

Framework-date Extensions for Duck Hunting in the United States: *Projected Impacts & Coping With Uncertainty*

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**Division of Migratory Bird Management
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Executive Summary: On August 3, 2000, Regulations Consultants representing the four Flyway Councils requested that the U.S. Fish and Wildlife Service (Service) conduct another assessment of the projected impacts of extended framework dates for duck hunting. To better assess the potential impact, the Service asked the Flyway Councils to survey their respective States concerning their interests in extended framework dates in each of their duck-hunting zones. Based on this survey, which assumed no penalties in season length or bag limit, only 13 of the 48 contiguous States would *not* take advantage of extended opening dates, closing dates, or both in at least a portion of the State. The predicted increase in annual harvest associated with extended framework dates in the moderate and liberal regulatory alternatives was approximately 15 percent and 5 percent for midcontinent and eastern mallards, respectively. Assuming these projected increases in harvest are accurate, we would expect a reduction in the frequency of liberal regulations, with a concurrent increase in the frequency of moderate regulations, in the Pacific, Central, and Mississippi Flyways. There was no discernable change in the expected frequency of liberal regulations in the Atlantic Flyway. Despite repeated assessments of this nature, however, the Service remains profoundly uncertain about the impacts of widespread framework-date extensions, and regulatory measures necessary to offset potential increases in harvests. Therefore, we propose a management approach that accounts for this uncertainty, and permits future modification of regulatory strategies as experience with framework-date extensions is accumulated.

Framework-date Extensions for Duck Hunting in the United States: *Projected Impacts & Coping With Uncertainty*

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Background

On August 3, 2000, Regulations Consultants representing the four Flyway Councils requested that the U.S. Fish and Wildlife Service (Service) conduct another assessment of the projected impacts of extended framework dates for duck hunting. The regulatory measure to be evaluated involves changing the earliest opening date for duck-hunting seasons from the Saturday nearest October 1 to the Saturday nearest September 24. The measure also involves changing the latest closing date from the Sunday nearest January 20 to the last Sunday in January.¹ The extended framework dates would apply only to the “moderate” and “liberal” regulatory alternatives during the 2001-05 hunting seasons. The Regulations Consultants also requested that the Service determine the reduction in bag limit or season length necessary to offset any projected increase in harvest.

To better assess the potential impact, the Service asked the Flyway Councils to survey their respective States concerning their interests in extended framework dates. On August 29, 2000, the Service provided guidelines to the Flyway Council Chairmen for soliciting input. Of interest was whether States would use an extended opening date, an extended closing date, or both in each of the currently recognized duck-hunting zones, assuming that no season-length or bag-limit reduction would be imposed. Also of interest was whether States would use extended framework dates in any portion of a State if it were necessary to reduce the season length or bag limit statewide. Responses from all States were compiled by the Flyway Councils and forwarded to the Service by September 20, 2000.

Nature of this Assessment

Previous assessments of the projected impacts of extended framework dates were provided by the Service in two reports to the U.S. Congress:

U.S. Fish and Wildlife Service. 1998. Framework-date extensions for duck hunting in the United States. U.S. Dept. Inter., Washington, D.C. 43pp.

U.S. Fish and Wildlife Service. 1999. Framework-date extensions for duck hunting in the United States: Supplemental assessment. U.S. Dept. Inter., Washington, D.C. 15pp.

¹Current framework dates in the Atlantic Flyway are fixed dates of October 1 to January 20.

These assessments relied on experience with framework-date extensions in Iowa (1979-87, 1995) and Mississippi (1979-84) to estimate the relative size of duck harvests associated with extended and traditional framework dates. For mallards, the proportional increases in harvest associated with framework extensions were assumed to be representative of the changes that could be expected in other States. This assumption permitted us to estimate the cumulative increase in nationwide mallard harvest that might be expected with widespread application of extended framework dates. Once the cumulative increase in harvest was estimated, we assumed that increases in harvest rate would be proportional to increases in harvest, and derived a projected optimal regulatory strategy for mallards based on established procedures for Adaptive Harvest Management (AHM) (*U.S. Fish and Wildlife Service. 2000. Adaptive Harvest Management: 2000 Duck Hunting Season. U.S. Dept. Inter. 43pp.*).

This assessment is similar to the one conducted in 1999, but differs in several important respects. First, in the 1999 assessment, we assumed that all States that held hunting seasons as early or late as possible during the 1997-98 hunting season would take advantage of extended framework dates if they were offered. We recognized that some States might not take advantage of extended framework dates, or would use them only with some regulatory alternatives or in some zones, but the Service had no basis for predicting such scenarios. Therefore, the 1999 assessment represented a worst-case scenario in terms of large-scale impacts. In this assessment, we used the declared intentions of each State for specifying which duck-hunting zones would take advantage of extended framework dates. Secondly, the 1999 assessment provided projected impacts only for midcontinent mallards because, at the time, their status was the basis for hunting regulations in all four Flyways. This assessment also provides projected impacts on eastern mallards, and describes how those impacts may affect future duck-hunting regulations in the Atlantic Flyway.

Perhaps more importantly, this assessment is concerned with the uncertainty associated with projected impacts of widespread framework-date extensions, and provides a suggested approach for coping with that uncertainty. In particular, we examine the critical assumption that historic experience with framework extensions in Iowa and Mississippi provides reliable inference about the changes in duck harvests that would be expected in other States using framework extensions for the first time. This assumption is common to all analyses of projected impacts conducted to date, including those described in this report. Because the validity of this assumption cannot be tested empirically, we propose a management approach that accounts for current uncertainty about harvest impacts, and permits future modification of regulatory strategies as experience with framework-date extensions is accumulated.

Finally, we emphasize that this assessment is restricted to the cumulative harvest impact on midcontinent and eastern mallards, and on Flyway regulatory strategies. We currently have no basis for quantifying regulatory impacts on segments of these populations, on other populations of mallards, or on other species. We also have no empirical basis to assess indirect impacts of framework-date extensions on mortality or reproductive rates arising from associated alterations in duck behavior.

Interest in Extended Framework Dates

Based on information provided by the Flyway Councils, only 13 of the 48 contiguous States would *not* take advantage of extended framework dates in at least a portion of the State (Fig. 1). Interest in an extended closing date was more widespread than in an extended opening date, and was manifest throughout southern and coastal States. Only Idaho expressed an interest in using both extended opening and closing dates in the same area. When States were asked whether they would use extended framework dates in any portion of the State if season length or bag limit were reduced statewide, there were only 16 positive responses. Of these 16 responses, 12 were from States that were interested in using extended framework dates statewide.

Projected Impacts on Mallard Harvests and Flyway Regulations

This assessment relies on the proportional increase in mallard harvest associated with framework extensions in Iowa and Mississippi, as described in the Service's second report to Congress. Thus, for harvest areas intending to use an extended opening date, we assumed that mallard harvest would increase by 32.0 percent (SE = 14.2) compared with the current framework date of approximately October 1. For areas using an extended closing date, we assumed that mallard harvest would increase by 18.0 percent (SE = 11.3) compared with a closing date of approximately January 20. Areas intending to use both extended opening and closing dates were assessed both rates of increase, suggesting an increase in these areas of 55.8 percent (SE = 22.5). No change (SE = 0) in harvest from current levels was assumed for areas not expected to use extended framework dates.

The overall increase in mallard harvest was calculated by averaging the predicted change in harvest for individual duck-hunting zones within States, using the proportion of band recoveries of mallards occurring in each zone as weights. Zones were defined on the basis of county boundaries, and most accurately reflect zones in effect during the 1996-2000 hunting seasons. Band recoveries were adjusted for known sources of variation in reporting rate. The predicted ratio of harvests with and without extended framework dates was 1.154 (SE = 0.039) for midcontinent mallards, suggesting a cumulative increase in harvest of 15 percent under the moderate and liberal regulatory alternatives. This increase is slightly less than the 23 percent (SE = 4) projected when the expected use of extended framework dates was examined on a State, rather than a zone, basis. The increase in harvest was projected to be less for eastern mallards. The predicted ratio of harvests was 1.051 (SE = 0.103) if the moderate or liberal regulatory alternatives are in effect nationwide, 1.040 (SE = 0.103) if moderate or liberal regulations are in effect only in the Pacific, Central, and Mississippi Flyways, and 1.025 (SE = 0.103) if moderate or liberal regulations are in effect only in the Atlantic Flyway.

Harvest rates of midcontinent and eastern mallards associated with framework extensions in the moderate and liberal alternatives were calculated by assuming that projected increases in harvest are proportional to increases in harvest rate (Table 1). We also assumed that the regulatory

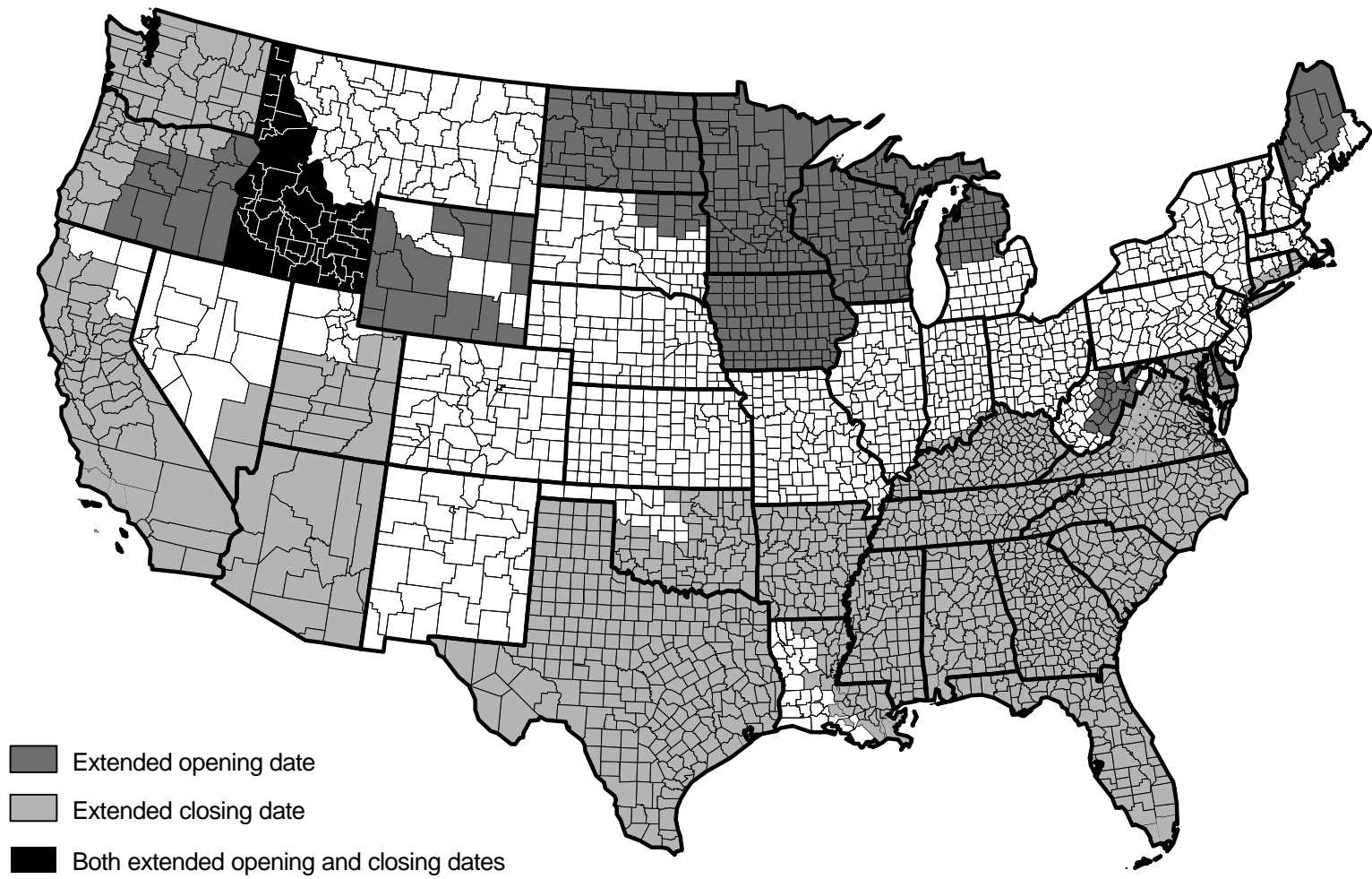


Fig. 1. Geographic extent of States' interest in extended framework dates, as based on a survey by Flyway Councils in September, 2000.

choice in the Atlantic Flyway has a negligible effect on the harvest rate of midcontinent mallards (see *U.S. Fish and Wildlife Service. 2000. Adaptive Harvest Management: 2000 Duck Hunting Season. U.S. Dept. Inter. 43pp.*). However, the regulatory choice in the western three Flyways does have a discernable effect on the harvest rate of eastern mallards. Therefore, we estimated eastern-mallards harvest rates associated with regulations in the Atlantic Flyway by taking a weighted average of the estimated harvest rates associated with each regulatory choice in the western Flyways, for each possible regulatory choice in the Atlantic Flyway. The weights were derived using simulations of the midcontinent-mallard strategy to determine the expected frequency of regulatory choices in the western Flyways.

Optimal regulatory strategies for mallards were derived using standard AHM methods. For midcontinent mallards, we used an objective function to maximize long-term cumulative harvest, with a proportional devaluation of harvest when the size of the mallard population is expected to fall below the goal of the North American Waterfowl Management Plan. We also used current probabilities associated with the four competing models of mallard population dynamics. For eastern mallards, we used an objective to maximize long-term cumulative harvest, and eight alternative models of population dynamics, equally weighted. We investigated the application of optimal strategies using Monte Carlo simulations, and evaluated expected performance using the mean of annual harvest and population size, and the frequency with which each of the four regulatory alternatives was used.

Table 1. Estimated harvest rates of midcontinent and eastern mallards with and without extended framework dates.

Flyway regulation	Framework extensions	Harvest rates (SE)	
		Midcontinent mallards	Eastern mallards
Closed	without	0.0088 (0.0030)	0.1100 (0.0135)
	with	0.0088 (0.0030)	0.1100 (0.0178)
Very Restrictive	without	0.0526 (0.0106)	0.1382 (0.0205)
	with	0.0526 (0.0106)	0.1388 (0.0249)
Restrictive	without	0.0665 (0.0142)	0.1488 (0.0223)
	with	0.0665 (0.0142)	0.1501 (0.0271)
Moderate	without	0.1114 (0.0266)	0.1661 (0.0258)
	with	0.1286 (0.0309)	0.1715 (0.0322)
Liberal	without	0.1305 (0.0323)	0.1756 (0.0278)
	with	0.1506 (0.0376)	0.1820 (0.0355)

Based on the projected harvest rates provided in Table 1, the optimal regulatory strategy for the three western Flyways would be more conservative with widespread use of framework-date extensions (Table 2). Most differences in hunting regulations between strategies with and without extended framework dates occurred at population sizes of midcontinent mallards from five to eight million, and tended to be associated with above-average pond numbers. Assuming the projected increases in harvest rates are accurate, we would expect a reduction in the frequency of liberal regulations, with a concurrent increase in the frequency of moderate regulations (Table 2). We would expect no discernable change in the average size of the midcontinent mallard population or its associated harvest.

For the Atlantic Flyway, the only difference in optimal regulatory choices between a strategy with and without extended framework dates occurs when there are 500-550 thousand eastern mallards. Although the regulatory strategy was slightly more conservative with extended framework dates, there was no discernable change in the expected frequency of liberal regulations (99.7% vs. 99.9%). We also would expect no significant change in average population size or harvest of eastern mallards. This lack of regulatory effect in the Atlantic Flyway is due to the fact that most States interested in framework-date extensions in the Flyway do not contribute significantly to the overall harvests of eastern or midcontinent mallards. Therefore, mallards, and hunting regulations based on their status, likely do not provide a sufficient basis for projecting the impact of framework-date extensions in the Atlantic Flyway. We also reiterate that projected changes in optimal regulatory strategies for both populations of mallards are based on current probabilities associated with the alternative models of mallard population dynamics, and these probabilities will change over time.

Table 2. Projected changes in the frequency of regulatory choices in the Mississippi, Central, and Pacific Flyways associated with extended framework dates.

Regulatory alternative	Projected frequency (%)	
	Without extensions	With extensions
Closed	0.0	0.0
Very restrictive	0.1	0.1
Restrictive	2.2	9.0
Moderate	17.3	47.4
Liberal	80.4	43.5

Contrary to the impression conveyed by these analyses, we remain profoundly uncertain about the increase in mallard harvests that might be expected with widespread use of extended framework dates. First, the strength of inferences about the impacts of framework-date extensions in Iowa

and Mississippi are limited due to the lack of experimental designs (see discussion in the Service's reports to Congress). Perhaps more importantly, we have no basis to determine whether the experience with extensions in Iowa and Mississippi is representative. In fact, there is every reason to believe otherwise because of differences among Flyways in duck populations, environmental conditions, and hunter activity. Additionally, we have documented Flyway-specific effects of other regulatory tools (e.g., season length, bag limit), suggesting that there are likely differences among Flyways in the effects of framework-date extensions as well. It is our judgement, then, that we have neither sufficient information or experience to reliably project regulatory impacts, nor to estimate the reduction in season length or bag limit that might be required to offset increases in harvest. To do otherwise would falsely portray the Service's ability to predict the consequences of its regulatory actions.

Coping With Uncertainty

Fortunately, there is a decision-making framework in place that can account for fundamental uncertainties in management outcomes, and that can modify future decisions based on accumulated management experience. AHM has proven to be effective tool for making decisions in the face of uncertainty, at least when there is broad-based agreement on management objectives (i.e., how to value harvests, and how those values should be shared). In this light, the decision to use framework-date extensions has been problematic not because of any shortcoming of AHM, but because of tacit disagreement over desirable distributions of harvest or harvest opportunity. Unfortunately, the lack of an effective process or protocol for organizing debate, as well as a paucity of information on hunter satisfaction, continue to be formidable obstacles to attaining agreement on "fairness" in harvest distribution.

In the absence of such agreement, however, it is still possible to formulate an adaptive approach to the use of framework-date extensions, provided that the Flyway Councils are prepared to accept the changes in harvest distribution that might occur. The approach would involve embracing two or more alternative hypotheses about the change in mallard harvests that would be associated with widespread application of extended framework dates. Initially, these alternative hypotheses might be considered equally likely, reflecting a high degree of uncertainty about harvest impacts.² Based on these alternative hypotheses and their associated probabilities, an optimal regulatory strategy including framework-date extensions would be derived. Once the appropriate regulatory decision had been made, mallard harvest rates would be estimated from band-recovery data and compared with the predictions made under the alternative hypotheses. The hypothesis predicting a harvest rate in closest agreement with that observed in the monitoring program would gain credence (i.e., probability mass) and, thus, be more influential in the determination of an optimal regulatory strategy prior to setting the next annual hunting regulations. Over time, this iterative process should identify which impact hypothesis is the most accurate among the alternatives, while ensuring that uncertainty as to harvest impacts is properly accounted for in each regulatory

² Alternatively, these hypotheses might be described and weighted based on the impact analyses provided in this report.

decision. An adaptive approach to framework-date extensions was first suggested by the inter-agency AHM Working Group, and is considered by that group as the only approach consistent with the goals, theory, and practice of AHM.

Essential to the successful application of this adaptive approach is a reliable monitoring program for estimating realized harvest rates of mallards. Such a program does not exist at this time because of continuing uncertainty about the rate at which hunters report band recoveries. This uncertainty resulted from the introduction of a toll-free phone number for reporting band recoveries, which is the key feature of a campaign designed to increase band-reporting rates. The Service currently is developing plans to estimate current band-reporting rates using a comparison of standard and reward bands.