contamination from an aluminum smelter 1.6 km above the dam. The average daily discharge of fluoride in 1982 was 384 kg. This was associated, at the dam, with a fluoride concentration of 0.5 mg/L and a migration time of more than 150 hours and a 55% loss. In 1983, discharge was reduced to 107 kg/day. This was associated with a reduction of concentration to 0.17 mgF/L and the migration time to less than 28 hours with a loss of 11%. In 1985, fluoride discharge of 49 kg/day was accompanied by a concentration of 0.2 mgF/L and a salmonid loss of 5%.

Damkaer and Dey confirmed the cause-and-effect relationship by means of a two-choice flume for fluoride gradient **salmon** behaviour tests. These

determined that the "critical level" was 0.2 mgF/L. It is interesting that the Damkaer and Dey study was not available at the time of Warrington's review.

There are other studies that indicate that fluoride at levels below 1.5 mg/L have lethal and other adverse effects on fish. Delayed hatching of rainbow trout occurred at 1.5 mgF/L (11); brown mussels died at 1.4 mgF/L (12); an alga (Porphyria tenera) was killed by a four-hour fumigation with fluoride with a critical concentration of 0.9 mgF/L (13); and, levels below 0.1 mgF/L were shown to be lethal to the water flea, Daphnia magna (14). These latter two studies suggest that **salmon** species may be affected by fluoride induced reduction of food supply.

Documents used in the Court case involving Meader's Trout farm in Pocatello, Idaho, in 1961 (15) contain evidence that between 1949 and 1950 trout damage and loss was related to fluoride contamination due to rain washing air-borne particles from leaves into hatchery water at levels as low as 0.5 mgF/L.

Therefore, there is evidence that the "safe level" of fluoride in the fresh water habitat of **salmon** species is not 1.5 mg/L but, 0.2 mg/L. Is this concentration exceeded by fluoridated communities on the banks of water-courses serving as **salmon** habitat?

Fluoride levels in water and sewer systems

In fluoridated areas, drinking water, obtained from surface water with an average fluoride concentration of 0.1-0.2 mg/L (16), is raised to the "optimal" level of 0.7-1.2 mgF/L by the addition of sodium fluoride, hydrofluosilicic acid, or sodium silicofluoride. Fluoride, in community drinking water, enters the fresh water ecosystem in various ways. Surface run-off from fire-fighting, washing cars, and watering gardens may enter streams directly or through storm sewers at optimal concentration, 0.7-1.2 mgF/L. Most enters during waste water treatment.

Masuda (17) studied a large number of cities and calculated the concentrations in waste water that were in excess of the concentration present in the cities' water supplies. In raw sewage, this was 1.30 mgF/L; primary treatment reduced this slightly to 1.28 mgF/L; secondary treatment to 0.39 mgF/L. Singer and Armstrong (18) found 0.38 mgF/L in unfluoridated sewage and 1.16-1.25 mgF/L fluoridated sewage.

It is clear that, in the case of artificially fluoridated communities the concentration of fluoride in both surface run-off and sewer effluent exceeds 0.2 mgF/L. The concentration of fluoride in receiving waters depends on a number of factors: background level (i.e., concentration above effluent outlet); concentration of community water before **fluoridation**: amount of fluoride added; and. the rates of flow of production, discharge, and receiving water.

Studies show that elevated concentrations in fresh water receiving fluoridated effluent may persist for some distance. Bahls (19) showed that the effluent from Bozeman Montana of 0.6-2.0 mgF/L, discharged into the East Galletin River did not return to the background level of 0.33 mgF/L for 5.3 km. Singer and Armstrong (18) reported that a distance of 16 km was required to return the Mississippi River to its background level of 0.2 mg/FL after receiving the effluent of 1.21 mgF/L from Minneapolis-St Paul.

Although dilution reduces concentration over distance, the amount of fluoride in effluent is either deposited in sediment locally or is carried to the estuary where it may persist for 1-2 million years (16) or may re-contaminate if dredging were to take place. Sewage sludge, a product of secondary treatment systems must contain high concentrations of fluoride. However, this is not measured, routinely, in the jurisdictions that were contacted for this study. This also, when spread on agricultural land, including forests, is a hazard in the "critical habitat" of **salmon** species. During application, aerosols are created that may be ingested by animals or contaminate surface water. The sludge adds toxic substances to the soil. Fluoride can move into ground water and the run-off of soil particulates may enter streams that play a role in the life cycle of **salmon**. Effluent from fluoridated cities is also discharged into tidal waters. Sea water has been shown to have a higher concentration of fluoride than unpolluted surface water (16). This concentration of 1.35-1.4 mgF/L is total fluoride. Ionic fluoride is 0.4-0.7-mgF/L and a similar amount is bound in ionic form to magnesium (20).

A more meaningful measure of fluoride pollution in sea water is the ratio of fluorine to chlorine (normally, 10^{-5}:1). Contaminated rivers flowing into an estuary, as well as direct discharge of effluent, can elevate the amount of fluoride. The possible effects on **salmon** species are left for future review.

Discussion

More research, especially field study is required. However, from information that is available, 0.2 mgF/L in the fresh water ecosystem in the US Northwest and British Columbia appears to be the appropriate safe level for **salmon** species rather than 1.5 mgF/L currently accepted. Artificially fluoridated communities

discharge fluoride into this ecosystem at levels that exceed this from surface run-off, sewage effluent and, probably, from the agricultural use of sludge. Decreases in water volume and/or flow velocity have the potential to increase fluoride concentration. Increased water temperature will enhance fluoride toxicity. **Fluoridation** deserves to be looked at as a component of "critical habitat" along with the more publicized factors.

A review of **Fluoridation** Census 1985 published by the US Department of Health and Human Services (21) shows that along the course of the Snake River from the Idaho-Wyoming border to its junction with the Columbia River in Washington State, there are three water systems fluoridated at 1.0 mgF/L. Eight artificially fluoridated water systems are located on the banks of the Columbia from the Canadian border to the mouth. That is, a total of 11 artificially fluoridated communities are located along the Columbia-Snake River system into which they release fluoride. Does this play a role in the catastrophic decline in salmonid stocks in this once highly productive ecosystem?

The declining **salmon** returns to the North Thompson, especially of Chinook and Coho, is threatening the existence of species. The City of Kamloops, which contributes run-off and sewage effluent to the North Thompson, is artificially fluoridated. Could this fluoride contribute to migration delay as occurred at the John Day Dam? Could the decline be related to loss of basic feed or hatching abnormalities associated with toxic levels of fluoride? Effluent levels in Kamloops have been measured at 0.6-1.2 mgF/L by employees of the City (personal communication) but no field studies on the effect on **salmon** species have been carried out.

The Fraser River of British Columbia begins in the Rocky Mountains, north of the origins of the Columbia. The Fraser travels west to the City of Prince George, where it is joined by the Nechako River carrying water from the western portion of the Province. From there, it flows south to enter the Strait of Georgia after it is joined by numerous tributaries, the largest of which is the Thompson River. Prince George, like Kamloops, is artificially fluoridated.

Does fluoride from Prince George contribute to reported declines in Chinook and Coho stocks in the Nechako? If the diversion of water from the Nechako River, as proposed in the "Kemano II" hydroelectric project takes place and lowers the water level, slows the flow and raises the temperature of the Nechako Fraser River system, will the fluoride from both Prince George and Kamloops be enhanced in its toxic effects not only on Chinook and Coho but on other **salmon**

species such as the Sockeye upon which fishers of both the US and Canada depend?

Conclusion

The decline in **salmon** stocks, especially Chinook and Coho, is a major economic problem for both commercial and sport fisheries. "Critical habitat restrictions" are currently (April 1994) being formulated. Fluoride pollution should be included. There are many questions. But, until evidence to the contrary based on impartially, conducted field studies, is available, the "critical level" of fluoride, in fresh water, to protect **salmon** species in the US Northwest and British Columbia, should be 0.2 mgF/L. Acceptance of this level would condemn both the direct metering into fresh water of fluoride wastes from such activities as smelting and phosphate fertilizer manufacture and the entry of fluoride after its deliberate addition to community water supplies.

The strategy for eliminating unacceptable levels of fluoride from the "critical habitat" of Northwest Pacific salmon consists in the immediate banning of artificial fluoridation and the rapid sunsetting of the current disposal practices of fluoride-producing industries."

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***Fluoride* Journal** is published by the International Society for Fluoride Research
Editorial Office: 81A Landscape Road, Mount Eden, Auckland 4, New Zealand
Subscription Rate: $40. U.S. Funds per year (quarterly publication)

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