# REGULATORY IMPACT ANALYSIS OF THE MIGRATORY BIRD HUNTING REGULATIONS FOR THE 2004-2005 SEASON

## Economic Background and Significance

The purpose of this Regulatory Impact analysis is to determine the economic effects of Federal regulatory alternatives for the 2004-2005 hunting season for migratory birds. This analysis centers on changing daily bag limits and season lengths, the two most important policy variables in the Federal framework. The analysis will show that differences in those key variables between alternatives result in measurable changes in the number of hunters, how often they hunt, and the amount of consumer surplus they enjoy as well as the amount of money they spend in pursuit of their sport. There are two components to this analysis: first, each of the regulatory alternatives will be evaluated for their effects on consumer surplus and second, each alternative will be evaluated for their effects on hunter expenditures. The results of this analysis will be part of the decision making process for the final framework for the 2004-2005 Fall migratory bird hunting season.

Migratory birds are a renewable, international, common property resource. Each consumer has an incentive to take as much of the resource as they can capture, so all consumers together can overexploit the resource. This type of market failure is termed an externality in that the actions of one party impose costs on others that cannot be captured by a market transaction. Over harvesting at the turn of the century resulted in depleted bird populations and inspired the Migratory Bird Treaties between the United States, Great Britain (Canada), Mexico, Japan, and the Soviet Union. The Act implementing the treaties authorizes the Secretary of the Interior to establish national frameworks within which States may establish migratory bird hunting regulations. The Act is permissive. Without the national frameworks, the states cannot establish hunting seasons and hunting is prohibited. The national framework indirectly regulates migratory bird hunting in the United States by setting maximums for season length and bag limits under which the States can set hunting regulations. The States can be more restrictive than the Federal framework but not more lenient (e.g. the States can set shorter seasons and/or lower bag limits).

Government policies generate economic effects by changing the use of resources in the economy. Alternative resource allocations may increase the efficiency of the national economy and generate greater welfare for its citizens, or policies may redistribute resources from one region or industry to another. The former are national economic development effects. The latter are regional economic development effects. By permitting hunting, the migratory bird hunting framework regulations generate both types of effects.

Approximately 1.6 million people reported hunting ducks or geese in the United States (U.S. Department of the Interior 2002). This analysis looks at duck hunting and the economic effects of regulatory alternatives on that major component of all migratory bird hunting. Sufficient data exists for duck hunting to generate an analysis of hunter

behavior in response to regulatory alternatives. The analysis for all migratory bird hunting is not possible because of data limitations but can be inferred from the results of the duck hunting analysis presented here.

Evidently, hunters derive more pleasure from duck hunting than from their next most preferred option for spending that time and money. The increment in their welfare versus the next most preferred activity and the increment in producer surplus versus the next most productive use of the resources are the national welfare benefits of duck hunting. The Fish and Wildlife Service believes that the migratory bird hunting frameworks constitute an economically significant rule, under the definition of Executive Order 12866.

**Effects of Allowing Hunting of the Migratory Bird Population**

The annual Environmental Assessment of the migratory bird hunting regulations provides detailed descriptions of five alternative frameworks for the annual duck hunting season:

Alternative 1. Close the season on ducks. This would be a complete closure of all seasons on migratory birds.

Alternative 2. Issue very restrictive regulations allowing fewer days than those issued during 2002-2003 season.

Alternative 3. Issue restrictive regulations allowing more days than those in alternative 2.

Alternative 4. Issue moderate regulations allowing more days that those in alternative 3.

Alternative 5. Issue liberal regulations identical to the regulations in the 2003-2004 season.

The Service proposes to issue liberal migratory bird hunting regulations in 2004-2005 (Alternative 5). A final determination of which alternative to promulgate will be made when the analysis of the bird population status, due to be completed in the summer of 2004, is available.

Theoretical Model

Two approaches for looking at participant behavior are the Random Utility Model (RUM) and conjoint analysis. The RUM model is a discrete choice model that uses an individual's utility function to explain an individual's choice among recreational sites. By incorporating recreational site attributes into the model, it is possible to measure the impact on welfare due to changes in site attributes.

The $k^{th}$ hunter's utility function from a visit to site *j* for *i* days can be described as:

$$U_{ijk} = V_k(T_{jk}, A_j, S_k) + \epsilon_{ijk}$$

where $T_{jk}$ = vector of travel costs for hunter *k* to site *j*
$A_j$ = vector of attributes for site *j*
$S_k$ = vector of socioeconomic attributes for hunter *k*
$\epsilon_{ijk}$ = unobservable utility for hunter *k* at site *j* for *i* days.

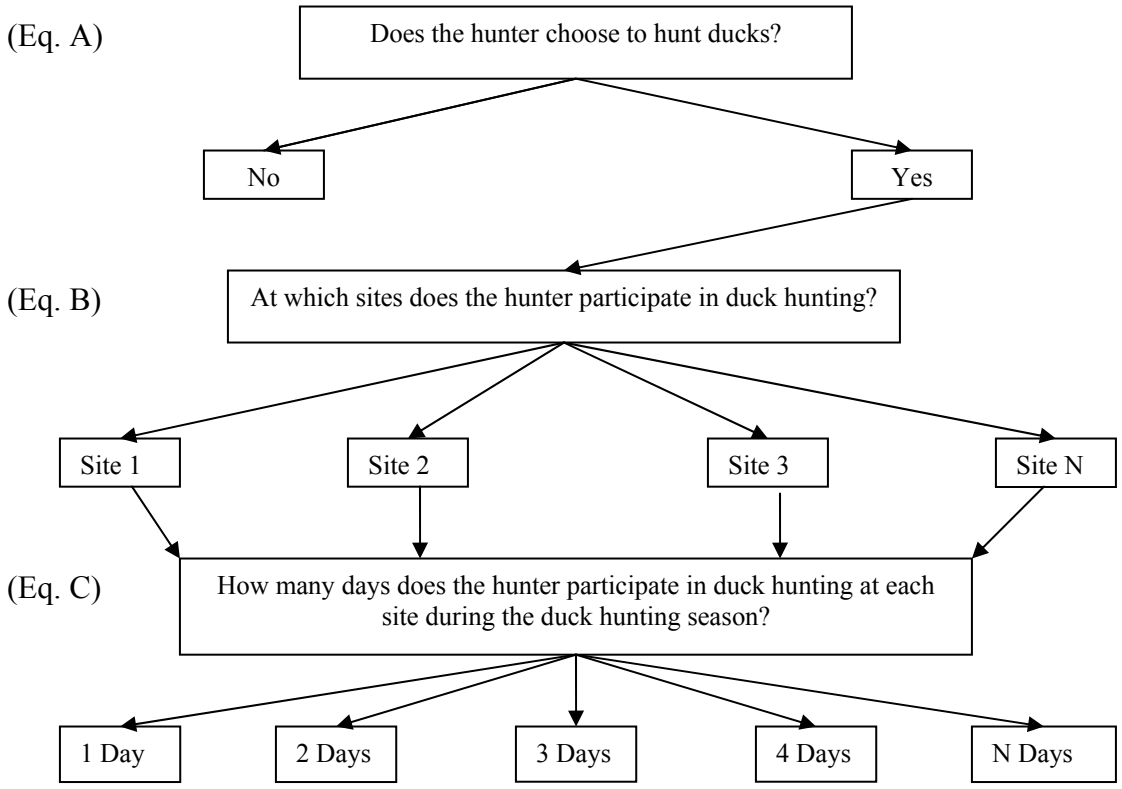
The hunter will choose to hunt ducks at a particular site for a number of days if his utility from hunting ducks at a particular site is greater than his utility of hunting for another animal at another site. The probability that a hunter will choose to participate in duck hunting at site *j* for *i* days is given as:

$$P(ijk) = P(i|j)P(j|k)P(k)$$

where $P(k)$ is the marginal probability of choosing to duck hunt, $P(j|k)$ is the conditional probability of choosing site *j* given that the hunter chooses to duck hunt, and $P(i|j)$ is the conditional probability of duck hunting for *i* days given that site *j* is chosen.

For the migratory bird harvest regulation, the random utility model would have a nested logit specification with three sequential decision-making levels. A nested model is necessary to ensure that the Independence of Irrelevant Alternatives (IIA) property is not violated. The IIA property assumes that the probability of choosing one alternative among two or more different types of recreational activities/sites is independent of the probability of choosing another alternative. By nesting together similar decisions, the IIA property holds true. The following figure diagrams the hunter's decision making process for duck hunting.

**Figure 1. The duck hunter's sequential decision-making process.**




The RUM is a good model to use to estimate the change in hunters' welfare as a result of a policy that changes duck hunting season length or bag limit. However, the migratory bird harvest regulation is a nationwide regulation covering 4 migratory bird flyways and 49 States with a vast number of site options for the duck hunter (equation B in Figure 1). To perform a valid RUM would require detailed information for each possible duck hunting site within the regulated 49 States. Thus, the data necessary to conduct a RUM would be prohibitively expensive to collect. The current national survey of Fishing, Hunting, and Wildlife Associated Recreation collects data on hunters by state of residence and activity but the state level of specificity would make the application of a RUM model nearly impossible.

Conjoint analysis is a modeling technique more suited to household surveys. The model consists of a series of scenarios that are framed as possible choices for the respondent. For each scenario, key variables are given different values along with other variables that don't change and the respondent is asked to pick the preferred scenario. This approach holds promise to model hunting behavior as the scenarios could be specified to include alternative sites and activities. This approach has not been used for migratory bird hunting nationwide, and as a result this approach cannot be implemented for the current analysis.

A model of duck hunting economics to compare the impact of each of the five alternatives was developed and is described in Appendix A. Current economic effects were determined by comparisons with the base case. For purposes of analysis the base case was set as the absence of a Federal framework, i.e. no migratory bird hunting permitted. This is referred to at alternative 1. Alternatives 2, 3, and 4 result in increasing hunting days reflecting an increase in consumer surplus when compared to the baseline (alternative 1). The estimated economic benefits resulting from liberal regulations (alternative 5) are the maximum achievable with the proposed framework.

Estimating Consumer Surplus

Estimates of individual's willingness to pay for duck hunting provides some insight into the size of the consumer surplus derived from this activity. Willingness to pay for migratory waterfowl hunting (which includes both ducks and geese) averaged $58 per day (2003$) (Walsh, Johnson, and McKean 1990). This is the average of 17 estimates the authors found in the research literature. In order to account for regional differences in consumer surplus estimates, data for estimating consumer surplus of waterfowl hunting by flyway are needed. The existing literature has two studies where sufficient data were collected to derive consumer surplus estimates by flyway. Charbonneau and Hay (1978), and Hay (1988) are the only studies found that estimated values for each of the four flyways. Average consumer surplus estimates are required to evaluate the alternative duck hunting frameworks, which are specified by flyway. In this report, the average consumer surplus is presented as a range taken from the Hay and Walsh, Johnson, and McKean studies. The daily consumer surplus estimates are used to determine the economic value of the baseline (no migratory bird hunting regulations) and the estimated effects of changes brought about by different frameworks. The estimates from the Hay study and the average consumer surplus per day reported in Walsh, Johnson, and McKean study form the range in estimates used in this analysis. The estimates range from $38 to $67 per hunting day. The days of duck hunting reported in the 2001 National Survey of Fishing, Hunting and Wildlife Associated Recreation were used to estimate the consumer surplus effects in the baseline. The results are shown in Table 1 below. This is the estimate for the consumer surplus loss if no migratory bird hunting regulations were issued for the 2004-2005 season.

Table 1. Consumer Surplus Loss for the Baseline for Duck Hunting

| Flyway | Duck Hunting Days | Consumer Surplus Per Day (2003 $) | Base Year Consumer Surplus |
|---|---|---|---|
| Atlantic | 3,599,553 | $38 - $67 | $137 - $240 million |
| Mississippi | 6,760,757 | $41 - $59 | $277 - $399 million |
| Central | 5,333,260 | $39 - $52 | $208 - $279 million |
| Pacific | 2,596,430 | $43 - $56 | $112 - $145 million |
| Total | 18,290,180 | | $734 - $1,064 million |

The national estimate of the consumer surplus lost without duck hunting regulations ranges from $734 million and $1.1 billion (2003$) annually, with a mid-point estimate of $899 million. This loss would be suffered by the approximately 1.6 million people who reported they hunted ducks in 2001.

Estimating Producer Surplus: Alternative 1/Baseline

The estimation of producer surplus is the missing value for a complete analysis of the economic benefits generated by the migratory bird framework. Producer surplus (sometimes called economic rent) is that portion of the profits that is over and above what is required to keep the company in business. Producer surplus is more difficult to quantify in the case of a natural resource. There may be some producer surplus associated with land leases for access to waterfowl hunting as well as habitat leases to provide primary constituent elements needed to allow waterfowl to reproduce. Any producer surplus associated with the sale of equipment and services to hunters is not easily estimated since the data on profits margins for all these items are not known. Also, the large numbers of suppliers of services and equipment would tend to eliminate excess profits through competition. Since most, if not all, the services and equipment have non-duck hunting applications, producers would tend to not be able to set a price that would include excess profits. Data to estimate producer surplus are not available and most likely producer surplus is minimal compared to consumer surplus.

Consumer Surplus Effects of Alternative Frameworks

An economic model of duck hunting was developed and estimated to evaluate the alternative duck hunting frameworks (Appendix A). This model is used to estimate changes in annual duck hunting days and the resulting consumer surplus. An analysis of the alternative frameworks shows that the proposed framework for the 2004-2005 hunting season will maximize consumer surplus and therefore, public benefits. Producer surplus, which is not estimated, should also be maximized, if it exists. For all the alternative frameworks that allow hunting regulations to be established, there is a positive consumer surplus when compared to the base case (no hunting regulations). The net effect of alternative frameworks results in relatively small increases in consumer surplus primarily reflecting the fact that the frameworks are not severely binding on duck hunters decisions on how many days to hunt. The differences between season length and days afield and bag limits and actual harvest are large enough that only marginal changes in hunter behavior are expected from alternative frameworks. The result of using the model in Appendix A to evaluate the alternatives is given in Table 2 below. The mid-point of the consumer surplus per day values were used to develop the table 2 estimates.

Table 2. Estimated Consumer Surplus for Alternative Frameworks for the 2004-2005 Duck Hunting Season.

Consumer Surplus Estimates by Framework

| Flyway | Alternative 2 Very Restrictive | Alternative 3 Restrictive | Alternative 4 Moderate | Alternative 5 Liberal |
|---|---|---|---|---|
| | (000$) | (000$) | (000$) | (000$) |
| Atlantic | $187,122 | $187,427 | $187,933 | $188,500 |
| Mississippi | $335,298 | $335,912 | $336,911 | $338,000 |
| Central | $242,315 | $242,611 | $243,119 | $243,500 |
| Pacific | $127,842 | $128,016 | $128,264 | $128,500 |
| Total | $892,577 | $893,966 | $896,227 | $898,500 |

The frameworks safeguard the efficient use of the resource over time by imposing limits on its exploitation. Overexploitation when access to the resource was unconstrained threatened its sustainability. Limiting resource consumption ensures future hunting opportunities and the resulting benefits to hunters.

The frameworks have little direct effect on other agencies' actions nor any material budgetary impact. As the framework procedure has been in place for over 20 years, no novel legal or policy issues are raised by these regulations.

Economic Effects of Alternative Frameworks

Table 2 shows the estimated increases in consumer surplus from duck hunting of the alternative frameworks when compared to the base case for each flyway. The total increases in consumer surplus ranges from $893 million for the very restrictive framework to $899 million for the liberal framework.

Alternative 1 This alternative is a closed season on all migratory birds. Closing the migratory bird season on all flyways will result in zero duck hunting days and so no consumer surplus. This is usually slightly over half of migratory bird hunting consumer surplus. Adoption of a closed season would have the longer lasting effect of discouraging people from pursuing the sport. The scale of the consumer surplus loss is between $734 and $1,064 million dollars per year for duck hunting, with a mid-point estimate of $899 million.

Alternative 2 This alternative includes very restrictive regulations allowing fewer days than those issued in 2003-2004. Bag limits are 3 ducks below the 2003 levels and seasons are 20 to 70 days shorter. The reduced bag limit reduces the probability of hunting about 1 percent resulting in 16,000

fewer hunters. Total hunting days falls by 120,000 days. Taken together the very restrictive framework results in an estimated $893 million (2003$) in duck hunter consumer surplus.

Alternative 3 Under this alternative, restrictive regulations would be issued. Bag limits would be reduced as in Alternative 2 but season lengths would be about 10 days longer. Season length has a much smaller effect than bag limits on hunter activity so impacts are similar to Alternative 2. The reduced bag limit reduces the probability of hunting resulting in 11,700 fewer hunters. Duck hunter consumer surplus would be an estimated $894 million (2003$).

Alternative 4 Bag limits under this alternative are the same as under the liberal base case but season lengths are 14 to 21 days shorter. Duck hunters would spend fewer days afield. The reduced bag limit reduces the probability of hunting resulting in 5,500 fewer hunters. Estimated consumer surplus would be $896 million (2003$).

Alternative 5 The liberal regulations similar to the 2003- 2004 regulations have the opposite economic effect when compared to the base case used in this analysis. The estimated consumer surplus ranges from $734 to$1,064 million with a mid-point estimate of $899 million. The liberal bag limits and season lengths results in an estimated 1.6 million duck hunters. This alternative is the preferred alternative and also maximizes hunters' welfare benefits which are related to bag and days afield.

The differences between alternatives are relatively small. This reflects the fact that there is only a small influence of the national frameworks to changing the actual days afield and hunter bag.

Duck hunting accounted for 62 percent of all migratory bird hunting days in 2001. This analysis of duck hunting benefits, if extrapolated to all migratory bird hunting, would be 38 percent higher than the current estimate. There is no data to support this extrapolation so it is not performed and assumed to represent total migratory bird hunting benefits.

**State Costs of the Rule**

The framework regulations for migratory bird hunting impose some costs of administration and enforcement on the States. If there were no migratory bird hunting, the States could apply their resources to different ends. As the States also derive revenue from licenses and sales taxes on hunting supplies, the net effect on State resources is uncertain.

If States were free to set hunting seasons and bag limits (abrogating the Migratory Bird Treaty Act), some might opt for longer seasons and higher bag limits without regard to the health of the waterfowl populations. To the extent the frameworks constrain the

regulatory regime these States may impose, the framework imposes an opportunity cost on the States. The opportunity cost is the lost revenue and hunter expenditures the State cannot recover because it is constrained by the framework in its hunting regulations. There is no way to quantify this cost. In particular, the long run impact of over harvesting the population would be difficult to estimate and value.

**Comment Solicitation**

We seek public comments on this initial analysis and will take into consideration comments and any additional information received during the 30-day comment period. If you wish to comment, you may submit your comments, suggestions of relevant studies that estimate producer surplus, identify data sources that could be used to estimate a full RUM model for duck hunting, or studies of businesses that cater to duck hunters by any one of several methods. You may mail comments to: John Charbonneau, U.S. Fish and Wildlife Service, 4401 North Fairfax Drive – MS224, Arlington, VA 22203. You may comment via the Internet to Joseph_Charbonneau@fws.gov. You may also fax comments to John Charbonneau, Division of Economics, 703-358-2319. Finally, you may hand-deliver comments to the address mentioned above.

## SMALL ENTITY ANALYSIS – INITIAL REGULATORY FLEXIBILITY ACT

### Regional Benefits of the Rule

This rule will have national economic development benefits in excess of $100 million. This rule will set in place the proposed national framework for the establishment of migratory bird hunting for the 2004-2005 season. While the national framework is aimed at regulating hunter behavior, it has indirect effects in the form of hunter expenditures that affect small businesses nationwide. Because of the magnitude of direct expenditures ($1.4billion), with some portion going to small entities, the Fish and Wildlife Service (Service) estimates that this regulation is a major rule under the Small Business Regulatory Enforcement Fairness Act. Consequently, the Service believes the rule will have a significant beneficial economic effect on a substantial number of small entities. This impact will be focused on regions with high migratory bird hunting activity. As a result, this initial Regulatory Flexibility Act analysis is being made available for public comment.

Major categories of Hunter Expenditures

Waterfowl and other migratory bird hunting represent an important part of the total economic activity generated by fishing and hunting in the United States. The National Survey of Fishing, Hunting and Wildlife Associated Recreation (Survey) indicates that migratory bird hunter expenditures, exclusive of licenses, stamps, tags and permits, totaled over $1.4 billion in 2001(2003$).

This analysis looks at duck hunting and the economic effects of regulatory alternatives on that major component of migratory bird hunting. Expenditure data specific to duck hunters are not directly available from the Survey. An estimate of duck hunter expenditures was obtained by using the numbers of active duck hunters and hunter days reported in the 2002 Waterfowl Harvest and Hunter Activity Administrative Report and the per capita and per day expenditure data reported in the 2001 Survey. Resulting expenditures for the four flyways totaled $725 million (2003$). Equipment and daily spending were estimated for each flyway. Equipment expenditures are calculated as per hunter equipment spending in the 2001 Survey times the number of duck hunters reported in the Administrative Report. Daily expenditures are calculated as variable expenditures (food, travel, and lodging) per day from the 2001 Survey multiplied by waterfowl hunter days from the Administrative Report. (All dollar figures in this section are constant 2003 dollars.)

Assuming that duck hunters distributed their spending among the Survey's travel expenditure categories in the same way as did other migratory bird hunters in 2001, duck hunters spending would have been as follows:

| CATEGORY | PERCENT | EXPENDITURES |
|---|---|---|
| Equipment | 52.7% | $731.6 million |
| Food | 16.4 | 227.9 |
| Transportation | 17.8 | 246.5 |
| Lodging | 3.8 | 52.4 |
| Other | 9.4 | 130.0 |
| **Total** | **100.0%** | **$1,388.6 million** |

Migratory bird hunters spent $1.25 billion for guns, ammunition, travel, and recreational services in 2001 (2003$,U.S. Department of the Interior 2002). These resources would have been spent on other activities if migratory bird hunting had not been possible so they do not represent a change in national economic efficiency or welfare. Nevertheless, this spending is important for the industries and regions where the money is spent. If items like hunting camps, off-road vehicles, and land are included, 2003 spending for migratory bird hunting increases to $2.7 billion. As this spending flowed through the national economy, it generated $7.4 billion of economic output and 66,274 jobs (Southwick Associates 2002).

Beneficiaries of the Rule

There were an estimated 1.6 million active duck hunters in the U.S. in 2001 (U.S. Department of the Interior 2002). The number of duck hunters in the U.S. has increased in the last ten years going from approximately 1 million in 1991 to 1.6 million in 2001. In addition to hunters, a wide range of businesses and individuals benefit economically from the establishment of the annual migratory bird hunting regulations. A partial list of migratory bird hunter expenditure categories and the types of businesses that benefit from those expenditures are shown below.

Migratory bird hunting regulations generate significant economic activity for small businesses. Nationwide, migratory bird hunters spent between $481 million and $1.2 billion at small businesses in 2003 (Table 3). As many as 742,380 small businesses will share in these sales. All but five of the States derive, as a minimum, an excess of $2 million in small business sales from migratory bird hunting.

| **Expenditure Item** | **Examples** | **Beneficiaries** |
|---|---|---|
| Equipment and Supplies | Guns, ammunition, boats | Sporting goods stores, department stores, boat dealers |
| Transportation | Gasoline, oil, repairs, air travel, vehicles | Service stations, vehicle dealers and rental agencies |
| Lodging | | Motels, campgrounds |
| Food and Beverages | | Restaurants, grocery stores |

| | | |
|---|---|---|
| Lands and Leases | Club memberships, daily and seasonal hunting fees | Hunting clubs, private land owners |
| Clothing | Specialized clothing, waders, boots | Retail clothing stores, mail order firms |

Limited information is available on the number of businesses and individuals in the various categories who benefit from duck hunter expenditures. This is not surprising considering that those who provide equipment, supplies and services to duck hunters often provide identical or similar items to non-hunters. For example:

1. A motel in a duck hunting area may obtain a portion of its income from duck hunters. Registrants are not requested to indicate the nature of their travel. The same situation prevails for food service establishments, gasoline stations, etc.

2. The number of sporting goods stores in the United States is obtainable. However, such stores may cater to fishermen, bowlers, skiers, joggers, etc., in addition to hunters. Without knowledge of their specialty, knowing the number of sporting goods stores is not sufficient.

3. Considerable leasing of lands for hunting and other purposes is accomplished informally without record keeping, and the payment is often in cash or otherwise undocumented.

**Methods**

This analysis combines information from the 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (Survey), the U.S. Department of Commerce County Business Patterns 1993 database, and the fisher library web site at the University of Virginia to develop two estimates of migratory bird hunters' expenditures at small businesses. The Survey provides excellent information about hunters and anglers expenditures for sporting trips and equipment. Trip expenditures are categorized as food, lodging, transportation, and other travel items (e.g., guide fees, access fees, and rentals). Equipment expenditures include guns, ammunition, decoys, and other hunting related equipment. Expenditures for magazines, memberships, vehicles, cabins, land, and dogs are excluded from this analysis. As very few respondents purchased these items, the data are considered unreliable. A recent study by Southwick Associates included these large items and so reports higher total expenditures by migratory bird hunters. In addition, the Southwick study applied economic multipliers to the expenditure figures to determine the indirect and induced economic activity from hunting. Such extensive economic analysis is beyond the scope of this small entity impact analysis.

The Survey does not collect information about vendors. Therefore, another method is necessary to find the proportion of total expenditures that can be attributed to small businesses. The U.S. Department of Commerce publishes the County Business Patterns

database that includes the number of enterprises and employment by county, Standard Industrial Classification (SIC), and number of employees. For this analysis, a small business is defined as any business having less than 50 employees. The County Business Patterns information permits calculation of small business' share of establishments and employees but not their share of sales. Two alternative methods are used to allocate sales to small businesses from establishment and employment information for each State. If all businesses sell about the same amount, the share of expenditures spent at small businesses will be the proportion small business *establishments* are to the total number of establishments. This proportion probably overstates small business' share. A large discount department store probably sells more guns and ammunition than a small neighborhood gun shop. Alternatively, if sales per employee are about the same, whatever the size of the business, the share of expenditures spent at small businesses will be the proportion small business *employment* is of total employment. This proportion may understate small business' share. While each gun shop employee sells a high cost item, a large discount department store employee sells a variety of goods including many low cost items. Of course, the department store employee sells a larger volume of goods. Using both methods generates high and low estimates of expenditures by migratory bird hunters at small businesses. The actual expenditures are likely to fall between the two extreme estimates. To illustrate the State level of benefits, the following tables have been developed based on the 2001 national Survey. These ranges are summarized by State and expenditure category in Table 3. All expenditures in this section are reported in thousands of 2003 dollars.

Table 4, Estimated Migratory Bird Hunters' Expenditures on Food, illustrates the calculations for each of the expenditure categories shown on tables 5 through 8. The first column contains State totals of the amounts respondents to the Survey reported they spent for food while on trips whose primary purpose was to hunt migratory birds. Food may be bought at a restaurant (SIC 5812) or grocery store (SIC 5410) so both types of establishments were combined. The second column shows the number of establishments in SIC 5812 or 5410 in each State. The third column shows the number of establishments with less than 50 employees in these SIC codes in each State. The proportion small business establishments are of the total is the first method used to allocate expenditures to small businesses. This allocation is shown in the fifth column. The sixth through ninth columns repeat the process using employment as the allocation basis. The fifth and ninth columns were transferred to the summary table (table 3).

Although more than 25,000 hunters and anglers were interviewed for the Survey, these expenditure estimates are based on only those who actually hunted during 2001 and stated that the primary purpose of their trip or equipment purchase was hunting migratory birds. Only a small subset of hunters in each State meets both criteria so the expenditures are quite sensitive to individual responses. For example, the Connecticut results are based on a sample of only 9 people, none of whom purchased lodging on hunting trips. Other zero totals are based on similar small sample sizes. Small samples may also inflate expenditure estimates. An asterisk by the state name indicates a small sample size.

County business pattern information may also introduce errors. To avoid disclosure of private information, the Census Bureau withholds employment information when there are few establishments in a geographic area. Exclusion of a single large employer can greatly affect the proportion attributed to small business. In addition, entry of enough firms into an area results in all of the establishments appearing in the statistics. This exacerbates the instability of the published series. No effort was made to compensate for unreported firms in this analysis.

Surveys of a wide range of businesses would be required to obtain the necessary detailed data. The Small Entity Analysis included in this section overcomes the first two examples by assuming all spending by migratory bird hunters is spread across all beneficiary businesses in proportion to the number of establishments or number of employees. The third example is insuperable.

The direct expenditures described above cycle through the economy generating additional income and sales. Analysis of this multiplier effect is beyond the scope of this report but clearly $1.4 billion is the minimum benefit from the migratory bird regulations.

**Results**

Migratory bird hunting generates considerable revenue for small businesses. In California and Michigan, migratory bird hunting would be considered a significant industry generating over $100 million in expenditures in each state. The multiplier effect in each of these regions generates significantly more economic activity. Nationwide, migratory bird hunters will spend between $481 million and $1.2 billion at thousands of small businesses in 2003. Some of this economic activity would occur without the annual promulgation of hunting regulations. Since much of the equipment and services used in migratory bird hunting can be used for other purposes, some of the annual sales would continue even if migratory bird hunting were prohibited. Much, if not all of this business activity would be redirected to alternative pursuits.

**Evaluation of Alternatives**

Each alternative outlined above results in a different level of economic stimulus generated from duck hunter spending. State expenditures for enforcement of duck hunting regulations are not affected by any of the proposed alternatives. In each case, the States would be required to field about the same enforcement effort. Only if the frameworks greatly relaxed bag limits and seasons would the States be able to reduce enforcement effort significantly. Alternatives 1 through 4 will reduce State license sales and sales taxes on hunting goods compared to the preferred Alternative 5. These revenue losses would be in addition to the lost benefits of expenditures in local economies.

Although reduced hunting now may result in more ducks to hunt next year, higher populations also increase the risk of disease outbreaks and unhealthy competition, in the absence of adequate natural predation. The opportunity cost of duck hunting, ignoring long run effects, is minimized by the most liberal frameworks, Alternative 5.

**Table 3. Estimated Expenditures by Migratory Bird Hunters at Small Businesses - Summary**
(Thousands of 2003 dollars. Asterisk (*) indicates small sample size.)

| | *Food* | | *Lodging* | | *Transportation* | | *Other Travel Items* | | *Equipment* | | *Total* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **State** | **High** | **Low** | **High** | **Low** | **High** | **Low** | **High** | **Low** | **High** | **Low** | **High** | **Low** |
| Alabama* | $4,213 | $2,835 | $0 | $0 | $2,658 | $1,922 | $9,239 | $6,345 | $4,955 | $873 | $21,545 | $11,975 |
| Alaska | $1,483 | $950 | $374 | $164 | $938 | $394 | $3,398 | $1,884 | $2,428 | $763 | $8,816 | $4,155 |
| Arizona | $3,427 | $2,133 | $0 | $0 | $4,044 | $1,483 | $597 | $439 | $3,835 | $634 | $12,175 | $4,689 |
| Arkansas | $6,931 | $5,007 | $356 | $229 | $7,360 | $6,667 | $3,497 | $2,713 | $17,059 | $2,593 | $36,005 | $17,208 |
| California | $43,061 | $27,864 | $2,294 | $638 | $27,626 | $12,035 | $37,647 | $17,197 | $82,286 | $14,100 | $197,310 | $71,834 |
| Colorado* | $2,229 | $1,408 | $331 | $90 | $3,162 | $1,100 | $417 | $92 | $8,552 | $2,191 | $15,025 | $4,880 |
| Connecticut* | $73 | $44 | $0 | $0 | $61 | $32 | $0 | $0 | $2,536 | $453 | $2,731 | $528 |
| Delaware | $1,700 | $1,076 | $1,402 | $653 | $1,079 | $768 | $500 | $217 | $1,727 | $277 | $6,554 | $2,991 |
| DC* | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| Florida* | $6,577 | $3,593 | $472 | $126 | $1,352 | $793 | $2,222 | $1,695 | $5,239 | $835 | $16,223 | $7,042 |
| Georgia | $4,224 | $2,699 | $641 | $230 | $3,479 | $1,514 | $2,251 | $2,107 | $22,245 | $3,633 | $33,589 | $10,183 |
| Hawaii* | $93 | $60 | $0 | $0 | $142 | $35 | $0 | $0 | $33 | $6 | $273 | $102 |
| Idaho* | $1,889 | $1,345 | $3 | $1 | $2,389 | $1,523 | $610 | $464 | $6,352 | $1,753 | $11,499 | $5,085 |
| Illinois* | $8,935 | $5,553 | $2,050 | $549 | $6,824 | $2,763 | $10,399 | $2,920 | $21,604 | $2,894 | $50,946 | $14,679 |
| Indiana* | $1,308 | $870 | $0 | $0 | $1,163 | $767 | $541 | $362 | $1,870 | $369 | $4,993 | $2,368 |
| Iowa* | $1,413 | $957 | $361 | $155 | $944 | $747 | $344 | $98 | $1,882 | $412 | $5,057 | $2,370 |
| Kansas* | $2,514 | $1,777 | $470 | $240 | $3,485 | $2,516 | $34 | $17 | $8,488 | $1,461 | $15,332 | $6,011 |
| Kentucky | $5,826 | $3,827 | $376 | $171 | $3,704 | $1,691 | $1,673 | $1,221 | $16,189 | $3,258 | $28,401 | $10,166 |
| Louisiana | $9,080 | $5,434 | $340 | $107 | $12,769 | $7,871 | $4,683 | $2,970 | $21,485 | $3,219 | $49,458 | $19,600 |
| Maine* | $4,958 | $3,466 | $2,738 | $1,406 | $4,874 | $4,291 | $3,420 | $684 | $499 | $138 | $16,865 | $9,986 |
| Maryland* | $2,961 | $1,851 | $1,431 | $539 | $2,773 | $2,326 | $2,880 | $2,281 | $10,900 | $2,200 | $21,423 | $9,196 |
| Massachusetts* | $522 | $310 | $0 | $0 | $1,134 | $593 | $23 | $11 | $7,859 | $1,242 | $9,755 | $2,156 |
| Michigan* | $12,188 | $8,066 | $7,852 | $3,126 | $11,798 | $7,291 | $7,628 | $3,937 | $74,624 | $11,746 | $116,690 | $34,166 |
| Minnesota | $8,331 | $5,308 | $231 | $79 | $8,248 | $4,147 | $315 | $78 | $29,592 | $5,403 | $47,782 | $15,014 |
| Mississippi | $5,410 | $3,823 | $844 | $349 | $6,077 | $4,498 | $3,614 | $363 | $28,207 | $5,558 | $45,159 | $14,591 |
| Missouri* | $4,147 | $2,739 | $1,567 | $600 | $6,518 | $2,924 | $691 | $593 | $12,483 | $1,790 | $25,984 | $8,646 |

***Table 3 continued***

| | *Food* | | *Lodging* | | *Transportation* | | *Other Travel Items* | | *Equipment* | | *Total* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **State** | **High** | **Low** | **High** | **Low** | **High** | **Low** | **High** | **Low** | **High** | **Low** | **High** | **Low** |
| Montana* | $12,747 | $9,814 | $0 | $0 | $9,739 | $6,327 | $33 | $17 | $4,930 | $1,532 | $28,073 | $17,689 |
| Nebraska | $4,975 | $3,240 | $1,305 | $657 | $5,904 | $4,569 | $570 | $203 | $14,931 | $3,810 | $28,317 | $12,479 |
| Nevada* | $1,702 | $1,080 | $609 | $19 | $1,592 | $519 | $105 | $16 | $3,437 | $428 | $7,614 | $2,062 |
| New Hampshire* | $402 | $256 | $132 | $17 | $280 | $196 | $42 | $8 | $1,501 | $352 | $2,410 | $828 |
| New Jersey* | $2,202 | $1,292 | $0 | $0 | $2,424 | $897 | $873 | $482 | $6,559 | $1,163 | $12,333 | $3,834 |
| New Mexico* | $554 | $374 | $19 | $8 | $879 | $534 | $31 | $11 | $897 | $219 | $2,435 | $1,147 |
| New York* | $1,265 | $821 | $0 | $0 | $2,983 | $1,065 | $2,849 | $1,676 | $3,591 | $799 | $10,932 | $4,361 |
| North Carolina* | $6,135 | $4,194 | $651 | $339 | $5,873 | $2,634 | $1,016 | $741 | $4,921 | $1,141 | $19,020 | $9,050 |
| North Dakota | $1,893 | $1,243 | $232 | $13 | $2,057 | $1,923 | $19 | $14 | $1,966 | $382 | $6,307 | $3,574 |
| Ohio* | $2,069 | $1,321 | $0 | $0 | $1,419 | $992 | $58 | $46 | $1,101 | $213 | $4,753 | $2,571 |
| Oklahoma* | $3,054 | $2,305 | $737 | $415 | $1,791 | $1,550 | $34 | $18 | $6,450 | $1,017 | $12,341 | $5,303 |
| Oregon* | $5,586 | $4,211 | $540 | $259 | $5,526 | $3,331 | $10,163 | $4,777 | $11,534 | $1,968 | $34,109 | $14,547 |
| Pennsylvania* | $1,891 | $1,134 | $0 | $0 | $1,153 | $611 | $103 | $63 | $309 | $56 | $3,535 | $1,864 |
| Rhode Island* | $168 | $101 | $15 | $5 | $72 | $46 | $70 | $27 | $146 | $19 | $481 | $198 |
| South Carolina | $5,173 | $3,450 | $2,064 | $975 | $5,365 | $4,489 | $4,300 | $3,483 | $23,073 | $4,813 | $40,885 | $17,210 |
| South Dakota | $2,661 | $1,866 | $140 | $81 | $5,812 | $5,269 | $154 | $69 | $4,856 | $1,214 | $13,933 | $8,498 |
| Tennessee* | $3,791 | $2,494 | $0 | $0 | $3,478 | $2,120 | $691 | $436 | $7,581 | $1,445 | $15,896 | $6,495 |
| Texas | $21,934 | $13,705 | $4,204 | $1,439 | $13,743 | $6,306 | $10,150 | $7,472 | $50,489 | $8,349 | $102,811 | $37,271 |
| Utah* | $1,335 | $821 | $0 | $0 | $1,683 | $763 | $107 | $31 | $6,202 | $1,228 | $9,540 | $2,843 |
| Vermont* | $601 | $443 | $259 | $105 | $520 | $422 | $61 | $6 | $1,720 | $743 | $3,233 | $1,718 |
| Virginia* | $1,086 | $696 | $133 | $51 | $1,268 | $784 | $873 | $667 | $4,416 | $1,037 | $7,953 | $3,235 |
| Washington* | $6,595 | $4,552 | $388 | $156 | $8,860 | $3,734 | $762 | $336 | $16,347 | $3,104 | $33,703 | $11,882 |
| West Virginia* | $79 | $56 | $0 | $0 | $143 | $111 | $0 | $0 | $63 | $16 | $291 | $184 |
| Wisconsin* | $5,073 | $3,407 | $2,029 | $885 | $4,892 | $3,541 | $1,361 | $368 | $15,847 | $2,347 | $29,867 | $10,548 |
| Wyoming* | $5,219 | $3,840 | $37 | $13 | $9,010 | $7,549 | $18 | $6 | $2,854 | $801 | $17,529 | $12,209 |
| **TOTAL** | **$241,680** | **$159,710** | **$37,624** | **$14,889** | **$221,066** | **$130,972** | **$131,064** | **$69,658** | **$588,649** | **$105,994** | **$1,247,890** | **$481,223** |

**Table 4. Estimated Migratory Bird Hunters' Expenditures on Food**
(Expenditures in thousands of 2003 dollars. Asterisk (*) indicates small sample size.)

| | | Establishments | | | | Employment | | | |
|---|---|---|---|---|---|---|---|---|---|
| *State* | *Total MB Hunter Expenditures on Food* | *Total Number of Establishments* | *Number of Small Businesses* | *Percent Small Businesses* | *Estimated MB Hunters' Expenditures at Small Businesses* | *Total Employed* | *Employed at Small Businesses* | *Percent Small Businesses of Total* | *Estimated MB Hunters' Expenditures at Small Businesses* |
| Alabama* | $4,602 | 7,840 | 7,178 | 91.6% | $4,213 | 137,914 | 84,976 | 61.6% | $2,835 |
| Alaska | $1,587 | 1,276 | 1,192 | 93.4% | $1,483 | 19,400 | 11,609 | 59.8% | $950 |
| Arizona | $3,829 | 7,636 | 6,836 | 89.5% | $3,427 | 157,707 | 87,874 | 55.7% | $2,133 |
| Arkansas | $7,395 | 5,098 | 4,778 | 93.7% | $6,931 | 76,287 | 51,647 | 67.7% | $5,007 |
| California | $46,931 | 62,395 | 57,249 | 91.8% | $43,061 | 1,030,623 | 611,905 | 59.4% | $27,864 |
| Colorado* | $2,465 | 7,568 | 6,842 | 90.4% | $2,229 | 154,860 | 88,428 | 57.1% | $1,408 |
| Connecticut* | $79 | 7,274 | 6,767 | 93.0% | $73 | 116,877 | 65,320 | 55.9% | $44 |
| Delaware | $1,859 | 1,627 | 1,488 | 91.5% | $1,700 | 28,440 | 16,468 | 57.9% | $1,076 |
| DC* | $0 | 1,759 | 1,627 | 92.5% | $0 | 29,741 | 17,205 | 57.8% | $0 |
| Florida* | $7,405 | 29,098 | 25,844 | 88.8% | $6,577 | 589,905 | 286,232 | 48.5% | $3,593 |
| Georgia | $4,650 | 14,209 | 12,907 | 90.8% | $4,224 | 276,071 | 160,257 | 58.0% | $2,699 |
| Hawaii* | $102 | 3,015 | 2,726 | 90.4% | $93 | 58,960 | 34,715 | 58.9% | $60 |
| Idaho* | $2,029 | 2,273 | 2,117 | 93.1% | $1,889 | 38,511 | 25,532 | 66.3% | $1,345 |
| Illinois* | $9,772 | 22,955 | 20,987 | 91.4% | $8,935 | 414,480 | 235,527 | 56.8% | $5,553 |
| Indiana* | $1,456 | 11,016 | 9,897 | 89.8% | $1,308 | 228,228 | 136,358 | 59.7% | $870 |
| Iowa* | $1,529 | 6,281 | 5,803 | 92.4% | $1,413 | 114,097 | 71,430 | 62.6% | $957 |
| Kansas* | $2,693 | 5,483 | 5,117 | 93.3% | $2,514 | 98,546 | 65,000 | 66.0% | $1,777 |
| Kentucky | $6,401 | 7,515 | 6,841 | 91.0% | $5,826 | 141,432 | 84,559 | 59.8% | $3,827 |
| Louisiana | $10,022 | 8,336 | 7,552 | 90.6% | $9,080 | 151,563 | 82,175 | 54.2% | $5,434 |
| Maine* | $5,192 | 3,566 | 3,405 | 95.5% | $4,958 | 45,596 | 30,438 | 66.8% | $3,466 |

***Table 4 continued***

| State | Total MB Hunter Expenditures on Food | Establishments | | | | Employment | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Total Number of Establishments | Number of Small Businesses | Percent Small Businesses | Estimated MB Hunters' Expenditures at Small Businesses | Total Employed | Employed at Small Businesses | Percent Small Businesses of Total | Estimated MB Hunters' Expenditures at Small Businesses |
| Maryland* | $3,255 | 9,719 | 8,841 | 91.0% | $2,961 | 173,256 | 98,538 | 56.9% | $1,851 |
| Massachusetts* | $564 | 14,127 | 13,083 | 92.6% | $522 | 239,233 | 131,466 | 55.0% | $310 |
| Michigan* | $13,387 | 19,493 | 17,747 | 91.0% | $12,188 | 343,001 | 206,660 | 60.3% | $8,066 |
| Minnesota | $9,226 | 8,926 | 8,060 | 90.3% | $8,331 | 178,224 | 102,540 | 57.5% | $5,308 |
| Mississippi | $5,788 | 5,097 | 4,764 | 93.5% | $5,410 | 76,521 | 50,541 | 66.0% | $3,823 |
| Missouri* | $4,537 | 10,622 | 9,707 | 91.4% | $4,147 | 198,958 | 120,110 | 60.4% | $2,739 |
| Montana* | $13,402 | 2,230 | 2,121 | 95.1% | $12,747 | 32,196 | 23,576 | 73.2% | $9,814 |
| Nebraska | $5,399 | 3,692 | 3,402 | 92.1% | $4,975 | 67,989 | 40,802 | 60.0% | $3,240 |
| Nevada* | $1,856 | 2,657 | 2,436 | 91.7% | $1,702 | 47,776 | 27,797 | 58.2% | $1,080 |
| New Hampshire* | $428 | 3,090 | 2,903 | 93.9% | $402 | 47,076 | 28,140 | 59.8% | $256 |
| New Jersey* | $2,350 | 17,565 | 16,458 | 93.7% | $2,202 | 241,815 | 132,939 | 55.0% | $1,292 |
| New Mexico* | $605 | 3,301 | 3,023 | 91.6% | $554 | 60,581 | 37,433 | 61.8% | $374 |
| New York* | $1,325 | 43,335 | 41,371 | 95.5% | $1,265 | 527,413 | 326,666 | 61.9% | $821 |
| North Carolina* | $6,753 | 15,007 | 13,635 | 90.9% | $6,135 | 267,161 | 165,929 | 62.1% | $4,194 |
| North Dakota | $2,061 | 1,434 | 1,317 | 91.8% | $1,893 | 24,477 | 14,758 | 60.3% | $1,243 |
| Ohio* | $2,283 | 22,633 | 20,510 | 90.6% | $2,069 | 427,736 | 247,432 | 57.8% | $1,321 |
| Oklahoma* | $3,238 | 7,385 | 6,965 | 94.3% | $3,054 | 111,820 | 79,588 | 71.2% | $2,305 |
| Oregon* | $5,950 | 7,460 | 7,003 | 93.9% | $5,586 | 117,516 | 83,171 | 70.8% | $4,211 |
| Pennsylvania* | $2,065 | 24,434 | 22,384 | 91.6% | $1,891 | 419,030 | 230,125 | 54.9% | $1,134 |
| Rhode Island* | $179 | 2,498 | 2,345 | 93.9% | $168 | 35,438 | 20,062 | 56.6% | $101 |
| South Carolina | $5,707 | 7,580 | 6,870 | 90.6% | $5,173 | 138,376 | 83,646 | 60.4% | $3,450 |

***Table 4 continued***

| *State* | *Total MB Hunter Expenditures on Food* | **Establishments** | | | | **Employment** | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | *Total Number of Establishments* | *Number of Small Businesses* | *Percent Small Businesses* | *Estimated MB Hunters' Expenditures at Small Businesses* | *Total Employed* | *Employed at Small Businesses* | *Percent Small Businesses of Total* | *Estimated MB Hunters' Expenditures at Small Businesses* |
| South Dakota | $2,834 | 1,748 | 1,641 | 93.9% | $2,661 | 28,452 | 18,738 | 65.9% | $1,866 |
| Tennessee* | $4,146 | 10,516 | 9,617 | 91.5% | $3,791 | 191,537 | 115,244 | 60.2% | $2,494 |
| Texas | $23,965 | 35,784 | 32,751 | 91.5% | $21,934 | 658,784 | 376,731 | 57.2% | $13,705 |
| Utah* | $1,492 | 3,239 | 2,899 | 89.5% | $1,335 | 69,331 | 38,148 | 55.0% | $821 |
| Vermont* | $632 | 1,874 | 1,781 | 95.0% | $601 | 25,290 | 17,703 | 70.0% | $443 |
| Virginia* | $1,195 | 13,857 | 12,594 | 90.9% | $1,086 | 244,137 | 142,210 | 58.3% | $696 |
| Washington* | $7,135 | 11,818 | 10,924 | 92.4% | $6,595 | 200,260 | 127,772 | 63.8% | $4,552 |
| West Virginia* | $84 | 3,691 | 3,442 | 93.3% | $79 | 54,983 | 36,606 | 66.6% | $56 |
| Wisconsin* | $5,605 | 9,926 | 8,983 | 90.5% | $5,073 | 197,159 | 119,831 | 60.8% | $3,407 |
| Wyoming* | $5,578 | 1,104 | 1,033 | 93.6% | $5,219 | 19,043 | 13,109 | 68.8% | $3,840 |
| **TOTAL** | **$263,023** | **542,062** | **497,763** | | **$241,680** | **9,373,807** | **5,505,666** | | **$159,710** |

**Table 5. Estimated Migratory Bird Hunters' Expenditures on Lodging**
(Expenditures in thousands of 2003 dollars. Asterisk (*) indicates small sample size.)

| | | Establishments | | | | Employment | | | |
|---|---|---|---|---|---|---|---|---|---|
| *State* | *Total MB Hunter Expenditures on Lodging* | *Total Number of Establishments* | *Number of Small Businesses* | *Percent Small Businesses* | *Estimated MB Hunters' Expenditures at Small Businesses* | *Total Employed* | *Employed at Small Businesses* | *Percent Small Businesses of Total* | *Estimated MB Hunters' Expenditures at Small Businesses* |
| Alabama* | $0 | 636 | 570 | 89.6% | $0 | 12,907 | 6,149 | 47.6% | $0 |
| Alaska | $401 | 342 | 319 | 93.3% | $374 | 4,888 | 2,007 | 41.1% | $164 |
| Arizona | $0 | 988 | 847 | 85.7% | $0 | 35,658 | 8,739 | 24.5% | $0 |
| Arkansas | $378 | 613 | 578 | 94.3% | $356 | 8,780 | 5,318 | 60.6% | $229 |
| California | $2,579 | 6,018 | 5,353 | 88.9% | $2,294 | 177,862 | 44,008 | 24.7% | $638 |
| Colorado* | $374 | 1,287 | 1,139 | 88.5% | $331 | 35,251 | 8,487 | 24.1% | $90 |
| Connecticut* | $0 | 379 | 319 | 84.2% | $0 | 10,910 | 3,324 | 30.5% | $0 |
| Delaware | $1,501 | 136 | 127 | 93.4% | $1,402 | 2,516 | 1,094 | 43.5% | $653 |
| DC* | $0 | 114 | 57 | 50.0% | $0 | 14,577 | 1,010 | 6.9% | $0 |
| Florida* | $558 | 3,697 | 3,125 | 84.5% | $472 | 135,814 | 30,556 | 22.5% | $126 |
| Georgia | $740 | 1,254 | 1,085 | 86.5% | $641 | 38,372 | 11,903 | 31.0% | $230 |
| Hawaii* | $0 | 279 | 173 | 62.0% | $0 | 37,558 | 2,360 | 6.3% | $0 |
| Idaho* | $3 | 373 | 343 | 92.0% | $3 | 8,029 | 2,448 | 30.5% | $1 |
| Illinois* | $2,365 | 1,382 | 1,198 | 86.7% | $2,050 | 49,610 | 11,521 | 23.2% | $549 |
| Indiana* | $0 | 882 | 786 | 89.1% | $0 | 19,173 | 6,830 | 35.6% | $0 |
| Iowa* | $403 | 692 | 621 | 89.7% | $361 | 13,308 | 5,133 | 38.6% | $155 |
| Kansas* | $501 | 587 | 551 | 93.9% | $470 | 9,674 | 4,632 | 47.9% | $240 |
| Kentucky | $407 | 586 | 541 | 92.3% | $376 | 13,441 | 5,634 | 41.9% | $171 |
| Louisiana | $396 | 578 | 496 | 85.8% | $340 | 20,541 | 5,554 | 27.0% | $107 |

***Table 5 continued***

| State | Total MB Hunter Expenditures on Lodging | Establishments | | | | Employment | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Total Number of Establishments | Number of Small Businesses | Percent Small Businesses | Estimated MB Hunters' Expenditures at Small Businesses | Total Employed | Employed at Small Businesses | Percent Small Businesses of Total | Estimated MB Hunters' Expenditures at Small Businesses |
| Maine* | $2,834 | 942 | 910 | 96.6% | $2,738 | 7,918 | 3,929 | 49.6% | $1,406 |
| Maryland* | $1,677 | 600 | 512 | 85.3% | $1,431 | 17,128 | 5,501 | 32.1% | $539 |
| Massachusetts* | $0 | 1,083 | 955 | 88.2% | $0 | 29,469 | 6,458 | 21.9% | $0 |
| Michigan* | $8,579 | 1,688 | 1,545 | 91.5% | $7,852 | 32,279 | 11,764 | 36.4% | $3,126 |
| Minnesota | $255 | 1,248 | 1,128 | 90.4% | $231 | 23,245 | 7,203 | 31.0% | $79 |
| Mississippi | $934 | 449 | 406 | 90.4% | $844 | 7,813 | 2,919 | 37.4% | $349 |
| Missouri* | $1,701 | 1,254 | 1,155 | 92.1% | $1,567 | 25,101 | 8,860 | 35.3% | $600 |
| Montana* | $0 | 623 | 591 | 94.9% | $0 | 7,510 | 3,928 | 52.3% | $0 |
| Nebraska | $1,416 | 418 | 385 | 92.1% | $1,305 | 6,586 | 3,054 | 46.4% | $657 |
| Nevada* | $838 | 603 | 438 | 72.6% | $609 | 160,476 | 3,600 | 2.2% | $19 |
| New Hampshire* | $140 | 561 | 530 | 94.5% | $132 | 6,613 | 817 | 12.4% | $17 |
| New Jersey* | $0 | 1,335 | 1,179 | 88.3% | $0 | 70,105 | 7,235 | 10.3% | $0 |
| New Mexico* | $21 | 664 | 602 | 90.7% | $19 | 12,865 | 4,982 | 38.7% | $8 |
| New York* | $0 | 2,578 | 2,317 | 89.9% | $0 | 72,673 | 16,187 | 22.3% | $0 |
| North Carolina* | $705 | 1,551 | 1,431 | 92.3% | $651 | 28,810 | 13,852 | 48.1% | $339 |
| North Dakota | $250 | 299 | 278 | 93.0% | $232 | 4,537 | 228 | 5.0% | $13 |
| Ohio* | $0 | 1,403 | 1,235 | 88.0% | $0 | 33,748 | 11,503 | 34.1% | $0 |
| Oklahoma* | $789 | 583 | 545 | 93.5% | $737 | 9,707 | 5,103 | 52.6% | $415 |
| Oregon* | $576 | 999 | 936 | 93.7% | $540 | 16,232 | 7,289 | 44.9% | $259 |
| Pennsylvania* | $0 | 1,773 | 1,541 | 86.9% | $0 | 46,969 | 11,337 | 24.1% | $0 |

***Table 5 continued***

| State | Total MB Hunter Expenditures on Lodging | Establishments | | | | Employment | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | *Total Number of Establishments* | *Number of Small Businesses* | *Percent Small Businesses* | *Estimated MB Hunters' Expenditures at Small Businesses* | *Total Employed* | *Employed at Small Businesses* | *Percent Small Businesses of Total* | *Estimated MB Hunters' Expenditures at Small Businesses* |
| Rhode Island* | $16 | 162 | 150 | 92.6% | $15 | 2,744 | 945 | 34.4% | $5 |
| South Carolina | $2,283 | 979 | 885 | 90.4% | $2,064 | 21,557 | 9,204 | 42.7% | $975 |
| South Dakota | $147 | 478 | 455 | 95.2% | $140 | 5,886 | 3,216 | 54.6% | $81 |
| Tennessee* | $0 | 1,156 | 1,053 | 91.1% | $0 | 25,906 | 4,885 | 18.9% | $0 |
| Texas | $4,704 | 2,803 | 2,505 | 89.4% | $4,204 | 79,103 | 24,207 | 30.6% | $1,439 |
| Utah* | $0 | 480 | 430 | 89.6% | $0 | 13,040 | 3,954 | 30.3% | $0 |
| Vermont* | $273 | 507 | 480 | 94.7% | $259 | 9,047 | 3,463 | 38.3% | $105 |
| Virginia* | $152 | 1,334 | 1,169 | 87.6% | $133 | 38,393 | 12,930 | 33.7% | $51 |
| Washington* | $421 | 1,279 | 1,179 | 92.2% | $388 | 26,337 | 9,774 | 37.1% | $156 |
| West Virginia* | $0 | 328 | 294 | 89.6% | $0 | 8,034 | 1,466 | 18.2% | $0 |
| Wisconsin* | $2,202 | 1,388 | 1,279 | 92.1% | $2,029 | 22,574 | 9,074 | 40.2% | $885 |
| Wyoming* | $39 | 503 | 474 | 94.2% | $37 | 5,852 | 1,942 | 33.2% | $13 |
| **TOTAL** | **$41,558** | **52,874** | **47,200** | | **$37,624** | **1,527,126** | **387,516** | | **$14,889** |

**Table 6. Estimated Migratory Bird Hunters' Expenditures on Transportation**
(Expenditures in thousands of 2003 dollars. Asterisk (*) indicates small sample size.)

| | | Establishments | | | | Employment | | | |
|---|---|---|---|---|---|---|---|---|---|
| *State* | *Total MB Hunter Expenditures on Transportation* | *Total Number of Establishments* | *Number of Small Businesses* | *Percent Small Businesses* | *Estimated MB Hunters' Expenditures at Small Businesses* | *Total Employed* | *Employed at Small Businesses* | *Percent Small Businesses of Total* | *Estimated MB Hunters' Expenditures at Small Businesses* |
| Alabama* | $2,697 | 2,293 | 2,260 | 98.6% | $2,658 | 16,017 | 11,415 | 71.3% | $1,922 |
| Alaska | $980 | 469 | 449 | 95.7% | $938 | 8,186 | 3,290 | 40.2% | $394 |
| Arizona | $4,207 | 1,448 | 1,392 | 96.1% | $4,044 | 32,423 | 11,433 | 35.3% | $1,483 |
| Arkansas | $7,427 | 1,440 | 1,427 | 99.1% | $7,360 | 11,168 | 10,026 | 89.8% | $6,667 |
| California | $28,815 | 10,320 | 9,894 | 95.9% | $27,626 | 179,552 | 74,990 | 41.8% | $12,035 |
| Colorado* | $3,269 | 1,727 | 1,670 | 96.7% | $3,162 | 32,343 | 10,879 | 33.6% | $1,100 |
| Connecticut* | $64 | 1,836 | 1,745 | 95.0% | $61 | 23,827 | 11,777 | 49.4% | $32 |
| Delaware | $1,107 | 441 | 430 | 97.5% | $1,079 | 3,719 | 2,580 | 69.4% | $768 |
| DC* | $0 | 236 | 227 | 96.2% | $0 | 2,924 | 1,115 | 38.1% | $0 |
| Florida* | $1,388 | 6,565 | 6,395 | 97.4% | $1,352 | 70,506 | 40,280 | 57.1% | $793 |
| Georgia | $3,542 | 3,637 | 3,573 | 98.2% | $3,479 | 49,413 | 21,120 | 42.7% | $1,514 |
| Hawaii* | $155 | 505 | 461 | 91.3% | $142 | 18,325 | 4,186 | 22.8% | $35 |
| Idaho* | $2,438 | 640 | 627 | 98.0% | $2,389 | 6,160 | 3,847 | 62.5% | $1,523 |
| Illinois* | $7,100 | 5,233 | 5,029 | 96.1% | $6,824 | 91,030 | 35,429 | 38.9% | $2,763 |
| Indiana* | $1,194 | 3,003 | 2,925 | 97.4% | $1,163 | 33,411 | 21,475 | 64.3% | $767 |
| Iowa* | $954 | 1,942 | 1,922 | 99.0% | $944 | 15,502 | 12,141 | 78.3% | $747 |
| Kansas* | $3,528 | 1,634 | 1,614 | 98.8% | $3,485 | 12,789 | 9,121 | 71.3% | $2,516 |
| Kentucky | $3,763 | 2,150 | 2,116 | 98.4% | $3,704 | 31,989 | 14,371 | 44.9% | $1,691 |
| Louisiana | $13,040 | 2,120 | 2,076 | 97.9% | $12,769 | 19,480 | 11,758 | 60.4% | $7,871 |

***Table 6 continued***

| State | Total MB Hunter Expenditures on Transportation | Establishments | | | | Employment | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Total Number of Establishments | Number of Small Businesses | Percent Small Businesses | Estimated MB Hunters' Expenditures at Small Businesses | Total Employed | Employed at Small Businesses | Percent Small Businesses of Total | Estimated MB Hunters' Expenditures at Small Businesses |
| Maine* | $4,949 | 795 | 783 | 98.5% | $4,874 | 6,515 | 5,649 | 86.7% | $4,291 |
| Maryland* | $2,840 | 2,392 | 2,336 | 97.7% | $2,773 | 18,695 | 15,310 | 81.9% | $2,326 |
| Massachusetts* | $1,176 | 3,329 | 3,210 | 96.4% | $1,134 | 41,187 | 20,770 | 50.4% | $593 |
| Michigan* | $12,029 | 4,312 | 4,229 | 98.1% | $11,798 | 45,965 | 27,860 | 60.6% | $7,291 |
| Minnesota | $8,471 | 2,858 | 2,783 | 97.4% | $8,248 | 51,203 | 25,066 | 49.0% | $4,147 |
| Mississippi | $6,123 | 1,334 | 1,324 | 99.3% | $6,077 | 8,435 | 6,197 | 73.5% | $4,498 |
| Missouri* | $6,727 | 3,261 | 3,160 | 96.9% | $6,518 | 44,849 | 19,492 | 43.5% | $2,924 |
| Montana* | $9,941 | 638 | 625 | 98.0% | $9,739 | 5,806 | 3,695 | 63.6% | $6,327 |
| Nebraska | $5,999 | 1,080 | 1,063 | 98.4% | $5,904 | 9,031 | 6,879 | 76.2% | $4,569 |
| Nevada* | $1,776 | 511 | 458 | 89.6% | $1,592 | 12,913 | 3,773 | 29.2% | $519 |
| New Hampshire* | $288 | 674 | 656 | 97.3% | $280 | 6,432 | 4,370 | 67.9% | $196 |
| New Jersey* | $2,526 | 4,492 | 4,311 | 96.0% | $2,424 | 66,100 | 23,485 | 35.5% | $897 |
| New Mexico* | $910 | 880 | 850 | 96.6% | $879 | 8,749 | 5,137 | 58.7% | $534 |
| New York* | $3,122 | 8,654 | 8,268 | 95.5% | $2,983 | 123,626 | 42,173 | 34.1% | $1,065 |
| North Carolina* | $5,955 | 3,796 | 3,744 | 98.6% | $5,873 | 40,825 | 18,059 | 44.2% | $2,634 |
| North Dakota | $2,081 | 503 | 497 | 98.8% | $2,057 | 3,126 | 2,888 | 92.4% | $1,923 |
| Ohio* | $1,456 | 5,134 | 5,005 | 97.5% | $1,419 | 50,585 | 34,454 | 68.1% | $992 |
| Oklahoma* | $1,817 | 1,671 | 1,647 | 98.6% | $1,791 | 10,298 | 8,782 | 85.3% | $1,550 |
| Oregon* | $5,768 | 1,286 | 1,232 | 95.8% | $5,526 | 18,114 | 10,461 | 57.8% | $3,331 |
| Pennsylvania* | $1,196 | 6,139 | 5,917 | 96.4% | $1,153 | 83,135 | 42,480 | 51.1% | $611 |
| Rhode Island* | $74 | 541 | 526 | 97.2% | $72 | 5,065 | 3,106 | 61.3% | $46 |

***Table 6 continued***

| State | Total MB Hunter Expenditures on Transportation | Establishments | | | | Employment | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Total Number of Establishments | Number of Small Businesses | Percent Small Businesses | Estimated MB Hunters' Expenditures at Small Businesses | Total Employed | Employed at Small Businesses | Percent Small Businesses of Total | Estimated MB Hunters' Expenditures at Small Businesses |
| South Carolina | $5,410 | 1,885 | 1,869 | 99.2% | $5,365 | 13,187 | 10,942 | 83.0% | $4,489 |
| South Dakota | $5,876 | 638 | 631 | 98.9% | $5,812 | 4,710 | 4,223 | 89.7% | $5,269 |
| Tennessee* | $3,552 | 2,786 | 2,728 | 97.9% | $3,478 | 29,304 | 17,488 | 59.7% | $2,120 |
| Texas | $14,027 | 8,247 | 8,080 | 98.0% | $13,743 | 105,301 | 47,336 | 45.0% | $6,306 |
| Utah* | $1,721 | 899 | 879 | 97.8% | $1,683 | 14,476 | 6,417 | 44.3% | $763 |
| Vermont* | $528 | 417 | 411 | 98.6% | $520 | 3,542 | 2,831 | 79.9% | $422 |
| Virginia* | $1,295 | 3,034 | 2,970 | 97.9% | $1,268 | 35,684 | 21,616 | 60.6% | $784 |
| Washington* | $9,131 | 1,787 | 1,734 | 97.0% | $8,860 | 29,979 | 12,258 | 40.9% | $3,734 |
| West Virginia* | $144 | 1,037 | 1,028 | 99.1% | $143 | 7,427 | 5,745 | 77.4% | $111 |
| Wisconsin* | $5,052 | 3,168 | 3,068 | 96.8% | $4,892 | 36,832 | 25,816 | 70.1% | $3,541 |
| Wyoming* | $9,069 | 458 | 455 | 99.3% | $9,010 | 3,127 | 2,603 | 83.2% | $7,549 |
| **TOTAL** | **$226,698** | **126,275** | **122,709** | | **$221,066** | **1,602,987** | **798,594** | | **$130,972** |

**Table 7. Estimated Migratory Bird Hunters' Expenditures on Other Travel**
(Expenditures in thousands of 2003 dollars. Asterisk (*) indicates small sample size.)

| | | Establishments | | | | Employment | | | |
|---|---|---|---|---|---|---|---|---|---|
| *State* | *Total MB Hunter Expenditures on Other Travel* | *Total Number of Establishments* | *Number of Small Businesses* | *Percent Small Businesses* | *Estimated MB Hunters' Expenditures at Small Businesses* | *Total Employed* | *Employed at Small Businesses* | *Percent Small Businesses of Total* | *Estimated MB Hunters' Expenditures at Small Businesses* |
| Alabama* | $9,380 | 384 | 378 | 98.5% | $9,239 | 6,359 | 4,302 | 67.7% | $6,345 |
| Alaska | $3,463 | 192 | 188 | 98.1% | $3,398 | 2,277 | 1,239 | 54.4% | $1,884 |
| Arizona | $620 | 500 | 482 | 96.4% | $597 | 5,916 | 4,187 | 70.8% | $439 |
| Arkansas | $3,551 | 273 | 269 | 98.5% | $3,497 | 2,590 | 1,979 | 76.4% | $2,713 |
| California | $39,353 | 4,027 | 3,852 | 95.7% | $37,647 | 60,384 | 26,387 | 43.7% | $17,197 |
| Colorado* | $450 | 437 | 405 | 92.8% | $417 | 5,015 | 1,028 | 20.5% | $92 |
| Connecticut* | $0 | 304 | 0 | 0.0% | $0 | 3,200 | 0 | 0.0% | $0 |
| Delaware | $511 | 88 | 86 | 97.8% | $500 | 1,137 | 483 | 42.5% | $217 |
| DC* | $0 | 0 | 0 | 0.0% | $0 | 0 | 0 | 0.0% | $0 |
| Florida* | $2,520 | 3,107 | 2,739 | 88.2% | $2,222 | 42,576 | 28,644 | 67.3% | $1,695 |
| Georgia | $2,290 | 964 | 948 | 98.3% | $2,251 | 12,208 | 11,236 | 92.0% | $2,107 |
| Hawaii* | $0 | 139 | 0 | 0.0% | $0 | 2,521 | 0 | 0.0% | $0 |
| Idaho* | $630 | 137 | 133 | 96.8% | $610 | 838 | 617 | 73.6% | $464 |
| Illinois* | $11,007 | 1,503 | 1,420 | 94.5% | $10,399 | 21,941 | 5,820 | 26.5% | $2,920 |
| Indiana* | $559 | 501 | 485 | 96.8% | $541 | 5,608 | 3,633 | 64.8% | $362 |
| Iowa* | $359 | 232 | 223 | 95.9% | $344 | 1,908 | 520 | 27.3% | $98 |
| Kansas* | $34 | 231 | 231 | 100.0% | $34 | 3,062 | 1,531 | 50.0% | $17 |
| Kentucky | $1,704 | 300 | 294 | 98.2% | $1,673 | 4,097 | 2,934 | 71.6% | $1,221 |
| Louisiana | $4,875 | 806 | 774 | 96.1% | $4,683 | 14,437 | 8,796 | 60.9% | $2,970 |
| Maine* | $3,591 | 139 | 132 | 95.2% | $3,420 | 940 | 179 | 19.0% | $684 |
| Maryland* | $2,962 | 522 | 508 | 97.2% | $2,880 | 8,158 | 6,280 | 77.0% | $2,281 |
| Massachusetts* | $27 | 546 | 455 | 83.3% | $23 | 5,321 | 2,217 | 41.7% | $11 |

***Table 7 continued***

| State | Total MB Hunter Expenditures on Other Travel | Establishments | | | | Employment | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Total Number of Establishments | Number of Small Businesses | Percent Small Businesses | Estimated MB Hunters' Expenditures at Small Businesses | Total Employed | Employed at Small Businesses | Percent Small Businesses of Total | Estimated MB Hunters' Expenditures at Small Businesses |
| Michigan* | $7,992 | 798 | 762 | 95.4% | $7,628 | 9,452 | 4,655 | 49.3% | $3,937 |
| Minnesota | $329 | 498 | 478 | 95.9% | $315 | 4,658 | 1,101 | 23.6% | $78 |
| Mississippi | $3,843 | 204 | 192 | 94.0% | $3,614 | 3,516 | 332 | 9.5% | $363 |
| Missouri* | $708 | 575 | 561 | 97.6% | $691 | 5,329 | 4,465 | 83.8% | $593 |
| Montana* | $34 | 106 | 102 | 96.7% | $33 | 764 | 382 | 50.0% | $17 |
| Nebraska | $595 | 142 | 136 | 95.8% | $570 | 1,936 | 659 | 34.0% | $203 |
| Nevada* | $129 | 185 | 150 | 80.9% | $105 | 2,034 | 248 | 12.2% | $16 |
| New Hampshire* | $44 | 84 | 80 | 94.9% | $42 | 507 | 91 | 17.9% | $8 |
| New Jersey* | $738 | 1,275 | 1,508 | 118.3% | $873 | 19,395 | 12,654 | 65.2% | $482 |
| New Mexico* | $33 | 153 | 146 | 95.4% | $31 | 2,674 | 927 | 34.7% | $11 |
| New York* | $2,917 | 1,531 | 1,495 | 97.6% | $2,849 | 11,845 | 6,803 | 57.4% | $1,676 |
| North Carolina* | $1,031 | 704 | 694 | 98.6% | $1,016 | 4,295 | 3,090 | 71.9% | $741 |
| North Dakota | $19 | 137 | 133 | 97.1% | $19 | 1,107 | 804 | 72.6% | $14 |
| Ohio* | $59 | 878 | 869 | 99.0% | $58 | 5,354 | 4,212 | 78.7% | $46 |
| Oklahoma* | $35 | 243 | 236 | 97.1% | $34 | 2,092 | 1,080 | 51.6% | $18 |
| Oregon* | $10,386 | 326 | 319 | 97.9% | $10,163 | 3,800 | 1,748 | 46.0% | $4,777 |
| Pennsylvania* | $105 | 960 | 947 | 98.6% | $103 | 7,309 | 4,390 | 60.1% | $63 |
| Rhode Island* | $71 | 103 | 101 | 98.1% | $70 | 569 | 215 | 37.8% | $27 |
| South Carolina | $4,344 | 397 | 393 | 99.0% | $4,300 | 2,426 | 1,945 | 80.2% | $3,483 |
| South Dakota | $167 | 146 | 135 | 92.5% | $154 | 2,231 | 923 | 41.4% | $69 |
| Tennessee* | $705 | 400 | 392 | 98.0% | $691 | 3,068 | 1,898 | 61.9% | $436 |
| Texas | $10,311 | 1,411 | 1,389 | 98.4% | $10,150 | 11,429 | 8,282 | 72.5% | $7,472 |
| Utah* | $113 | 202 | 193 | 95.5% | $107 | 3,707 | 1,005 | 27.1% | $31 |
| Vermont* | $65 | 111 | 104 | 93.7% | $61 | 3,068 | 297 | 9.7% | $6 |

***Table 7 continued***

| | | Establishments | | | | Employment | | | |
|---|---|---|---|---|---|---|---|---|---|
| *State* | *Total MB Hunter Expenditures on Other Travel* | *Total Number of Establishments* | *Number of Small Businesses* | *Percent Small Businesses* | *Estimated MB Hunters' Expenditures at Small Businesses* | *Total Employed* | *Employed at Small Businesses* | *Percent Small Businesses of Total* | *Estimated MB Hunters' Expenditures at Small Businesses* |
| Virginia* | $887 | 528 | 520 | 98.5% | $873 | 3,233 | 2,431 | 75.2% | $667 |
| Washington* | $806 | 665 | 629 | 94.6% | $762 | 9,736 | 4,055 | 41.6% | $336 |
| West Virginia* | $0 | 127 | 126 | 99.2% | $0 | 568 | 420 | 73.9% | $0 |
| Wisconsin* | $1,412 | 473 | 456 | 96.4% | $1,361 | 4,997 | 1,303 | 26.1% | $368 |
| Wyoming* | $18 | 164 | 162 | 98.8% | $18 | 1,221 | 420 | 34.4% | $6 |
| **TOTAL** | **$135,778** | **28,858** | **27,410** | | **$131,064** | **342,813** | **182,848** | | **$69,658** |

**Table 8. Estimated Migratory Bird Hunters' Expenditures on Equipment**
(Expenditures in thousands of 2003 dollars. Asterisk (*) indicates small sample size.)

| | | Establishments | | | | Employment | | | |
|---|---|---|---|---|---|---|---|---|---|
| *State* | *Total MB Hunter Expenditures on Equipment* | *Total Number of Establishments* | *Number of Small Businesses* | *Percent Small Businesses* | *Estimated MB Hunters' Expenditures at Small Businesses* | *Total Employed* | *Employed at Small Businesses* | *Percent Small Businesses of Total* | *Estimated MB Hunters' Expenditures at Small Businesses* |
| Alabama* | $6,065 | 1,131 | 924 | 81.7% | $4,955 | 37,871 | 5,448 | 14.4% | $873 |
| Alaska | $2,598 | 229 | 214 | 93.4% | $2,428 | 3,927 | 1,153 | 29.4% | $763 |
| Arizona | $4,940 | 800 | 621 | 77.6% | $3,835 | 33,058 | 4,243 | 12.8% | $634 |
| Arkansas | $21,502 | 634 | 503 | 79.3% | $17,059 | 25,063 | 3,022 | 12.1% | $2,593 |
| California | $105,070 | 5,271 | 4,128 | 78.3% | $82,286 | 243,058 | 32,618 | 13.4% | $14,100 |
| Colorado* | $10,440 | 1,062 | 870 | 81.9% | $8,552 | 36,050 | 7,565 | 21.0% | $2,191 |
| Connecticut* | $3,221 | 705 | 555 | 78.7% | $2,536 | 25,654 | 3,604 | 14.0% | $453 |
| Delaware | $2,189 | 218 | 172 | 78.9% | $1,727 | 8,731 | 1,106 | 12.7% | $277 |
| DC* | $0 | 52 | 47 | 90.4% | $0 | 1,977 | 280 | 14.2% | $0 |
| Florida* | $6,701 | 3,313 | 2,590 | 78.2% | $5,239 | 126,279 | 15,737 | 12.5% | $835 |
| Georgia | $28,377 | 1,606 | 1,259 | 78.4% | $22,245 | 62,961 | 8,061 | 12.8% | $3,633 |
| Hawaii* | $38 | 301 | 257 | 85.4% | $33 | 9,428 | 1,585 | 16.8% | $6 |
| Idaho* | $7,470 | 394 | 335 | 85.0% | $6,352 | 9,551 | 2,241 | 23.5% | $1,753 |
| Illinois* | $28,658 | 2,405 | 1,813 | 75.4% | $21,604 | 108,122 | 10,917 | 10.1% | $2,894 |
| Indiana* | $2,410 | 1,450 | 1,125 | 77.6% | $1,870 | 56,131 | 8,596 | 15.3% | $369 |
| Iowa* | $2,418 | 794 | 618 | 77.8% | $1,882 | 27,995 | 4,775 | 17.1% | $412 |
| Kansas* | $10,893 | 625 | 487 | 77.9% | $8,488 | 24,986 | 3,352 | 13.4% | $1,461 |
| Kentucky | $20,075 | 1,028 | 829 | 80.6% | $16,189 | 34,534 | 5,604 | 16.2% | $3,258 |
| Louisiana | $27,863 | 948 | 731 | 77.1% | $21,485 | 39,337 | 4,544 | 11.6% | $3,219 |
| Maine* | $578 | 580 | 500 | 86.2% | $499 | 11,057 | 2,641 | 23.9% | $138 |

***Table 8 continued***

| State | Total MB Hunter Expenditures on Equipment | Establishments | | | | Employment | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Total Number of Establishments | Number of Small Businesses | Percent Small Businesses | Estimated MB Hunters' Expenditures at Small Businesses | Total Employed | Employed at Small Businesses | Percent Small Businesses of Total | Estimated MB Hunters' Expenditures at Small Businesses |
| Maryland* | $13,432 | 1,114 | 904 | 81.1% | $10,900 | 40,320 | 6,603 | 16.4% | $2,200 |
| Massachusetts* | $9,976 | 1,296 | 1,021 | 78.8% | $7,859 | 46,857 | 5,834 | 12.5% | $1,242 |
| Michigan* | $94,104 | 2,140 | 1,697 | 79.3% | $74,624 | 108,912 | 13,594 | 12.5% | $11,746 |
| Minnesota | $37,194 | 1,189 | 946 | 79.6% | $29,592 | 48,988 | 7,116 | 14.5% | $5,403 |
| Mississippi | $33,624 | 807 | 677 | 83.9% | $28,207 | 23,674 | 3,913 | 16.5% | $5,558 |
| Missouri* | $16,104 | 1,294 | 1,003 | 77.5% | $12,483 | 54,303 | 6,037 | 11.1% | $1,790 |
| Montana* | $5,768 | 337 | 288 | 85.5% | $4,930 | 7,764 | 2,062 | 26.6% | $1,532 |
| Nebraska | $17,896 | 507 | 423 | 83.4% | $14,931 | 16,690 | 3,553 | 21.3% | $3,810 |
| Nevada* | $4,548 | 262 | 198 | 75.6% | $3,437 | 12,298 | 1,158 | 9.4% | $428 |
| New Hampshire* | $1,832 | 488 | 400 | 82.0% | $1,501 | 13,307 | 2,556 | 19.2% | $352 |
| New Jersey* | $8,055 | 1,529 | 1,245 | 81.4% | $6,559 | 59,523 | 8,597 | 14.4% | $1,163 |
| New Mexico* | $1,119 | 362 | 290 | 80.1% | $897 | 13,397 | 2,616 | 19.5% | $219 |
| New York* | $4,249 | 3,712 | 3,137 | 84.5% | $3,591 | 123,064 | 23,145 | 18.8% | $799 |
| North Carolina* | $6,167 | 2,010 | 1,604 | 79.8% | $4,921 | 62,645 | 11,589 | 18.5% | $1,141 |
| North Dakota | $2,579 | 202 | 154 | 76.2% | $1,966 | 7,763 | 1,149 | 14.8% | $382 |
| Ohio* | $1,409 | 2,426 | 1,897 | 78.2% | $1,101 | 106,467 | 16,110 | 15.1% | $213 |
| Oklahoma* | $8,509 | 719 | 545 | 75.8% | $6,450 | 28,826 | 3,444 | 11.9% | $1,017 |
| Oregon* | $14,776 | 775 | 605 | 78.1% | $11,534 | 31,231 | 4,160 | 13.3% | $1,968 |
| Pennsylvania* | $401 | 2,693 | 2,078 | 77.2% | $309 | 107,399 | 15,138 | 14.1% | $56 |
| Rhode Island* | $181 | 192 | 155 | 80.7% | $146 | 7,024 | 721 | 10.3% | $19 |

***Table 8 continued***

| State | Total MB Hunter Expenditures on Equipment | Establishments | | | | Employment | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | *Total Number of Establishments* | *Number of Small Businesses* | *Percent Small Businesses* | *Estimated MB Hunters' Expenditures at Small Businesses* | *Total Employed* | *Employed at Small Businesses* | *Percent Small Businesses of Total* | *Estimated MB Hunters' Expenditures at Small Businesses* |
| South Carolina | $28,881 | 925 | 739 | 79.9% | $23,073 | 30,885 | 5,147 | 16.7% | $4,813 |
| South Dakota | $5,862 | 239 | 198 | 82.8% | $4,856 | 7,142 | 1,479 | 20.7% | $1,214 |
| Tennessee* | $9,735 | 1,297 | 1,010 | 77.9% | $7,581 | 49,297 | 7,316 | 14.8% | $1,445 |
| Texas | $65,562 | 3,858 | 2,971 | 77.0% | $50,489 | 164,697 | 20,973 | 12.7% | $8,349 |
| Utah* | $8,237 | 421 | 317 | 75.3% | $6,202 | 17,526 | 2,614 | 14.9% | $1,228 |
| Vermont* | $1,928 | 278 | 248 | 89.2% | $1,720 | 3,701 | 1,426 | 38.5% | $743 |
| Virginia* | $5,495 | 1,726 | 1,387 | 80.4% | $4,416 | 55,776 | 10,526 | 18.9% | $1,037 |
| Washington* | $20,167 | 1,135 | 920 | 81.1% | $16,347 | 41,690 | 6,417 | 15.4% | $3,104 |
| West Virginia* | $77 | 588 | 488 | 83.0% | $63 | 15,502 | 3,236 | 20.9% | $16 |
| Wisconsin* | $21,348 | 1,300 | 965 | 74.2% | $15,847 | 53,595 | 5,892 | 11.0% | $2,347 |
| Wyoming* | $3,235 | 238 | 210 | 88.2% | $2,854 | 4,905 | 1,214 | 24.8% | $801 |
| **TOTAL** | **$743,954** | **59,605** | **47,298** | | **$588,649** | **2,290,938** | **332,427** | | **$105,994** |

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## Appendix A

Introduction

To analyze the 2004-2005 migratory bird hunting framework, an economic model was necessary that described hunter behavior under different regulatory frameworks. Available data to apply any model efforts consisted of the 2001 National Survey of Fishing, Hunting and Wildlife-Associated Recreation and Administrative Reports for the 2001 waterfowl hunting season. The 2001 National Survey is the most current database that is comprehensive enough to allow this type of analysis. The primary research interest of this analysis is the tradeoff between season length and bag limit assuming a desired total harvest of ducks. This is not the question these alternative frameworks pose. Each framework varies both bag limit and season length in order to not over harvest the species. The present analysis seeks to quantify these relationships and apply them to changes in both season length and bag limit.

Because of the less stringent data requirements, the empirical approach employed for this analysis is a reduced form of the random utility model by bypassing the site decision equation. The hunter's decision is limited to two questions. First, does the hunter choose to hunt ducks? Second, how many total days does the hunter choose to hunt ducks during one hunting season? The methodology used to analyze the impacts of varying the season length and/or bag limit is explained in the following text.

In any season, the total harvest of ducks (K) is the product of average bag per day per hunter (B), average days afield per hunter per season (DAF), the probability that a hunter will hunt ducks (PROB), and total hunters of all game (H):

$$(1) \qquad K = (B)\,(DAF)\,(PROB)\,H$$

The variables in the model and in the subsequent empirical analysis are defined in Table 9. The analysis was conducted under the assumption that total harvest, K, is set according to annual biological considerations. To develop the parameters of the model it was assumed that once K is determined, it remains constant under all alternative combinations of daily bag and season length. Therefore in the model, any change in K, denoted as (dK), is equated to zero.

This can be seen in the total differential of equation (1):

$$(2) \qquad dK = dB\frac{\delta K}{\delta B} + dDAF \quad \frac{\delta K}{\delta DAF} + d(PROB) \quad \frac{\delta K}{\delta PROB} = 0$$

The differential shows that the various components of dK can be allowed to vary as long as the effects of their changes on K net out to zero. The components are the changes in duck harvest that can be attributed to changes in bag per day (dB), days afield (dDAF), and probability (dPROB). It is assumed that total number of hunters (H) remains constant. Measuring the compensating changes in these components is what ultimately

permits the determination of the tradeoffs between bag limit and season length. The magnitude of the change in harvest caused by each of the components is the product of the initial change in the component and the partial derivative of K with respect to the component. For example, the effect on K of a change in daily bag (dB) is the product of dB and the partial derivative of harvest with respect to daily bag ($\delta K/\delta B$). Thus, equation (2) summarizes the nature of the tradeoffs between daily bag limits and season length in setting the regulatory framework. It shows that any increase in daily bag ($dB > 0$) must be offset by decreases in DAF and PROB such that total harvest remains the same ($dK = 0$).

**Table 9. Definition of Variables**

| ***Variable*** | ***Definition*** | ***Unit of Measurement*** |
|---|---|---|
| PROB | Probability of duck hunting, given that a person hunts | 1 = if hunts ducks<br>0 = otherwise |
| DAF | Days afield per hunter per season | Days |
| SL | Season length | Days |
| BL | Bag limit per hunter per day | Ducks |
| B | Actual daily harvest per hunter | Ducks |
| K | Duck harvest per season | Ducks |
| H | Number of hunters of all species | Participants |
| DH | Number of duck hunters | Participants |
| HD | Duck hunting days (DAF x DH) | Days |
| AGE | Age of individual | Years |
| INC | Individual's household income | Thousands of dollars |
| SEX | Sex of individual | 1 = if male<br>0 = female |
| METRO | Urban residence | 1 = if residence is in urban area<br>0 = otherwise |
| BD00 | 2000 average daily harvest of ducks per hunter in individual's state of residence | Ducks |
| WH97 | Square miles of waterfowl habitat in individual's state of residence in 1997 | Square miles of wetlands per square mile of total state area |
| AES | Average 2001 equipment expenditures of duck hunters | 2003 Dollars |
| AVS | Average 2001 variable expenditures per day for duck hunting | 2003 Dollars |
| E | Elasticity of season length with respect to days afield | Unitless Number |

To measure those tradeoffs it is first necessary to express the components of (2) in other terms. From equation (1), the partial derivatives of total harvest with respect to daily bag (B), days afield (DAF), and probability (PROB) are:

$$(2.1) \qquad \frac{\delta K}{\delta B} = DAF(PROB)H$$

$$(2.2) \qquad \frac{\delta K}{\delta DAF} = B(PROB)H$$

$$(2.3) \qquad \frac{\delta K}{\delta PROB} = B(DAF)H$$

Two equations were specified to incorporate hunter behavior into the model. It is assumed that a hunter makes two decisions.

First, a hunter decides whether to hunt ducks. The decision to participate is binary; the individual either hunts ducks (PROB=1) or he does not (PROB=0). The mean of PROB is the proportion of hunters that hunts ducks, the participation rate.

As discussed in detail below, the decision to participate is influenced by a number of factors. The probability that a given hunter will hunt ducks is a function of age, sex, residence in a rural versus urban area, income, season length, and the amount of waterfowl habitat and the bag per day per hunter in the individual's home state. To simplify the discussion, all factors influencing the decision to hunt ducks except bag per day can be combined in the intercept (a), making the probability that an individual hunts ducks a function of bag per day.

$$(3) \qquad PROB = a + bB$$

Second, after deciding to hunt ducks the hunter must decide how many days to hunt during the season (DAF). The days afield decision is influenced by a number of the same variables: income, availability of duck habitat, and bag per day. Once again, all factors influencing DAF except bag per day can be summarized in the intercept ©.

$$(4) \qquad DAF = c + eB$$

Solving equation (4) for B and substituting into equation (3) yields:

$$(5) \qquad PROB = a + \frac{b(DAF - c)}{e}$$

The derivative of (5) with respect to DAF is:

$$(6) \qquad \frac{dPROB}{dDAF} = \frac{b}{e}$$

Substituting (6) and the partial derivatives (2.1, 2.2, and 2.3) into equation (2) and solving for the change in DAF results in:

$$(7) \qquad dDAF = \frac{-dB(DAF)(PROB)H}{B(PROB)H + \frac{b}{e}B(DAF)H}$$

Equation (7) may be simplified by combining all factors on the right hand side except dB into a constant, J. This makes the tradeoffs between changes in DAF and B apparent, in equation (8).

$$(7.1) \qquad J = \frac{(DAF)(PROB)H}{B(PROB)H + \frac{b}{e}B(DAF)H}$$

$$(8) \qquad dDAF = -dB(J)$$

Note that B in the model is actual bag whereas the policy variable set in the regulations is bag limit (BL), a maximum number of ducks per day attained by relatively few hunters. The estimated relationship between changes in B and BL for each flyway is shown in Table 10. When dBL is known, the corresponding dB is determined from those estimates. The change in days afield (dDAF) for a given dB is derived from (8). With H and K constant, the new probability (PROB) is then calculated by substituting the new levels of DAF and B into equation (1). This keeps the duck hunters in the flyway on the isoquant representing a constant total harvest (K) while allowing BL and SL to vary.

The change in SL consistent with the change in BL is determined by the elasticity of SL with respect to DAF (the ratio of the percent change in SL to the percent change in DAF):

$$(9) \qquad E = \frac{dSL}{SL} \Big/ \frac{dDAF}{DAF} = \left(\frac{dSL}{dDAF}\right)\left(\frac{DAF}{SL}\right)$$

Equation (9) shows how much SL must change to produce the change in DAF required by the new level of BL. If BL is increased, SL must decrease if total harvest is to be held constant.

After the new probability of duck hunting is determined, the difference (dPROB) between it and the base probability is multiplied by the total number of hunters (H) to obtain the change in the number of duck hunters (dDH). Assuming that the new hunters will spend the same amount on equipment as the average of previous duck hunters (AES), the product of dDH and AES is the first part of the economic impact ($IMP_1$) caused by changing BL. The second part of the impact ($IMP_2$) is the change in variable

expenditures. It is the product of dHD, the change in hunter days due to the change in BL, and average variable spending (AVS) per day.

(10) Impact = $IMP_1 + IMP_2$

(10.1) $IMP_1$ = dDH(AES), where:
dDH = (dPROB)(H)

(10.2) $IMP_2$ = (dHD)(AVS), where:
dHD = dDH(DAF + dDAF) + dDAF(DH)

Thus, the economic impacts are measured as changes from the base case in terms of hunter equipment spending and spending for food, travel and lodging as the number of duck hunters and days afield change in response to the regulatory alternatives.

Estimation of the Model Parameters

As discussed above, the individual hunter is assumed to first decide whether to hunt ducks and then decide the amount of time to spend in the field. The individual's decision whether or not to hunt ducks is specified as a function of age, sex, residence in rural versus urban areas, income, season length, and average bag per day and amount of waterfowl habitat in the hunter's home state. The last two variables are included as measures of the relative quality and availability of waterfowl among states. The days afield (DAF) equation is a function of household income, average daily harvest, season length, and residence in rural versus urban areas. The variables in the equations are defined in Table 9. Data used for this analysis are from the 2001 National Survey of Fishing, Hunting and Wildlife Associated Recreation, and the Waterfowl Harvest and Hunter Activity Administrative Reports for the 1979 through 2001 seasons. These data sources provide the required variability in harvest, season length and bag limits to allow the estimation of the economic model.

The two equations were estimated on a national basis because there was insufficient variation for some variables to estimate individually for each flyway. The probability equation was estimated with logit equation, and the days afield equation was estimated with ordinary least squares. Below each parameter estimate is the t-value in parentheses. The probability equation is estimated for all hunters. The days afield equation is estimated for those hunters who hunted ducks. The results are shown in Table 10 below.

**Table 10. Results**

| Parameter | Probability (Eq. 11) | | Days Afield (Eq. 12) |
|---|---|---|---|
| | Coefficient | Marginal Effect | |
| Intercept | -5.0656<br>(0.00757) | -- | 8.3864<br>(2.38639) |
| AGE | -0.0177<br>(0.000072) | -0.0035<br>(000007.32) | |
| SEX | 1.0035<br>(0.00473) | 0.1289<br>(.00025) | |
| METRO | 0.3904<br>(0.00195) | 0.0010<br>(.00015) | -3.7244<br>(0.96550) |
| INCOME | 0.0090<br>(0.000027) | 0.0768<br>(.00000288) | -0.0223<br>(0.01353) |
| BD00 | 0.3540<br>(0.00257) | 0.0017<br>(.00015) | 2.1340<br>(1.10002) |
| WH97 | 0.0053<br>(0.000017) | 0.0041<br>(.00000154) | |
| SL | 0.0206<br>(0.000066) | 0.0696<br>(.00000511) | 0.0465<br>(0.02640) |
| | n = 4,479<br>LR = 523,149.36<br>Pr > ChiSq = 0.0001 | | n = 611<br>$R^2$ = 0.041<br>F = 6.47<br>Pr > F = 0.0001 |

In equation (11), all coefficients are significant and show that the probability that a hunter will hunt ducks is higher for male hunters and residents of urban areas, other things being equal. The probability decreases among older hunters but increases with household income and with the quality of duck hunting and length of the season in the home state. BD00, representing average daily bag in the previous year, was used instead of B as a measure of the quality of hunting in the individual's home state. The quality of the previous year's duck hunting was considered a more relevant factor for hunter decisions in 2001.

In equation (12), all coefficients are significant at the 10 percent level. The coefficients of BD00 and SL are positive which indicates that hunters in states with a longer season length and high bag per day hunt ducks more days per year than do hunters in other states, other things being equal. Also, the number of days spent duck hunting is inversely related to income and residents of urban areas, other things being equal.

Estimates of equations (3) and (4) were developed for each flyway from the coefficients in (11) and (12) by using flyway mean values for all independent variables except BD00 and collapsing them into the intercept (Table 11). The same coefficients of BD00 from equations (11) and (12) were used in all flyways. For example, the intercept (a) in the probability equation is 10.509 for the Mississippi Flyway. The slope (b) in the

probability equation is 0.002 for all flyways. The key parameters used in the analysis are sown in Table 11 below.

**Table 11. Key Flyway Parameters Used in 2004 Update**

| | *Flyway* | | | |
|---|---|---|---|---|
| | *Atlantic* | *Mississippi* | *Central* | *Pacific* |
| Eqn 3. PROB = a +bB | | | | |
| a = | 12.467 | 10.509 | 9.741 | 9.336 |
| b = | 0.002 | 0.002 | 0.002 | 0.002 |
| Eqn 4. DAF = c + eB | | | | |
| C= | 0.550 | -0.247 | -0.749 | -0.324 |
| E= | 2.134 | 2.134 | 2.134 | 2.134 |
| Eqn 7.1. J = | 2.638 | 1.896 | 1.476 | 1.814 |
| Response of B to BL | | | | |
| Increase in BL | 3.0% | 3.5% | 5.0% | 3.9% |
| Decrease in BL | -8.4% | -7.9% | -9.9% | -8.1% |
| Elasticity of SL to DAF | 4.977 | 6.214 | 4.404 | 3.186 |

The elasticity of SL with respect to DAF (percent change in SL due to a one percent change in DAF) was estimated from a set of time series/cross section data for the years 1979 to 2001. The equation is as follows:

DAF = 3.87 + .033SL + .456lagged bag/day + 1.033 split seasons + .057 zones +
(.006) (.402) (.276) (.22)
.099 bag limit + .042 pacific flyway + .036 central flyway + .073 Miss. North
(.039) (.017) (.013) (.013)
flyway + .214 Miss. South flyway + .016 Atlantic flyway
(.016) (.011)

R squared = .87
N = 115

The partial of DAF with respect to SL = .033 computed for the nation was converted to a flyway specific elasticity of SL with respect to DAF – the percent change of SL for a one percent change in DAF. This was done by taking the reciprocal and multiplying it by the ration of DAF to SL for each flyway. The Mississippi Flyway elasticity is 6.214.

The remaining estimates for the base case representing the 2001 hunting season were obtained from other sources. Starting with the first row of Table 11, the total seasonal duck harvest (K) used in equation (1) was obtained from the Administrative Report. The numbers of hunters differs somewhat in the 2001 Survey, the 2002 Administrative Report, and state license data. Estimates of duck hunters from Administrative Reports

were used to be compatible with harvest and days afield information. Total hunters of all game and participation rates are from the 2001 Survey.

The base case probability (PROB) was estimated as follows. Daily harvest (B) and days afield (DAF) are from the 2002 Administrative Report, and PROB was solved for by substituting H and K into equation (1). The responsiveness (dB/B) of daily harvest (in percent) to a one unit change in bag limit (dBL) based on research results is in Table 11. It is flyway specific and is shown separately for increases and decreases. For example, an increase in the Mississippi Flyway BL from 4 to 5 ducks per day causes a 3.5 percent increase in B and a decrease in the BL from 4 to 3 per day causes a 7.9 percent decrease in B. To extend the results to more than a unit change in bag limit the same rate of change is applied to additional units in either direction, i.e., a change from 4 to 6 ducks per day yields twice the change in B as a change from 4 to 5.