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Memo

To: Santa Ana Sucker Conservation Team

From: Drs. Jonathan Baskin, Thomas Haglund and Steve Bryant
Principal Senior Scientists

Date: November 21, 2006

Re: Draft - SAWPA Sucker Research Monthly Progress Report – Correction of October Report

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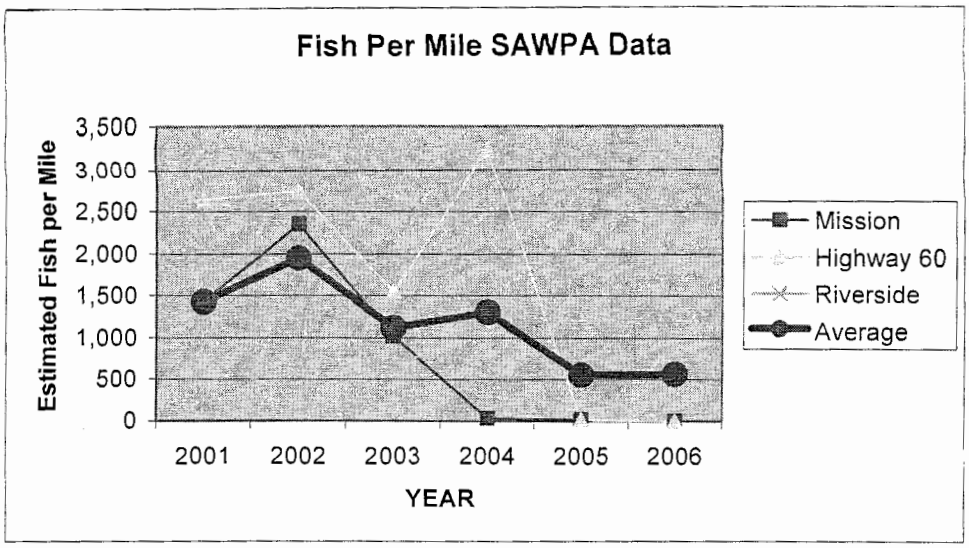
SAWPA Population Trend Data 2001-2006

I would suggest that we regress fish/mile against time (year) for each site independently then regress average fish/mile against time (year). If we do this we can answer whether there is a statistically significant trend at any of the three sites and whether there is a significant trend in the river based on these three sites.

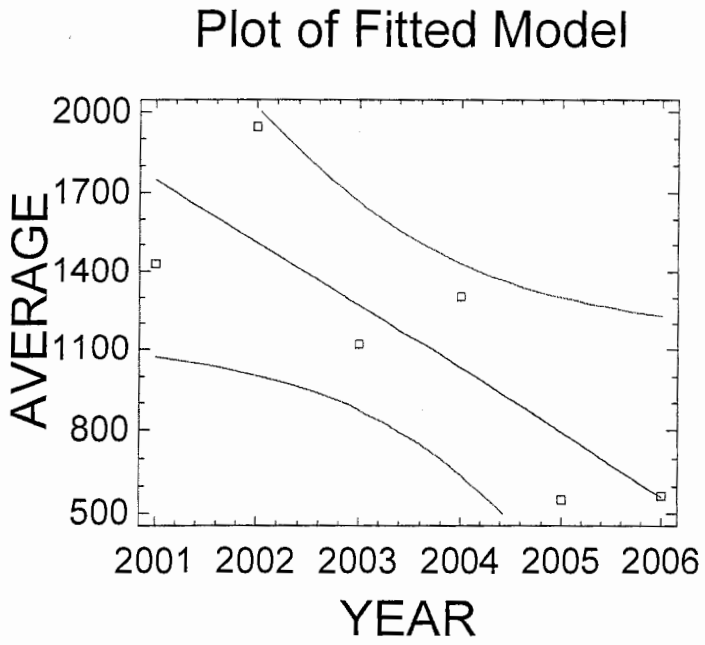
These are the data that should be used. Everything is expressed as fish/mile.

Year	Mission	Highway 60	Riverside	Average
2001	1,432	2,639	209	1,427
2002	2,350	2,736	756	1,947
2003	1,014	1,545	805	1,121
2004	32	3,235	644	1,304
2005	16	16	1,625	552
2006	0	0	1,689	563



Regressions: the following 4 pages have the regressions for "Average" and each of the sites. Data were not tested as to meeting assumptions of test. Following that are a few comments on the data.

For "Average" against "Year":



Regression Analysis - Linear model: Y = a + b*X

Dependent variable: AVERAGE
Independent variable: YEAR

Parameter	Estimate	Standard Error	T Statistic	P-Value
Intercept	477527.0	160507.0	2.97512	0.0409
Slope	-237.771	80.1132	-2.96794	0.0412

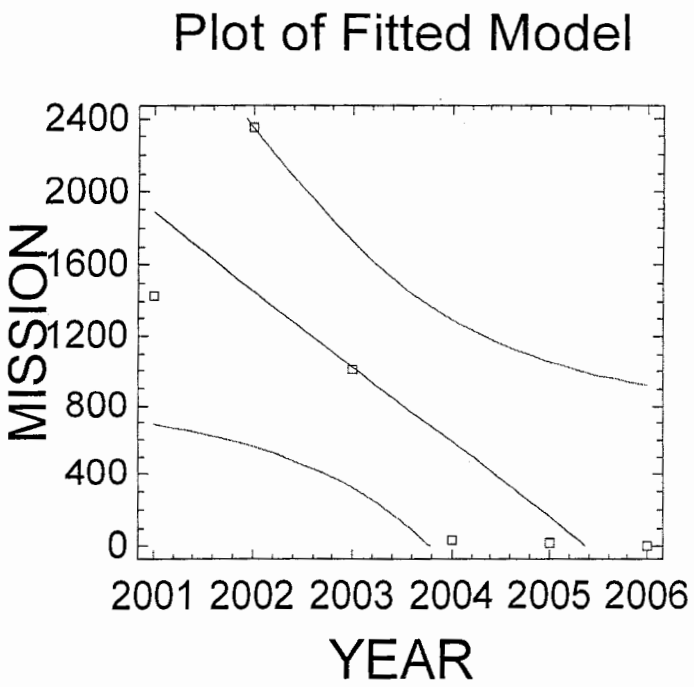
Analysis of Variance

Source	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
Model	989367.0	1	989367.0	8.81	0.0412
Residual	449268.0	4	112317.0		
Total (Corr.)	1.43864E6	5			

Correlation Coefficient = -0.829284
R-squared = 68.7712 percent
R-squared (adjusted for d.f.) = 60.964 percent

Thus, there is significant (barely) decline in estimated fish per mile over the 6 years of the study. "Year" explains about 60% of the variation in "Average".

For Mission:



Regression Analysis - Linear model: Y = a + b*X

Dependent variable: MISSION
Independent variable: YEAR

Parameter	Estimate	Standard Error	T Statistic	P-Value
Intercept	867693.0	284910.0	3.0455	0.0382
Slope	-432.686	142.206	-3.04267	0.0383

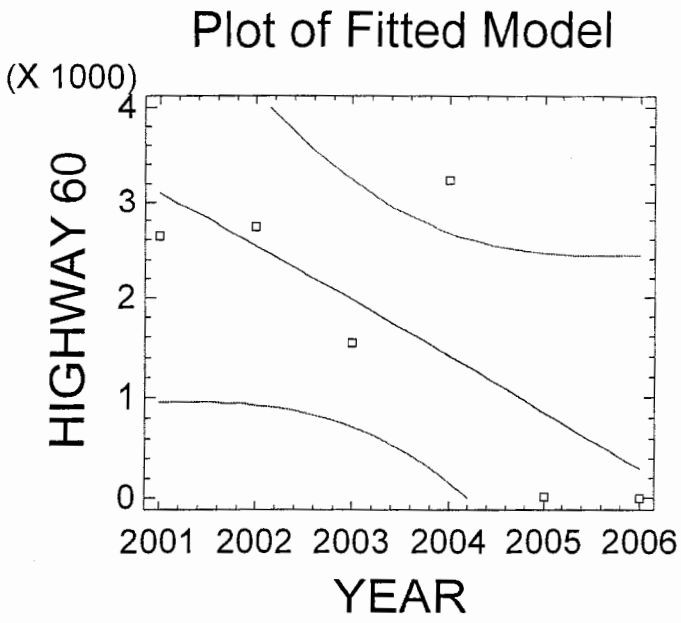
Analysis of Variance

Source	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
Model	3.2763E6	1	3.2763E6	9.26	0.0383
Residual	1.41558E6	4	353895.0		
Total (Corr.)	4.69188E6	5			

Correlation Coefficient = -0.835638
R-squared = 69.8291 percent
R-squared (adjusted for d.f.) = 62.2864 percent

Thus, there is significant (barely) decline in estimated fish per mile over the 6 years of the study. "Year" explains about 62% of the variation in "Mission".

For Highway 60:



Regression Analysis - Linear model: Y = a + b*X

Dependent variable: HIGHWAY 60
Independent variable: YEAR

Parameter	Estimate	Standard Error	T Statistic	P-Value
Intercept	1.12738E6	510037.0	2.21038	0.0916
Slope	-561.857	254.573	-2.20706	0.0919

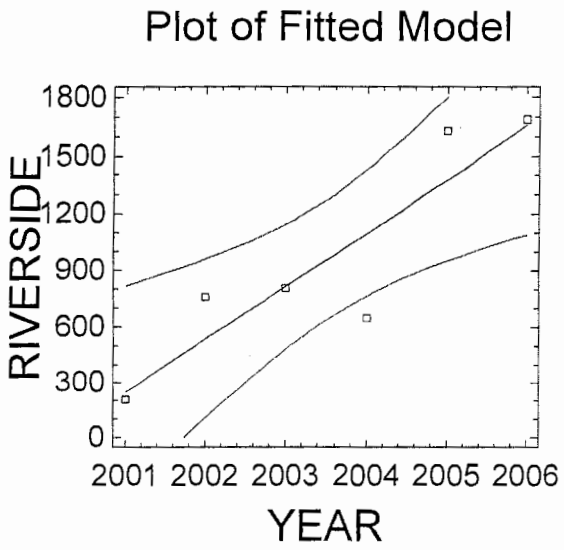
Analysis of Variance

Source	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
Model	5.52446E6	1	5.52446E6	4.87	0.0919
Residual	4.53652E6	4	1.13413E6		
Total (Corr.)	1.0061E7	5			

Correlation Coefficient = -0.741011
R-squared = 54.9097 percent
R-squared (adjusted for d.f.) = 43.6372 percent

Thus, there is no regression for the Highway 60 data. That is, there is no significant trend in the data.

For Riverside:



Regression Analysis - Linear model: Y = a + b*X

Dependent variable: RIVERSIDE
Independent variable: YEAR

Parameter	Estimate	Standard Error	T Statistic	P-Value
Intercept	-562659.0	135055.0	-4.16614	0.0141
Slope	281.314	67.4095	4.17321	0.0140

Analysis of Variance

Source	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
Model	1.38491E6	1	1.38491E6	17.42	0.0140
Residual	318083.0	4	79520.8		
Total (Corr.)	1.70299E6	5			

Correlation Coefficient = 0.901788
R-squared = 81.3221 percent
R-squared (adjusted for d.f.) = 76.6526 percent

For Riverside, there is a significant upward trend in the data. "Year" explains about 77% of the variation in "Riverside".

Conclusions: There is a significant downward trend in the "Average" data. The sites show differences; for Mission, there is a significant decline, for Highway 60, there is no significant regression, though the best fit line has a negative slope, and for Riverside there is a positive change in the data over the sampling years.

A detailed comparison of the Mission and Riverside habitats may be in order, since they show opposite trends.

The ANOVA for the data shows no differences among sites nor among years, due to the large variation among sites and the large variation among years.

Analysis of Variance for FISH - Type III Sums of Squares

Source	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
MAIN EFFECTS					
A:YEARS	4.31538E6	5	863076.0	0.71	0.6290
B:SITE	2.71659E6	2	1.3583E6	1.12	0.3643
RESIDUAL	1.21405E7	10	1.21405E6		
TOTAL (CORRECTED)	1.91724E7	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor

The ANOVA table decomposes the variability of FISH into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on FISH at the 95.0% confidence level.

In other words, the data are so highly variable that there are no significant differences in the "estimated fish per mile" among sites nor among years, but there is nonetheless a (barely) significant downward trend in the average estimated fish per mile combining all sites. Hence, there is cause for concern. However, even though there are no significant differences in mean estimated fish per mile among sites, the estimated fish per mile is increasing at the Riverside site, while decreasing at the Mission site, so a detailed habitat analysis of these sites may provide clues for increasing the population.