May 31, 2012

To: Distribution

From: Phil Mundy (NOAA), Katie Howard (ADFG), and Will Koeppen (AOOS/Axiom)

Contact: phil.mundy@noaa.gov

RE: 2012 outlook and forecast for Chinook salmon timing in the lower Yukon River (Area Y-1)

Outlook

The outlook for 2012 Chinook timing is for a late migration. A late run is most likely, an average migration is unlikely, and a slightly early migration is highly unlikely but within the realm of past experience. The Spring of 2012 has been on the cold side based on most environmental indicators. Spring ice cover, March 20 - May 31, **(PICE) is 0.753**, which is well above the long term (1970 – 2011) average of 0.57, and only slightly below the all time maximum of 0.784. The marine surface temperature, as an average of daily temperatures in May 2012, **(MSSTC)** was similarly quite cold **at -3.47 C**, which is well below the long term average of -0.29 C, and not far from the coldest marine surface temperature since 1961 of -3.834 C. On the other hand, the April mean air temperature of Nome **(AMATC) of -6.34 C** was close to the long term average of -7.10 C, and substantially below the coldest observed April monthly average of -17.06 C. Taken together, the combination of low marine surface temperature in May and high Spring ice concentration are almost always associated with late Chinook migrations. April mean air temperature alone is not the best indicator of timing, so it must be interpreted in combination with the ice cover and marine surface temperatures. For data and updates please go to
http://www.aoos.org/yukon-chinook-forecasting-data-page/

Forecast

Table 1. Expected dates of cumulative percent total migration of Chinook salmon in Area Y-1

Fifteen percent (FIFDJ)	**June 17**
Twenty-five percent (QDJ)	**June 20**
Fifty percent (MDJ)	**June 25**

Table 2. Long term averages with standard deviations of dates of three percentiles percentage points of migration.

N = 51 (1961 – 2011)	**FIFDJ**	**QDJ**	**MDJ**
Mean	**June 13 (13.76)**	**June 16 (16.02)**	**June 20 (20.75)**
s.d.	**4.76**	**4.77**	**4.63**
Max	**June 23**	**June 26**	**June 30**
Min	**June 5**	**June 6**	**June 10**

Multiple linear regression models provided good fits of the data; statistics given below. Ice concentration did not enter into the forecast models chosen for 2012, however ice is very important to understanding run timing (Mundy and Evenson 2011). Of the twenty-two years with ice concentrations greater than average (0.57) since the first observing season of 1970, the date of the 25th percentile, QDJ, was earlier than average (June 16) only two times (2/22). Of the ten years when ice concentrations have equaled or exceeded 0.70 (70%), only three years have been earlier than the forecasted QDJ of June 20 (3/10), nine were later than average (June 16) (9/10) and one was slightly early, (1/10). Hence the experience of the past indicates that a late run is most likely, an average migration is unlikely, and a slightly early migration is highly unlikely but within the realm of past experience.

Acknowledgments

In addition to the people issuing this memo, the outlook and forecast were prepared with help and advice from Peter Olsson, Ivan Show, Brian BJ Stone and Stephanie Schmidt. Material support was provided by the Alaska Ocean Observing System, the Alaska Department of Fish and Game Division of Commercial Fisheries, and the National Oceanic and Atmospheric Administration's Alaska Fisheries Science Center.

Disclaimer and Notice to Users

Reference

Mundy, P. R., and Evenson, D. F. 2011. Environmental controls of phenology of high-latitude Chinook salmon populations of the Yukon River, North America, with application to fishery management. ICES Journal of Marine Science, 68: 1155–1164.

Regression Models

FIFDJ = 8.7985 - 0.6433(AMATC) – 1.3574(MSSTC)

QDJ = 11.4925 – 0.5735(AMATC) – 1.5504(MSSTC)

MDJ = 17.3998 – 0.4032(AMATC) – 1.6479(MSSTC)

AMATC MSSTC on FIFDJ **FIFDJ = 17.5871**

Regression Statistics	
Multiple R	0.7881
R Square	0.6211
Adjusted R Square	0.6053
Standard Error	2.9933
Observation	51.0000

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2.0000	705.0898	352.5449	39.3459	0.0000
Residual	48.0000	430.0867	8.9601		
Total	50.0000	1135.1765			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	8.7985	1.1167	7.8793	0.0000	6.5533	11.0437
AMATC	-0.6433	0.1516	-4.2436	0.0001	-0.9481	-0.3385
MSSTC	-1.3574	0.3001	-4.5237	0.0000	-1.9608	-0.7541

AMATC MSSTC on QDJ **QDJ = 20.5087**

Regression Statistics	
Multiple R	0.8062
R Square	0.6499
Adjusted R Square	0.6354
Standard Error	2.8821
Observation	51.0000

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2.0000	740.2739	370.1370	44.5605	0.0000
Residual	48.0000	398.7065	8.3064		
Total	50.0000	1138.9804			

AMATC MSSTC on QDJ cont.

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	11.4925	1.0751	10.6893	0.0000	9.3308	13.6543
AMATC	-0.5735	0.1460	-3.9297	0.0003	-0.8670	-0.2801
MSSTC	-1.5504	0.2889	-5.3662	0.0000	-2.1313	-0.9695

AMATC MSSTC on MDJ

MDJ = 25.6744

Regression Statistics	
Multiple R	0.7693
R Square	0.5919
Adjusted R Square	0.5749
Standard Error	3.0158
Observation	51.0000

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2.0000	633.1106	316.5553	34.8042	0.0000
Residual	48.0000	436.5756	9.0953		
Total	50.0000	1069.6863			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	17.3998	1.1250	15.4658	0.0000	15.1377	19.6618
AMATC	-0.4032	0.1527	-2.6402	0.0111	-0.7103	-0.0961
MSSTC	-1.6479	0.3023	-5.4507	0.0000	-2.2558	-1.0400