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Final Environmental Assessment Zones and Split Seasons for Duck Hunting

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United States Department of the Interior

FISH AND WILDLIFE SERVICE

Washington, D.C. 20240



FINDING OF NO SIGNIFICANT IMPACT

ENVIRONMENTAL ASSESSMENT ZONES AND SPLIT SEASONS FOR DUCK HUNTING

Zoning is defined as the delineation of areas within a State where duck hunting seasons are set independently of each other. The purpose of zoning is to provide a more equitable distribution of duck harvest opportunity among hunters in a given State. States are allowed the option of splitting their allotted hunting days into two (or in some cases, three) segments to take advantage of species-specific peaks of abundance or to satisfy hunters in different areas who want to hunt during the period of peak waterfowl abundance in their area. The Service's current zoning/split criteria allow States the following options:

- (1) Three zones with no splits
- (2) Split seasons (no more than three segments) with no zones
- (3) Two zones with the option for two-way split seasons in one or both zones.

Flyway Councils have requested a revision in zoning and split season guidelines, which have remained unchanged since 1996. This environmental assessment evaluates four alternative structures for zoning and split season guidelines within which States must choose duck hunting seasons:

Alternative 1: Retain the current zoning and splits guidelines (No action)

Alternative 2: Modify the current zones and splits guidelines to allow 2 additional options (Proposed action)

Alternative 3: Eliminate restrictions on the number of zones in a State with varying sub-alternatives for the number of splits

Alternative 4: Eliminate the use of zones and splits

Analysis of the proposed action (Alternative 2) indicated that the number of days in which ducks are exposed to hunting throughout a hunting season will likely increase from the current level. The addition of one duck zone in all States would increase the number of duck exposure days by 5-25%, depending on Flyway. Furthermore, national duck harvest potentially would increase up to 17% (approximately 2.2 million birds) above the "no change" alternative with the addition of one zone in all eligible States. If not all States choose to add a zone, the magnitude of the increase in harvest will be lower. Because there are States that currently do not take full advantage of the existing zone/split criteria it is anticipated that modifying the criteria will not entice them to change their zone/split

configurations. Therefore, it is believed that not all States will choose to add a new zone and that the predicted potential increase in duck harvest will not be realized.

Based on review and evaluation of the information contained in the supporting documents below, I have determined that the proposed action to modify the criteria for duck hunting zones and splits will maintain adequate protection to ducks and that this is not a major Federal action that would significantly affect the quality of the human environment within the meaning of Section 102(2)(C) of the National Environmental Policy Act of 1969. Accordingly, the preparation of an environmental impact statement on the proposed action is not required.

Supporting Documents

1. Environmental Assessment: Zones and Split Seasons for Duck Hunting

12 August 2011
Date

Gregory E. Siskanic
Acting Director

**UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE**

**FINAL ENVIRONMENTAL ASSESSMENT
ZONES AND SPLIT SEASONS FOR DUCK HUNTING**

JULY 2011

EXECUTIVE SUMMARY

Zoning is defined as the delineation of areas within a State where duck hunting seasons are set independently of each other. The purpose of zoning is to provide a more equitable distribution of duck harvest opportunity among hunters in a given State. States are allowed the option of splitting their allotted hunting days into two (or in some cases, three) segments to take advantage of species-specific peaks of abundance or to satisfy hunters in different areas who want to hunt during the period of peak waterfowl abundance in their area. The Service's current zoning/split criteria allow States the following options:

- (1) Three zones with no splits
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- (3) Two zones with the option for two-way split seasons in one or both zones.

Flyway Councils have requested a revision in zoning and split season guidelines, which have remained unchanged since 1996. This environmental assessment evaluates four alternative structures for zoning and split season guidelines within which States must choose duck hunting seasons:

Alternative 1: Retain the current zoning and splits guidelines (No action)

Alternative 2: Modify the current zones and splits guidelines to allow 2 additional options (Proposed action)

Alternative 3: Eliminate restrictions on the number of zones in a State with varying sub-alternatives for the number of splits

Alternative 4: Eliminate the use of zones and splits

Analysis of the proposed action resulted in the following anticipated impacts:

Ducks

Under Alternative 2, the number of days in which ducks are exposed to hunting throughout a hunting season will likely increase from the current level. The addition of one duck zone in all States would increase the number of duck exposure days by 5-25%, depending on Flyway. Furthermore, national duck harvest would increase up to 17% (approximately 2.2 million birds) above the "no change" alternative with the addition of one zone in all States. If not all States choose to add a zone, the magnitude of the increase in harvest will be lower.

Endangered Species

The Service conducts Section 7 consultation before establishing any special hunting seasons for any migratory game bird in the contiguous United States, Alaska, Hawaii, Puerto Rico, and the Virgin Islands. This consultation ensures that there will be no likelihood of jeopardy to a listed species or its habitat.

Socioeconomic Impacts

Hunters

The Service does not believe this alternative would recruit new hunters, and therefore hunter numbers would probably remain similar to 2008 levels. However, if increasing the number of zones/splits encourages current hunters to spend more days afield, an attendant increase in expenditures would be expected. Therefore, the national estimate of the consumer surplus expected under this alternative may be higher than the estimate of \$317 million annually (range of \$274 to \$362 million [2007\$]) that would be expected under the “no change” alternative above. However, we believe the percent increase in consumer surplus would be less than 17%.

Nonhunters and Nongovernmental Organizations

The non-hunting public has expressed no opinion about zoning. Within this large group, individuals opposed to hunting will likely object to zoning if they believe it will enhance or encourage hunting. Others favor more restrictive regulations, and some believe that all hunting should be discontinued.

Governments

Flyway Councils support this alternative. Duck hunter numbers would likely be similar to that of 2008, which would maintain the current level of revenues to the States and Service through sales of waterfowl hunting licenses and duck stamps.

Businesses

This alternative potentially would increase hunter expenditures above the current level of \$1.2 billion (2007\$). However, we believe the increase will be less than 17%.

For more information regarding this document contact Marcia Pradines, Acting Chief, Division of Migratory Bird Management, U.S. Fish and Wildlife Service, Arlington Square, Mail Stop MBSP – 4107, 4401 N. Fairfax Drive, Arlington, VA 22203, (703) 358-1966.

PURPOSE AND NEED FOR ACTION

Purpose

Annually, the Service issues regulations permitting the sport hunting of migratory birds. The Final Supplemental Environmental Impact Statement: Issuance of Annual Regulations Permitting the Sport Hunting of Migratory Birds (SEIS 88) (USDI 1988) provides National Environmental Policy Act coverage for this activity. The Service recently published a draft Supplemental Environmental Impact Statement (DSEIS10) on the issuance of annual regulations permitting the hunting of migratory birds, which will replace SEIS 88 (USDI 2010). Zones and split seasons are "special regulations" designed to distribute hunting opportunities and harvests according to temporal, geographic, and demographic variability in waterfowl populations. States have been allowed the option of dividing their allotted hunting days into two (or in some cases, three) segments to take advantage of species-specific peaks of abundance or to satisfy hunters in different areas who want to hunt during the peak of waterfowl abundance in their area. The split season option does not fully satisfy many States who wish to provide a more equitable distribution of harvest opportunities. Therefore, the Service also has allowed the establishment of independent seasons in two or more zones within States for the purpose of providing more equitable distribution of harvest opportunity for hunters throughout the state. In 1978, the Service prepared an Environmental Assessment on the use of zones to set duck hunting regulations (USFWS 1978). A primary tenet of the 1978 EA was that zoning will be for the primary purpose of providing equitable distribution of hunting opportunity within a State or region and not for the purpose of increasing total annual waterfowl harvest in the zoned areas. In fact, harvest levels were to be adjusted downward if they exceeded traditional levels as a result of zoning (USFWS 1978). Subsequently, the Service conducted a review of the use of zones and split seasons in 1990 (USFWS 1990). The purpose of this environmental assessment is to evaluate various alternatives used to control the use of split seasons and zones for duck hunting within States.

Scope

Annual regulations governing the hunting of migratory birds are specified in Title 50, Code of Federal Regulations, Part 20, Subpart K. This assessment applies specifically to the use of split seasons and zones, which are special regulations not covered by Subpart K. The current guidelines used to govern the selection of split seasons and zones were last published on May 13, 2010 (75 FR 27150). This assessment is limited to guidelines for the use of split seasons and zones for duck hunting. Although the number of split seasons for goose hunting is generally limited to 2-3 segments, the Service has not imposed any guidelines governing the use of zoning for geese. Goose zones typically are delineated to manage specific populations of Canada geese and the use of goose zones does not lend itself to formulation of national guidelines.

Need for Action

There continues to be high demand for utilization of the migratory game bird resource. In 2009, about 1.1 million people in the United States over the age of 16 actively hunted in the current year duck season and harvested 13.1 million ducks (USFWS 2010a). Migratory bird populations

fluctuate annually primarily in response to habitat change. The Service annually evaluates demographic and habitat parameters to assess the status of migratory bird populations, and to set migratory bird hunting regulations appropriate to ensure the long-term welfare of these populations. Every five years States are afforded the opportunity to change the zoning and split season configuration within which they set their annual duck hunting regulations. This schedule of “open seasons” for making changes to splits and zones is being evaluated in DSEIS10, however, the specific guidelines for choosing splits and zones are not a part of that evaluation. In 2005 (70 FR 55667), and again in 2010 (75 FR 27150), the Service announced that the current guidelines for choosing splits and zones would be used for all future “open seasons.” However, this environmental assessment is needed because Flyway Councils have requested a revision in zoning and split season guidelines, which have remained unchanged since 1996. The assessment will evaluate several alternative structures for zoning and split season guidelines within which States must choose duck hunting seasons.

Authority and Responsibility

Migratory game birds, including ducks, are those bird species so designated in conventions between the United States and several foreign nations for the protection and management of these birds. Under the Migratory Bird Treaty Act (16 U.S.C. 703–712), the Secretary of the Interior is authorized to determine when “hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any * * * bird, or any part, nest, or egg” of migratory game birds can take place, and to adopt regulations for this purpose. These regulations are written after giving due regard to “the zones of temperature and to the distribution, abundance, economic value, breeding habits, and times and lines of migratory flight of such birds” and are updated annually (16 U.S.C. 704(a)). This responsibility has been delegated to the Service as the lead Federal agency for managing and conserving migratory birds in the United States. The Service develops migratory game bird hunting regulations by establishing the frameworks, or outside limits, for season lengths, daily bag limits, and areas for migratory game bird hunting. After Service establishment of final frameworks for hunting seasons, the States may select season dates, daily bag limits, and other regulatory options for the hunting seasons for each zone within their boundaries. States may select hunting seasons that are more restrictive than what the Federal frameworks allow, but may not exceed those frameworks. SEIS 88 and DSEIS10 document the statutory authority and responsibility of the Federal Government and the States in migratory bird management.

Administrative Process

Overview

Acknowledging regional differences in hunting conditions, the Service has administratively divided the nation into four Flyways for the primary purpose of managing migratory game birds. Each Flyway (Atlantic, Mississippi, Central, and Pacific) has a Flyway Council, a formal organization generally composed of one member from each State and Province in that Flyway. The Flyway Councils, established through the Association of Fish and Wildlife Agencies, also assist in researching and providing migratory game bird management information for Federal, State, and Provincial Governments, as well as private conservation agencies and the general public.

The process for adopting migratory game bird hunting regulations, located at 50 CFR 20, is constrained by three primary factors. Legal and administrative considerations dictate how long the rulemaking process will last. Most importantly, however, the biological cycle of migratory game birds controls the timing of data-gathering activities and thus the dates on which these results are available for consideration and deliberation. For each regulatory cycle, Service biologists gather, analyze, and interpret biological survey data and provide this information to all those involved in the process through a series of published status reports and presentations to Flyway Councils and other interested parties. Because the Service is required to take abundance of migratory game birds and other factors into consideration, the Service undertakes a number of surveys throughout the year in conjunction with Service Regional Offices, the Canadian Wildlife Service, and State and Provincial wildlife-management agencies. To determine the appropriate frameworks for each species, the Service considers factors such as population size and trend, geographical distribution, annual breeding effort, the condition of breeding and wintering habitat, the number of hunters, and the anticipated harvest. SEIS 88 and DSEIS10 provide more complete information on the administrative process for issuing annual regulations permitting the sport hunting of migratory birds.

Schedule

The Service exercises its authority and fulfills its responsibilities through a well-established, multi-step administrative process. The Service invites comments, suggestions, and recommendations from interested persons and organizations throughout the rule making process to ensure that the final regulations are as responsive to the need for action as possible. The following events are major steps in the 5-year cycle for allowing States to make changes to their splits and zones configuration:

1. In the year prior to the open season in which States may change their split/zone configuration the Service will publish a proposed rulemaking notice in the *Federal Register* sometime in the second quarter of the year. The proposal provides a background and overview of the splits/zones open season process and outlines the guidelines within which States may choose their splits/zones configuration. The proposed rule for the 2011 open season was published in the *Federal Register* on May 13, 2010 (75 FR 27144).
2. Flyway Councils, technical committees, and Management Unit committees meet in March and July to provide recommendations on general migratory bird hunting regulations, as well as to provide their input to the splits/zones open season process.
3. A final rulemaking notice is published in the *Federal Register* in mid-September of the year preceding the open season. The notice reiterates the splits/zones guidelines and provides States with a notice of the deadline by which they must notify the Service of any changes to their splits/zones configuration. During the 2006 open season, States were required to notify the Service of their splits/zones configuration by May 1. The Service will notify States of the deadline for future open seasons.

ALTERNATIVES INCLUDING THE PROPOSED ACTION

BACKGROUND

In 1978, the Service prepared an Environmental Assessment to formally evaluate the concept of zoning as a tool in duck harvest management (USDI 1978). Zoning was defined as “the delineation of areas within a State where hunting seasons are set independently of each other.” The purpose of zoning was to provide a more equitable distribution of duck harvest opportunity among hunters in a given State. Increased harvest of ducks within a zoned State was not the objective of zoning. In fact, the EA stated that harvest levels would be adjusted downward if zoning was determined to increase harvest beyond traditional levels (USDI 1978). The EA gave an overview of the early history of duck zoning:

Early History of Zoning

Pacific Flyway - California first initiated zoning in 1942, when it was agreed that seasons within a 10 mile zone bordering the Colorado River would conform to those selected by Arizona. In 1945, a similar arrangement was made with Oregon, whereby that State’s season selection would apply to the Tule-Klamath region in northeastern California. The Pacific Flyway Council assigned a committee in 1953 to study the possibilities of zoning on a Flyway basis. The States were surveyed, and waterfowl harvest zones based on early or late season date selections were delineated. The zoning committee recommended that zoning should not be used unless season length within the Flyway was restricted to 50 days or less. However, the proposed zoning scheme was never formally adopted.

Central Flyway - Zoning in the Central Flyway was initiated in connection with creation of the High Plains Mallard Management Unit in 1968. The unit was delineated in connection with an experimental late mallard drake season in Montana, Wyoming and Colorado. New Mexico and parts of western South Dakota and Nebraska were included within the High Plains zone in 1969, in effect creating two large zones within the Central Flyway.

Mississippi Flyway - One of the earliest examples of zoning in the Mississippi Flyway occurred in Ohio, where in the late 1940’s the State began adopting Pennsylvania regulations for the Pymatuning Reservoir area. Near the mouth of the Mississippi River, portions of southeast Louisiana lie on the east side of the river and portions of southwest Mississippi lie west of the river. In the early 1950’s, Louisiana and Mississippi began adopting each other’s regulations for those respective parts of their States lying across the river, separate from the rest of the State.

Atlantic Flyway - Zoning first occurred in New York in 1899, when Long Island, under State regulation, was given a waterfowl season separate from the remainder of the State. This arrangement continued until 1935. From 1935 to 1968, Long Island, under Federal regulation, continued with seasons separate from upstate New York, but they were required to conform to the season selected by either Connecticut or New Jersey. In 1968 this requirement was dropped and Long Island seasons could once again be set without regard to those in the rest of the State or in Connecticut or New Jersey. Two other zones existed briefly in upstate New York. Jefferson County had an extended waterfowl season in 1901 and 1902, and in 1922 the upstate region was divided into north and south zones.

States are allowed the option of splitting their allotted hunting days into two (or in some cases, three) segments to take advantage of species-specific peaks of abundance or to satisfy hunters in

different areas who want to hunt during the period of peak waterfowl abundance in their area (Martin and Carney 1977). A limited number of special harvest units, which encompass portions of flyways rather than portions of States, also have been implemented to better manage discrete duck populations with unique demographic characteristics. In 1990, because of concerns about the proliferation of zones and split seasons for duck hunting, the Service conducted an extensive review of the history of the use of these tools in waterfowl harvest management (USDI 1990). The 1990 review did not show that the proliferation of these options had increased harvest pressure; however, the ability to detect the impact of zone/split configurations was poor because of unreliable response variables, the lack of statistical tests to differentiate between real and perceived changes, and the absence of adequate experimental controls. Consequently, guidelines were established to provide a framework for controlling the proliferation of changes in zone/split options. By controlling variability in zone/split configurations, managers can better evaluate other variables, such as season length and daily bag limit, which are more likely to affect duck harvest.

CURRENT GUIDELINES FOR DUCK ZONES AND SPLIT SEASONS

The following zone/split-season guidelines apply only for the *regular* duck season:

1. A zone is a geographic area or portion of a State, with a contiguous boundary, for which independent dates may be selected for the regular duck season.
2. Consideration of changes for management-unit boundaries is not subject to the guidelines and provisions governing the use of zones and split seasons for ducks.
3. Only minor (less than a county in size) boundary changes will be allowed for any grandfathered arrangement, and changes are limited to the open season.
4. Once a zone/split option is selected during an open season, it must remain in place for the following five years. Any State may continue the configuration used in the previous five-year period. If changes are made, the zone/split-season configuration must conform to one of the following options:
 - a. Three zones with no splits
 - b. Split seasons (no more than three segments) with no zones
 - c. Two zones with the option for two-way split seasons in one or both zones.

Grandfathered Zone/Split Arrangements

When the zone/split guidelines were first implemented in 1991, several States had completed experiments with zone/split arrangements different from Options 1–3 above. Those States were offered a one-time opportunity to continue those arrangements, with the stipulation that only minor changes could be made to zone boundaries; and if they ever wished to change their zone/split arrangement, the new arrangement would have to conform to one of the three options identified above. If a grandfathered State changed its zoning arrangement, it could not go back to the grandfathered arrangement it previously had in place. Current grandfathered arrangements are:

Atlantic Flyway: Massachusetts, New Jersey—three zones with two-segment splits in each zone. New York—5 zones with 2-segment splits in each zone. Pennsylvania—4 zones with 2-segment splits in each zone.

Mississippi Flyway: Michigan and Indiana —3 zones with 2-segment splits in each zone.

Central Flyway: Nebraska—5 zones with 2-segment splits in each zone. South Dakota—4 zones with 2-segment splits in each zone.

Pacific Flyway: Alaska—5 zones with 2-segment splits in 1 zone. California—5 zones with 2-segment splits in each zone.

DESCRIPTION OF ALTERNATIVES

Alternative 1: Retain the current zoning and splits guidelines (No action)

This alternative would maintain the current options available to States with regards to zones and splits:

- No zones, with split seasons (no more than 3 segments)

- Three zones, no splits

- Two zones, with option for 2-way (2 segment) split seasons in one or both zones

- All grandfathered arrangements

Alternative 2: Modify the current zones and splits guidelines to allow 2 additional options (Proposed action)

The proposed action is to modify the zones and splits guidelines to allow up to 4 zones (from the current maximum of 3, with no splitting), and to increase the number of zones in which 2 splits may occur from 2 to 3. The following zone/split combinations would be possible under this alternative (Figure 1):

- No zones, with split seasons (no more than 3 segments)

- Up to four zones, no splits

- Up to three zones with option for 2-way (2 segments) split seasons in one or more zones

- All grandfathered arrangements

Alternative 3: Eliminate restrictions on the number of zones in a State with varying sub-alternatives for the number of splits

This alternative would allow States to create an unlimited number of duck hunting zones within their boundaries. Furthermore, under this alternative the following sub-alternatives are analyzed:

Sub-alternative A. No splitting allowed – This sub-alternative would require States to hold their duck season within a single segment in each zone for the number of days provided for in the current year’s hunting frameworks.

Sub-alternative B. Maximum of three splits per zone – This is the “no change” sub-alternative that maintains the current maximum of three splits per zone within a State.

Sub-alternative C. No restriction on the number of splits – This sub-alternative would allow States to divide their duck hunting season into an unlimited number of segments in each zone until the maximum number of days provided for in the hunting frameworks were utilized.

Alternative 4: Eliminate the use of zones and splits

This alternative would require States to remove existing boundaries of duck zones and effectively treat the entire State as one zone. Furthermore, States would no longer be able to split their duck season into multiple segments and would require the duck hunting season in the entire State to be held in one continuous segment until the maximum number of days provided for in the hunting frameworks were utilized.

AFFECTED ENVIRONMENT

Ducks

The taxonomic family Anatidae, principally subfamily Anatinae (ducks), and its habitat comprise the affected environment. A complete list of species and general description of habitats are found in DSEIS10.

Duck Population Status Monitoring

Spring Surveys

Federal, provincial, and state agencies conduct surveys each spring to estimate the size of duck breeding populations and to evaluate habitat conditions. These surveys are conducted using fixed-wing aircraft and helicopters, and cover over 2.0 million square miles that encompass principal breeding areas of North America. The traditional survey area comprises parts of Alaska, Canada, and the northcentral United States, and includes approximately 1.3 million square miles. The eastern survey area includes parts of Ontario, Quebec, Labrador, Newfoundland, Nova Scotia, Prince Edward Island, New Brunswick, New York, and Maine, covering an area of approximately 0.7 million square miles. In Prairie and Parkland Canada and the northcentral United States, aerial waterfowl counts are corrected annually for visibility bias by conducting ground counts. In the northern portions of the traditional survey area and the eastern survey area, duck estimates are adjusted using visibility correction factors derived from a

comparison of airplane and helicopter counts. Annual estimates of duck abundance are available since 1955 for the traditional survey area and since 1996 for all strata (except 57–59, 69) in the eastern survey area. However, portions of the eastern survey area have been surveyed since 1990. In the traditional survey area, estimates of pond abundance in Prairie Canada are available since 1961 and in the northcentral United States since 1974. Several provinces and states also conduct breeding waterfowl surveys using various methods; some have survey designs that allow calculation of measures of precision for their estimates. Information about habitat conditions is supplied primarily by biologists working in the survey areas, and ancillary weather information is obtained from agricultural and weather internet sites.

The waterfowl breeding population survey begins in mid-April and ends in mid-June. It provides population estimates of the total duck population and for each of several major duck species nesting in principal breeding areas of North America. The survey also provides an estimate of the number of ponds in the northcentral United States and Prairie Canada. Information from this survey is most reliable for abundant and widely distributed species, such as the mallard; it is less reliable for species with lower abundance and for those species whose nesting range is partly outside the survey area. Thus, for example, changes in the status of mallard breeding populations are measured with greater precision than those for canvasback and scaup. Results of breeding waterfowl abundance and habitat surveys are published annually. This year's survey results are published in *Waterfowl Population Status, 2010* (USFWS 2010b).

Fall and Winter Population Surveys

Special surveys are conducted during fall and winter to determine the distribution of certain waterfowl species and the size of various population segments. For ducks, the species surveyed include, but are not limited to, canvasbacks, redheads, and sea ducks. These surveys are a cooperative effort between the Service and States.

An extensive waterfowl survey is conducted each year in early January. Coordinated by the Service, it is conducted cooperatively with the States and other agencies. The purpose of this survey is to record the number and distribution of waterfowl wintering in the United States and Mexico, and the condition of wintering habitat. It provides supplementary information on the status of various waterfowl species for which breeding ground surveys are unsatisfactory or are being developed, such as for mottled ducks. Population estimates based on winter surveys may have wide confidence limits because of the large area covered, potential regional differences in survey methods, and imprecision associated with counting large concentrations of birds. Results of special surveys are generally published annually in *Flyway Data Books* maintained by Service representatives to the Flyways.

Duck Harvest, Harvest Rates, and Survival Monitoring **Waterfowl Harvest Survey**

The Service conducts a mail survey each year to gather data on the activity and success of waterfowl hunters. The survey is based on a sample of migratory bird hunters from each State whose names and addresses were gathered through the Migratory Bird Harvest Information

Program (HIP). Information from this survey is used in developing annual estimates of the United States waterfowl harvest.

Some of the mail survey cooperators are asked to send in wings or tail feathers from migratory birds they shoot. Prepaid envelopes are provided for submitting these parts to the Service. Examination of plumage reveals the species, age, and sex of harvested birds. Data from the Parts Collection survey are used to adjust data from the larger HIP survey, allowing national estimates to be made of the species composition and age and sex ratios of harvested waterfowl. Age ratios of the harvest provide indices to the recruitment rates for various populations. Results of the waterfowl harvest surveys are published annually. This year's survey results are published in *Migratory Bird Hunting Activity and Harvest During the 2008 and 2009 Hunting Seasons: Preliminary Estimates* (USFWS 2010a).

Banding Programs

Approximately 200,000 ducks are banded annually to gather information needed for managing waterfowl. Band-recovery data are used to determine the distribution of harvest from various breeding and wintering areas and to define the source of birds harvested in an area. Band recoveries from hunters provide an index to the harvest rate; this rate is useful for understanding the effects of changes in hunting regulations. Direct recoveries are those recoveries that occur within the first year after the bird was banded. Harvest rates can be estimated from direct recovery rates, if band-reporting and band-loss rates are known. Band loss is assumed to be negligible. In 1995, the Service and other cooperators began using bands imprinted with a toll free phone number for reporting band recoveries. During the first year the toll-free number bands were used, band-reporting rates increased up to 80% over the 32% rate of earlier-style bands (U.S. Fish and Wildlife Service, unpublished data). As toll-free numbers became more widely disseminated during the 1996 and 1997 hunting seasons, the Service believes band-reporting rates have increased further.

Current Duck Breeding Population Status and Habitat Conditions

In this year's Waterfowl Breeding Population and Habitat Survey traditional survey area (strata 1-18, 20-50, and 75-77), the total duck population estimate was 40.9 ± 0.7 million birds). This estimate was similar to last year's estimate of 42.0 ± 0.7 million birds and was 21% above the long-term average (1955-2009). Estimated mallard (*Anas platyrhynchos*) abundance was 8.4 ± 0.3 million birds, which was similar to the 2009 estimate of 8.5 ± 0.2 million birds and 12% above the long-term average. Estimated abundance of gadwall (*A. strepera*; 3.0 ± 0.2 million) was similar to the 2009 estimate and 67% above the long-term average. Estimated American wigeon abundance (*A. americana*; 2.4 ± 0.1 million) was similar to 2009 and the long-term average (2.6 ± 0.03 million). The green-winged teal (*A. crecca*) estimate was 3.5 ± 0.2 million, which was similar to the 2009 estimate and 78% above their long-term average of 1.9 ± 0.02 million. The blue-winged teal (*A. discors*) estimate of 6.3 ± 0.4 million was 14% below the 2009 estimate and 36% above their long-term average of 4.7 ± 0.04 million. Estimates of Northern shovelers (*A. clypeata*; 4.1 ± 0.2 million) and redheads (*Aythya americana*; 1.1 ± 0.1 million) were similar to their 2009 estimates and were 76% and 63% above their long-term averages of 2.3 ± 0.02 million and 0.7 ± 0.01 million, respectively. The estimate for northern pintails (*A.*

acuta) was 3.5 ± 0.2 million, which was similar to the 2009 estimate, and 13% below the long-term average of 4.0 ± 0.04 million. The canvasback estimate (*A. valisineria*; 0.6 ± 0.05 million) was similar to the 2009 estimate and to the long-term average. The scaup estimate (*A. affinis* and *A. marila* combined; 4.2 ± 0.2 million) was similar to that of 2009 and 16% below the long-term average of 5.1 ± 0.05 million (USFWS 2010b).

Habitat conditions during the 2010 Waterfowl Breeding Population and Habitat Survey were characterized by average to below-average moisture, a mild winter, and early spring across the entire traditional and eastern survey areas. The total pond estimate (prairie Canada and U.S. combined) was 6.7 ± 0.2 million. This was similar to last year's estimate and 34% above the long-term average of 5.0 ± 0.03 million ponds. The 2010 estimate of ponds in prairie Canada was 3.7 ± 0.2 million. This was similar to last year's estimate (3.6 ± 0.1 million) and to the long-term average (3.4 ± 0.03 million). The 2010 pond estimate for the northcentral U.S. of 2.9 ± 0.1 million was similar to last year's estimate and 87% above the long-term average (1.6 ± 0.02 million).

The eastern survey area was restratified in 2005 and is now composed of strata 51–72. Estimates of mallards, scaup, scoters (black [*Melanitta nigra*], white-winged [*M. fusca*], and surf [*M. perspicillata*]), green-winged teal, American wigeon, bufflehead (*Bucephala albeola*), American black duck (*Anas rubripes*), ring-necked duck (*Aythya collaris*), and goldeneyes (common [*B. clangula*] and Barrow's [*B. islandica*]) were all similar to their 2009 estimates and long-term averages. The population estimate for mergansers (red-breasted [*Mergus serrator*], common [*M. merganser*], and hooded [*Lophodytes cucullatus*]) was 386.4 thousand, which was 15% below the 2009 estimate, and 14% below the long-term average. More information about the current duck breeding population status, habitat conditions, and production may be found in Waterfowl Population Status, 2010 (USFWS 2010b).

CONSEQUENCES OF ALTERNATIVES

Despite substantial investment of effort in data collection and analytical work and thought, relationships among hunting regulations, harvests, and survival of migratory birds is largely unknown (SEIS 88). However, comparisons of harvest indicators between years of relatively liberal and relatively restrictive hunting regulations suggest that harvest and harvest rate can be influenced by regulations. If the major regulatory components (daily bag limit, season timing and length) are altered in a restrictive manner, reductions in harvest rate generally result. Similarly, liberal regulations can result in increased harvest rates, at least within limits. Thus, the Service has the ability to produce and measure general changes in harvest rates through broad regulatory actions. However, to date it has been impossible to measure the impact of minor regulatory changes such as zones and splits on duck harvest.

Predicted changes in harvest resulting from zone proliferation

The total number of duck hunting zones in the U.S. increased 44% between 1978 and 1996 (Table 1). Although hunting regulations were essentially the same for those two years, both the number of duck stamps sold and the number of successful hunters were lower for the 1996

season. This does not support the contention by some that increasing the number of duck hunting zones will recruit and retain duck hunters. However, it is likely that other societal factors contributed to the decline in duck hunter numbers. Despite this decline in hunter numbers, the number of ducks harvested per duck stamp purchaser and ducks harvested per successful hunter increased (Table 1). The reason for this increase is unclear. However, the combination of an increase in the number of zones and number of season splits has resulted in an increase in the number of exposure days that migrating ducks experience from early fall to winter (Figures 2-13). Also, if some hunters choose to travel to multiple zones, they will be able to hunt for more days than if they choose to hunt in one zone. Unfortunately, there is no way to determine the extent to which increasing number of exposure days was responsible for the increase in harvest per successful duck hunter. Changes in State duck zones and splits since 1991 are presented in Table 2.

We examined the relationship between the number of zones in a state and the number of duck exposure days during the regular duck season by comparing these two variables in 1978 and 1996 for each Flyway. The length of the regular duck season was similar in both years (i.e. 50 days in Atlantic Flyway); however the number of duck zones had increased in many states during the period from 1978-1996. The slope from linear regression was used to estimate the percent change in duck exposure days that would occur if a new duck zone is added within a state's boundary. We defined an exposure day as any day in which all or some portion of a state was open to duck hunting during the regular season. For each Flyway except the Central (P=0.19), the number of exposure days was significantly related to the number of zones in a state (P<0.02). For the Central Flyway the percent change in duck exposure days was calculated for states that added one zone between 1978 and 1996. For each Flyway, the average percent change in exposure days per zone addition was calculated.

The above analysis was used to estimate the impact on duck harvest that would result if the Service's split/zones criteria were changed to allow more zones. The number of duck exposure days during the 2009 regular season was determined for each state in each Flyway. For each state, the number of exposure days was multiplied by the flyway-specific proportional increase in days expected if a zone was added to that state. In addition, the number of ducks harvested per exposure day was estimated by dividing each state's 2009 regular season total duck harvest by the total number of duck exposure days in the state for that year.

The expected increase in harvest resulting from the addition of a zone in each state was determined by multiplying the number of ducks harvested per exposure day by the additional exposure days per zone addition. The expected increase in total duck harvest was determined for each Flyway and nationally, and compared to the estimated Flyway and national harvest in 2009. The percent increase in the number of exposure days per zone addition ranged from 5 to 26% among the four Flyways (Table 3). The corresponding increase in harvest resulting from a zone addition ranged from 2-25% among Flyways, and was 17% nationally (Table 3). It should be noted that this estimate is based on the assumption that all eligible States add one duck zone within their boundaries. Because some States do not maximize the number of zones currently allowed, it is likely that not all States will avail themselves of the opportunity to add zones if the zoning criteria are modified. Therefore, it is likely that the national increase in harvest due to a change in the zoning criteria will be less than 17%.

Harvest strategies

We anticipate that the species composition of the duck harvest will not change appreciably as a result of proposed changes to the zoning criteria. However, early-migrating species such as teal and wood ducks may be affected by zone changes to a lesser extent in northern latitudes. The mallard dominates the harvest in all four Flyways and we expect that its harvest ranking will remain the same if changes in zoning criteria result in increased duck harvest. The harvest of mallards is regulated through the adaptive management (AHM) protocol set up for eastern, mid-continent and western stocks of the species (USDI 2010). The AHM approach provides a framework for making objective decisions in a setting of incomplete knowledge concerning waterfowl population dynamics and regulatory impacts. This approach explicitly recognizes that the consequences of hunting regulations cannot be predicted with certainty, and provides a framework for making objective decisions in the face of that uncertainty (Williams and Johnson 1995). Inherent in the adaptive approach is an awareness that management performance can be maximized only if regulatory effects can be predicted reliably. Thus, adaptive management relies on an iterative cycle of monitoring, assessment, and decision-making to clarify the relationships among hunting regulations, harvests, and waterfowl abundance.

In regulating waterfowl harvests, managers face four fundamental sources of uncertainty (Nichols et al. 1995, Johnson et al. 1996, Williams et al. 1996):

1. Environmental variation - the temporal and spatial variation in weather conditions and other key features of waterfowl habitat; an example is the annual change in the number of ponds in the Prairie Pothole Region, where water conditions influence duck reproductive success;
2. Partial controllability - the ability of managers to control harvest only within limits; the harvest resulting from a particular set of hunting regulations cannot be predicted with certainty because of variation in weather conditions, timing of migration, hunter effort, and other factors;
3. Partial observability - the ability to estimate key population attributes (e.g., population size, reproductive rate, harvest) only within the precision afforded by extant monitoring programs; and
4. Structural uncertainty - an incomplete understanding of biological processes; a familiar example is the long-standing debate about whether harvest is additive to other sources of mortality or whether populations compensate for hunting losses through reduced natural mortality. Structural uncertainty increases contentiousness in the decision-making process and decreases the extent to which managers can meet long-term conservation goals.

AHM was developed as a systematic process for dealing objectively with these uncertainties. The key components of AHM include (Johnson et al. 1993, Williams and Johnson 1995):

1. A limited number of regulatory alternatives, which describe Flyway-specific season lengths, bag limits, and framework dates;
2. A set of population models describing various hypotheses about the effects of harvest and environmental factors on waterfowl abundance;
3. A measure of reliability (probability or “weight”) for each population model; and
4. A mathematical description of the objective(s) of harvest management (i.e., an “objective function”), by which alternative regulatory strategies can be compared.

These components are used in a stochastic optimization procedure to derive a regulatory strategy. A regulatory strategy specifies the optimal regulatory choice, with respect to the stated management objectives, for each possible combination of breeding population size, environmental conditions, and model weights. The setting of annual hunting regulations then involves an iterative process:

1. Each year, an optimal regulatory choice is identified based on resource and environmental conditions, and on current model weights;
2. After the regulatory decision is made, model-specific predictions for subsequent breeding population size are determined;
3. When monitoring data become available, model weights are increased to the extent that observations of population size agree with predictions, and decreased to the extent that they disagree; and
4. The new model weights are used to start another iteration of the process.

By iteratively updating model weights and optimizing regulatory choices, the process should eventually identify which model is the best overall predictor of changes in population abundance. The process is optimal in the sense that it provides the regulatory choice each year necessary to maximize management performance. It is adaptive in the sense that the harvest strategy “evolves” to account for new knowledge generated by a comparison of predicted and observed population sizes.

The AHM protocol is based on the population dynamics and status of three mallard stocks. Mid-continent mallards are defined as those breeding in the traditional survey strata 13–18, 20–50, and 75–77 plus mallards breeding in the states of Michigan, Minnesota, and Wisconsin (state surveys). The prescribed regulatory alternative for the Mississippi and Central Flyways depends exclusively on the status of these mallards. Eastern mallards are defined as those breeding in survey strata 51–54 and 56 and breeding in the states of Virginia northward into New Hampshire (Atlantic Flyway Breeding Waterfowl Survey [AFBWS]). The regulatory choice for the Atlantic Flyway depends exclusively on the status of these mallards. Western mallards are defined as those birds breeding in WBPHS strata 1–12 and those birds breeding in the states of California and Oregon (state surveys). The regulatory choice for the Pacific Flyway depends exclusively on the status of these mallards.

The status of mallards determines the overall season length and daily duck bag limit for a particular flyway, with additional restrictions on daily bag limit for some species (see below). Consequently, the season length and daily bag limit for most other duck species change in tandem with mallard regulations. Potential changes in mallard population status due to increased harvest resulting from an increase in the number of duck zones will be swiftly taken into consideration the following year and appropriate hunting regulations (i.e. season length, bag limit) will be chosen. Any restrictions in season length intended to reduce mallard harvest as a result of adding zones will have concomitant reductions in harvest for other species, including those for which harvest strategies do not exist. We believe the AHM protocol will allow us to respond swiftly to any change in status of mallards (and thus most other duck species) as a result of changes to the zoning/splits criteria.

There are several duck species that present unique management challenges and for which species-specific harvest strategies have been developed (USDI 2010). For example, the canvasback population has fluctuated at relatively low levels and the harvest strategy developed for the species has an objective of achieving a spring population of 500,000 birds (U.S. Fish and Wildlife Service 2008b). The strategy provides for: (1) an open season with a daily bag and possession limit of 1 and 2 canvasbacks (either sex), respectively, for the entire regular duck season whenever the allowable harvest projects a breeding population in the subsequent year of $\geq 500,000$ canvasbacks. If the subsequent year's predicted breeding population equals or exceeds 725,000, the option for a daily bag limit of 2 canvasbacks (either sex) and a possession limit of 4 will be offered based on revisions to the strategy in 2008; (2) a partial season at the "restrictive" package level (currently 30 days in the Atlantic and Mississippi Flyways, 39 days in the Central Flyway, and 60 in the Pacific Flyway) within the regular duck season whenever a full season projects a breeding population in the subsequent year of less than 500,000 but a partial season projects a breeding population $\geq 500,000$ birds; and (3) a closed season in all Flyways whenever the allowable harvest under both the full and partial seasons project a breeding population in the subsequent year of less than 500,000. We believe the canvasback strategy will adequately protect the status of canvasbacks in the face of any increase in harvest resulting from changes to the zones/splits criteria. The distribution of canvasback harvest in States that have grandfathered zone/split arrangements will mitigate some of the increase in harvest that may result from changing the zone/split criteria. For example, 65% of the canvasback harvest in the Pacific Flyway (outside of Alaska) occurs in California, which likely will not change their grandfathered zoning arrangement of 5 zones. Therefore, the increase in total duck harvest in the Pacific Flyway that is predicted to occur with a change in the zoning criteria will tend to affect other species to a greater extent than canvasbacks. Similarly, increases in canvasback harvest will be minimized in other Flyways due to grandfathered zoning arrangements in States that account for canvasback harvest (e.g. 15% of canvasback harvest in grandfathered states in the Atlantic Flyway, 9% in the Central Flyway, and 5% in the Mississippi Flyway).

In most cases, species-specific harvest strategies have been developed to address long-term population declines [e.g. Northern pintail (U.S. Fish and Wildlife Service 2010c), scaup (Boomer et al. 2007), and black duck (Black Duck International Management Group 2008)]. An AHM approach to managing black ducks is currently being developed (Black Duck International

Management Group 2008). In the meantime, the Black Duck International Management Group has developed an interim harvest strategy. The overall goal of the interim strategy is to maintain the population at or above current levels, i.e., the 1998-2007 average of the entire composite survey area (717,450 black ducks). To achieve this goal, Canada and the U.S. will independently determine appropriate regulations that are designed to achieve either no change in harvest or the change required to meet established criteria. The breeding-ground survey data (from the entire composite survey area) drives management actions, using the 3-year moving average of the total survey area compared to the long-term (1998-2007) average. The decision criteria for regulatory changes would be a 15% difference between the 3-year moving average and the 1998-2007 long-term average. For every regulatory cycle there will be 2 possible tests to determine the appropriate regulatory action: a test for restriction and a test for liberalization. Tests are framed from the negative presumption perspective with a Type I error rate α of 0.10. When the decision criteria call for a regulatory change, the required proportional change in harvest will be of the same magnitude as the population-based threshold for determining if a regulatory change is warranted (i.e., 15% change in harvest). Harvest will be estimated from harvest survey data in Canada and the US. When no regulatory changes are required, harvest regulations set in each country will be expected to be harvest-neutral. That is, any harvest regulations changes would be expected to have no significant impact on realized harvest. A harvest-neutral proposal would be one in which the predicted country-specific total harvest of black ducks would fall within the 90% confidence interval of the mean 2002-2006 country-specific total harvest. The 2002-2006 period was chosen to reflect the most recent levels of black duck harvest. The goal of the black duck harvest strategy is to share the harvest equally between the U.S. and Canada. However, recognizing incomplete control of harvest through regulations, the strategy allows realized harvest in either country to vary between 40 and 60%. Parity will be assessed from a running average of country-specific total harvest proportions for the same period length as the harvest-neutral regulations criteria (5 years). If the average proportion of harvest in a country exceeds 60%, the Black Duck International Management Group will make the decision regarding how to proceed. Country-specific harvest proportions will be calculated from harvest surveys using total black duck harvest.

Parity in black duck harvest is assessed according to the 5-year moving average of the proportional harvest in each country. Over the most recent 5 years for which harvest data are available (2004–2008), the average proportion of the total harvest in the U.S. was 0.5602 and 0.4398 in Canada. Since this falls within the accepted bounds of 60:40, no consultation is necessary with the Black Duck International Management Group. Recognizing the importance of maintaining the long-term data sets that support the above harvest strategy, Canada and the U.S. will maintain harvest surveys (parts-collection and questionnaire), the Eastern Waterfowl Breeding Population Survey, and pre-season banding.

As an example of how the black duck harvest strategy operates, the following calculations were used to set harvest regulations for the 2010-11 hunting season: The hierarchical composite model estimate of American black ducks for 2009, over the entire eastern survey area was 701,000 (95% credibility interval 571,200– 941,000). The Bayesian methods used for estimation of the hierarchical models are such that the entire time series is re-estimated every year. Thus, historical estimates reported here may differ slightly from those published in previous years. The current harvest strategy considers restrictions or liberalizations if the 3-year running average is

determined to be 15% above or below the 1998–2007 average with a Type I error rate of 0.10. Based on current estimates, the 1998–2007 average was 717,450, and the upper and lower critical population thresholds for regulatory change are 825,067 and 609,832, respectively. The current 3-year running average (2007–2009) is $719,133 + [SE] 30,122$. The test for possible regulatory restriction indicates that the 3-year running average is not significantly below the lower population threshold, therefore restrictions are not necessary. Similarly, the test for possible regulatory liberalization indicates that the 3-year average is not significantly above the upper threshold, therefore liberalization should not be considered.

Because no black duck regulatory changes would be called for, harvest regulations in each country will be expected to be harvest-neutral. Black ducks are harvested almost entirely within the Atlantic and Mississippi Flyways. Although we predict that a change in the zones and split criteria may result in a maximum Flyway-wide increase in total duck harvest of 21-25% in these Flyways, we believe the impacts to black duck harvest will be substantially less than that. In the Atlantic Flyway, 74% of the total black duck harvest occurs in only six states (NY, MD, NJ, VA, PA, and DE). Of those six states, three currently have grand-fathered zone-split configurations (NY, NJ, and PA) and are not expected to alter their configuration if the Service modifies the criteria. Therefore, we expect that black duck harvest in those States would remain un-changed and the Flyway wide impact to black ducks would be minimal. This is especially important because the Atlantic Flyway accounts for 73% of the U.S. black duck harvest which will likely ensure that regulations in the U.S. would be harvest-neutral for the species. Similarly, in the Mississippi Flyway the top two black duck harvest States (MI and OH) have grand-fathered zoning arrangements and account for 43% of the Flyway's black duck harvest. Therefore, we do not expect a 25% increase in black duck harvest if a change in zoning criteria occurs. The Service believes the interim harvest strategy will adequately protect the status of black ducks in the face of any increase in harvest resulting from changes to the zones/splits criteria.

Mottled ducks have been a species of management concern in the Central and Mississippi Flyways. Although a mottled duck harvest strategy has not been developed, the Service recently requested the Central and Mississippi Flyways to reduce harvest of the Western Gulf Coast Population of the species by up to 30% (74 FR 48824). Non-mallard duck species for which harvest strategies have been developed, or for which restrictive regulations have been put in place (e.g. mottled ducks), typically have lower daily bag limits intended to reduce harvest. These lower bag limits will tend to dampen any effect on harvest that may result from increasing the number of duck zones in a Flyway.

Socioeconomic impacts

As with environmental consequences, it also is difficult to precisely predict the socioeconomic impacts of regulatory changes. Limited knowledge precludes detailed, quantitative assessments. Consequently, certain assumptions regarding impacts are necessary, and the impacts must be discussed in general terms. Some important assumptions are:

1. The major socioeconomic impacts of annual waterfowl hunting regulations on participants in waterfowl hunting.

2. Factors not related to regulations (e.g., hunter success, availability of birds, hunting sites, weather, and habitat) will affect hunter participation and therefore also affect the socioeconomic environment.
3. Capital or fixed expenditures (e.g., purchase of guns) are likely to be affected more by hunter numbers, while variable costs (e.g., purchase of fuel) are probably more closely related to hunter days afield.
4. The total economic value of waterfowl hunting represents a negligible portion of the national product.

In 2008, the Service conducted analyses to determine the amount of consumer surplus associated with waterfowl hunting (USFWS 2008). Consumer surplus is an estimate of an individual's willingness to pay to hunt waterfowl. Flyway-specific estimates of daily consumer surplus were used to determine the economic value of the baseline (no migratory bird hunting regulations) and the estimated effects of changes brought about by different regulatory alternatives. For example, the effects of changes brought about by increasing season length from moderate regulations (45 days, 5 bird daily bag limit) to liberal regulations (60 days, 6 bird daily bag limit) were estimated. The Service does not believe that the proposed changes in zone/split guidelines will result in impacts of the same magnitude as those anticipated by changing from moderate to liberal regulations. However, by examining the effects of gross regulatory changes (i.e., change from moderate to liberal regulations) the Service can develop a perspective of the magnitude of changes that may result from relatively minor changes in regulations such as the zones/splits guidelines.

Under moderate hunting regulations (e.g., 45 days in Atlantic Flyway), duck harvests would likely be about 13.0 million (based on the mean annual duck harvest in the United States during 1979–84 and 1995–96 when similar regulations to this alternative were issued). Compared to harvest expected under liberal regulations (e.g., 60 days in Atlantic Flyway) of about 13.8 million ducks, harvest would likely be increased by 0.8 million ducks or fewer by changing from moderate to liberal regulations.

The national estimate of the consumer surplus expected under liberal regulations (e.g., 60 days in Atlantic Flyway) ranges from \$274 to \$362 million (2007\$) annually, with a mid-point estimate of \$317 million (USFWS 2008). Duck hunter expenditures are expected to be about \$1.2 billion (2007\$) under liberal regulations, similar to that estimated during the 2008 hunting season when similar regulations were issued. Under moderate hunting regulations, the national mid-point estimate of the consumer surplus is expected to be \$277 million (2007\$) annually (USFWS 2008). Duck hunter expenditures likely would be lower than the \$1.2 billion (2007\$) expected under liberal regulations. This would be a result of reduced season length by 14–21 days (depending on the Flyway) and the likely reduction in active hunters numbers compared to liberal regulations. As mentioned earlier, the addition of a duck zone in all States is expected to increase the number of duck exposure days in each Flyway (Table 3). This increase is due to the fact that States are allowed to distribute a given number of hunting days for a certain season length across more zones. Therefore, duck hunter expenditures would likely increase as well. However, because it is unlikely that all hunters will choose to hunt in all zones, the percent increase in duck hunter expenditures will likely be lower than the percent increase in expected harvest (i.e. lower than 17%).

The April 2010 release of oil into the Gulf of Mexico following the explosion and sinking of the Deepwater Horizon mobile offshore drilling unit and impacts to Gulf wetlands and wildlife has led to concerns about the potential for increased mortality in waterfowl and other migratory game birds, particularly in the fall and winter when local populations increase. However, it is important to remember that waterfowl migration and habitat use are highly variable from year to year, not only at the Flyway level but at regional and local levels, and dependent on any number of environmental factors. It is also important to recognize that populations of many species of North American waterfowl naturally undergo large population fluctuations in response to variability in breeding habitat conditions across their range, especially within the important prairie-parkland region. In fact, during the drought-stricken years of the 1980s and early 1990s, many North American waterfowl species declined to population sizes less than one-half those recently experienced as a result of natural declines in productivity and ongoing mortality. Fortunately, waterfowl management has a rich and successful history of monitoring and assessment programs which provide annual updates on the status and health of waterfowl populations. Programs such as the May aerial breeding population survey, the continental bird banding program, the mid-winter waterfowl surveys, and the hunter harvest surveys, among others, all provide important pieces of information on the population status, productivity, and distribution of important waterfowl species. These data are integral in the process of establishing hunting regulations for waterfowl and other migratory game birds. Through the Adaptive Harvest Management process we currently utilize to establish waterfowl seasons, and other associated species-specific harvest strategies, monitoring and assessment data are explicitly linked to regulatory decision making, ensuring that appropriate regulatory actions will be taken if warranted by changes in continental population status due to cumulative impacts of the oil spill in the face of potential changes to the Service's criteria on zones and splits.

Recently obtained results of annual spring waterfowl population surveys indicate that population sizes of most duck species and breeding habitat conditions were good in 2010. While we believe that regulatory restrictions are currently unnecessary, we remain very concerned about both the short and long-term impacts of the oil spill on migratory birds, their habitats, and the resources upon which birds depend. There remains considerable uncertainty regarding the short-term and long-term impacts the spill will have on waterfowl and other migratory game birds that utilize the impacted region during all or part of their annual life cycle.

Working with conservation partners, we are preparing to implement a range of on-the-ground habitat conservation or management measures near the oil-impact area intended to minimize the entrance of oil into managed habitats along the Gulf and to enhance the availability of food resources outside the oil impact area. Simultaneous with immediate response efforts, we are also working with partners to assess potential pathways for long-term acute and sub-lethal effects of the BP oil spill on the full suite of migratory birds utilizing Gulf (or other impacted) habitats during some portion of their life cycle. Effects may result from direct exposure of birds to oil or to the long-term accumulation of polycyclic aromatic hydrocarbons or other toxins at levels sufficient to cause physiological disorders impacting productivity or survival. The intent of this assessment is to assist in identifying potential mitigation and conservation measures as well as long-term monitoring and assessment needs for migratory birds.

In summary, from both a National and Flyway harvest-management perspective, we intend to respond to the Deepwater Horizon oil spill as we would any other non-hunting factor with potentially substantial effects on mortality or reproduction (e.g., hurricane, disease, prairie drought, habitat loss), by monitoring abundance and vital rates of waterfowl and other migratory game birds and adjusting harvest regulations as needed on the basis of existing harvest strategies. We believe this is the most prudent course of action, and further, firmly believe that our existing monitoring and assessment programs are sufficient to help safeguard the long-term conservation of any potentially-affected waterfowl or other migratory game birds due to the cumulative impacts of the oil spill and changes to the criteria for zones and splits. As of December 14, 2010, less than 50 ducks (all species combined) had been reported in the Bird Impact Report on the Service's Deepwater Horizon Oil Spill Response website. Therefore, we believe that our proposed action with regard to the criteria for zones and splits will not negatively impact duck populations.

A summary of the anticipated consequences for the alternatives is presented in Table 4.

Alternative 1: Retain the current zoning and splits guidelines (No action):

Environmental Impacts

Ducks

Under Alternative 1, duck harvests would likely be about 13.8 million (based on the mean annual duck harvest in the United States during 1997–2008 when similar regulations to this alternative were issued [i.e., 60 days, 6 bird daily bag limit]). By maintaining the current zoning and splits guidelines the Service anticipates no change in mean annual duck harvest. Species-specific harvest strategies will remain in place in order to maintain harvest levels that are commensurate with the population status of the species of interest.

Endangered Species

The Service obtains a biological opinion pursuant to Section 7 of the Endangered Species Act prior to establishing annual hunting regulations for migratory birds. The regulations promulgated as a result of this consultation remove or alleviate chances of conflict between seasons for migratory game birds and threatened and endangered species and their critical habitats. The Service conducts Section 7 consultation before establishing any special hunting seasons for any migratory game bird in the contiguous United States, Alaska, Hawaii, Puerto Rico, and the Virgin Islands. This consultation ensures that there will be no likelihood of jeopardy to a listed species or its habitat.

Socioeconomic Impacts

Hunters

Hunter numbers would probably remain near 2008 levels when similar regulations to this alternative were issued. Although many hunters would likely support the continuation of current zoning and splits guidelines, another portion of the duck hunting public would continue to request liberalization of the guidelines. The national estimate of the consumer surplus expected under this alternative ranges from \$274 to \$362 million (2007\$) annually, with a mid-point estimate of \$317 million (USFWS 2008).

Nonhunters and Nongovernmental Organizations

The non-hunting public has expressed no opinion about zoning. Within this large group, individuals opposed to hunting will likely object to zoning if they believe it will enhance or encourage hunting. Others favor more restrictive regulations, and some believe that all hunting should be discontinued.

Governments

Flyway Councils do not support this alternative, and support Alternative 2 instead. Duck hunter numbers would likely be similar to that of 2008, and this would maintain the current level of revenues to the States and the Service through sales of waterfowl hunting licenses and duck stamps.

Businesses

This alternative would maintain the current level of hunter expenditures compared to the other alternatives. Duck hunter expenditures are expected to be about \$1.2 billion (2007\$), similar to that estimated during the 2008 hunting season when similar regulations to this alternative were issued.

Alternative 2: Modify the current zones and splits guidelines to allow 2 additional options (Proposed action):

Environmental Impacts

Ducks

Under Alternative 2, the number of days in which ducks are exposed to hunting throughout a hunting season will likely increase from the current level (Figures 2-13). Regression analyses presented earlier indicated that the addition of one duck zone in all States would potentially increase the number of duck exposure days by 5-25%, depending on Flyway. Furthermore, national duck harvest would potentially increase up to 17% (approximately 2.2 million birds)

above the “no change” alternative with the addition of one zone in all States. However, this should be viewed as a maximum estimate of the potential increase in harvest that may result. It should be noted that many States currently do not take full advantage of the maximum number of zones/splits they are allowed under existing criteria. Therefore, if zoning criteria are liberalized under this alternative it is likely that many States will not alter their zone configuration by adding a zone. Therefore, if not all States choose to add a zone, the magnitude of the increase in harvest will be lower than the maximum we have projected.

Under this alternative, species-specific harvest strategies (see page 14) will remain in place in order to maintain harvest levels that are commensurate with the population status of the species of interest. Such strategies generally utilize reduced daily bag limits that will tend to minimize any potential harvest impacts that may result from liberalizing zoning criteria. Thus even we estimate that some flyways like the Atlantic and Mississippi could potentially experience an increase in exposure days of 21 and 25%, respectively, such species-specific harvest strategies, by design, will mitigate impacts to those species. If needed, additional harvest restrictions can be implemented in the future for these species should a change in their status warrant it. Other species, such as mallards and gadwalls which have experienced substantial increases above the long-term average, would likely consist of a greater proportion of duck species harvested in the Atlantic and Mississippi Flyways from the increase in exposure days.

Endangered Species

The Service obtains a biological opinion pursuant to Section 7 of the Endangered Species Act prior to establishing annual hunting regulations for migratory birds. The regulations promulgated as a result of this consultation remove or alleviate chances of conflict between seasons for migratory game birds and threatened and endangered species and their critical habitats. The Service conducts Section 7 consultation before establishing any special hunting seasons for any migratory game bird in the contiguous United States, Alaska, Hawaii, Puerto Rico, and the Virgin Islands. This consultation ensures that there will be no likelihood of jeopardy to a listed species or its habitat.

Socioeconomic Impacts

Hunters

Historically, the number of duck hunters has not increased commensurate with the increase in the number of duck zones across the nation (Table 1). Therefore, the Service does not believe this alternative would recruit new hunters, and therefore hunter numbers would probably remain similar to 2008 levels. However, if increasing the number of zones/splits encourages current hunters to spend more days afield, an attendant increase in expenditures would be expected. Therefore, the national estimate of the consumer surplus expected under this alternative may be higher than the estimate of \$317 million annually (range of \$274 to \$362 million [2007\$]) that would be expected under the “no change” alternative above. However, we believe the percent increase in consumer surplus would be less than 17% (see page 13).

Nonhunters and Nongovernmental Organizations

The non-hunting public has expressed no opinion about zoning. Within this large group, individuals opposed to hunting will likely object to zoning if they believe it will enhance or encourage hunting. Others favor more restrictive regulations, and some believe that all hunting should be discontinued.

Governments

Flyway Councils support this alternative. Duck hunter numbers would likely be similar to that of 2008, which would maintain the current level of revenues to the States and Service through sales of waterfowl hunting licenses and duck stamps.

Businesses

This alternative potentially would increase hunter expenditures above the current level of \$1.2 billion (2007\$). However, we believe the increase will be less than 17% (see page 13).

Alternative 3: Eliminate restrictions on the number of zones in a State with varying sub-alternatives for the number of splits:

Environmental Impacts

Ducks

Under all sub-alternatives of Alternative 3, the number of days in which ducks are exposed to hunting throughout a hunting season will likely increase from the current levels shown in Figures 4, 7, 10 and 13. As described earlier, compared to the no action alternative we anticipate that total duck harvest will increase 17% nationally if all States add one duck zone within their boundaries. If restrictions on the number of zones is eliminated, some States may opt to add more than one duck zone. For example, if all States add 2 duck zones we would expect total duck harvest to increase approximately 34% nationally (i.e. twice the expected increase in harvest from adding one zone). However, because many States currently do not avail themselves of having the maximum allowed number of zones, we do not believe that all States will add two or more duck zones if restrictions are eliminated. Therefore, if restrictions on the number of duck zones are eliminated, the total increase in harvest would likely be below 34%.

The linear regression analyses presented earlier (page 11) already include the effects of season splits on harvest. Because it is likely that some States will not avail themselves of the maximum number of zones, the range of sub-alternatives presented below will likely have impacts that are already accounted for in the estimated impacts of changes in zones.

Sub-alternative A. No splitting allowed – This sub-alternative would likely partially offset any increase in duck harvest that would result from eliminating restrictions on the number of zones within a state.

Sub-alternative B. Maximum of 3 splits per zone – This sub-alternative would allow more exposure days (and thus, potentially more harvest) than under sub-alternative A, and more exposure days than would be allowed under Alternatives 1 and 2.

Sub-alternative C. No restriction on the number of splits – This sub-alternative would maximize the number of allowable days during which ducks are exposed to hunting, and therefore would maximize the effects of zones and split seasons on duck harvest. Total duck harvest would be higher than sub-alternatives A and B of this alternative. Additionally, it is likely that total duck harvest under this subalternative would be greater than that anticipated under the proposed Alternative 2.

Under this alternative, species-specific harvest strategies (see page 14) will remain in place in order to maintain harvest levels that are commensurate with the population status of the species of interest. Such strategies utilize reduced daily bag limits that will tend to minimize any potential harvest impacts that may result from liberalizing zoning criteria.

Endangered Species

The Service obtains a biological opinion pursuant to Section 7 of the Endangered Species Act prior to establishing annual hunting regulations for migratory birds. The regulations promulgated as a result of this consultation remove or alleviate chances of conflict between seasons for migratory game birds and threatened and endangered species and their critical habitats. The Service conducts Section 7 consultation before establishing any special hunting seasons for any migratory game bird in the contiguous United States, Alaska, Hawaii, Puerto Rico, and the Virgin Islands. This consultation ensures that there will be no likelihood of jeopardy to a listed species or its habitat under this alternative or any of the sub-alternatives.

Socioeconomic Impacts

Hunters

Historically, the number of duck hunters has not increased commensurate with the increase in the number of duck zones across the nation (Table 1). Therefore, the Service does not believe this alternative would recruit new hunters, and therefore hunter numbers would probably remain similar to 2008 levels. However, if increasing the number of zones encourages current hunters to spend more days afield, an increase in expenditures would be expected. Therefore, the national estimate of the consumer surplus expected under this alternative may be higher than the estimate of \$317 million annually (range of \$274 to \$362 million [2007\$]) that would be expected under the “no change” alternative above. However, we believe the percent increase in consumer surplus would be less than 17% (see page 13).

Sub-alternative A. No splitting allowed – This sub-alternative would likely partially offset any increase in hunter days afield and consumer surplus that would result from eliminating restrictions on the number of zones within a State.

Sub-alternative B. Maximum of 3 splits per zone – This sub-alternative would provide the potential for more hunter days afield and consumer surplus than sub-alternative A or Alternatives 1 and 2. Thus, more expenditures and a greater consumer surplus would be expected than would be realized under sub-alternative A or Alternatives 1 and 2.

Sub-alternative C. No restriction on the number of splits – This sub-alternative would maximize potential hunter days afield, therefore it would result in the maximum expenditures and consumer surplus that could be expected from any zone and split season configuration. However, no information is available to allow an estimation of the impacts of zoning and split seasons on hunter behavior (e.g., increases in hunter days afield and expenditures that would be attributable to zone and split season regulations).

Nonhunters and Nongovernmental Organizations

The non-hunting public has expressed no opinion about zoning or any of the sub-alternatives involving splitting. Within this large group, individuals opposed to hunting will likely object to zoning and split seasons if they believe it will enhance or encourage hunting. Others favor more restrictive regulations, and some believe that all hunting should be discontinued.

Sub-alternative A. No splitting allowed – The non-hunting public likely would favor this sub-alternative versus sub-alternatives B and C.

Sub-alternative B. Maximum of 3 splits per zone – The non-hunting public would favor this sub-alternative more than sub-alternative C, but likely would favor sub-alternative A more than B.

Sub-alternative C. No restriction on the number of splits – This would be the least preferred sub-alternative of the non-hunting public.

Governments

Some Flyway Councils likely would not support this alternative due to the increased complexity of hunting regulations. However, some States may support this alternative. Duck hunter numbers would likely be similar to that of 2008, which would maintain the current level of revenues to the States and Service through sales of waterfowl hunting licenses and duck stamps.

Sub-alternative A. No splitting allowed – Some Flyway Councils and States likely would favor this sub-alternative in order to offset the increase in regulations complexity that would result from eliminating restrictions on the number of zones within a State.

Sub-alternative B. Maximum of 3 splits per zone – Some Flyway Councils would likely favor this sub-alternative more than sub-alternative A.

Sub-alternative C. No restriction on the number of splits – Some Flyway Councils likely would not favor this sub-alternative due to the fact that it would maximize complexity of hunting regulations. However, some State agencies may favor this sub-alternative.

Businesses

This alternative potentially would increase hunter expenditures above the current level of \$1.2 billion (2007\$). However, we believe the increase will be less than 17% (see page 13).

Sub-alternative A. No splitting allowed – This sub-alternative would likely partially offset any increase in hunter days afield and expenditures that would result from eliminating restrictions on the number of zones within a state.

Sub-alternative B. Maximum of 3 splits per zone – This sub-alternative would provide the potential for more hunter days afield, and thus more expenditures, than sub-alternative A or Alternatives 1 and 2.

Sub-alternative C. No restriction on the number of splits – This sub-alternative would maximize potential hunter days afield, therefore it would result in the maximum expenditures that could be expected from any zone and split season configuration. However, there is no information available to allow an estimation of the impacts of zoning and split seasons on hunter behavior (e.g., increases in hunter days afield and expenditures that would be attributable to zone and split season regulations).

Alternative 4: Eliminate the use of zones and splits:

Environmental Impacts

Ducks

Under Alternative 4, duck harvests likely would decrease due to the inability of States to configure zones and alter the timing of split seasons to take advantage of duck migration within State boundaries. Just as total duck harvest is expected to increase 17% with the addition of one duck zone in all States, we would expect that eliminating one duck zone in all States would reduce harvest by up to 17%. However, since many States currently have only one duck zone we would not expect harvest to be reduced by the full 17%. Under this alternative, species-specific harvest strategies (see page 14) will remain in place in order to maintain harvest levels that are commensurate with the population status of the species of interest.

Endangered Species

The Service obtains a biological opinion pursuant to Section 7 of the Endangered Species Act prior to establishing annual hunting regulations for migratory birds. The regulations promulgated as a result of this consultation remove or alleviate chances of conflict between seasons for migratory game birds and threatened and endangered species and their critical habitats. The Service conducts Section 7 consultation before establishing any special hunting seasons for any migratory game bird in the contiguous United States, Alaska, Hawaii, Puerto Rico, and the Virgin Islands. This consultation ensures that there will be no likelihood of jeopardy to a listed species or its habitat.

Socioeconomic Impacts

Hunters

Hunter numbers would likely decline somewhat under this alternative. Removal of zones intended to provide equitable hunting opportunity within a State would likely create dissatisfaction among a certain proportion of hunters and potentially cause them to either reduce the number of days they hunt or discontinue hunting altogether. Therefore, the consumer surplus expected under this alternative would likely be less than the mid-point estimate of \$317 million expected under the “no change” alternative (USFWS 2008).

Nonhunters and Nongovernmental Organizations

The non-hunting public has expressed no opinion about zoning. Within this large group, individuals opposed to hunting will likely object to zoning if they believe it will enhance or encourage hunting. Others favor more restrictive regulations, and some believe that all hunting should be discontinued.

Governments

Flyway Councils do not support this alternative, and support Alternative 2 instead. Duck hunter numbers would likely decline from 2008 levels, and this would decrease revenues to the States and Service through sales of waterfowl hunting licenses and duck stamps.

Businesses

This alternative would likely decrease hunter expenditures compared to the other alternatives. Information is not currently available to allow an estimation of the loss in revenues. However, duck hunter expenditures would likely be less than the \$1.2 billion (2007\$) expected under the “no change” alternative.

CONSULTATION AND COORDINATION

A well-established process for public involvement in decision-making on duck hunting regulations includes a series of public meetings and notices published in the *Federal Register* throughout the year leading to establishment of specific regulations in September prior to the onset of hunting (see Administrative Process section under Purpose and Need for Action; also complete details on the process can be found in DSEIS 10).

Prior to developing proposed regulations, information from current biological surveys was made available to management agencies and the public. The Canadian Wildlife Service and Provinces of Canada participated in the biological surveys and provided assessments of populations and habitat from their perspective. Results of current biological surveys and other technical data were presented and reviewed at meetings held in conjunction with the four Flyway Council meetings in March and July. Participants at these meetings included members and consultants from the Flyway Councils, biologists and administrators from State conservation agencies, and other interested persons. The Flyway Councils developed regulatory recommendations, which were presented to the Service for consideration and action. The Service Regulations Committee subsequently met to formulate proposed regulations after considering current biological information, socioeconomic effects, and comments and recommendations received by the Service. Proposed regulations were published in the *Federal Register* and comments were invited from interested persons and organizations to ensure that the final regulations are as responsive to the need for action as possible. After considering comments received by the Service, final regulations will be announced in 2011.

PUBLIC COMMENTS ON THE DRAFT ENVIRONMENTAL ASSESSMENT AND SERVICE RESPONSE

Comments from Flyway Councils

The Atlantic Flyway Council recommended allowing States two periods for selecting their zone and split options: spring 2011 for currently offered options, and spring 2012 for possible additional available options.

The Mississippi Flyway Council urged us to provide new options for zones/split-season criteria (i.e., three zones with two splits or four zones) for use during the 2011–12 regulations cycle season. They note, however, that some States may not be able to use these new criteria even if they are approved this year because of their internal regulations setting process. Thus, they request extending the open season for States to select zone/split-season configurations through the 2012 regulations cycle.

The Central and Pacific Flyway Councils recommended extending the current open season for States to select regular season zone/split configurations for 2011–15 through June 2012.

Comments from State Agencies

Written Comments: The Mississippi and Central Flyway Councils and the States of Colorado, Illinois, Kansas, Nebraska, New York, Wisconsin and Wyoming expressed their support for our proposal to modify the zones and split season guidelines to allow up to four zones (no splits) and up to three zones with two splits, including all grandfathered arrangements. Both the Councils and States supported the extension of the open season for State selections of zone and split season configurations into the 2012–13 regulatory cycle. The States appreciated our efforts to assess the potential impacts of changes in the criteria on duck harvest, and believed that such impacts would be minimal.

Comments from Non-governmental Organizations and Individuals

Six non-governmental organizations from Illinois and 106 individuals from Illinois, Ohio, and Wisconsin expressed support for the proposed changes to the guidelines. Twenty individuals did not support changing the guidelines, while four individuals supported the abolishment of zone and split season criteria all together.

Service Response: With regard to extending the open season on making changes to zones and splits configurations into the 2012-13 regulatory cycle, we indicated in our proposed rule that we would be amenable to extending the open season into next year (76 FR 19883).

Our Environmental Assessment of the zones and split season guidelines provides an analysis of the anticipated impacts of several management alternatives, including the no change alternative. Our analysis of the preferred alternative to provide additional zoning options indicates the potential impact varies by Flyway. Whereas the anticipated impact on duck harvest may be minimal in some Flyways (e.g. < 3% increase in the Pacific Flyway), the impact in other Flyways may be much higher (e.g. 25% in the Mississippi Flyway). However, we recognize that our analyses are conservative in nature and utilize assumptions that may not be fully realized during implementation of the new guidelines. For example, our analysis assumes that all States that are eligible to make changes to their zones-splits configurations will actually make such changes. However, many States have indicated that they will not avail themselves of new options available to them. This will tend to lower the realized increase in harvest in a particular Flyway.

With regard to abolishing the zones and splits criteria, we disagree. Implementation of the criteria for zones and splits was meant to stem the increasing proliferation of zoning and split seasons, which complicated the assessment of the impacts of harvest regulations on duck populations. We believe the use of zoning criteria provides a certain level of stability to duck regulations, which enhances the assessment of the impacts of other regulations (e.g. season length and bag limit) on duck populations.

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Public and Professional Contacts

Officials in the organizations listed below have been involved in meetings and correspondence with Service personnel in 2009–2010 in regard to their viewpoints and informational needs for waterfowl. Input from all of these sources was considered in development of this document.

State and Territorial Organizations

All State and Territorial wildlife agencies

Regional and National Organizations

Atlantic Flyway Council

Mississippi Flyway Council

Central Flyway Council

Pacific Flyway Council

Canadian Wildlife Service

LITERATURE CITED

Black Duck International Management Group. 2008. Black duck international harvest strategy. Ottawa, Canada. Unpublished report. Available online at <http://www.fws.gov/migratorybirds/newspublicationsreports.html>

Boomer, G.S. F.A. Johnson, M.D. Koneff, T.A. Sanders, and R.E. Trost. 2007. A process for determining scaup regulatory alternatives. U.S. Fish and Wildlife Service, Washington, D.C. 20pp. Available online at <http://www.fws.gov/migratorybirds/newspublicationsreports.html>

Johnson, F. A., B. K. Williams, and P. R. Schmidt. 1996. Adaptive decision-making in waterfowl harvest and habitat management. Proceedings of the International Waterfowl Symposium 7:26-33.

- Martin, E. M., and S. M. Carney. 1977. Population ecology of the mallard. IV. A review of duck hunting regulations, activity, and success, with special reference to the mallard. U.S. Fish and Wildlife Service, Resource Publication 130. 137pp.
- Nichols, J. D., F. A. Johnson, and B. K. Williams. 1995. Managing North American waterfowl in the face of uncertainty. *Annual Review of Ecology and Systematics* 26:177-199.
- U.S. Department of the Interior. 1978. Environmental Assessment: Proposal to establish duck harvest regulations by zones for the sport hunting of ducks. U.S. Fish and Wildlife Service, Washington, D.C. 49pp.
- U.S. Department of the Interior. 1988. Final Supplemental Environmental Impact Statement: Issuance of Annual Regulations Permitting the Sport Hunting of Migratory Birds (FSEIS 88-14). U.S. Fish and Wildlife Service, Washington, D.C. 340pp.
- U.S. Department of the Interior. 1990. Unpublished Report: Zones and split seasons for duck hunting. U.S. Fish and Wildlife Service, Washington, D.C. 44pp.
- U.S. Department of the Interior. 2010. Draft Supplemental Environmental Impact Statement: Issuance of Annual Regulations Permitting the Sport Hunting of Migratory Birds. U.S. Fish and Wildlife Service, Washington, D.C. 296pp.
- U.S. Fish and Wildlife Service. 2008. Economic analysis of the migratory bird hunting regulations for the 2008-2009 season. U.S. Department of the Interior, Washington, D.C. 33pp.
- U.S. Fish and Wildlife Service. 2008b. Canvasback harvest strategy. Unpublished report. U.S. Department of the Interior, Washington, D.C. 6pp.
- U.S. Fish and Wildlife Service. 2010a. Migratory bird hunting activity and harvest during the 2008 and 2009 hunting seasons: preliminary estimates. U.S. Department of the Interior, Washington, D.C. 63pp.
- U.S. Fish and Wildlife Service. 2010b. Waterfowl population status, 2010. U.S. Department of the Interior, Washington, D.C. 78pp.
- U.S. Fish and Wildlife Service. 2010c. Northern Pintail Harvest Strategy 2010. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C.
- Williams, B. K., F. A. Johnson, and K. Wilkins. 1996. Uncertainty and the adaptive management of waterfowl harvests. *Journal of Wildlife Management* 60:223-232.

Table 1. Number of duck hunting zones, duck stamp sales, successful duck hunters, duck harvest, ducks per successful hunter, and ducks per stamp purchaser by Flyway in 1978 and 1996.

Flyways	# of zones		Duck stamp sales		Successful duck hunters		Duck harvest		Ducks per successful hunter		Ducks per stamp purchaser	
	1978	1996	1978	1996	1978	1996	1978	1996	1978	1996	1978	1996
Atlantic	24	32	451,321	291,829	235,300	157,700	1,961,100	1,663,600	8.3	10.5	4.3	5.7
Mississippi	22	35	848,856	695,870	554,200	469,100	6,365,100	6,905,100	11.5	14.7	7.5	9.9
Central	15	25	430,590	298,751	268,700	172,200	2,942,900	2,124,800	11.0	12.3	6.8	7.1
Pacific	18	22	381,302	226,291	250,700	158,400	3,959,200	3,027,500	15.8	19.1	10.4	13.4
U.S. total	79	114	2,112,069	1,512,741	1,308,900	957,400	15,228,300	13,721,000	11.6	14.3	7.2	9.1

Table 3. Estimated increase in duck exposure days and total duck harvest resulting from the addition of one duck zone in all States within each Flyway (compared to 2009 levels).

Flyway	Percent increase in duck exposure days per zone addition	Percent increase in total duck harvest per zone addition
Atlantic	26.5	21.2
Mississippi	25.1	25.1
Central	15.4	12.9
Pacific ¹	4.7	2.4
Total		17.0

¹ Excluding Alaska

Table 4. Summary of environmental consequences of various alternatives for duck zones and split seasons.

Actions	Alternative 1. No Action. Retain current zones and splits criteria	Alternative 2. (Proposed). Modify zones and splits criteria to allow 2 more options.	Alternative 3. Eliminate restrictions on number of zones, with varying subalternative for number of splits	Alternative 4. Eliminate the use of zones and splits.
Number of duck zones within a State	Maximum of 3 zones with no spitting of zones	Maximum of 4 zones (no splitting of zones) Maximum of 3 zones (if splitting allowed)	Unlimited zones	No zoning allowed
Number of splits in a State	Maximum of 3 splits (no zones) or 2 splits (if max of 2 zones)	Maximum of 3 splits (no zones) or 2 splits (if maximum of 3 zones)	Three subalternatives 1. No splitting 2. Max of 3 splits 3. Unlimited splits	No splitting allowed
Status of grandfathered zone/split arrangements	Unchanged	Unchanged	Unchanged	Eliminate grandfathered arrangements
Duck harvest	No change in mean annual harvest	Up to 17% increase in mean annual harvest	Potential increase in mean annual harvest	Potential decrease in mean annual harvest
Endangered species	Unaffected	Unaffected	Unaffected	Unaffected
Socioeconomic	Unchanged	Potential slight increase in hunter expenditures	Potential increase in hunter expenditures	Potential decrease in hunter expenditures

MATRIX OF ZONE/SPLIT OPTIONS FOR DUCK HUNTING

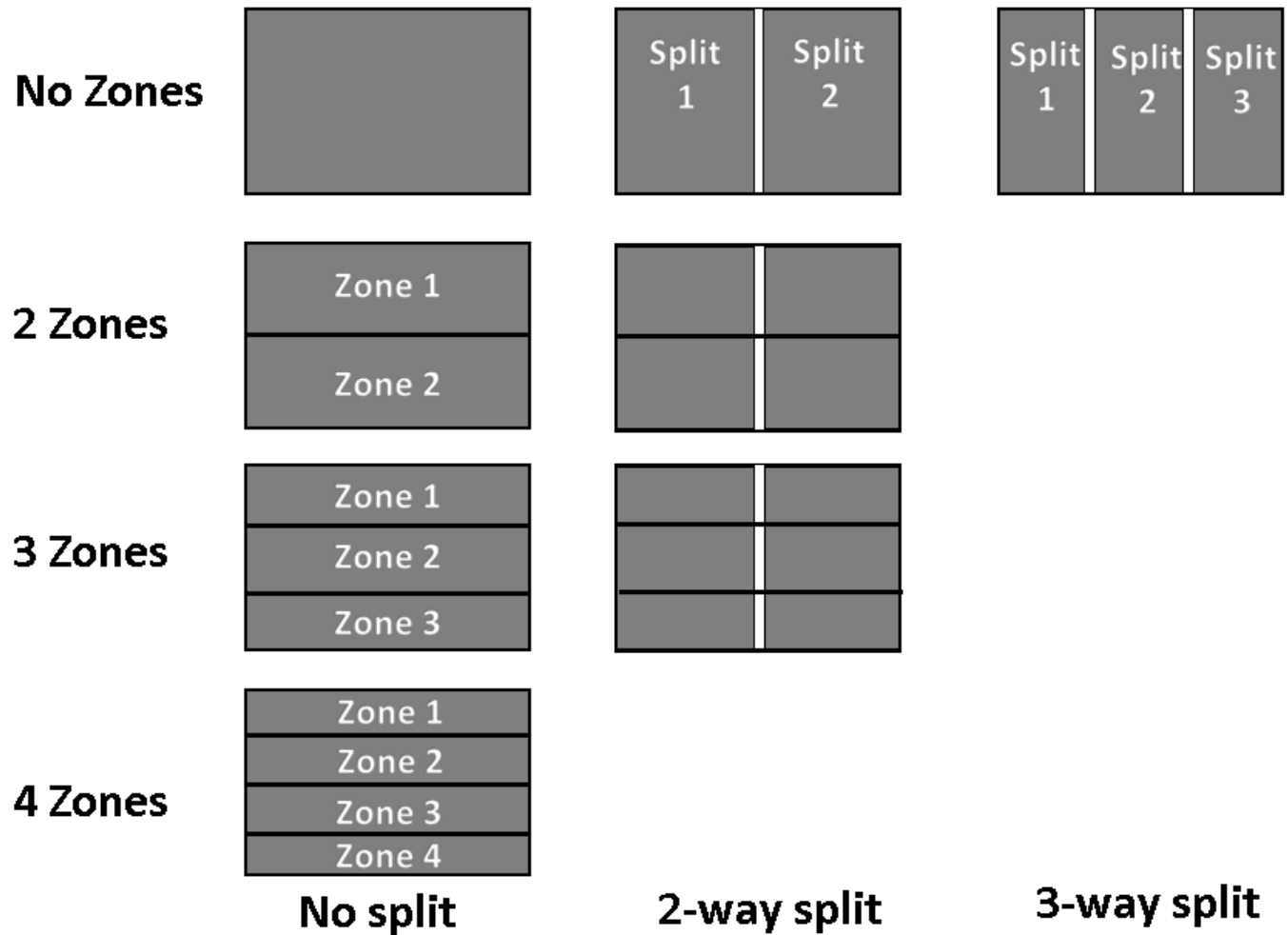


Figure 1. Matrix of various duck zone and season split combinations under the proposed action.

1978 Atlantic Flyway Duck Exposure Days (includes Early Special and Regular Season - 50 Day Season)

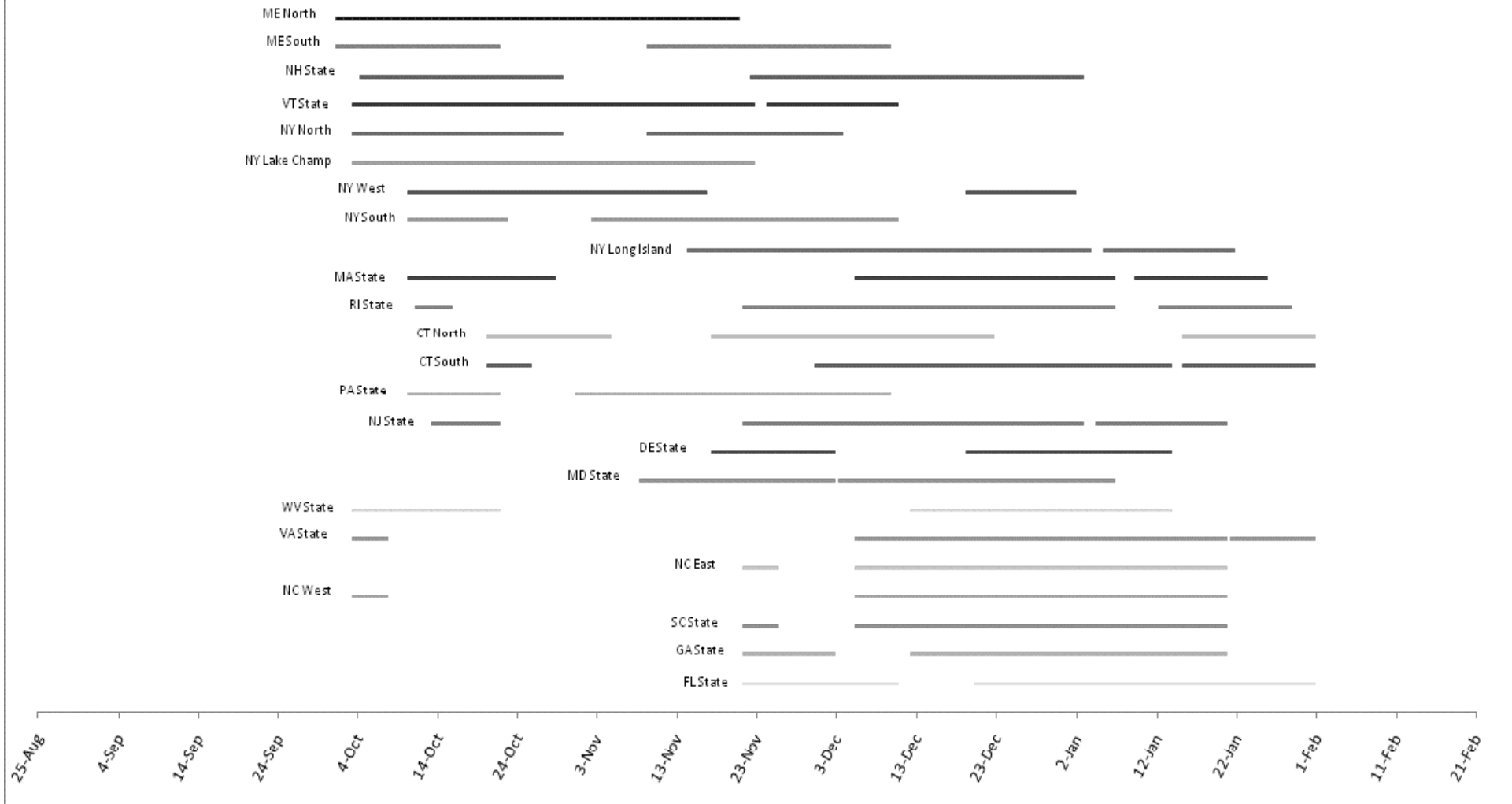


Figure 2. Duck exposure days in the Atlantic Flyway, 1978.

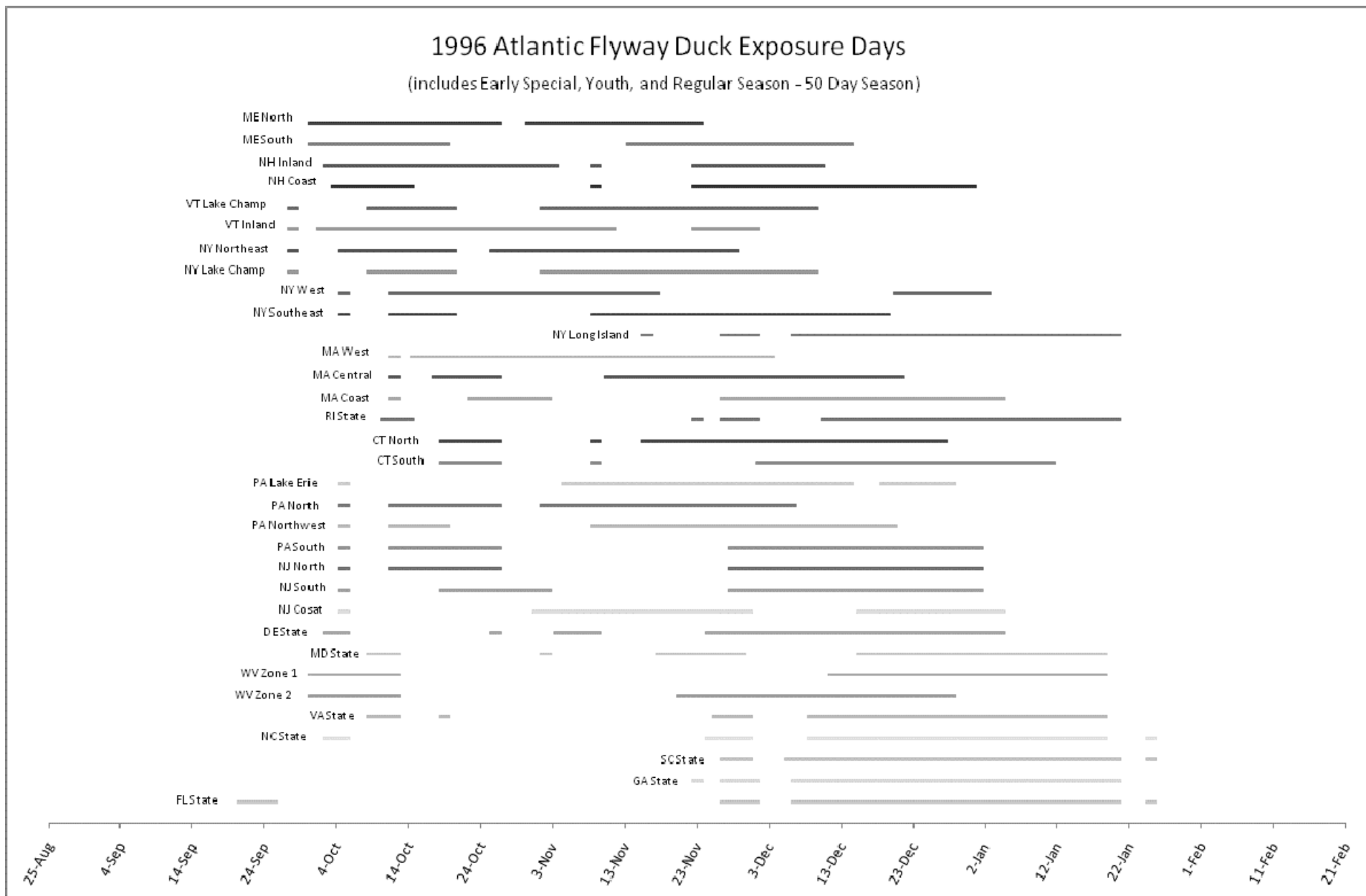


Figure 3. Duck exposure days in the Atlantic Flyway, 1996.

2009 Atlantic Flyway Duck Exposure Days

(includes Early Special, Youth, and Regular Season - 60 Day Season)

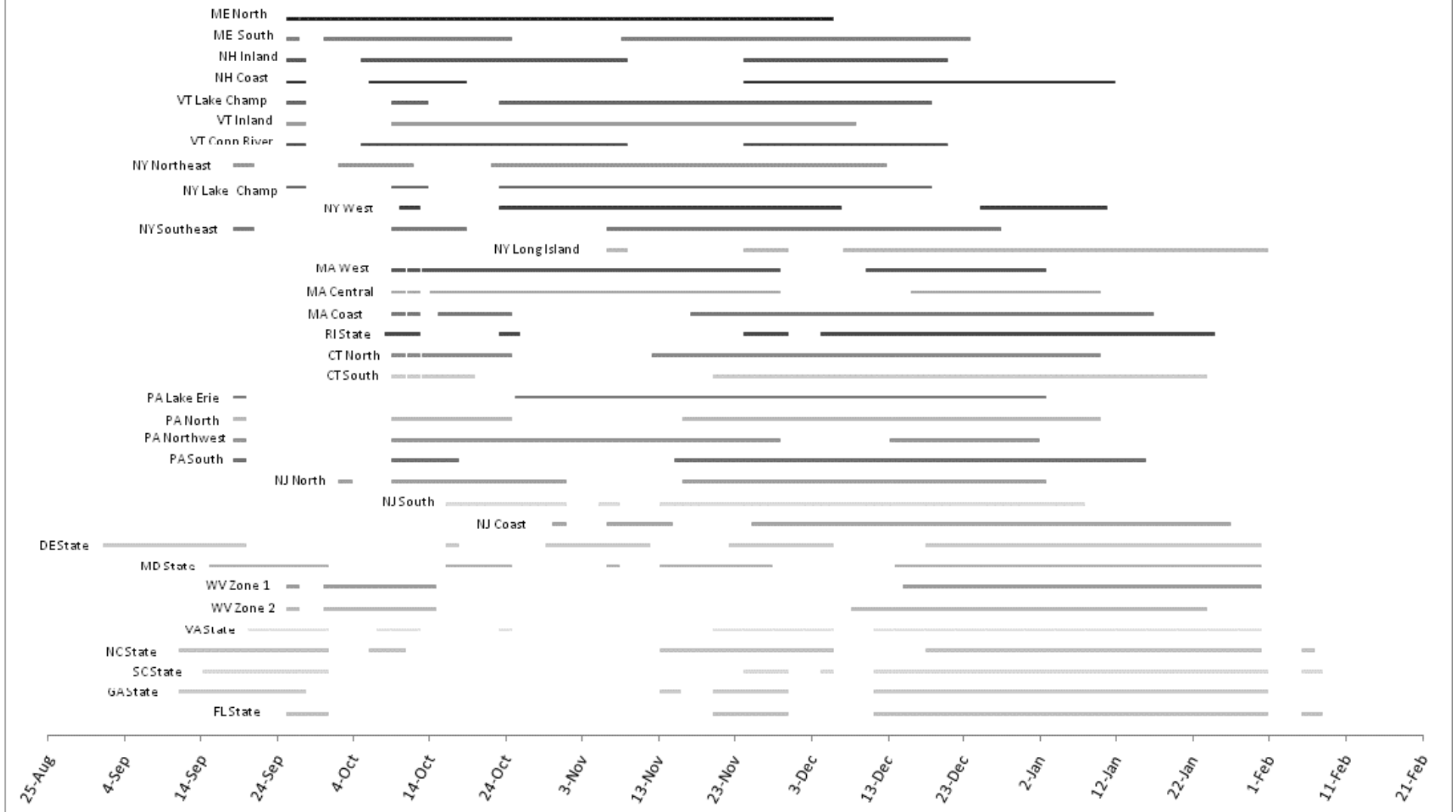


Figure 4. Duck exposure days in the Atlantic Flyway, 2009.

1978 Mississippi Flyway Duck Exposure Days

(includes Early Special and Regular Season - 50 Day Season)

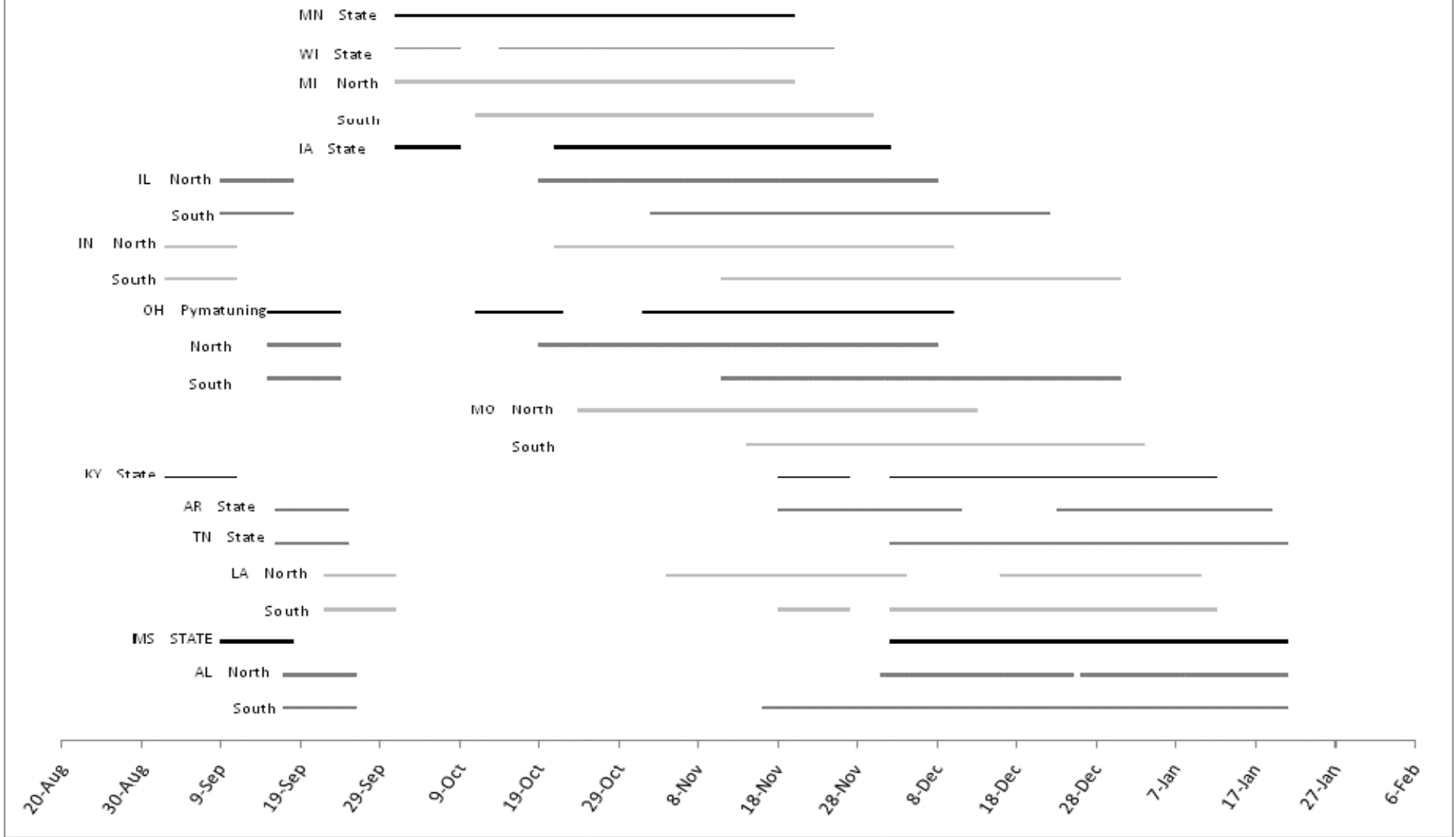


Figure 5. Duck exposure days in the Mississippi Flyway, 1978.

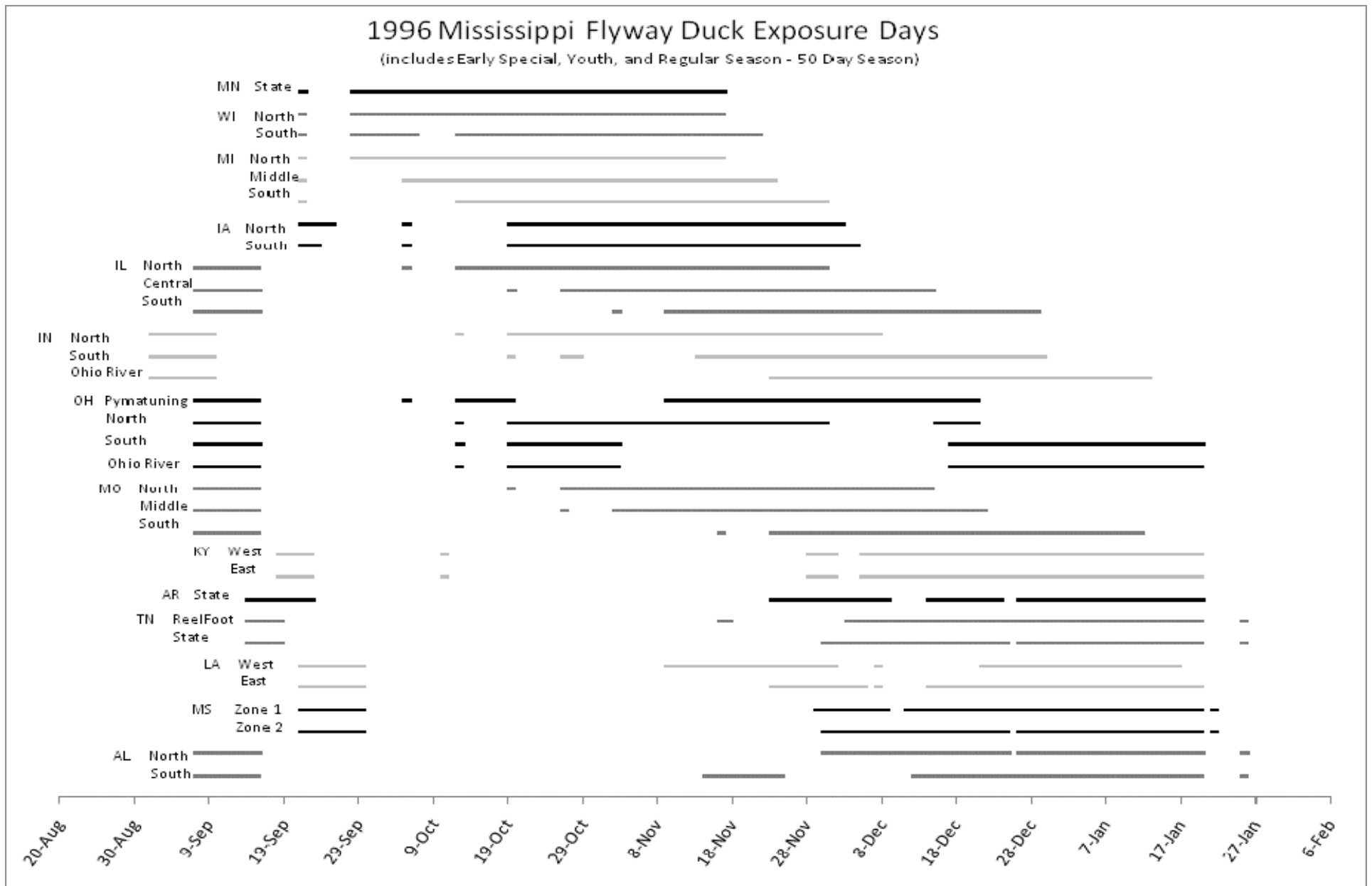


Figure 6. Duck exposure days in the Mississippi Flyway, 1996.

2009 Mississippi Flyway Duck Exposure Days

(includes Early Special, Youth, and Regular Season - 60 Day Season)

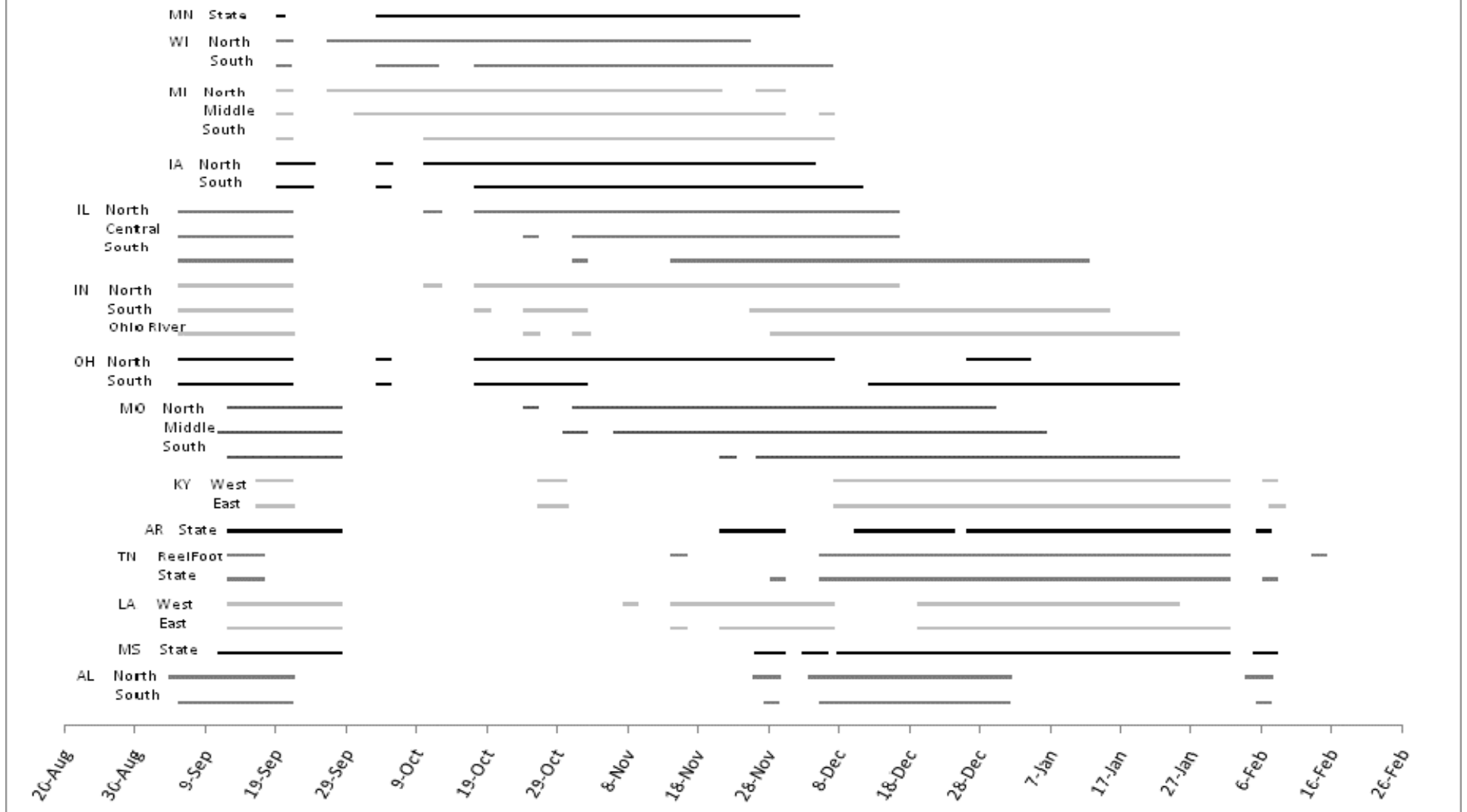


Figure 7. Duck exposure days in the Mississippi Flyway, 2009.

1978 Central Flyway Duck Exposure Days

(includes Early Special and Regular Season - 60 Day Season)

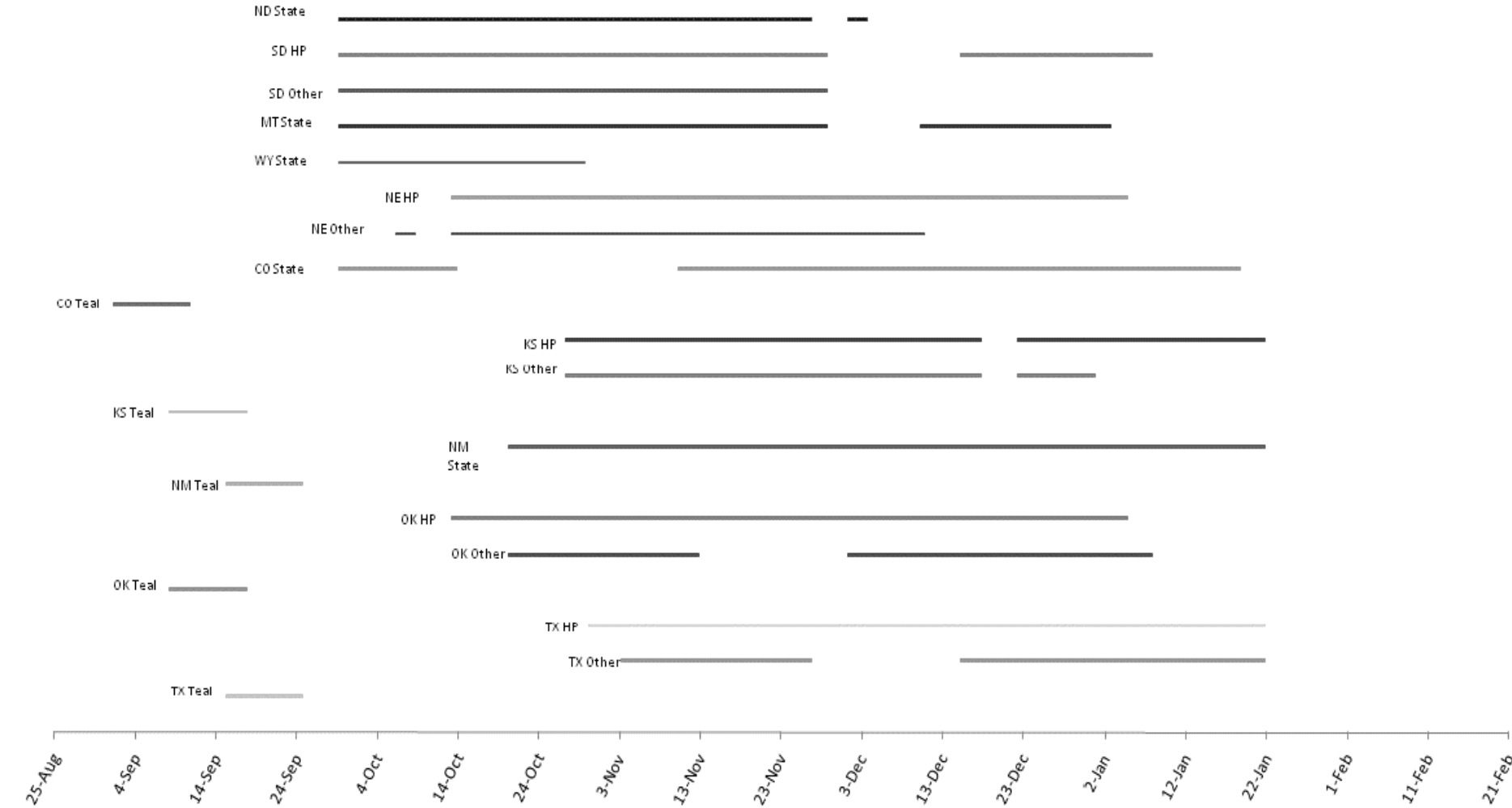


Figure 8. Duck exposure days in the Central Flyway, 1978.

1996 Central Flyway Duck Exposure Days

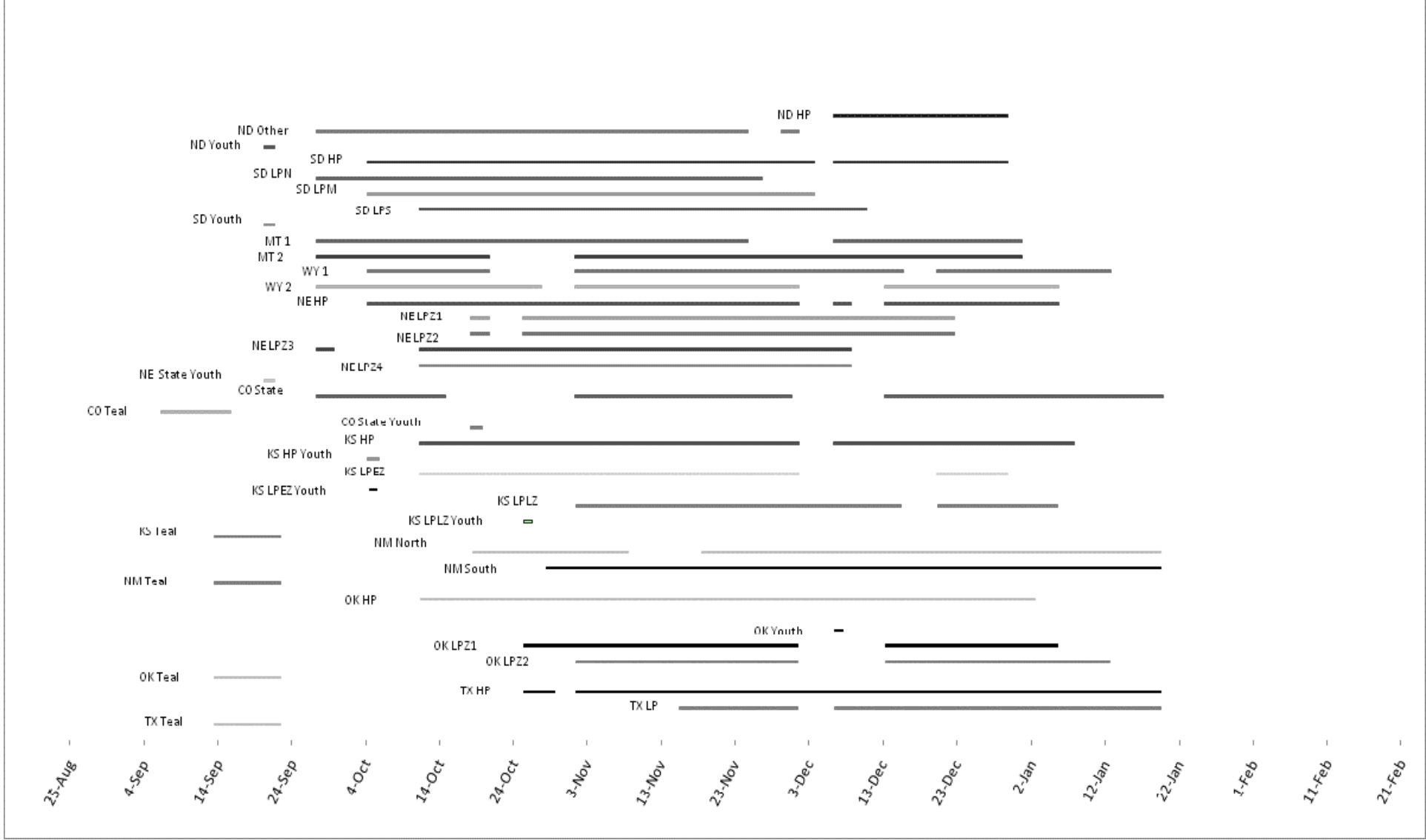


Figure 9. Duck exposure days in the Central Flyway, 1996.

2009 Central Flyway Duck Exposure Days

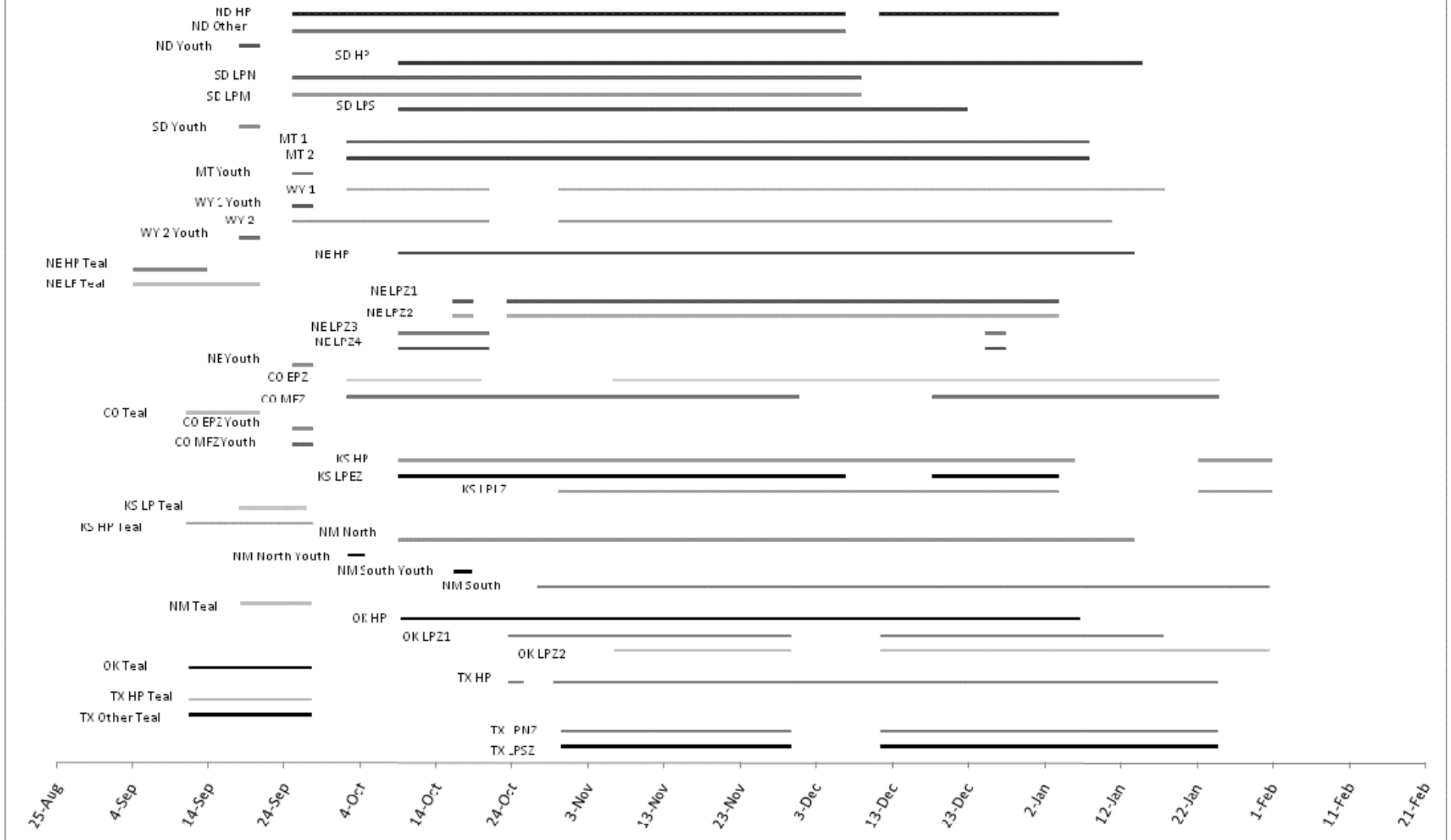


Figure 10. Duck exposure days in the Central Flyway, 2009.

1978 Pacific Flyway Duck Exposure Days (includes Youth and Regular Season - 107 days)

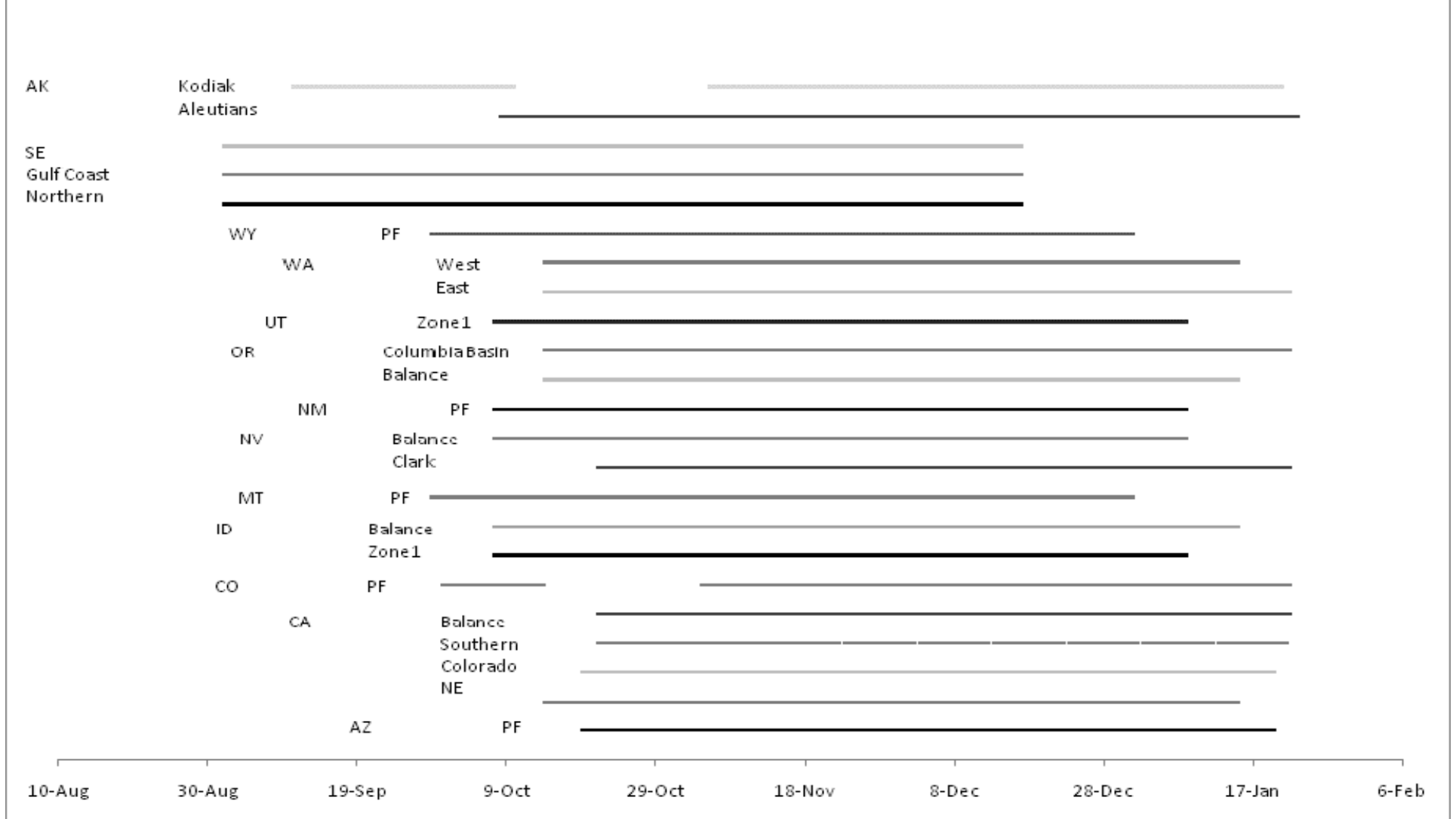


Figure 11. Duck exposure days in the Pacific Flyway, 1978.

1996 Pacific Flyway Duck Exposure Days (includes Youth and Regular Season - 107 days)

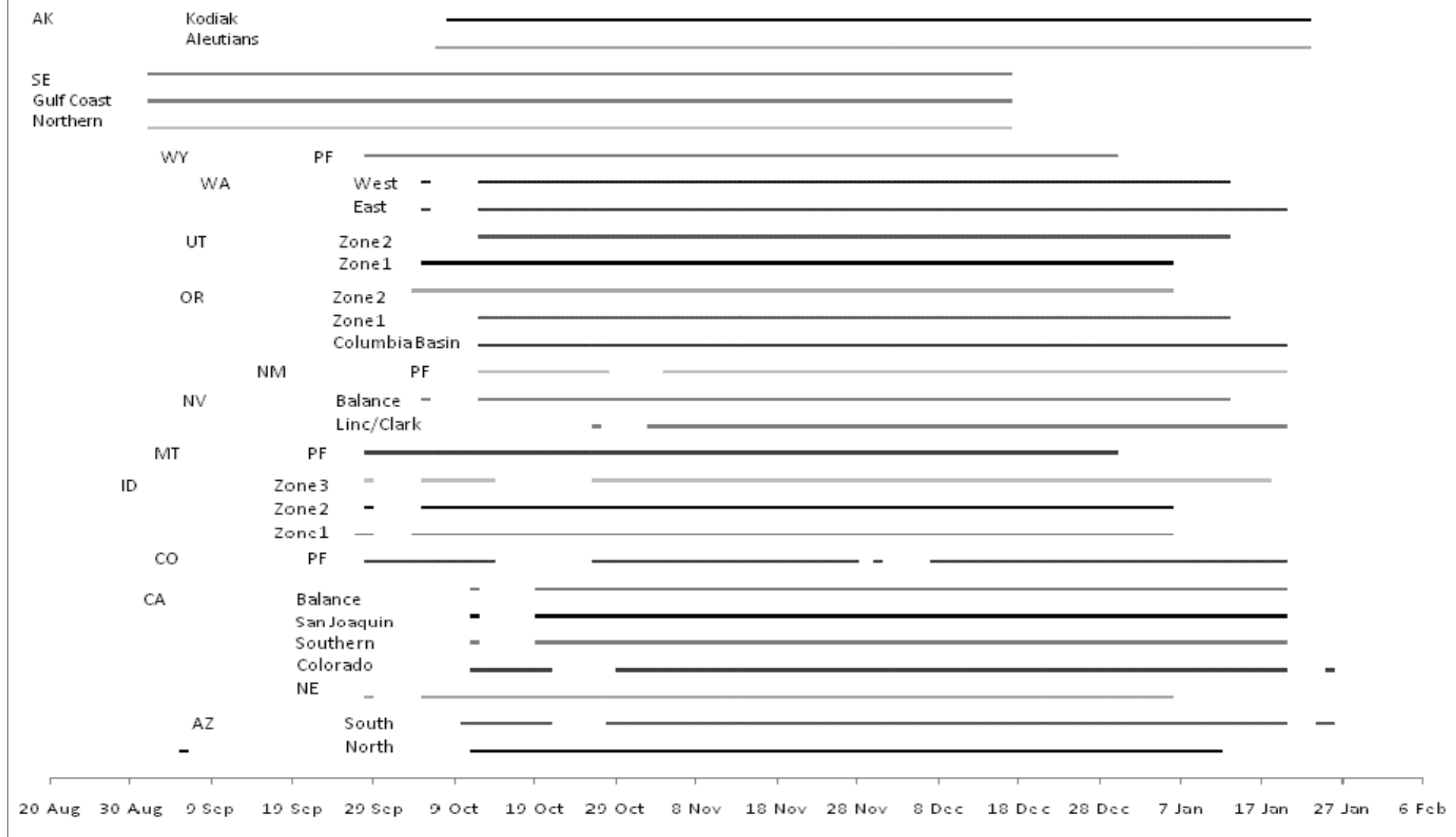


Figure 12. Duck exposure days in the Pacific Flyway, 1996.

2009 Pacific Flyway Duck Exposure Days (includes Youth and Regular Season - 107 days)

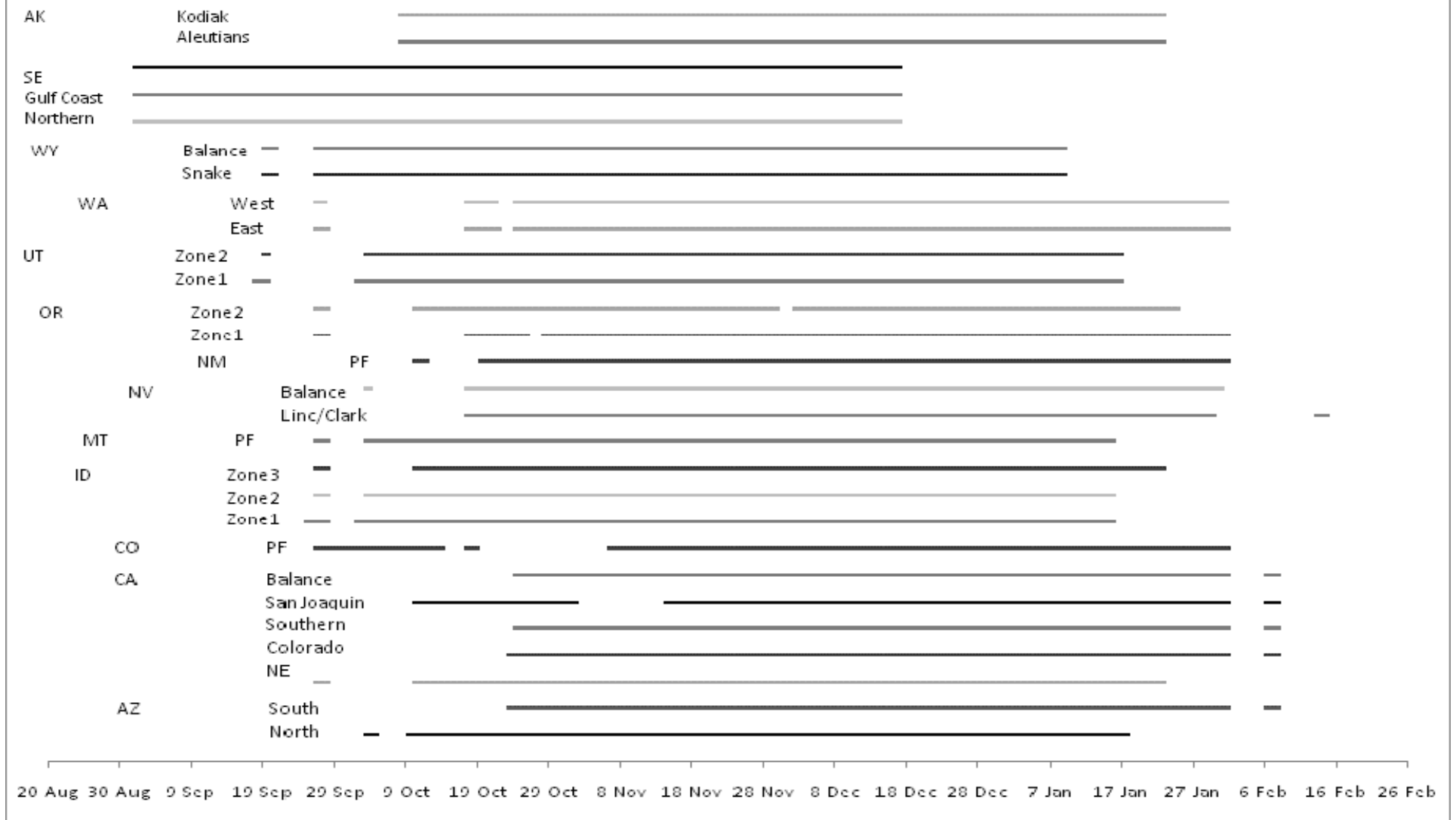


Figure 13. Duck exposure days in the Pacific Flyway, 2009.