Joint Testimony of John Nelson and Ian Drury
California Department of Fish and Game

We are providing expert testimony on information related to Key Issue 2 in the hearing notice, specifically in relation to the information in the declarations of William Mitchell and Paul Bratovich. The facts of our testimony are based on personal and professional knowledge and are as follows:

2000-2002 Salmon Spawning Data

The additional three years of fall-run Chinook salmon escapement (population) data does not change the trend from that in the previous hearing. Analysis of pre- and post-New Bullards Bar population data, while incorporating the 2000 through 2002 information, indicates there remains no significant difference between those data sets because of the extreme variability in the populations for both pre- (12,906± 11,395 fish) and post- (15,622± 8,380 fish) New Bullards Bar. In fact, the trend lines (Figures 1 and 2) for pre- and post-New Bullards Bar Chinook salmon populations, remain unchanged from the standpoint that the pre-New Bullards Bar population still remains expanding at a greater rate than the post-New Bullards Bar population. Hence it is reasonable to conclude that conditions have not resulted in improved Chinook salmon populations.

Juvenile Outmigration

The Department of Fish and Game (Department) operated a rotary screw trap (RST) on the Yuba River approximately six river miles upstream from the city of Marysville from November 1999 through July 2000, and from October 2000 through June 2002 (approximately three years). Except during extraordinary events (<6%) which included high water flows or periods of excessive debris, the RST was fished 24 hours per day, seven days a week.

The purpose of the monitoring was to begin development of baseline information for juvenile salmon and steelhead trout life history strategies on the Yuba River. Data were collected to determine and document species and race composition, the timing of downstream movement below the spawning area, duration of downstream movement, and the condition and size of downstream migrants. Trap efficiency tests (trap calibration experiments) were not conducted with Chinook salmon or steelhead trout. Trap efficiency test are necessary when either the size of the fish changes, flow condition change or the trap is moved. Data from an uncalibrated trap represent trends (size of fish outmigrating and timing of movement) and does not represent abundance or any other account of total population. Department monitoring ended in June 2002 due to a lack of funding.

In June 2002 the Department loaned Yuba County Water Agency (YCWA) our screw traps to monitor juvenile salmonids during that years' water transfer. This was required as a condition of their water transfers scheduled for that year. YCWA conducted RST operations from mid-June 2002 through early-October 2002

(approximately four months). The species of primary concern was Central Valley steelhead trout, because previous monitoring by the Department indicated that juvenile steelhead trout (Young of the Year) prematurely moved downstream during the high in-stream flows associated with past water transfers. To accomplish the monitoring, the Department loaned and helped install three RST's for YCWA, as well as provided technical advice to YCWA on how to operate the traps.

The catch per unit effort abundance indices (reported by YCWA) were determined solely through the use of daily RST catches (number of fish of each species caught per day) and data regarding trap operational variables (how much water a RST sieves per day) and not based on caliberated traps (i.e. how efficiently different size of fish are captured). The data used only represents trends and can not accurately or meaningfully determine the number of fish outmigrating; this is the primary shortcoming of the way the data was used by YCWA.

To derive a meaningful number representing the number and timing of juvenile salmonids migrating out of the Yuba River, RST efficiency tests would be required for all species of interest, and for all size classes (life histories) of these species at different flows. Additionally, a multi-year effort that looks at all water year types and all possible flow regimes would be necessary before an accurate estimate of how many juvenile salmon are outmigrating at different times of the year could be determined.

The primary concerns with an uncaliberated trap are (1) juvenile salmonids are not evenly distributed throughout the water column and therefore do not have an equal probability of being captured, (2) juvenile out-migrating salmonids of different species and different size classes (fry and smolt) do not have an equal probability of being captured due either to location in the water column or avoidance by larger fish (Roper 2000, Martin et. al 2001).

Survival of any species including anadromous fish (Chinook salmon) is based on basic biological and ecological principles. The survival of a species or population is based in its' resiliency so that it is least susceptible to environmental events that would adversely affect the species (Colinvaux 1973). Life history strategies that provide a variety of outmigration strategies, specifically different times and sizes at outmigration, provides for a more resilient population. This is a standard strategy under which Chinook salmon have evolved. Typical outmigration strategies of Chinook salmon in Sacramento Valley rivers consists of a variety of size and age classes, including fry, pre-smolts, smolts, post-smolts, and yearlings outmigrating at different times of the year (Department of Fish and Game 2000, Snider and Titus 2000, Department of Fish and Game 1999, Snider and Titus 1998, Ward 2003).

The larger the juvenile at outmigration the greater its' survival rate. Survival of fry to maturity is significantly less than from fingerling/smolt to maturity (Ward 2003, Everhart and Youngs 1981). The relationship between the size of Chinook salmon released and returns (survival) has been studied (Hallock et. al 1980, Reavis 1980). Hallock (1980) found sequential increases in survival as size (fry to smolt) increased

(Table 2). The survival of Chinook salmon fry released at a weight of 8 grams (g) increased by 230% over fish released at 4 grams. Increases in size at release from 8g to 16g, 15g to 30g and 30g to 60g resulted in increase in survival of 150%, 100% and 80%, respectively. Studies at Nimbus Hatchery on the American River indicated that yearling [actually smolt based on weight at release] Chinook salmon released at 45g returned to the hatchery at 34 times greater than smaller fingerlings (Warner et. al 1961 as cited Reavis 1980). Sholes and Hallock (1979 as cited by Reavis 1980) found similar results. As a result of these studies hatchery practices were revised throughout the state to rear salmon to a larger size prior to release.

Table 2. The percent increase in survival expected from doubling the size at release of fall-run chinook salmon from California's Sacramento River system, and from several stream's in the state of Washington.

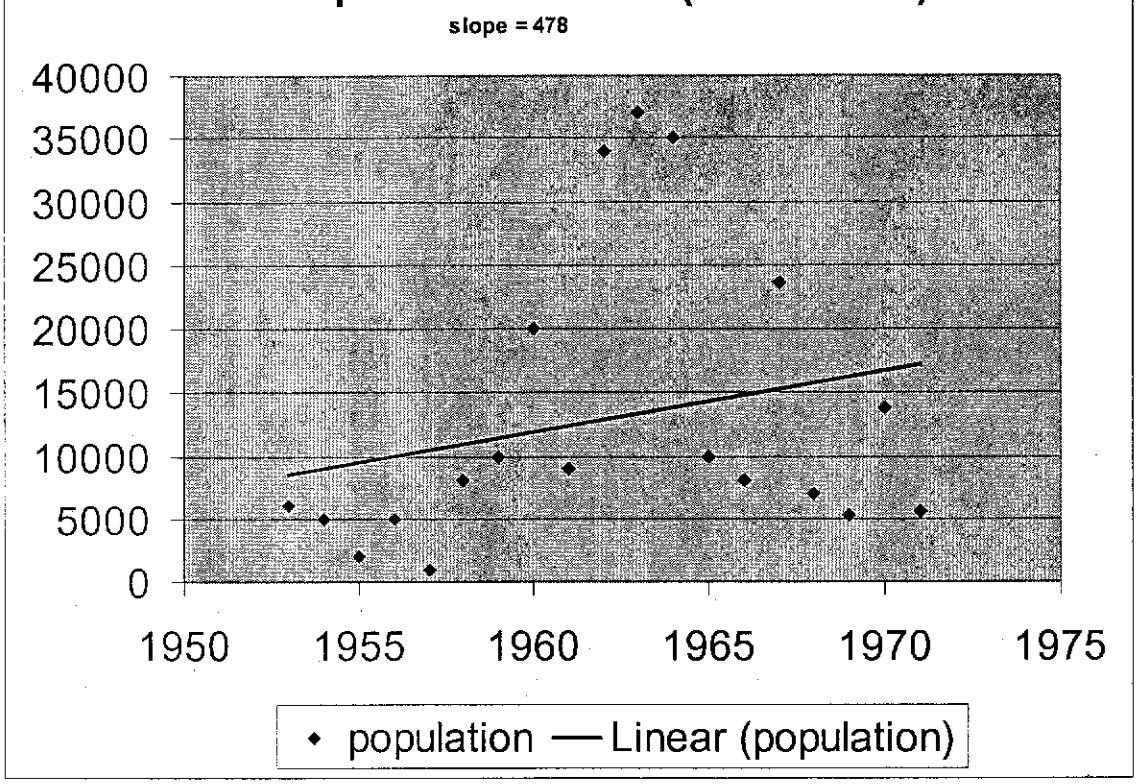
Increase in Size (grams)		Increase in Survival (%)		
From	To	Sacramento River Fish	Washington 1970 Brood Year	Washington 1971 brood year
4	8	230	290	220
8	16	150	120	90
15	30	100	70	70
30	60	80	50	50

From Hallock et. al 1980

Conclusions:

- **There remains no significant difference between pre- and post-New Bullards Bar Chinook salmon populations.**
- **Pre-New Bullards Bar Chinook salmon populations were still expanding at a greater rate than the post-New Bullards Bar population.**
- **Conditions have not resulted in improved populations.**
- **Larger the juvenile salmon at outmigration the greater the survival rate.**
- **It is necessary to manage for both fry and smolts outmigration strategies in order to maintain the Chinook salmon population.**

Figure 1. Pre-New Bullards Chinook Salmon Population Trend (1953-1971)



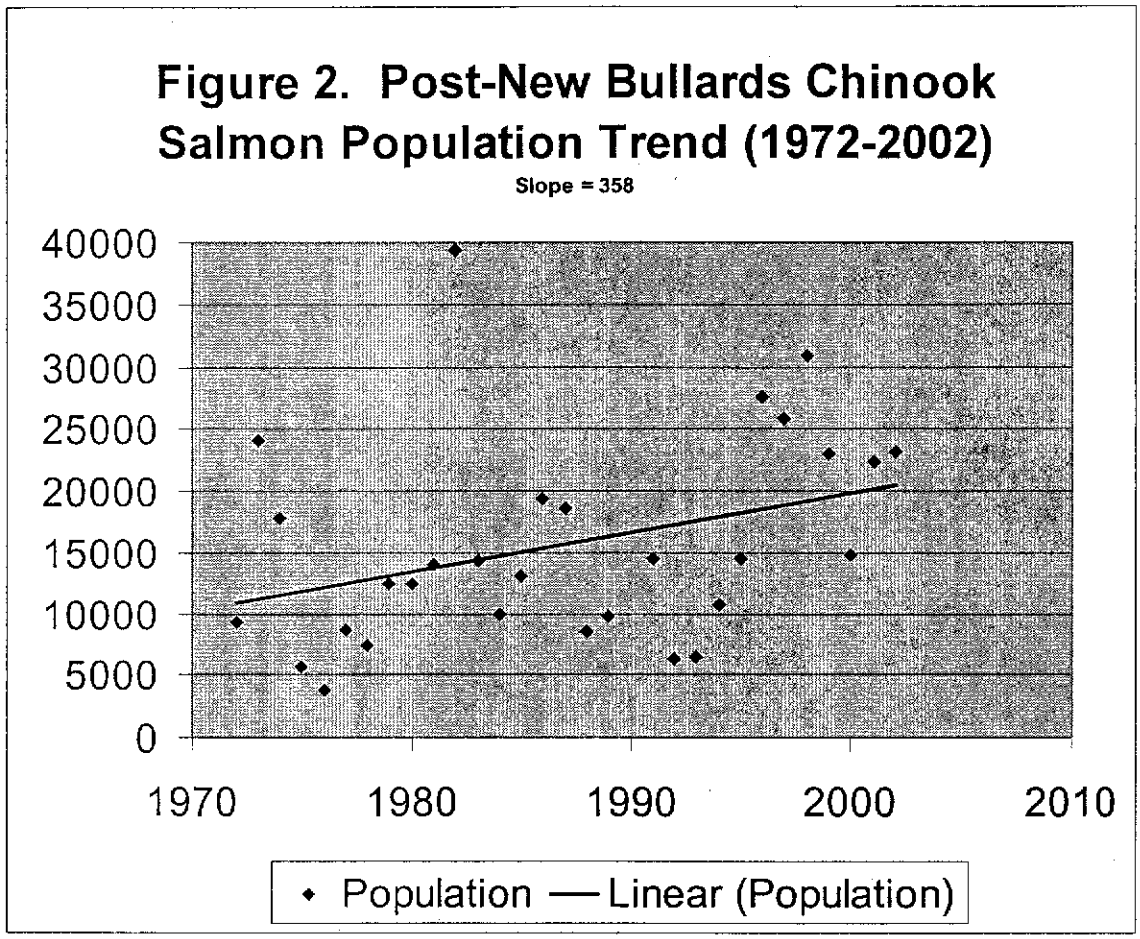


Figure 2. Post-New Bullards Chinook Salmon Population Trend (1972-2002)
Slope = 358
40000
35000
30000
25000
20000
15000
10000
5000
0
1970
1980
1990
2000
2010
Population
Linear (Population)

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