



# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

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Population and Habitat Assessment Branch  
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### MEMORANDUM

TO: Mark Koneff

FROM: Todd A. Sanders

DATE: 17 July 2008

SUBJECT: Western mallard population status and harvest policy

In 1995 the U.S. Fish and Wildlife Service (Service) implemented the Adaptive Harvest Management (AHM) program for setting duck hunting regulations in the United States. The AHM approach provides a framework for making objective decisions in an environment of incomplete knowledge concerning waterfowl population dynamics and regulatory impacts.

The AHM protocol was based on the population dynamics and status of eastern and mid-continent mallard stocks, but now also recognizes a western stock beginning in 2008. This briefing is specific to the western stock. Western mallards consist of 2 substocks and are defined as those birds breeding in Alaska and Yukon Territory (federal survey strata 1–12; hereafter Alaska) and those birds breeding in California and Oregon. Estimates of population size have varied from 283 to 843 thousand in Alaska since 1990 and 355 to 694 thousand in California-Oregon since 1992 (there are no estimates for California-Oregon during 1990 and 1991). The regulatory choice for the Pacific Flyway depends exclusively on the status of these mallards.

For the 2008 hunting season, the Service is considering the same regulatory alternatives as last year. The nature of the restrictive, moderate, and liberal alternatives has remained essentially unchanged since 1997, except that extended framework dates have been offered in the moderate and liberal alternatives since 2002.

Based on available estimates of harvest rates of mallards banded in California and Oregon during 1990–95 and 2002–07, there is no apparent relationship between harvest rate and regulatory changes in the Pacific Flyway. This is unusual given our ability to document such a relationship in other mallard stocks and in other species. We note, however, that the period 2002–07 was comprised of both stable and liberal regulations and harvest rate estimates were based solely on

reward bands. Regulations were relatively restrictive during most of the earlier period and harvest rates were estimated based on standard bands using reporting rates estimated from reward banding during 1987–88. Additionally, 1993–95 were transition years in which full-address and toll-free bands were being introduced and information to assess their reporting rates (and their effects on reporting rates of standard bands) is limited. Thus, the two periods in which we wish to compare harvest rates are characterized not only by changes in regulations, but also in estimation methods.

Consequently, we lack a sound empirical basis for predicting harvest rates of western mallards associated with current regulatory alternatives in the Pacific Flyway. For this year, however, we specified regulation-specific harvest rates of 0.01, 0.06, 0.09, and 0.11 with associated standard deviations of 0.002, 0.02, 0.03, and 0.01 for the closed, restrictive, moderate, and liberal alternatives, respectively. Harvest rate for the liberal alternative was based on empirical estimates realized under the current liberal alternative during 2002–07 determined from adult-male mallards banded with reward bands in California and Oregon. Harvest rates for the moderate and restrictive alternatives were based on the proportional (0.85 and 0.51) difference in harvest rates expected for mid-continent mallards under the respective alternatives. A relatively large standard deviation ( $CV=0.3$ ) was chosen to reflect greater uncertainty about the mean than that for midcontinent mallards ( $CV=0.2$ ). And finally, harvest rate for the closed alternative was based on what we might realize with a closed season in the U.S. (including Alaska) and a very restrictive season in Canada, similar to that for mid-continent mallards.

Prior to next year, these assumptions will be reviewed and modified if appropriate. Further, we intend to develop a Bayesian hierarchical framework to update harvest rate estimates as experience allows. This framework will be analogous to that currently in use for midcontinent and eastern mallards (refer to appendix D of the 2007 AHM report).

The model of western mallard population dynamics remains unchanged from that documented in the Service report by Johnson et al. 2007 titled “A proposed protocol for the adaptive harvest management of mallards breeding in western North America.” However, management control was changed in the optimization from fixed harvest rates to regulations with a mean and standard deviation for each alternative as described above.

We calculated an optimal regulatory strategy for western mallards (Fig. 1) using stochastic dynamic programming. We based this optimization on: (1) the 2008 regulatory alternatives, (2) current (1990–07) population models and parameter estimates, and (3) an objective to maximize long-term cumulative harvest subject to a constraint intended to prevent extreme changes in regulations associated with relatively small changes in population sizes. The 2008 Alaska breeding population was  $532,414 \pm 46,797$  and the California-Oregon breeding population was  $381,402 \pm 47,824$  (mean  $\pm$  SE). The optimal choice for the Pacific Flyway in 2008 is the liberal alternative.

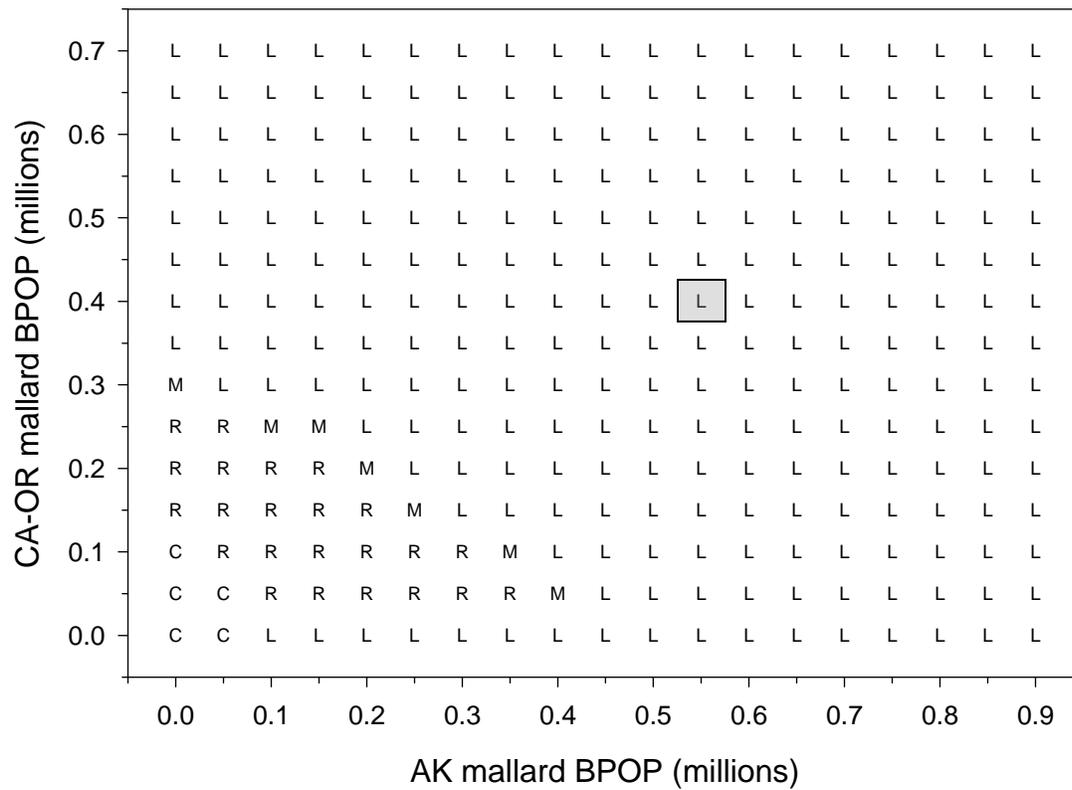


Figure 1. Optimal regulatory strategy (C=closed, R=restrictive, M=moderate, L=liberal) for the Pacific Flyway during the 2008 hunting season. This strategy is based on the 2008 regulatory alternatives, (2) current (1990–07) population models and parameter estimates, and (3) an objective to maximize long-term cumulative harvest subject to a constraint intended to prevent extreme changes in regulations associated with relatively small changes in population sizes. The shaded cell indicates the regulatory prescription for 2008.