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Department of Fish and Wildlife
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March 7, 2011

Bob Turner
Assistant Regional Administrator
Salmon Management Division
National Marine Fisheries Service
510 Desmond Drive SE, Suite 103
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Dear Mr. Turner,

The 2010 Biological Opinion (BiOp) completed by National Marine Fisheries Service (NMFS) regarding the effects of the Pacific Coast Salmon Plan on Columbia River Chinook applied to proposed fisheries in 2010 and 2011. The BiOp set the total exploitation rate on lower Columbia River tule fall Chinook in 2010 at 38%. The exploitation limit for 2011 was set at 36%, but the BiOp allowed for an increase to 37% if certain tasks are completed. Tasks A through H are listed in the conservation recommendations section of the opinion. Task E reads as follows:

> *Describe the transition strategy for reducing the proportion of hatchery fish in natural spawning areas for primary tule Chinook populations in a manner that addresses short term demographic risks while promoting progress to recovery objectives.*

The Washington Department of Fish and Wildlife (WDFW) have developed a strategy to reduce pHOS on spawning grounds in response to Task E of the BiOp. WDFW's strategy is fully described in the attached documents.

Sincerely,

Pat Frazier
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WDFW Strategy to Reduce pHOS on Spawning Grounds
Task E

March 4, 2011

NOAA Assignment: Strategy to address pHOS

"NMFS will produce or receive a report that describes the transition strategy for reducing the proportion of hatchery fish in natural spawning areas for primary Tule Chinook populations in a manner that addresses short term demographic risks while promoting progress to recovery objectives."

Background & Overview

In a letter Washington Department of Fish and Wildlife (WDFW) sent to NOAA Fisheries on February 22, 2010, we outlined actions WDFW was implementing to assist in recovering lower Columbia tule Chinook and addressing hatchery risk factors identified in the Lower Columbia salmon recovery plan. In particular, we suggested approaches for preserving genetic legacy populations as well as non-legacy populations. We concur with the biological opinion for the Pacific Salmon Treaty (Bi-Op) completed in 2008 that the survival and recovery of the non-legacy populations will require a "comprehensive, coordinated, and deliberate strategy of reform." We believe that the Bi-Op described an appropriate transitional strategy for these populations, which included addressing risks of hatchery fish on natural spawning populations. The purpose of this report is to describe WDFW's transition strategy for reducing the proportion of hatchery spawners returning to natural spawning areas in the lower Columbia River (LCR). This document, including Attachment 1, will describe the strategies that will be implemented to reduce the proportion of hatchery fish in natural spawning areas for primary Tule Chinook populations in a manner that addresses short term demographic risks while promoting progress to long-term recovery objectives**.**

The Bi-Op provided a solid discussion of this strategy and, because of its importance to the survival and recovery of lower Columbia tule Chinook; we have repeated this discussion in its entirety, as follows:

> "It is therefore pertinent, when considering whether an action is likely to appreciably reduce the survival and recovery of a population, or jeopardize the ESU as a whole, to consider the extent of local adaptation to natural conditions in these populations and whether it has been compromised by past practice to the point where it is no longer distinct. Populations are defined by their relative isolation from each other which presumably allows for their adaptation to unique conditions that exist in specific habitats. If there are populations that still retain their historic genetic legacy, then the appropriate course to insure their survival and recovery is to preserve that genetic legacy and rebuild those populations.

> Preserving that legacy should be a high priority and, if threatened, requires a sense of urgency and implementation of actions necessary and appropriate to preserve the unique characteristics of those populations. However, if the genetic characteristics of the populations are significantly diminished and we are left with individuals that can no longer be associated with a distinct population, then the appropriate course to recover the population, consistent with the requirements of the ESA, is to use individuals that best approximate the genetic legacy of each population, reduce the effects of the factors that have limited their production, and provide the opportunity for them to readapt to the existing conditions. These circumstances will require a deliberate response, but one that may be less urgent in the sense that coordinated progress can and should be made over time to address the limiting factors. For example, if the source of individuals for the rebuilding effort is a hatchery with thousands of returning fish, then recovery will have to occur through a coordinated and deliberate strategy that reduces the effects of hatchery straying and harvest, and improves the habitat to the degree necessary for the population to adapt and rebuild. Retaining some of the hatchery fish may be important for the near term to provide on ongoing source of brood stock during the transition and guard against catastrophic loss. The transition will most often involve allowing time for habitat improvements and for the population to readapt to exiting circumstances. Given the nature of these processes, it is reasonable to expect that rebuilding and recovery will take years and perhaps decades of consistent and steady progress. Our assessment of the effects of the proposed actions takes these considerations into account."

WDFW anticipates that the following transition plan and action steps will not only further reduce risks to the genetic legacy populations, but also begin to increase the viability of each of the "primary" tule populations. Similar considerations were described in NOAA Fisheries' 2010 biological opinion that considered the effects of harvest on LCR Chinook in particular.

Development and Implementation of Transition Plan

WDFW supports the two-pronged strategy described by NOAA that emphasizes the importance and urgency of preserving the genetic legacy populations, and recognizes that a transition period will be necessary for the non-legacy populations. The NOAA strategy also recognizes that habitat improvements are essential during this transition period and the population will readapt to the natural environment.

To meet WDFW's hatchery and harvest commitments outlined in the Lower Columbia Salmon Recovery plan[i] as well as the WDFW Hatchery and Fishery Reform Policy[ii], WDFW has proposed a multifaceted strategy to improve management of hatchery broodstock, reduce hatchery origin fish in natural spawning areas, monitor Chinook populations to determine the results of this strategy and use adaptive management to take

corrective action where and when needed. These strategies were developed using guidance from both the Hatchery Scientific Review Group[iii] and the Recovery Implementation Science Team (RIST) Reports[iv].

WDFW believes that there are five related actions that need to be taken during the next five years to accelerate the transition to locally-adapted, viable wild tule Chinook populations. The actions involve hatchery and harvest reforms and improved monitoring. These actions will not only further reduce the risks to the genetic legacy populations, but also begin to increase the viability of each of the primary tule populations:

1) Implement hatchery actions in the Lower Columbia Conservation and Sustainable Fisheries Plan[v] that prioritize broodstock management actions and will improve the viability of primary populations. Emphasis will be on reducing the proportion of hatchery fish in natural spawning areas for primary Tule Chinook populations in a manner that addresses short term demographic risks while promoting progress to recovery objectives**.** These actions include:

    a. Reducing the size of hatchery programs (Grays, Elochoman, Toutle, and Washougal)
    b. Installing and operating temporary weirs to reduce the number of hatchery fish on the spawning grounds, (Grays, Elochoman, Coweeman, Kalama, Toutle, and Washougal)
    c. Developing appropriate weir management strategies for each population based on status, hatchery influence and presence of genetic legacy fish in the population

2) Develop and implement optimal broodstock management strategies to re-establish locally adapted populations. Key questions that will be addressed for the non-legacy populations include: a) what is the best source of broodstock to reconstruct a locally adapted population; and b) what is the optimal number and composition of hatchery and natural-origin fish to place above weirs to promote re-adaption but limit the risk of extirpation.

3) Incrementally implement, test, and evaluate mark-selective fisheries. Working through U.S. v. Oregon and other forums, WDFW will develop and implement a schedule to incrementally implement, test, and ensure that mark-selective fisheries meet U.S. v. Oregon and other commitments. Implementation of mark-selective fisheries in the ocean recreational, ocean troll, Buoy 10 recreational, lower Columbia recreational, and lower Columbia commercial fisheries provide

substantial opportunities to further reduce fishery exploitation rates on wild tule fall Chinook. (This task is described in another report.)

4) Implement alternative commercial fishing gear in the Lower Columbia River. Working with the commercial fishing industry, the WDFW is testing and implementing alternative commercial fishing gear in the Lower Columbia River that will facilitate the harvest of hatchery fish with minimal mortality to wild tule Chinook. The use of alternative commercial gear can create a differential harvest rate on hatchery and wild tules leading to a reduction of hatchery fish on the spawning grounds and the protection of natural origin returning adults. WDFW remains on-track with the schedule laid out in the 2008 letter from WDFW to NOAA. WDFW initiated testing in 2009 and expanded the test with the assistance of ODFW in 2010. WDFW anticipates initiating commercial fishing with these gears in the period from 2012-2016.

5) Monitor spawners and assess the productivity of primary populations. WDFW is implementing an improved monitoring program to provide better estimates of HOR and NOR abundance in natural spawning areas and hatchery broodstock. Empirical estimates (i.e., based on spawner and/or juvenile production) of productivity are currently available for only three populations (Grays, Coweeman, and East Fork Lewis). Enumeration of natural origin spawners will improve significantly over the next 5 years as a result of hatchery returns being identifiable with an adipose fin-clip. (This task is described in another report.)

Transition Plan for Reducing pHOS on Spawning Grounds

WDFW has been working with a multi-agency science team to develop a plan for transitioning from the current condition of high pHOS levels on natural spawning grounds to a condition of low pHOS on natural spawning grounds. WDFW has developed a short-term action plan for reducing pHOS levels on spawning grounds, as described in Attachment 1. In developing this plan WDFW also views this as an opportunity to test the effectiveness of different strategies at reducing pHOS on spawning grounds while managing demographic risks unique to each population. The remainder of this document will describe the key elements of this transition plan, including key assumptions that will affect the success of this plan, actions that will be implemented as part of this plan, a timeline for implementation of various actions of this plan and the expected outcomes that will result from the implementation of this plan. It is WDFW's recommendation that this plan be implemented and monitored over the next five years. Results from this 5-year period will provide the basis for future actions for reducing

pHOS on spawning grounds to assist in the recovery of listed tule fall Chinook in the lower Columbia River.

Key Assumptions:
There are many factors that influence the Tule pHOS success of this transition plan. WDFW's key assumptions for a successfully reducing pHOS on spawning grounds for Tule fall Chinook are:

- Improved Tule Chinook hatchery management from broodstock selection to rearing strategies will improve fitness of hatchery fish that spawn in the wild, which is expected to reduce the difference in Relative Reproductive Success (RRS) between hatchery and NOR populations.

- Reducing pHOS will improve fitness/productivity of wild Tule Chinook populations. This is a key goal in LCR salmon recovery plan.

- The most aggressive strategy to improve natural origin fitness is to simultaneously implement pHOS reductions and hatchery broodstock reform.

- Different strategies and timelines are likely needed for the various Tule Chinook populations due to their status, risk factors, and long-term recovery goals.

- There are uncertainties about how aggressive pHOS reduction strategies should be while continuing to maintain high persistence probabilities. Therefore, a structured experimental design and monitoring program, coupled with an adaptive management approach, is the best method to track, evaluate and learn about pHOS reductions and demographic risks associated with a variable but aggressive strategy.

Actions:
1. Develop an overview of transition strategies based on: present population status, interim and long-term goals for pHOS and abundance for each population, as well as overall goals for hatchery broodstock management. At a minimum these strategies should include changes in hatchery programs, weir operations, implementation and monitoring of selective fisheries, accounting for stochasticity in marine survival, expected habitat improvements, and improved monitoring and evaluation.

2. Convene multi-agency science team to provide technical guidance to: (Action completed see Attachment 1)

a. Categorize Washington Chinook Tule populations to be used in weir management strategy development.

b. Develop weir management/recovery strategies that addresses hatchery origin strays and *are contingent on the relative returns of hatchery and unmarked fish that balance genetic and demographic risk objectives. Discuss alternative approaches for different populations designed to elucidate key uncertainties by exploring alternative strategies.*

3. Convene multi-agency science team to provide technical guidance on key transition strategies. Key actions include:
    a. Identify minimum demographic risk threshold that should have extremely high probability of be achieved, recovery plan viability goal and full seeding of available habitat for all tule fall Chinook populations in Washington tributaries to the lower Columbia River.
    b. Develop experimental design that will implement and evaluate several short term recovery strategies to evaluate how different levels of NOR's and HOR's on spawning grounds impact progress towards recovery goals. Utilize results of this modeling exercise to determine specific numbers of fish (NOR's and HOR's) passed upstream under different short-term recovery strategies.
    c. Develop and implement monitoring and evaluation program to determine effectiveness of various short-term recovery strategies identified in Attachment 1, Specifically focus analysis on changes in pHOS and NOR rates in response to implementation of short-term recovery strategies.
    d. Determine approaches to model the rate of change in RRS of current hatchery and naturally produced Tule Chinook under different implementation strategies and determine how to incorporate a Relative Reproductive Success study into the short-term recovery strategies being implemented in the fall of 2011.

4. WDFW will develop detailed individual population implementation plans, with input from the multi-agency science team to meet strategies outlined in Attachment 1. Annual implementation plans can be as simple as the annual future broodstock document. A more extensive review of the transition strategy will occur every five years beginning in 2015 which will trigger adaptive management actions.

5. Conduct on the ground actions necessary to implement WDFW's transition plan described above. Actions to be implemented will include:
    a. Implement integrated hatchery programs.
    b. Install and operate weirs in key tule fall Chinook tributaries to the lower Columbia River.

c. Modify monitoring and evaluation program to ensure that data collected will measure changes in hatchery/wild composition of fall Chinook in natural spawning areas.

Implementation Timeline:

Action	***Status Update***	***Lead Entity(s)***
1	Included in draft Conservation and Sustainable Fisheries Plan completed in 2009.	WDFW
2.a	Categorization of Washington tule populations is included in Attachment 1 and completed in 2010.	Multi-Agency Science Team
2.b	Strategies to be implemented for Washington tule populations included in Attachment 1 and completed in 2010.	Multi-Agency Science Team
3.a	Work in progress with minimum risk thresholds to be determined by 8/1/11.	Multi-Agency Science Team
3.b	Experimental design is included in Attachment 1.	WDFW/Mobrand and Multi-Agency Science Team
3.c	Monitoring and evaluation plan completed and implemented by WDFW in fall of 2010.	WDFW and Multi-Agency Science Team
3.d	Work in progress with final modeling analyses and Reproductive Success Study Plan to be completed by 8/1/11.	Multi-Agency Science Team
4	Work in progress to completed final plan. Adaptive management process to be initiated in fall 2015.	WDFW and Multi-Agency Science Team
5.a	Integrated hatchery programs are being initiated in fall of 2010 and 2011 as hatchery production becomes fully mass marked (include age 5 fish).	WDFW
5.b	Weirs installed and operated in 2010 in the Grays, Elochoman, Kalama and Toutle. Weirs to be installed and operated beginning in 2009 in the Washougal and Coweeman.	WDFW
5.c	Spawning ground survey methodology modified to estimate hatchery-origin and natural-origin fall Chinook abundances beginning 2010. Methodology will be further modified in 2011to implement results of action 3.c.	WDFW

Expected Outcomes:
The lower Columbia River Salmon Recovery Plan established goals for improvement in the human activities that are currently negatively impacting the recovery of listed salmon and steelhead in the lower Columbia River and these goals were established in the term of percent improvement. WDFW developed a method to measure fitness of any given population, which can be used to determine the amount or percent of improvement in the condition of a given population based on changes implemented in hatchery and harvest management. The projected improvements in fitness are model estimates and therefore based on the underlying assumptions of the model. These projected fitness estimates can nonetheless be used to determine if hatchery and harvest actions implemented as part of the Conservation and Sustainable Fishery Plan (C&SF Plan) are meeting the goals set forth in recovery plan for Washington tule fall Chinook populations. The following table summarizes current estimated fitness and projected fitness based on expected results from planned hatchery and harvest actions that are being implemented as part of WDFW's draft C&SF Plan.

Basin	Species	Population Designation	Fitness Goal	
			Current Estimated Fitness	C&SF Plan*
Grays\Chinook	Fall Chinook	*Contributing*	**0.50**	**0.82**
Elochoman/Skamokawa	Fall Chinook	*Primary*	**0.50**	**0.92**
Mill/Abernathy/Germany (MAG)	Fall Chinook	*Primary*	**0.51**	**0.50**
Coweeman	Fall Chinook	*Primary*	**0.62**	**0.90**
Lower Cowlitz	Fall Chinook	*Contributing*	**0.50**	**0.66**
South Fork Toutle	Fall Chinook	*Primary*	**0.50**	**0.86**
North Fork Toutle	Fall Chinook	*Primary*	**0.5**	**0.86**
Kalama	Fall Chinook	*Contributing*	**0.50**	**0.50**
N.F. Lewis	Fall Chinook	*Primary*	**0.95**	**0.98**
E.F. Lewis	Fall Chinook	*Primary*	**0.50**	**TBD**
Washougal	Fall Chinook	*Primary*	0.50	0.80

[i] NMFS. Lower Columbia Salmon Recovery Plan

[ii] Washington Fish and Wildlife Commission Hatchery and Fishery Reform Policy, Policy # POL-C3619.

[iii] Hatchery Scientific Review Group. This federal Hatchery Reform Project has completed a review of all state, tribal and federal Puget Sound, coastal Washington and Columbia River hatchery programs. HSRG review and recommendations are available at www.hatcheryreform.us

[iv] RIST (Recovery Implementation Science Team). 2009. Hatchery Reform Science. April 9. 93 pp.

[v] WDFW (Washington Department of Fish and Wildlife). 2010. DRAFT Lower Columbia Conservation and Sustainable Fishery plan. Washington Department of Fish and Wildlife, Fish Program, Region Five. DRAFT 2010. 207pp.

Attachment 1

Short-term Recovery Strategies for Washington Tule Chinook Populations Task E

Purpose:

- Develop weir management/recovery strategies that addresses hatchery origin strays and are contingent on the relative returns of hatchery and unmarked fish that balance genetic and demographic risk objectives. Discuss alternative approaches for different populations designed to elucidate key uncertainties by exploring alternative strategies.
- This document will provide guidance for implementing weir management strategies that will be implemented as part of WDFW's transition plan to convert Washington populations from their current condition with high pHOS on the spawning grounds to the desired condition with low pHOS on the spawning grounds.

Assumptions:

- Adaptive management actions described in the document will be initiated in 2015 when 5-year averages (8 brood years – 5) of key population metrics will become available.
- Minimum demographic threshold level to be determined by the multi-agency science team by August 1, 2011.
- Final experimental design to be completed by the multi-agency science team by August 1, 2011.
- All weirs necessary to implement this plan will be in operation by August 1, 2011.
- Monitoring and Evaluation Plan to determine evaluate effectiveness of these actions will be implemented by August 1, 2011.

Category 1

Populations with:

- relatively small numbers of hatchery fish present on the spawning grounds, or no hatchery program on the system, **AND**
- genetic legacy, **AND**
- with an adequate abundance of natural spawning fish to avoid demographic risk and be self-sustaining.

Objective: Wild Fish Refuges- Only NORs allowed to spawn.

Population/Designation	Weir Management Strategy
Coweeman/Primary	• Establish weir and allow only NORs upstream
EF Lewis/Primary & Mill/Abernathy/Germany (MAG)/Primary	• Monitor presence of HORs for levels and origin, additional actions to be determined as necessary

Adaptive management options: Consider additional management actions if NOR abundance drops below the minimum demographic risk threshold over 8 brood years - 5 year running average: additional actions may include increased mark selective fisheries, reductions in hatchery programs contributing to pHOS, additional weirs. Monitor efficiency and physical effects of weir structure.

Category 2

Populations with:

- NOR abundance too low to avoid demographic risk **AND**
- large percentage of hatchery fish present.

Objective: Move from hatchery dominated system to one with locally adapted natural population. Utilize three approaches to improve adaption at different rates depending on population designation and stock status**.**

(A) *Aggressive local adaptation*- Manage for hatchery broodstock standards (PNI/pHOS) consistent with population designation. HORs allowed to spawn naturally to achieved minimum escapement target (demographic risk threshold) only when NOR returns are insufficient. PNI/pHOS levels to be calculated on 5 year rolling averages beginning in 2015.

Population/Designation	Weir Management Strategy
Toutle/Primary	• Establish integrated hatchery program with broodstock management goal of >0.67 PNI • Modify existing weir to control numbers of HORs on spawning grounds

Adaptive management options: Remaining habitat in Toutle basin may not be sufficient to maintain NOR populations above minimum demographic risk threshold. Consider additional management actions if PNI goal cannot be achieved over 8 brood years - 5 year running average. Additional actions may include increased mark selective fisheries, reduction in size of hatchery program, additional modifications to weir. Monitor efficiency and physical effects of weir structure.

(B) *Moderately-aggressive local adaption*: Manage for hatchery broodstock standards (PNI/pHOS) consistent with population designation. HORs allowed to spawn naturally to achieved minimum escapement targets (Recovery Plan viability abundance goal) only when NOR returns are insufficient. PNI/pHOS levels to be calculated on 5 year rolling averages.

Population/Designation	Weir Management Strategy
Washougal/Primary	• Establish integrated hatchery program with broodstock management goal of >0.67 PNI • Establish weir to control numbers of HORs on spawning grounds. pHOS/PNI may vary annually to meet minimum escapement target and due to annual variation in NOR/HOR run size

Adaptive management options: Consideration of additional management actions (if PNI goal cannot be achieved over 8 brood years - 5 year running average): increased mark selective fisheries, reduction in size of hatchery program, modify weir. Monitor efficiency and physical effects of weir structure.

Population/Designation	Weir Management Strategy
Cowlitz/Contributing	• Establish integrated hatchery program with broodstock management goal of >0.50 PNI • pHOS/PNI may vary annually to meet minimum natural escapement target and due to annual variation in NOR/HOR run size • Develop methods to capture NOR for use as broodstock.

Adaptive management options: Consider additional management actions if PNI goal cannot be achieved over 8 brood years - 5 year running average. Additional management actions may include: improve NOR capture technique, expand the use of NOR capture techniques to remove additional HORs, increased mark selective fisheries, reduction in size of hatchery program.

(C) *Moderate local adaptation*: Manage for hatchery broodstock standards (PNI/pHOS) consistent with population designation (PNI/pHOS). HORs allowed to spawn naturally to achieve escapement targets (full seeding of available spawning habitat) only when NOR returns are insufficient. PNI/pHOS levels to be calculated on 5 year rolling averages.

Population/Designation	Weir Management Strategy
Kalama/Contributing	• Establish integrated hatchery program with broodstock management goal of >0.50 PNI • pHOS/PNI may vary annually to meet natural escapement target and due to annual variation in NOR/HOR run size • Modify existing weir to control numbers of HORs on spawning grounds/collect NORs for brood

Adaptive management options- Consider additional actions if PNI/pHOS goal cannot be achieved over 8 brood years - 5 year running average. Additional management actions may include: increased mark selective fisheries, reduction in size of hatchery program, additional modifications to weir. Monitor efficiency and physical effects of weir structure.

Category 3

Populations with:

- too few fish returning, either natural or hatchery (Tule stock) origin, to prevent extinction.

Objective: Maintain a minimum population size above demographic risk threshold through juvenile or adult supplementation.

(A) *Juvenile Supplementation*.

Population/Designation	Weir Management Strategy
Elochoman/Primary	• Existing weir will be used to collect NOR/HORs for broodstock and exclude HORs in excess of natural escapement needed to achieve demographic risk threshold
Additional juvenile production actions include:	
	• Implement a small juvenile artificial production scenario incorporating NORs, plus HORs as needed for broodstock. • Program size determined based on minimum natural escapement necessary to achieve demographic risk threshold and hatchery brood requirements • If available excess NOR's released upstream

Adaptive Management- If demographic risk threshold cannot be achieved over 8 brood years - 5 year running average then increase size of hatchery program. If demographic risk threshold exceeded over 8 brood years - 5 year running average then decrease size of hatchery program. Monitor efficiency and physical effects of weir structure. Develop and implement juvenile trapping program to collect data necessary to monitor changes in productivity.

(B) *Adult Supplementation.*

Population/Designation	**Weir Management Strategy**
Grays/Contributing	• Existing weir used to exclude non-tule origin adults from spawning grounds
Additional broodstock management actions include:	
	• Surplus HOR adults from an appropriate donor stock (Tule) will be used to supplement natural escapement to achieve demographic risk threshold
	OR
	• No HOR adults will be used to supplement natural escapement to determine if population is able to reestablish itself above demographic risk threshold

Adaptive Management - Monitor efficiency and physical effects of weir structure. Consider additional actions if PNI/pHOS goal cannot be achieved over 8 brood years - 5 year running average. Additional management actions may include:

- Adjust the number of hatchery supplementation adults planted annually to achieve demographic risk threshold.

OR

- If natural population fails to reach a self-sustaining level then implement and program to surplus HOR adults for an appropriate donor stock (Tule) will be used to supplement natural escapement to achieve demographic risk threshold.