

# **SUPPORTING INFORMATION SUBMITTED TO THE NATIONAL MARINE FISHERIES SERVICE REGARDING THE WINTHROP NATIONAL FISH HATCHERY SPRING CHINOOK HGMP**

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## **1.0 BACKGROUND**

The National Marine Fisheries Service (NMFS) has requested that the U.S. Fish and Wildlife Service (USFWS) provide additional information and analyses in support of the *Winthrop National Fish Hatchery (WNFH) Spring Chinook Hatchery and Genetic Management Plan (HGMP)* originally submitted to NMFS on July 31, 2009 and resubmitted as a companion to this document. In particular, NMFS has requested that the agencies in charge of operating and funding spring Chinook hatchery programs in the Methow River Basin quantify the probability of achieving various program- and population-specific goals including the probability of achieving a pHOS of less than 0.25 in the Methow Basin. NMFS also requested a description of the methodology used for the analyses, a presentation of adaptive management options, and presentation of updates to the programs. This document is intended to serve as a supplemental analysis describing the potential to achieve a management goal ( $\text{pHOS} \leq 0.25$ ) and possible actions to achieve this goal. This document is not intended to advocate for any of these potential management actions but to provide a comprehensive view of what might be possible.

Information specific to WNFH will be presented below. Any details concerning Douglas Public Utility District (DPUD) and the Washington Department of Fish and Wildlife (WDFW) management actions or programs provided in this document are intended to serve as context and to provide a comprehensive view of spring Chinook management in the Methow River Basin. Actions described herein pertaining to programs separate from the WNFH spring Chinook program are informational in nature and, while they are based on discussions that have occurred between the USFWS, DPUD, and WDFW; these details and actions are not binding to the two latter parties. For additional details regarding DPUD Hatchery programs, the reader is referred to the Methow spring Chinook Hatchery program HGMP and supplemental materials submitted by DPUD and WDFW as companions to their HGMP.

## **2.0 INTRODUCTION**

This document provides additional information and analyses in support of the *WNFH Spring Chinook HGMP* initially submitted to NMFS on July 31, 2009. Since then the USFWS has worked with the parties to US v OR to revise the US v OR Management Agreement such that the changes and actions discussed in the WNFH HGMP are now aligned with the management requirements and details described in the US v OR Management Agreement. Namely the parties to the US v OR Management Agreement are in consensus regarding two key factors. Spring Chinook production at WNFH will be adipose fin clipped to distinguish it from natural-origin fish and hatchery-origin fish from other Methow River Basin programs and 1/3 of the WNFH spring Chinook production (200,000 smolts) will be made available for release in the Okanogan drainage as part of a spring Chinook reintroduction program led by the Confederated Tribes of

the Colville Reservation (CCT). These changes help to reduce the impact of the WNFH spring Chinook program on natural origin spring Chinook in two key ways: 1) Winthrop production can now be visually distinguished allowing effective adult management of hatchery escapement and adoption of a stepping stone model of broodstock management and 2) the transfer of the WNFH production to the Okanogan reduces the number of hatchery fish released in the Methow River, reducing the hatchery impact of spring Chinook programs in the basin. These changes were described and anticipated in the HGMP submitted earlier but were contingent on the consensus of the parties to US v OR.

Also, changes to the PUD funded spring Chinook program at the Methow Fish Hatchery (FH) have occurred that will further reduce the hatchery impact on the natural origin spring Chinook population. Specifically, the overall program size at the Methow FH has decreased from what was originally proposed (550,000 smolts) because Chelan PUD and DPUD hatchery compensation was adjusted for population dynamics by the Rocky Reach HCP and Wells HCP Hatchery Committee in December 2011. Similarly, Grant PUD hatchery compensation was adjusted in January 2012 by the Priest Rapids Coordinating Committee. The production numbers presented herein reflect the programs to be reared at the Methow FH for DPUD (29,123) and Grant PUD (134,126) to meet their respective mitigation obligations. Chelan PUD has an obligation to produce 60,516 spring Chinook salmon smolts annually and is currently in discussions with the parties to the Rocky Reach HCP Hatchery Committee to determine how best to fulfill this obligation. When that determination is made, the analysis described herein may need to be adjusted. However, the estimates provided should not change by more than 11% given that Chelan PUD's obligation represents no more than 11% of the total production planned for the Methow River Basin.

**Twisp River, DPUD Methow FH:** The proposed production level of 30,000 yearling spring Chinook will be initiated starting with brood year 2013 (release year 2015). The spring Chinook production for the Twisp River conservation program will be managed to address demographic goals in the Twisp and to meet a pHOS target of 0.25 or less, to the extent possible, for the Twisp population based on abundance of natural origin fish, adult management opportunities, and broodstock collection needs, as described below. Projections presented below represent estimated long term averages with associated confidence intervals.

**Methow River, DPUD Methow FH:** The proposed production level of 135,000 yearling spring Chinook will be initiated starting with brood year 2013 (release year 2015). The spring Chinook production for the Methow River conservation program will be managed to address demographic goals in the Methow River and to meet a pHOS target of 0.25 or less in this river, to the extent possible, based on abundance of natural origin fish, adult management opportunities, and broodstock collection needs, as described below. Projections presented below represent estimated long term averages with associated confidence intervals.

**Methow River, USFWS Winthrop National Fish Hatchery:** The USFWS will release up to 400,000 spring Chinook smolts from WNFH in the Methow Basin. Additional detail can be found in the accompanying WNFH Spring Chinook HGMP. This program is intended to serve as a genetic reserve and safety net program for the conservation hatchery programs at Methow FH. Spring Chinook produced at WNFH will be adipose fin clipped to distinguish them from

adults produced at the Methow FH and natural origin adults. When returns allow, WNFH production will be available for selective harvest. This program will also be the source population for a spring Chinook reintroduction effort in the Okanogan basin. WNFH adults, returning in numbers that exceed conservation and broodstock goals, will be the first priority for removal and adult management efforts. This will be accomplished through a combination of selective harvest and manual removal efforts at Wells FH, Methow FH, and WNFH. Projections presented below represent estimated long term averages with associated confidence intervals.

### **3.0 ANALYSIS**

The management strategies described below were developed based on analyses that modeled likely outcomes of various management strategies and assumptions for both WNFH and Methow FH spring Chinook programs.

The adult return, smolt release, and broodstock data used for the modeling were derived from the *Monitoring and Evaluation of Wells and Methow Hatchery Programs in 2010* (Snow et al. 2011). The program sizes were from the *Wells HCP Hatchery Committee Final Statement of Agreement (SOA) Regarding the 2013 No Net Impact (NNI) Recalculation and Implementation Plan, Approved on 14 December 2011*. Additional data and information was provided by C. Snow, WDFW (October 2012) and M. Cooper, USFWS (October 2012).

The analyses used historic adult spring Chinook return estimates (Snow et al. 2011) spanning spring Chinook return years 2004 - 2011. Data from earlier years was excluded because management regimes were substantially different than in more contemporary years.

Estimation of the annual run sizes and demographics and effects of management actions was performed using the following approach: The annual number of natural-origin and hatchery-origin returns to Wells Dam (C. Snow, WDFW, October 2012) was further divided into their river of origin (natural-origin fish) or hatchery and river of origin (hatchery-origin fish). Return years 2004 - 2010 were used in the analysis. Origin groups consisted of the following (Table 1):

**Table 1. Origin groups of spring Chinook in the Methow Basin**

Origin	Hatchery	River of Origin	Stock	Program Type
Natural	NA	Twisp	Twisp	NA
Natural	NA	Methow	MetChew	NA
Natural	NA	Chewuch	MetChew	NA
Hatchery	Methow	Twisp	Twisp	Conservation
Hatchery	Methow	Methow	MetChew	Conservation
Hatchery	Methow	Chewuch	MetChew	Conservation
Hatchery	WNFH	Methow	MetChew	Safety-Net

The proportions of each origin group were derived from spawner survey population estimates for each year. The number of spawners was estimated by expanding redd counts in the Methow Basin using a redd-to-spawner multiplication factor. The origin of the spawners was estimated through carcass recovery, where fish were initially grouped into hatchery and natural origin. The hatchery origin fish were further grouped by hatchery of origin using coded wire tag (CWT) recoveries. Taken together, these data provided estimates of the number of spawners subdivided into origin groups (Snow et al. 2011). The estimates of spawners were then adjusted to account for pre-spawn mortality (C. Snow, WDFW, October 2012), which provided estimates of escapement after broodstock collection or fish removal for surplus. The numbers of fish removed for broodstock or surplus were added to these estimates, providing estimates of the escapement upstream of Wells Dam to the Methow River. However, these estimates were used only to obtain an estimate of the relative proportions of each origin group upstream of Wells Dam. These proportions were then applied to the counts of fish at Wells Dam for each year (counts were also adjusted for fish migrating to the Okanogan River). The count of fish at Wells Dam is a more reliable estimate of the number of fish escaping to the Methow Basin, but does not provide a breakdown of the groups of fish by origin. Therefore, we used the most reliable fish counts as a basis for overall numbers and parsed these fish into categories of origin using the more detailed spawning ground and broodstock collection data. This provided an annual estimate of the number of fish returning to Wells Dam each year subdivided by origin.

Modeling of future management actions was accomplished by adjusting the numbers of hatchery-origin returns to reflect what would have returned in those years if smolt releases were of the numbers presented in this document. Natural-origin returns to the Methow Basin were maintained at historic levels. Spatial distribution of hatchery returns was inferred through release location, where the preponderance of fish was assumed to return to the sub-basin where they were released. Broodstock and/or adult management opportunities that were assessed include Wells Dam, Twisp Weir, WNFH volunteer trap, and Methow FH volunteer trap. Broodstock collection followed numbers presented in the *Methow Hatchery Spring Chinook HGMP*, but was adjusted for the new release numbers.

Modeling was performed by estimating the overall removal of both WNFH and Methow FH released fish required to meet  $pHOS \leq 0.25$ . Removal was partitioned among hatchery facilities and programs and removal rates pertaining to each program are presented in each section. Conservation fisheries were included in the analyses. However, these fisheries would only target WNFH returns. Returning Methow FH conservation fish would be incidentally taken only as by-catch in the selective fisheries. The analysis assumes that a Columbia mainstem fishery would

remove 5% of target fish and 1% of non-target conservation hatchery and natural origin fish. Similarly, a conservation fishery in the Methow Basin was assumed to remove 20% of target fish and 1% of non-target conservation hatchery and natural origin fish (J. Korth, WDFW, personal communication). For WNFH returns, a 15% removal by a fishery downstream of Wells Dam was also used to account for lower river sport and tribal harvest. This estimate is based on prior experience at WNFH and Leavenworth NFH with Carson stock SCS production programs. For the Twisp release, modeling was performed using historic return rates and modulating smolt release numbers to achieve an average pHOS of  $\leq 0.25$  to minimize the need to perform adult management adjacent to the spawning grounds and reduce mining of natural-origin adults for broodstock. The number of natural spawners of each origin type was estimated in each sub-basin, as were the number of fish removed through adult management and broodstock collection activities. Key management parameters such as pHOS, pNOB, and PNI were also estimated. Each simulation was run 10,000 times by resampling the data with replacement and uncertainty in the estimates, as expressed by 95% confidence intervals (PopTools; Hood 2011), which was primarily derived from inter-annual variation in return sizes. This modeling represents our best estimates of what is most likely to occur and was used to guide the choice of preferred management strategies.

#### **4.0 OVERVIEW OF THE PROGRAMS**

The spawning escapement goal for the Methow Basin is 1,140 spawners, with 470 in each the Methow and Chewuch Rivers and 200 in the Twisp River as described in the Methow FH spring Chinook HGMP. WNFH has a total production goal of 600,000 yearling smolts annually. This production is split between releases at WNFH (400,000 smolts, Methow River Safety Net) and releases into the Okanogan River (200,000 smolts, Okanogan reintroduction). The DPUD and Grant PUD hatchery programs have a combined release of 163,249 yearling spring Chinook and were designed to return appropriate numbers of spawners to the Methow and Twisp sub-basins. However, a limitation in the number of natural origin spawners is likely to prevent achievement of the escapement goals in some years. The Chewuch River is not supplemented by the Methow FH programs due to the reduction in numbers of fish available at the facility through adjustment of hatchery compensation by the Douglas and Grant PUDs and the departure of Chelan PUD's spring Chinook mitigation obligation production from the facility.

A brief description of the spring Chinook hatchery programs operating in the Methow River basin can be found in the following sections. In regards to adult management, the Twisp River releases will be considered separately from the Upper Methow (above the confluence of the Chewuch River) and Chewuch Rivers which will be considered in aggregate. The hatchery program descriptions are presented following this format.

## **5.0 TWISP RIVER INTEGRATED RECOVERY PROGRAM**

### **5.1 Management Goal**

Enhance the wild Twisp River spring Chinook population. Achieve pHOS less than or equal to 0.25. The minimum spawning escapement (virtual extinction threshold) is 50 spawners, with a management target of 200 spawners. Analysis of management actions that would likely be required to meet pHOS less than or equal 0.25 are presented.

### **5.2 Program Size**

30,000 yearling smolt release.

### **5.3 Broodstock**

Broodstock (N = 18) will be wild x wild (WxW) parentage or hatchery x wild (HxW) parentage of Twisp stock adults collected at the Twisp Weir and Wells Dam. Up to 33% of the Twisp River natural-origin spawners may be collected and used as broodstock for the Twisp program. Hatchery-origin broodstock will be used to augment wild-origin broodstock to the extent necessary to meet the program production target. The expected pNOB is 0.88 (95% CI 0.79 – 0.97). Broodstock will be held and spawned at the Methow FH or the Wells Hatchery.

### **5.4 Rearing**

Twisp River spring Chinook will be spawned and reared at the Methow FH. Twisp River fish may also be spawned and reared at the Wells Hatchery. Experimental early imprinting designed to enhance homing may be performed at the eyed-egg through emergent fry life stages. This would entail exposing fish to Twisp River water either on-site at the Twisp River in a remote incubation facility or at the Methow or Wells hatcheries.

### **5.5 Release/Acclimation**

Yearling smolts will be acclimated on Twisp River surface water in the Twisp Pond (co-acclimated with 48,000 Twisp summer steelhead) in March and released in April/May depending on conditions.

### **5.6 Adult Management**

Adult management may be performed at Wells Hatchery, Wells Dam, Methow FH volunteer channel, WNFH volunteer channel, and the Twisp Weir. Estimated adult management removal magnitude and proportion of the hatchery returns is provided in Table 2. Fish removed for adult management may be used for broodstock at WNFH or Chief Joseph Hatchery (CJH).

**Table 2. Expected adult management disposition, number and proportion of Twisp River hatchery-origin adult spring Chinook (Wells Dam 25%, Twisp Weir 65%, pHOS goal  $\leq 0.25$ ).**

Disposition	Mean	95% CI of Mean	% of Hatchery Return	95% CI of % of Hatchery Return
Broodstock	2	1 – 4	2 %	1 - 4 %
Adult Managed	82	55 – 110	75 %	74 - 75 %
Combined (Total)	82	55 – 111	75 %	74 - 75 %

The expected pHOS is 0.23 (95% CI 0.14 - 0.34) and the expected PNI is 0.79 (95% CI 0.70 - 0.87). On average, approximately 80 (95% CI 54 - 109) hatchery origin adults will be available as broodstock for other programs. The combined annual wild and hatchery spawning escapement is estimated to be 90 fish (95% CI 49 - 147) (Table 3).

**Table 3. Expected spawning escapement of wild- and hatchery-origin spring Chinook in the Twisp River.**

Origin	Mean	95 % CI
Wild	74	34 - 126
Hatchery	16	10 - 23
Combined (Total)	90	49 - 147

## **6.0 WNFH SAFETY NET PROGRAM AND DPUD METHOW FH INTEGRATED RECOVERY PROGRAM**

### **6.1 Management Goal**

#### *Methow FH Integrated Recovery Program*

Enhance the wild Methow River spring Chinook population. Achieve pHOS less than or equal to 0.25. The minimum spawning escapement target is 500 spawners for the Upper Methow and Chewuch Rivers combined, while the spawning escapement target for the Methow River is 470 spawners. Analysis of management actions that would likely be required to meet pHOS less than or equal 0.25 are presented.

#### *WNFH Safety Net Program*

Serve as a genetic reserve and safety net for the Integrated Recovery Program at the Methow FH and provide hatchery juveniles for a spring Chinook reintroduction effort in the Okanogan basin that is integrated through a stepping stone model of broodstock management with the natural origin population in the Methow River basin. In years of sufficient adult returns, provide a harvestable surplus of hatchery adults.

## **6.2 Program Size**

135,000 yearling smolt release, Methow FH Program.

400,000 yearling smolt release, WNFH Program.

## **6.3 Broodstock**

### *Methow FH*

Broodstock (Methow stock N=85 for the Methow River program) will be of wild x wild (WxW) parentage or hatchery x wild (HxW) parentage. Hatchery x hatchery (HxH) crosses may be used only in years of very low abundance. Wild-origin broodstock collection will not exceed 33% of the wild run. Hatchery-origin broodstock will be used to augment wild-origin broodstock to the extent necessary to meet the program production target. Broodstock will be collected at Wells Dam and the volunteer trap at the Methow FH. Broodstock will be held and spawned at the Methow FH or the Wells Hatchery. The estimated pNOB for the program is 0.49 (95% CI 0.46 – 0.51).

### *WNFH*

Broodstock will be collected as volunteers to WNFH and Methow FH. Total broodstock needs are 360 hatchery origin adults collected annually to populate two programs: 400,000 yearling smolts released at WNFH and 200,000 yearling smolts transferred as pre-smolts or eyed eggs and used by the CCT for their Okanogan reintroduction program. Surplus Methow FH adults would be used preferentially targeting a Methow FH inclusion rate of 30% for the portion of the program released at WNFH. Returning WNFH adults will be used for broodstock for the Okanogan reintroduction program.

## **6.4 Rearing**

Spawning and rearing will occur at Methow FH or Wells Hatchery, (Integrated Recovery) and at WNFH (Safety Net).

## **6.5 Release/Acclimation**

Yearling smolts will be released from the Methow Acclimation Pond (acclimated on Methow River surface water) in April/May depending on conditions (Methow FH program) and forcibly released from the raceways at WNFH in April/May (WNFH program). Fish transferred to the CCT for release in the Okanogan will be released from acclimation ponds in the Okanogan River Basin.

## **6.6 Adult Management**

Wells Dam, and the Wells Hatchery, Methow FH, and WNFH outfalls may all be used to control excess hatchery-origin returns from both the WNFH and Methow FH programs. A conservation fishery may operate in the Upper Columbia and Methow Rivers targeting WNFH returns.

Hatchery origin returns may be managed at the ladder traps at Wells Dam in years when pHOS is expected to exceed 0.25 and minimum spawning escapement goals have been achieved. Estimated adult management removal magnitude and proportion of the hatchery returns is provided in Table 4. On average, 89% of the WNFH adults (mean 946, 95% CI 567 – 1,415) and 87% of the returning Methow FH adults (mean 593, 95% CI 372 – 808) will need to be removed for broodstock or other purposes, in order to meet pHOS equal to or less than 0.25 in the Methow River. Excess hatchery origin adults from the Methow conservation program (mean 552, 95% CI 325 - 769) may be used as broodstock for the WNFH spring Chinook program and the CJH spring Chinook program.

**Table 4. Expected total adult removal rates for both WNFH and Methow FH-origin adult spring Chinook necessary to achieve pHOS goal:  $\leq 0.25$ .(assumptions: 15% fishery removal below Wells, 25% removal at Wells Dam for broodstock, 20% Methow River fishery, 20% removal at Methow FH for WNFH and 20% removal at WNFH for Methow FH, 84% removal of WNFH at WNFH and 78% of removal at Methow FH for Methow Integrated Recovery Programs).**

Disposition	Mean	95% CI of Mean	% of Hatchery Return
WNFH Removed	946	567 – 1,415	90%
MFH Removed	593	372 - 808	87 %
<b>Total Removed</b>	<b>1,537</b>	<b>1,071- 2,076</b>	<b>89%</b>

The combined annual wild and hatchery spawning escapement is estimated to be 389 (95% CI – 294 - 496) (Table 5). The expected pHOS for WNFH is 0.17 (95% CI 0.12 – 0.22) and for MFH is 0.15 (95% CI 0.11 – 0.19) with a combined total pHOS of 0.28 (95% CI 0.24 – 0.32).

**Table 5. Expected spawning escapement of wild- and hatchery-origin spring Chinook in the Methow and Chewuch Rivers.**

Origin	Mean	95 % CI
Wild	283	216 - 367
WNFH	57	38 – 79
Methow FH	49	31 - 67
<b>Combined (Total)</b>	<b>389</b>	<b>294 - 496</b>

Although modeling results did not achieve a targeted pHOS of 0.25, they do suggest future returns will experience significantly lower pHOS values than previous years. Reductions in pHOS in conjunction with the other actions proposed in the WNFH spring Chinook HGMP and the Methow FH spring Chinook HGMP should significantly curtail any negative impacts these program have on the natural population resulting in an increased abundance on natural origin fish. This expected increase in NOR abundance can have a significant effect on the probability of achieving a pHOS target of 0.25. This can be revealed by repeating the prior analysis with

increasing NOR population sizes (Fig. 1). Indeed assuming other factors are constant, an increase of less than 25% of the current average NOR is needed to enable the achievement of a pHOS goal of 0.25.

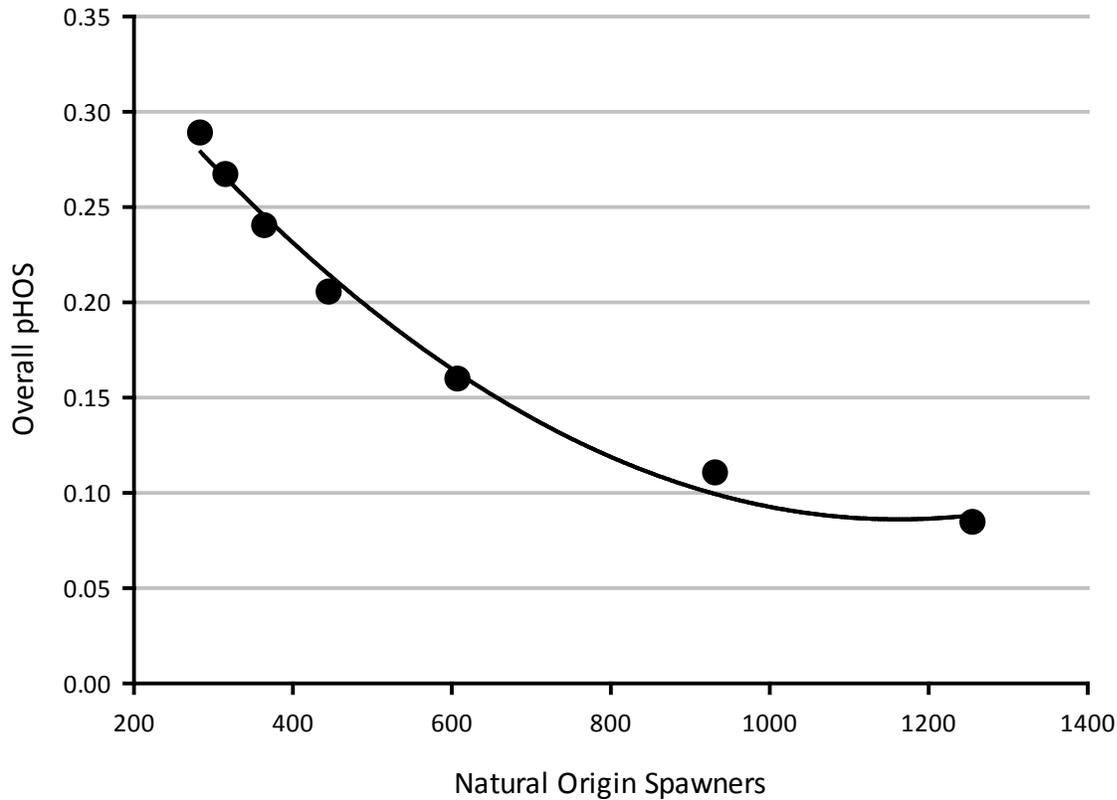


Figure 1. Relationship between the number of natural origin spring Chinook spawners in the Upper Methow and Chewuch River basins and estimated pHOS. The line represents a quadratic fit to the data.

### 6.6.1 Additional Adult Management Opportunities

*Conservation Fishery Management:* The development of new conservation fisheries in the mainstem Columbia River and the Methow River are key to targeting the removal WNFH adults in excess to broodstock and conservation needs. Currently, no fishery on Methow Basin spring Chinook exists. Conducting a conservation fishery will help reduce the number of hatchery-origin adults and has the added benefit of selectively removing WNFH safety net adults while largely leaving the unmarked conservation fish from the Methow FH program unharmed. Given that these fisheries are new and that there is limited information available in terms of effectiveness and harvest efficiency, it is possible that harvest managers can make management adjustments (e.g. change in season, bag limit, gear, etc.) that will increase the ability to manage pHOS and reduce the importance of other removal methods (e.g. Wells Dam or hatchery removal).

## **7.0 MONITORING AND EVALUATION**

The majority of monitoring and evaluation (M & E) in the Methow Basin is currently conducted by WDFW, under contract with DPUD, to assess the programs at Wells Complex hatcheries (Wells and Methow FHs). This is largely due to the timing and nature of how programs at Methow FH and WNFH were developed. Because of the numerous changes occurring to both USFWS WNFH and Methow FH spring Chinook programs in the Methow Basin, there is an identified need to develop a single cohesive M&E Plan that addresses the monitoring and evaluation needs of both USFWS WNFH and Methow FH programs that incorporates the programmatic changes proposed in HGMPs. Using the framework provided in the existing DPUD M&E Plan, the USFWS will develop a new, compatible M&E plan for WNFH that addresses the performance indicators and programmatic changes discussed in WNFH's HGMP. The USFWS anticipate that much of this M&E will continue to be conducted by WDFW and the USFWS will continue to work cooperatively within the Wells HCP framework to ensure that changes at all of the Methow Basin hatchery programs are addressed by the appropriate parties. This effort may entail an increased M&E responsibility for the USFWS as changes at the Methow FH and WNFH are realized.

To adequately examine the effectiveness of the proposed adult management framework, time is needed to allow the recent changes and adjustments to the WNFH and Methow FH programs to be fully realized. For instance, the reductions in the Methow FH program, as part of the recent Mid-Columbia HCP re-calculation processes, will not be implemented until brood year 2013, with release in 2015, and the adult returns based on these new production levels will not be fully realized until return year 2018. Evaluations can be done to look at the effectiveness of adult management at reaching removal rates. However, evaluation of the ability to reach a set pHOS target cannot be contemplated for some time.

## **8.0 REFERENCES**

Hood, G. M. 2011. PopTools version 3.2.5. Available on the internet. URL <http://www.poptools.org>

Snow, C., C. Frady, A. Repp, and A. Murdoch. 2011. Monitoring and Evaluation of Wells and Methow Hatchery Programs in 2010. Prepared for Douglas County Public Utility District and Wells Habitat Conservation Plan Hatchery Committee. Submitted by the Supplementation Research Team, Hatchery/Wild Interactions Unit, Science Division, WDFW, Twisp, Washington.