The Northern Pintail in North America:

The Problem and Prescription for Recovery

February 2003

Part 1. Proceedings of the Northern Pintail Workshop, 23-25 March 2001, Sacramento, CA

Part 2. A Management and Research Plan for Northern Pintails

EXECUTIVE SUMMARY

The North American population of northern pintails (*Anas acuta*) exhibited minimal response to the record increase in May Ponds across the prairies of Canada and the United States (U.S.) during the 1990s. In contrast, most other prairie-nesting ducks attained record high populations. The problem with pintails appears to be chronic because breeding populations have decreased in response to each wet-dry cycle on the prairies since 1955.

A workshop was held 23–25 March 2001 in Sacramento, California to assess our current understanding of pintail biology and population status, explore possible explanations for the continued poor status of the species, and develop a management and research plan to help resolve this dilemma. The workshop attracted waterfowl research biologists, land managers, and population managers from the U.S. and Canada. Participants examined information pertinent to the various potential hypotheses associated with the decline of pintails in North America. There was a strong consensus with a high degree of confidence that poor nest success on the prairie breeding grounds, especially in Canada, is the factor most plausible for explaining the decline in the pintail population and/or its lack of response to recently improved wetland conditions. Poor nest success is believed to result from factors that have accompanied the conversion of native prairie to cropland in the heart of pintail nesting landscapes, including very high predation rates and changing cropping practices that result in destruction of pintail nests. Workshop participants ranked breeding propensity, disease, and adult breeding season survival as secondary in importance, although the level of confidence in these factors was comparatively low.

An outgrowth of the Workshop was the development of a Management and Research Plan. This plan involves land management actions, population management actions, and directed field investigations. The top priority for land management action is to reduce cultivated land and spring tillage in key pintail breeding areas on the prairies. Program components include conversion of cropland into permanent cover through direct habitat management and policy initiatives, increased use of fall-seeded crops and no-till practices, and maintenance of existing grassland areas. A second priority for land management action is the maintenance of pintail habitats outside of the prairie breeding area. Recommended population management actions include implementation of adaptive harvest management for pintails, examination of meta-population structuring, re-examination of the North American Waterfowl Management Plan population goal, and improved monitoring of population size and distribution. Recommended field activities and investigations include an enhanced pintail banding program, nesting ecology studies, examination of relationships between pintail populations and habitats, tests of multiple hypotheses to explain the pintail decline, and adaptive habitat management (i.e., habitat program evaluation and adjustment).

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Part 1. PROCEEDINGS OF THE NORTHERN PINTAIL WORKSHOP

23–25 March 2001
Sacramento, CA

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Purpose Of The Workshop

At the summer 2000 joint Flyway Council meeting in Memphis, Tennessee, a resolution was passed requesting that the United States Fish and Wildlife Service (USFWS) organize a pintail workshop to address the continued failure of the northern pintail (*Anas acuta*) population to recover despite excellent wetland habitat conditions on the prairies of the U. S. and Canada. An organizational meeting was held in October 2001 in Saskatoon, Saskatchewan in conjunction with the Second North American Duck Conference, to plan for such a workshop.

The workshop was subsequently held 23–25 March 2001 in Sacramento, CA, and attracted waterfowl research biologists, land managers, and population managers from the U.S. and Canada (see Appendix I). The purpose of the workshop was to assess current understanding of pintail biology and population status, explore possible explanations for the continued poor status of the species, develop a management and research plan to help resolve this dilemma, and create a summary report that could be used to attract support and funding to implement the required conservation programs and to address information needs.

The workshop commenced with a series of presentations on pintail biology, population status, and potential hypotheses to explain the decline of the population. Workshop participants were organized into 4 break-out groups that met separately to discuss specific items and reach conclusions. In particular, the groups were charged with 3 tasks: 1) examine the North American Waterfowl Management Plan (NAWMP) pintail breeding population (BPOP) objective (USFWS et al. 1994) ; 2) discuss gaps in biological data still required to better manage northern pintails and support conservation; and 3) recommend a series of population and land management conservation programs that would seem to have the best chance of successfully restoring pintail populations in North America. A representative from each group presented that group's findings to all workshop participants for discussion by the group as a whole. Following the workshop, organizers requested that participants prioritize the hypotheses and review the draft Workshop Proceedings and the Management and Research Plan. The editing team compiled the results of the workshop, and comments received after the workshop, and attempted to include all participants' concerns, comments, and contributions. This final report is the result of that effort.

Introduction

The number of northern pintails in North America continues to be low despite substantially improved prairie wetland conditions during the mid to late 1990s (USFWS 2001) (Figure 1). In 1993–97, following extended drought during the 1980s and early 1990s, favorable precipitation patterns returned to the critical waterfowl nesting areas of the northern Great Plains of the U.S. and Canada (USFWS 2001), the area known as the Prairie Pothole Region (PPR) (Bellrose 1980). Historically, when the number of wetlands (May Ponds) counted on the May Waterfowl Breeding Population and Habitat Survey increased in the PPR, the pintail BPOP increased as well (e.g., Smith 1970). However, even though May Ponds attained record high levels in 1996 and 1997, the pintail BPOP exhibited only a modest 30% increase (Figure 1), remaining 19%

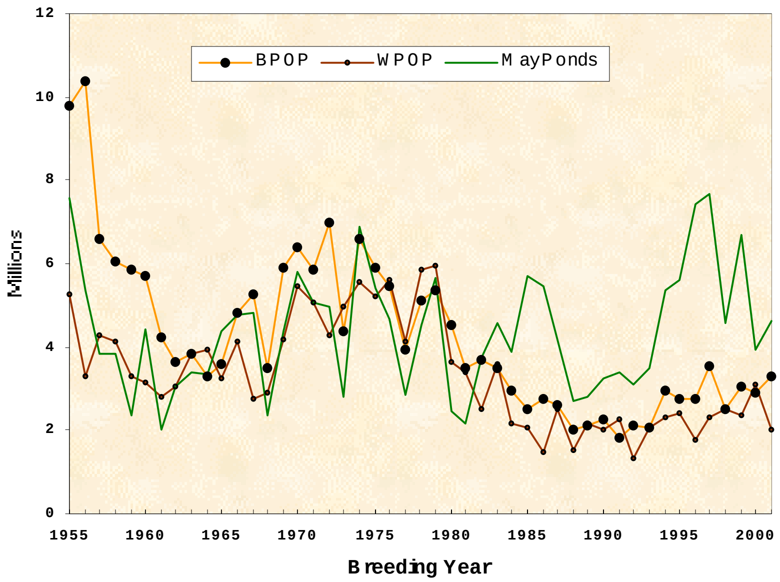

Figure 1. Northern pintail breeding populations, wintering populations, and unadjusted May Ponds in the traditional survey area in North America, 1955- 2001.

below the long-term average and 36% below the NAWMP goal of 5.6 million (USFWS 2001). Since 1955–56, each subsequent peak and trough in pintail BPOP has been successively lower (Figure 1). In contrast, all other PPR-nesting dabbling ducks (tribe *Anatini*) rebounded in the 1990s to levels that exceeded objectives set by NAWMP. The long-term declining trend of the pintail BPOP has been accompanied by a similar decline in the mid-winter index of the continental winter population (WPOP), except that the historic high BPOPs in 1955–56 did not result in similarly high WPOPs (Figure 1; see also Miller and Duncan 1999).

The poor response of pintails to the excellent prairie wetland conditions in the 1990s is perplexing because previous periods of abundant May Ponds resulted in very large pintail populations (Figure 1), and other prairie-nesting duck species exhibited strong positive responses during this same period. A closer examination of PPR pintail-pond relationships reveals that the failure of pintails to respond is not a spurious result of the improved wetland conditions occurring in areas of the prairies that are not important for pintails. For example, survey strata 32 in prairie Saskatchewan, which typically has 3–4 times more pintails than any other prairie strata in wet years (16–29% of the total pintail BPOP; Smith 1995), experienced good wetland conditions in the 1970s and 1990s, yet the pintail BPOP in this important region has shown a progressive decrease (Figure 2). Hence, wetland conditions in the 1990s did indeed improve within areas that are critical to pintails, but the population did not respond as it had in previous decades and the prairies formerly supported many more pintails than at present. These data also suggest that future increases in May Ponds are unlikely to result in large increases in pintail BPOP, particularly in light of the record pond levels observed in the late 1990s (Miller and Duncan 1999).

Background

The most important pintail nesting regions are the PPR of Canada (Alberta, Saskatchewan, Manitoba; survey strata 26–40) and the U.S. (Montana, North and South Dakota; survey strata 41–49), and the forest and tundra habitats of Alaska, Yukon, and the western Northwest Territories (survey strata 1–13) (see Smith 1995 for strata locations). These strata normally account for 85–98% of all pintails recorded on the surveys. From the 1950s to early 1980s, pintail BPOPs typically exceeded May Ponds; however, since 1982, May Ponds have exceeded the BPOP (Figure 1). The most pronounced decline in pintail BPOP has occurred in the Canadian prairies. See Miller and Duncan (1999) for additional details on long-term trends in pintail BPOP by various survey regions.

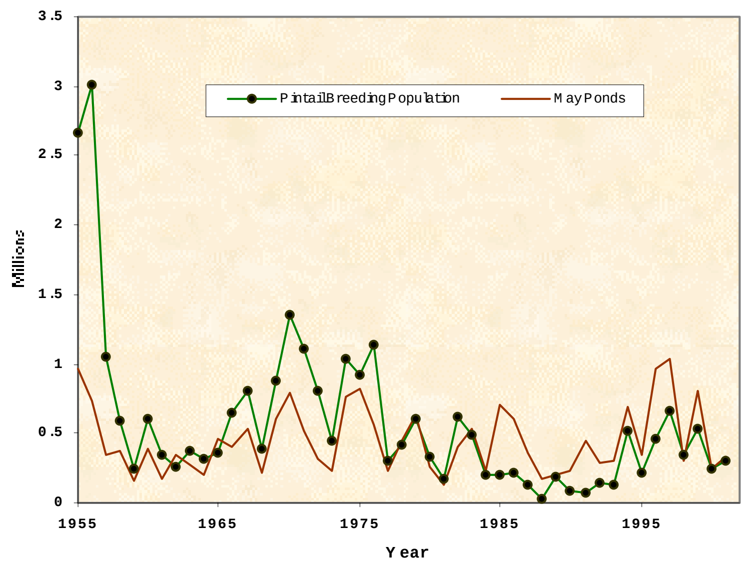

Figure 2. Northern pintail breeding populations and unadjusted May Ponds in stratum 32, Saskatchewan, 1955 – 2001.

Historically, pintail BPOP density (pintails/km^2) correlated positively with total and local May Pond counts in the PPR, but correlations were weaker in parklands than prairie (Johnson and Grier 1988). Breeding density in northern areas (e.g., Alaska, Northwest Territories, Yukon), correlated negatively with total May Ponds (Johnson and Grier 1988), because pintails migrate north during droughts in the PPR (Hansen and McKnight 1964, Smith 1970, Derksen and Eldridge 1980).

The Pacific Flyway is the largest conduit for pintails in North America. During fall migration, most pintails from key nesting regions migrate primarily to California, followed by Texas, Louisiana, Arkansas, and Mexico, with only small numbers migrating to the southern Atlantic Coast (Bellrose 1980). Pintails show a greater fidelity for the Central Valley of California (80% returning in succeeding years) than to Puget Sound, Chesapeake Bay, and Gulf Coast wintering regions (two-thirds returning) (Hestbeck 1993*a*). These proportions, however, could be biased low because of harvest north of the wintering regions.

Pintails tend to lay clutches 1 to 2 eggs smaller than those of other dabbling ducks (7.0–7.6 eggs in Alaska and 6.0–8.3 in the PPR; see references in Austin and Miller 1995). Pintails nest relatively early in the season, a time when cold weather and high predation rates (possibly related to limited alternative prey and sparse nest cover) combine to cause most nests to fail. In the PPR, pintails show a stronger predilection to nest in sparse cover, burned areas, and grain stubble than do other species, in addition to nesting relatively farther from water (see references in Miller and Duncan 1999). Use of sparse cover and dispersed nesting, which contributes to nesting in stubble fields over vast areas, may make nests vulnerable to loss. In Alaska, fewer habitat types are available, and pintails and other dabbling ducks nest in meadows or slough banks (see Miller and Duncan 1999). Pintails will renest upon destruction of their clutch but not as persistently as will mallards (*Anas platyrhynchos*) (see Miller and Duncan 1999, Guyn and Clark 2000, K. Richkus unpubl. data).

Pintails arrive on nesting grounds with fat reserves obtained from foraging on winter and spring migration areas (Krapu 1974, Mann and Sedinger 1993, Esler and Grand 1994). Fat reserves support initial clutch production in mallards (Krapu 1981), and presumably also in pintails, and mallard hens in relatively better condition may produce more nests (J. Devries, unpubl. data). Therefore, winter habitat probably affects pintail recruitment under certain circumstances (Raveling and Heitmeyer 1989). Similarly, migration and staging habitat are also important and some of these habitats also have undergone detrimental changes (R. Cox, unpubl. data, M. Heitmeyer, pers. comm.).

Population Objective For Northern Pintails

A clearly defined population objective for pintails is required to implement management programs designed to benefit the species. The current NAWMP pintail objective of 5.6 million (average BPOP in the 1970s to be achieved under average environmental conditions) was considered by workshop participants to be acceptable at present; however, we lack the necessary biological information on which to base an appropriate evaluation at this time. Population managers should re-assess the objective at periodic intervals to ensure that it is appropriate for the longer term, or recommend change based on sound science.

In recognition of the long-term natural dynamics of habitats and populations, a conceptual objective of restoring the historical relationship between pintail BPOP and May Ponds, such that the natural dynamics of May Pond abundance again predicts variation in pintail BPOP without population deficits (e.g., Bethke and Nudds 1995), is supported in all strata. Attainment of this objective may require field studies and examination of existing data sets to determine the actual ecological and habitat relationships that control distribution and abundance of pintails. Given the likely future effects of global warming on the nesting environment of pintails in North America (e.g., Poiani and Johnson 1991), we need to preserve the resiliency of the pintail population to maintain long-term sustainability through widely varying annual wetland conditions.

Explanations For Poor Pintail Status

The failure of the North American pintail population to respond strongly to the record increase in May Ponds on the prairies is chronic. Since 1955, increases in pintail BPOP in response to improved wetland conditions have fallen with each wet-dry cycle (Figure 1). The cause of the pintail population decline, or the failure to increase in response to short term improvements in key habitats, must result from reduced survival of adults, reduced recruitment of young, or both. Reduced survival could result from increased loss of adults and fledged juveniles to disease, predators, or harvest. Inadequate recruitment could result from low nest success, low hen success, poor brood success, reduced breeding propensity or some combination thereof. Any or all of these might result from deterioration of habitat conditions or complete elimination of habitats at various stages of the pintail life cycle.

Within the major subdivisions of survival and recruitment, information was provided by workshop participants to support or reject the following competing hypotheses as potential causative factors responsible for the decline of the pintail population: 1) Inadequate Survival - breeding season, period and overall survival; and 2) Inadequate Recruitment - breeding propensity, nest success, and duckling/brood survival. Alternatively, basic population data presently available may not be sufficient to properly assess the true status of pintails; this idea was explored in a section entitled: Problem? What problem? Additionally, an integrated cross-seasonal effects hypothesis was considered, wherein factors operating during one part of the life cycle affect a succeeding part of the cycle. Below is a summary of the information presented during the examination of each of the above hypotheses.

Hypothesis 1: Decreased Survival Of Adult Pintails

HARVEST. Pintails compose an important percentage of the total duck harvest only in California, Texas, Louisiana, Mexico (Miller and Duncan 1999), and Alaska (Martin et al. 2001). Furthermore, the pintail has historically been a major harvest species (> 10% of total harvest) only in the Pacific Flyway. Direct recovery rates of adult pintails are typically low, having been <2% of recent Pacific Flyway preseason bandings (Dubovsky 1996), 2.1–3.8% for preseason-banded adult males in Saskatchewan (Anderson and Sterling 1974), and generally <4% for winter (postseason) bandings (Hestbeck 1993*b*). Harvest rate was <7% for adult pintails banded preseason in the 1980s and <4% in the 1990s prior to liberalization of regulations in 1994 (USFWS and Canadian Wildlife Service 1992, Sheaffer et al. 1999). We conclude that only a relatively small proportion of the fall flight of pintails is harvested annually under restrictive or liberal hunting regulations. Hestbeck (1995*b*) showed that pintail survival during 1980–92 was generally greater than or equivalent to earlier periods characterized by larger BPOPs, suggesting that mortality has not contributed to the decline of pintails. While survival and harvest rates for pintails have large confidence intervals, there is no apparent relationship between survival rate and harvest rates of pintails, and harvest rates of pintails have not increased coincident with the decreasing population (Figure 3). Overall there appears to be little evidence to support the hypothesis that pintail harvest has caused the decline in the pintail population; there is however uncertainty in how harvest of a declining species should be managed.

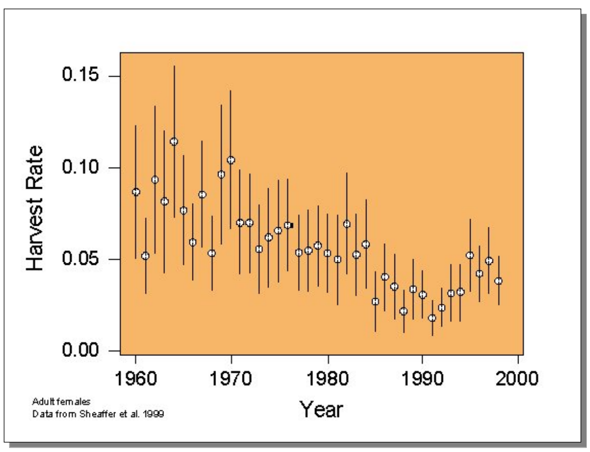

Figure 3. Harvest rates of adult female northern pintails (M. Runge from data in Sheaffer et al. 1999).

DISEASE. Avian botulism (*Clostridium botulinum*) and cholera (*Pasturella multocida*) are the most often diagnosed diseases in ducks, and 13–40% of carcasses collected in the U.S. and Canada have been pintails (see Austin and Miller 1995, Pybus and Eslinger 1996). Cholera is chronic continent-wide. Although avian botulism is not new to North America (e.g., reports date from the 1920s), very large losses have occurred recently in Canada and the U.S. Botulism losses at Pakowki (Alberta), Old Wives (Saskatchewan), and Whitewater (Manitoba) Lakes during 1997 may have approached 500,000 (B. Clark, unpubl. data; see also Miller and Duncan 1999). These losses occurred mainly after nesting and before the hunting season, and could have depressed pintail WPOP and harvest (Pybus and Eslinger 1996). Pacific Flyway WPOP would be affected disproportionately because ≥ half of the pintails originating from the botulism areas migrate to California and other western states (see references in Miller and Duncan 1999). The magnitude of known botulism losses is such that in some years it could be a substantial mortality factor. How disease (e.g., botulism) might affect our estimation of harvest and survival rates is unknown. Although there is no evidence that botulism has caused the pintail population to decline over the long-term, this source of mortality, in combination with other detrimental factors, could prevent population recovery.

ADULT BREEDING SEASON SURVIVAL (FEMALES). Predation is a major source of mortality for pintails during the nesting season. Sargeant et al. (1984) reported that pintails had the highest red fox (*Vulpes vulpes*) predation rate index relative to other ducks; about 75% of pintails killed in North Dakota were hens, and red fox killed about 1 nesting female pintail/km^2, a large proportion relative to nesting densities in U.S. prairie (see Figure 3*d* in Miller and Duncan 1999). The red fox also is an important predator of nesting pintails in Alaska (J. B. Grand, pers. comm.). Information on hen pintail survival rates during the breeding season is scant. Available evidence suggests that pintail hen mortality might be 10–13% (K. Guyn, unpubl. data; K. Richkus, unpubl. data). Whereas this appears to be lower than the 24% found for parkland-nesting mallards (J. Devries, unpubl. data), coincident 1-year estimates from prairie Saskatchewan showed 5% mortality in mallards versus 10% in pintails (K. Richkus, unpubl. data). Although there is not good evidence to suggest abnormally high pintail hen mortality during the breeding season, or decreasing hen survival rates over time, the large landscape changes that have occurred in the PPR, apparently leading to reduced nest success (see below), may also have resulted in increased predation on breeding hens.

OVERALL AND PERIOD SURVIVAL. Pintails tend to survive at high annual rates relative to other dabbling ducks (see references in Miller and Duncan 1999). Flint et al. (1998) found that annual adult survival rate (banding data) had a greater influence on modeled pintail population growth in an Alaskan population than did recruitment; however, we do not know if this same relationship holds in the PPR.

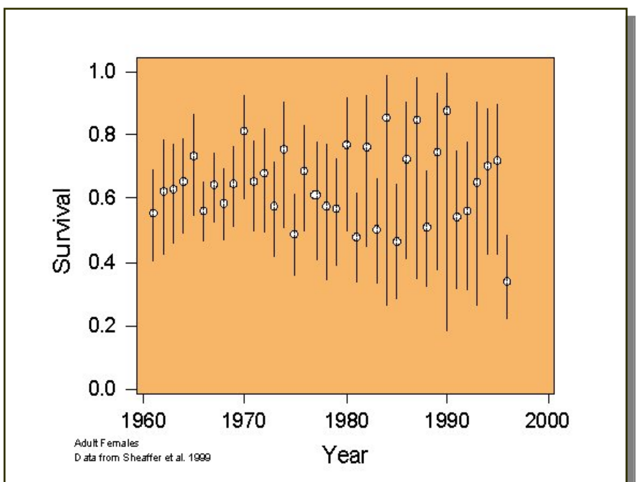

Figure 4. Survival rates of adult female northern pintails (M. Runge from data in Sheaffer et al. 1999).

Hestbeck (1995*b*) used banding data to show that pintail survival during 1980–92 was generally greater than or equivalent to earlier periods characterized by larger BPOPs, suggesting that mortality has not contributed to the decline of pintails. While annual survival rates of pintails have large confidence intervals (banding data), there has been no decreasing trend in pintail survival rates (Figure 4; M. Runge, unpubl. data). Period survival rates, particularly during winter, have varied from very high on the west coast of Mexico and in the Sacramento Valley of California, to moderate and variable in the San Joaquin Valley and Suisun Marsh of California and in Louisiana (see reviews in Austin and Miller 1995, Miller and Duncan 1999). These winter estimates were derived using telemetry, so “radio effects” could have artificially increased mortality rates. The relatively high annual survival rates of pintails suggests survival is, on average, probably sufficient to maintain or increase the BPOP. However, the heterogeneous nature of period survival rates measured to date indicate that local wintering populations could be under different mortality pressures. Although hunting losses seem to be of greatest importance most years and in most regions (e.g., Fleskes et al. 2002), disease has been an important factor in California (Miller et al. 1995). Overall, there is a lack of evidence to support the hypothesis that decreased survival has produced the decline in the pintail population, although a weak banding database, upon which various parameters are estimated, complicates analyses.

Hypothesis 2: Decreased Recruitment

GENERAL. Harvest age ratios (young:adult) provide an approximation of recruitment. Age ratios for pintails typically have been lower than for other dabbling ducks (Padding et al. 1998, see review in Miller and Duncan 1999), in agreement with the relatively low productivity observed in pintails compared to other ducks. Age ratios of female pintails adjusted for vulnerability exhibit substantial annual variation with no distinct long-term trend, although age ratios appear to have been higher in the 1960s than in the following decades (Figure 5). Smith (1970) demonstrated how pintail age ratios increased as the proportion of pintails increased in southern Alberta and Saskatchewan during 1961–68 ($r > 0.90$). Hestbeck (1995*a*, 1995*b*, 1996) updated the analyses through the early 1990s, to determine if a disproportionate increase in recruitment occurred in wet years on the prairies. He concluded this no longer occurred in the Pacific Flyway, and never occurred in the eastern flyways.

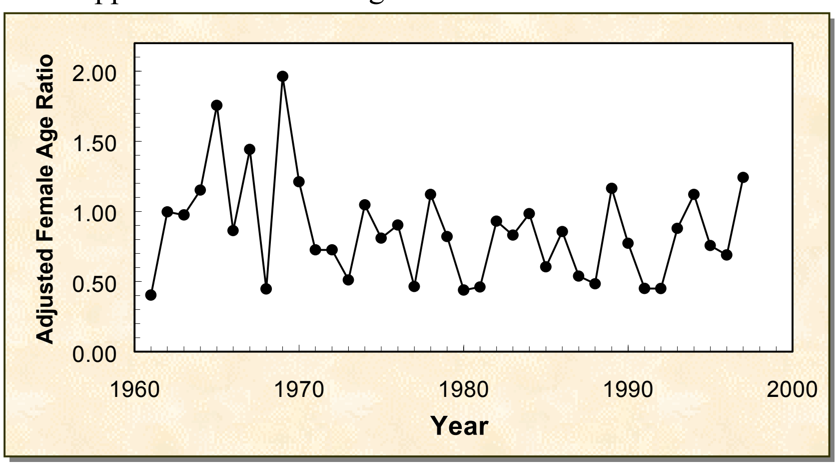

Figure 5. Age ratios of female northern pintails harvested in the U.S. adjusted for vulnerability. 1961-1997.

However, Sheaffer et al. (1999) recently conducted a more sophisticated analysis of age ratios and confirmed Smith's (1970) earlier finding that pintail recruitment is lower when there are relatively more birds in northern areas.

Sheaffer et al. (1999) present several different and more refined models for recruitment. The model that predicted harvest age ratios most efficiently included mean latitude of the breeding population, *ln*BPOP, and mean monthly precipitation during January through March in the PPR of southern Alberta, southern Saskatchewan and the Dakotas. An update of that analysis found a significant year-latitude interaction, which is consistent with the idea that recruitment rate has decreased over time, even when a major portion of the population is at low latitudes nesting on the prairies (M. Runge, pers. comm.). Thus, harvest age ratios provide some weak evidence consistent with the idea that recruitment in pintails has declined over the long-term.

NESTING SUCCESS AND HABITATS. A wide array of mammalian and avian species prey on pintail nests, and flooding can destroy numerous nests in Alaska (see references in Miller and Duncan 1999). Nest success (Mayfield 1961) of pintails in the PPR has been only 6–18% in recent extensive studies (see Miller and Duncan 1999, Guyn and Clark 2000), although even these estimates are likely biased high because most PPR nesting studies have included few nests in grain stubble where large numbers of pintails attempt to nest, albeit unsuccessfully (Miller and Duncan 1999, K. Richkus, unpubl. data). Because of this trait, pintail nests are very susceptible to loss by agricultural activities, primarily cultivation (Miller and Duncan 1999). A recent study in Saskatchewan, however, suggests that predation may be the primary cause of nest loss even in stubble (K. Richkus, unpubl. data).

Pintails are much more prone to nest in cultivated land than are other ducks (Klett et al. 1988, Greenwood et al. 1995). Pintails nest in stubble fields in proportion to their availability, unlike mallards, which avoid stubble fields (K. Richkus, unpubl. data). Studies have estimated that 34–57% of pintail nests are located in cropland (Klett et al. 1988, Greenwood et al. 1995) where nest success ranges from 0–2% (K. Richkus, unpubl. data, Greenwood et al. 1995) to 7% (Klett et al. 1988). In contrast, duck productivity equated to nest success of 45–60% on large, unbroken tracts of grazed grasslands in Montana (Ball et al. 1995). Other estimates of nest success on grassland pastures range from 14–25% (Klett et al. 1988, Greenwood et al. 1995, Ignatiuk and Duncan 2001). High nest success also has been achieved on vast Conservation Reserve Program (CRP) lands in the Dakotas (Reynolds et al. 1994, 2001). In the PPR, apparent nest success of pintails was similar to that of other ducks in early studies, but recent Mayfield estimates usually were lower than for other species of ducks. Nest success of 5 species of dabbling ducks declined since the 1930s, and pintail success was the lowest of the 5 (Beauchamp et al. 1996*a*).

Photo: K. Guyn, Ducks Unlimited

Bethke and Nudds (1995) estimated a "deficit" of 1.6 million pintails in 1989 (45% of predicted abundance based on the historical relationship between pintail BPOP and wetland conditions during 1955–74) and concluded that duck deficits resulted from continued westward expansion of small grain agriculture in the Canadian PPR. An update of that analysis presented by Mark Miller during the workshop, showed that pintail deficits still exist in both Canada and the U.S., but they are > 350% larger in Canada. This regional disparity was attributed to the positive effects of CRP and the record numbers of May Ponds in the Dakotas, which has resulted in high nest success of ducks (Reynolds et al. 1994, 2001), coupled with the relative scarcity of upland cover and relatively fewer ponds in Canada (Mark Miller, unpubl. data).

Extensive changes occurred on the Canadian prairies during the 1900s, including the conversion of about 75% of the prairie grassland to cropland (Trottier 1992). Additionally, there was a major shift away from the practice of fallowing land since the 1970's, and most land is now continuously cultivated on an annual basis (Carlyle 1997). Fallow land may have attracted pintail hens to nest and may have been a safer habitat for nesting, because it was generally not tilled until somewhat later in the spring as seeding was completed (Podruzny et al. 2002). The most common upland nesting habitat in most areas of the pintail range in the PPR today is stubble. An overlay of high density pintail BPOP areas with cropland/grassland on the Canadian prairies shows that much of the prime pintail breeding habitat is cropland (Figure 6). These changes in land cover and land-use practices have been coincident with the decline of pintail numbers. These correlations, combined with poor nest success on cultivated land compared to grassland, provide evidence for the hypothesis that declining nest success, especially in Canada, has been a key factor contributing to the decline in the pintail population.

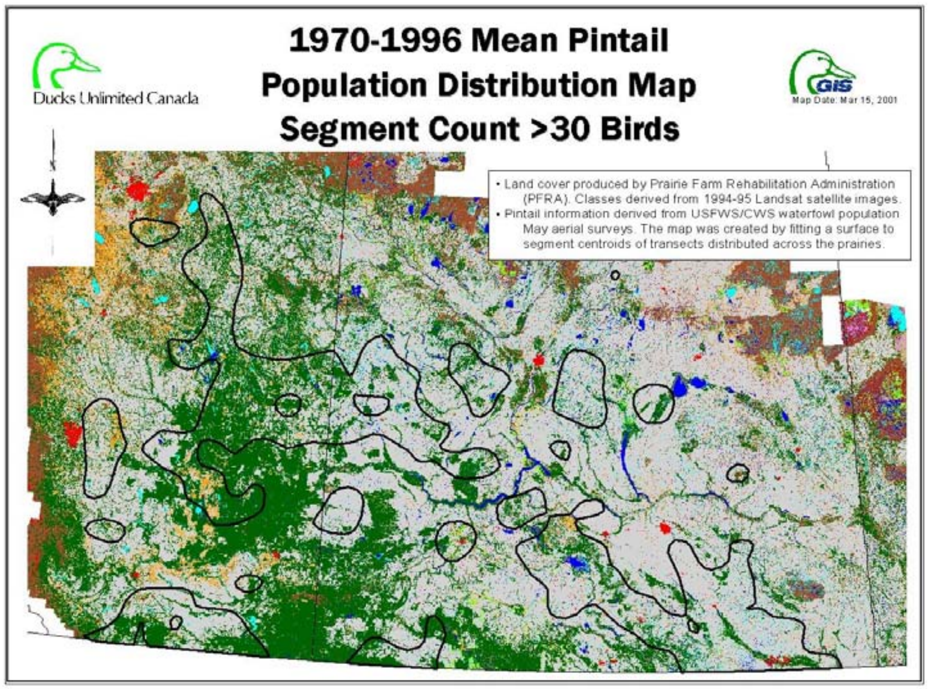

Figure 6. Overlap between primary northern pintail breeding range in prairie Canada (areas enclosed by black lines) and cultivated land (green areas). Primary pintail range based on the 1970 – 1996 pintail density as derived from USFWS/CWS waterfowl breeding survey.

DUCKLING AND BROOD SURVIVAL. Pintail brood survival (at least 1 duckling surviving) was estimated at 29% and 72–88% in Alberta (Duncan 1986, Guyn and Clark 1999), 35–56% in Saskatchewan (Peterson 1999), and 18–45% in Alaska (Grand and Flint 1996). These values encompass the 34–70% for PPR mallards (Ball et al. 1975, Talent et al. 1983, Orthmeyer and Ball 1990, Rotella and Ratti 1992) although a recent extensive study of mallards in the Canadian parkland found a mean rate of 79% (J. Devries, unpubl. data), larger than most of the pintail values. Pintail duckling survival was 4–14% in Alaska (Grand and Flint 1996) and 42–65% in Alberta (Guyn and Clark 1999), nearly bracketing mallard duckling survival in the PPR (22–51%) (Talent et al. 1983, Orthmeyer and Ball 1990, Rotella and Ratti 1992, J. Devries unpubl. data). Although data are too sparse, particularly from the 1950s and 1970s, to determine if brood/duckling survival has declined over time, pintail brood and duckling survival rates appear comparable to those of other species, suggesting that these rates may not be disproportionately low.

BREEDING PROPENSITY. This hypothesis states that some substantial segment of the pintail population is experiencing factors that reduce their likelihood of breeding. The cause of such an effect may be distant from the breeding ground area. Although there was substantial interest in this hypothesis, no data exist to examine the possible influence of this factor. A large proportion of North America's pintails probably do not attempt to nest during prairie droughts; instead, they continue northward to parkland and boreal habitats in the northern reaches of the prairie provinces, the Northwest Territories, Nunavut, Alaska, and eastern Russia (Smith 1970, Henny 1973, Derksen and Eldridge 1980). In mallards, few hens attempt to nest under dry conditions (Krapu et al. 1983). First-year nesters begin nesting later and are less productive than experienced hens (see Johnson et al. 1992 and Rohwer 1992 for reviews), and young hens may not nest in less than optimum conditions. How the percentage of a potential nesting population that actually attempts to nest, interacts with the processes that produce annual recruitment is not known; thus, there is considerable uncertainty associated with this issue.

Problem? What Problem?

Pintails have received relatively little research and management emphasis compared to mallards. As a result, basic life history data are incomplete, and the data sets routinely relied upon by managers and researchers to make management decisions may not be adequate to provide reliable answers. For example, recruitment and survival rate estimates are compromised by inadequate and piecemeal banding efforts. Additionally, recent satellite tracking of spring migration (Miller et al. 2000, 2001) verifies analyses (M. Runge, unpubl.data), which show that the May Survey underestimates pintail numbers because a substantial proportion of the population is in unsurveyed areas when strata are counted, particularly when the prairies are dry. The high population estimates of the 1950s may have been inaccurate; as a result managers may have overestimated the pintail's reproductive potential, leading to overly optimistic expectations at best and unrealistic conservation goals at worst.

Pintail WPOP estimates generally correlate very well with BPOP estimates over the long-term, with the exception of the unusually large BPOPs from 1955 and 1956 (Miller and Duncan 1999). May Ponds were similarly very abundant during 1955, 1974 and 1997 (Figure 1), but the pintail BPOP was unusually high in 1955 and 1956. Pintail WPOP estimates, however, did not reflect these very high BPOPs in any flyway. In fact, winter counts in the Pacific and Central Flyways going back to 1948 showed no unusual numbers of pintails at any time prior to the 1970s (Figure 7). Counts indicated that fewer pintails wintered in Mexico during the 1950s than 1970s (U.S. Fish and Wildlife Service, unpubl. data). In summary, the pintail BPOP was exceptionally high during 1955-56, but similarly high counts did not appear in the WPOP. In contrast, mallard BPOPS were very high during 1955–58 as well, but these were accompanied by high WPOP's in subsequent winter counts. In addition, only mallards and pintails showed extremely large BPOPs in the 1950s, whereas the other 8 prairie duck species did not (USFWS 1998). Given the excellent pond counts of those years and the recent dramatic increase in all inventoried prairie dabbling duck species, except pintails, through 1997–98 (USFWS 1998), the lack of response by

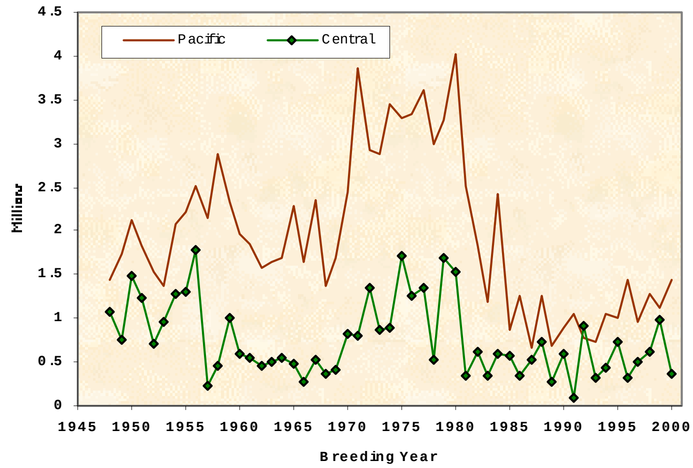

Figure 7. Winter populations (from midwinter inventory) of northern pintails in the Pacific and Central Flyways, 1948-2000.

other species in the 1950s is perplexing. Further exploration of this issue with old data sets, field notes of pilot biologists, and field biologists is warranted.

The NAWMP objective of 5.6 million pintails might be too high, or at least too optimistic, suggesting that the goal may be unattainable, and thereby lead to frustration. For example, the peak BPOP during the 1970s was markedly lower than during the 1950s, indicating a clear downward trend even then (Figure 1). Thus, in hindsight, managers could have concluded in the 1980's, when NAWMP objectives were established, that recruitment potential had changed for this species (or that 1970s data were unusually high if one believes that the 1950s data were inaccurate). In comparison, peak mallard populations in the 1970s were much closer to those of the 1950s (Figure 8), and managers correctly concluded that similar levels could occur again. This view has been verified with the very high peak mallard BPOP achieved during the late 1990s. In contrast, the recent "peak" in pintail BPOP recorded in 1997 simply extends a nearly 5-decade downward trend. Clearly, pintails have not been as responsive to improved wetland conditions over the long term as have mallards. Should NAWMP objectives take this into account and perhaps tailor pintail recovery to a more achievable potential? Alternatively, maintenance of the larger goal may better support habitat management programs.

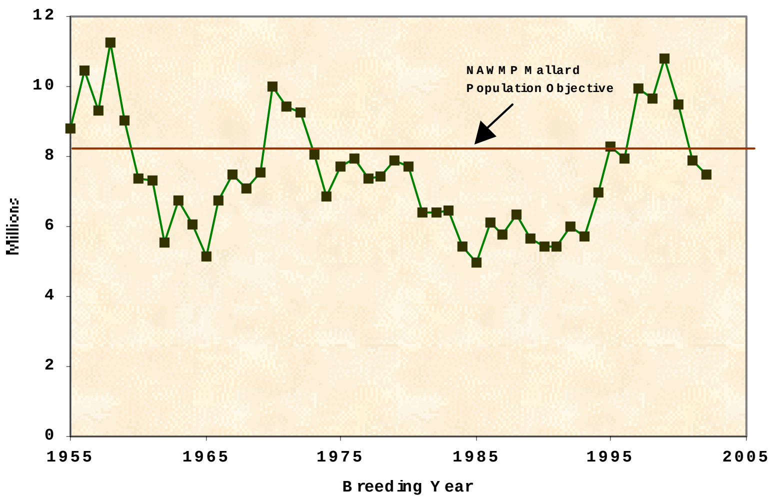

Figure 8. Breeding populations of mallards in North America, 1955-2002, shown with NAWMP objective.

Banding data for pintails are not adequate for management purposes. Since the 1920s, both mallards and pintails have been banded regularly in North America; however, after 1957, pintail banding was greatly reduced in favor of heightened emphasis on mallards (Figure 9). As a result, mallard bandings increased markedly as those for pintails fell, perhaps partially because of changing banding techniques. This situation clearly compromises the ability of managers to measure pintail vital rates and implement adaptive harvest management for pintails. Lack of bandings is critical, but so too is the notion that pintails, perhaps more than any other species, fall victim to major mortality events between the time of banding and beginning of hunting season, namely avian botulism losses. Such undocumented losses of banded birds prior to hunting season can bias harvest rates, certainly, and may complicate interpretation of survival rates. Inadequate banding precludes proper interpretation of additive/compensatory mortality models, or even derivation of harvest.

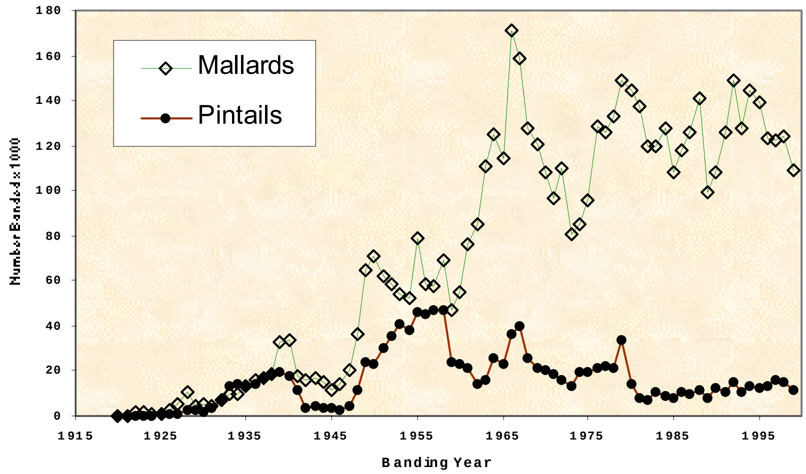

Figure 9. Mallards and northern pintails banded in North America, 1920-2000.

Pintails are undercounted by the May Survey, especially in years of prairie drought. Through development of the pintail adaptive harvest model, Sheaffer et al. (1999) discovered quantitatively that as the average latitude of the pintail BPOP moves north in response to reduced wetlands on the dry prairies, BPOP estimates decline (M. Runge, unpubl. data). Satellite tracking data can help explain this phenomenon. In spring 2000 and 2001, a portion of pintails-marked with satellite transmitters moved to unsurveyed regions in Alaska, Northwest Territories, British Columbia, Yukon and Russia where up to 20-40% may have been missed (Miller et al. 2000, 2001). In contrast, virtually all pintails were accounted for in the prairies. This problem is fixable by adjustments to survey timing, by extrapolation, or by expanding existing strata or establishing new ones where needed. Before major changes are undertaken, however, data are needed from the other flyways. The inefficiency of the May Survey to account for pintails is a problem for AHM, in which accurate population estimates are required.

Since AHM for pintails has not been implemented, harvest restrictions imposed over the last decade and more, might have been more restrictive than necessary. The resulting reduced harvest may have decreased the comparability of harvest age ratios (Miller and Duncan 1999), because the very low bag limit, high vulnerability of young and hunter selectivity for males, reduce the chance that adult hens will be taken; therefore, recent harvest ratios may be biased high (M. Runge, pers. commun.).

May Pond counts (Types 3-5 [USFWS and Canadian Wildlife Service 1987]) do not necessarily reflect pintail distribution during the time of the survey. Pintails are generally found in the prairies west and south of where the highest density of May Ponds are distributed, even in wet years (D. Caswell, unpubl. data; Podruzny et al. 2002). Thus, pintail must be responding to factors other than inventoried ponds. Type 1 ponds, shallow ephemeral wetlands important to pintails, are not included in reported May Pond counts. Additionally, since May Ponds were once strongly correlated with pintail BPOP, there may have been a disconnect between Type 1 and reported ponds since the 1980's. This could have resulted from landscape changes over a wide area, in which native prairie has given way to cultivation, reducing the quality or quantity of ponds during average or even wet conditions. Might inclusion of Type 1 counts in annual surveys help explain pintail population trends?

Integrated Hypothesis: Cross-seasonal Effects

There was substantial discussion of the potential role of cross-seasonal effects contributing to the pintail decline. This theory suggests that habitat or population impacts at one part of the life-cycle affect subsequent aspects of the life-cycle. Although this notion is intuitively reasonable, hard evidence to support this idea has, for the most part, not been developed, and doing so defies ready solution at this time. Most workshop participants considered cross-seasonal effects a difficult issue to resolve, largely because of logistical difficulties. Nonetheless, a good argument was made for the potential existence of cross-seasonal forces underlying population processes. Ultimately, participants reasoned that any cross-seasonal effects would have to be expressed through one or more of the above mechanistic factors/hypotheses. Therefore, the cross-seasonal concept remains a viable and useful way of incorporating factors operating at specific times of the life cycle, and may be very useful in planning for habitat needs and research programs during the entire pintail life cycle.

Photo: Ducks Unlimited Canada

Prioritization Of Hypotheses To Explain Pintail Status

The pintail workshop ended before most participants could fully consider and determine which hypothesis(ses) the evidence best supported. Participants noted that the interaction of factors from across the wide range of pintail habitats in all seasons (cross-seasonal relationships) needed to be considered to increase confidence in any conclusions. Subsequent to the workshop, organizers asked participants to rank seven factors thought to be important to pintail population dynamics. Specifically, participants assessed each factor's importance in explaining the long-term decline of pintails, and the inability of this species to respond positively to recent improvements in wetland conditions. Participants ranked each factor from 1–7, in which a rank of 1 was most important and 7 least important. Respondents also rated their confidence in the knowledge available to support their ranking of each factor (rank of 1 = quite confident, 2 = somewhat confident, 3 = not confident).

Of the 32 responses received, 28 ranked nest success as most important, and the majority had a high degree of confidence in their ranking (Table 1). Thus, respondents concluded with a high degree of confidence that poor nest success is the factor most responsible for the decline in the pintail population, its lack of response to recently improved water conditions, or both.

Table 1. Average ranks of factors thought to affect pintail population dynamics and, thus, population status (the lower the number, the greater its importance and confidence).

	Breeding Propensity	Nest Success	Duckling Survival	Adult Breeding Season Survival	Harvest	Disease	General Survival
Importance	3.0	1.2	4.0	3.5	5.0	3.0	7.0
Confidence	2.9	1.3	2.0	2.0	2.0	2.0	2.0

Breeding propensity, disease, and adult breeding season survival were ranked as secondary in importance. Duckling survival, harvests, and general survival received the lowest importance rankings. The confidence ranking for each of these other factors was lower than for nest success, with particularly low confidence about breeding propensity, indicating that each of these may warrant future study to better assess their importance to pintail population dynamics.

Conclusions Based On Examination Of Hypotheses

There was a strong consensus that the decline in the North American pintail population, the apparent weak response to recently improved wetland conditions, or both, stems from a prairie breeding ground problem, especially in Canada, with decreased nest success being by far the most likely problem. Poor nest success is believed to result from factors that have accompanied the conversion of native prairie to cropland in the heart of pintail nesting landscapes. These factors include: 1) very high predation rates imposed by an altered predator community, possibly as a byproduct of altered habitats, and 2) changing cropping practices that result in direct destruction of nests. The pintail's habit of nesting in stubble fields in areas dominated by spring seeding is of paramount concern. Research suggests that predation and farm machinery account for the severe nest losses in these fields.

Maintaining Momentum

Participants at the Pintail Workshop discussed how to keep pintails "on the front burner" for the express purpose of increasing management efforts and attracting needed funding to implement management programs, including adaptive evaluation of results. The group thought it critical to create a "Pintail Recovery Group" consisting of biologists to focus on these twin objectives for pintails in the years ahead to make sure that recommended programs get adequate support and funding. Such a group ideally would have official recognition by NAWMP. This group would consist of volunteer biologists and managers, with a chairman selected on a rotating basis. Group members would make themselves available for presentations to NAWMP Joint Ventures that have a direct interest in the status and recovery of pintails in North America. Presentations also could be given at the annual Wildlife Society Conference, Flyway meetings, International Waterfowl and Wetlands Symposium, and others. Workshop participants identified the need that some members of the group likely will need direct monetary support to defray travel costs.

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Part 2. A MANAGEMENT AND RESEARCH PLAN FOR NORTHERN PINTAILS

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Introduction

The primary objective of the pintail workshop was to develop a suite of remedies to solve the pintail dilemma through the production of a management and research plan. Participants used the information presented and debated during the workshop to begin to develop potential conservation programs that could be implemented and evaluated. These fall under "Landscape Management" projects and "Population Management" projects. These new proposals reflect the consensus of participants that pintail recovery will require both improvements to upland, and sometimes wetland, habitat conditions over vast areas of Prairie Canada and in the U.S., as well as improvements to the basic life history data sets upon which pintail population and harvest management are based. Prairie Canada is the prime target for land management because of its historic importance to the continental pintail breeding population, the lack of a strong response by pintails in that region to improved wetland conditions in the 1990s, and the absence of a CRP type program in Canada (see Miller and Duncan 1999).

Because the workshop did not progress to the extent originally anticipated, we used the results and discussions from the workshop to develop a pintail management and research plan, after first soliciting comments and assistance from all participants on working drafts. We are confident that the conclusions and recommendations for management actions listed in this final report represent a consensus of views shared during the workshop in Sacramento, and those received subsequently in response to solicitations.

General Discussions From Pintail Workshop

Workshop facilitator Dr. John Eadie emphasized the uncertainty of much of the pintail data and analyses, particularly that associated with banding information, and the relative paucity of basic life history information on pintails in comparison to mallards. He also pointed out the apparent importance of scale, citing evidence of variation in numerous vital rates over time and space, evidence of duck deficit variance within Canada versus the U.S. (i.e., large in Canada), and effects of habitat variables at different scales (e.g., May Survey stratum versus transect segments). He noted the value in contrasting vital rates among areas with different demographics (e.g., source-sink dynamics) and the potential value of thinking about pintail life history and evolution in comparison with other ducks. Lastly, Eadie noted the utility and limitations of models, the oftentimes lack of supporting data, possible linkages between geographic areas, and the potential implications for AHM for pintails.

Eadie urged workshop participants to think of adaptive management implications from the various hypotheses, including cross-seasonal effects, and challenged participants to think about data requirements and the appropriate spatial and temporal scale to test hypotheses. He urged the development of management scenarios that would help discriminate among multiple hypotheses, pointing out that any hypothesis must explain the decline, track change since the 1960s, have a viable (testable) mechanism, and be linked to some management action. Eadie challenged the group to also think about how we might learn quickly, and he developed a decision tree to assist in logical examination of the population decline (Figure 10). Lastly, Eadie asked participants to conceive of a truly integrated large scale program that would: 1) allow testing of alternative hypotheses; 2) test by management action; 3) incorporate evaluation to learn and decrease uncertainty; and 4) build in an updating mechanism as we learn.

Workshop facilitator Bob Trost urged participants to integrate research and management on the pintail issue. He pointed out that even though this is single species management at a time when it is not in vogue, the pintail problem has links to other species such as other declining prairie birds. Trost urged the group to be product-oriented and produce something that has not been produced in the past. He emphasized that we have no existing example of a specific science-based program in which both habitat and population management programs are linked and suggested that the pintail situation may lend itself to such an effort. Trost asked the group to consider how we might integrate pintail conservation into existing programs to achieve the underlying objective of increasing the number of pintails in the world.

Trost pointed out that the essential elements of an adaptive approach are:
1) a clearly defined objective; 2) a set of management alternatives; 3) a set of models that predict results of alternatives; 4) a way to monitor results; and 5) a way to incorporate

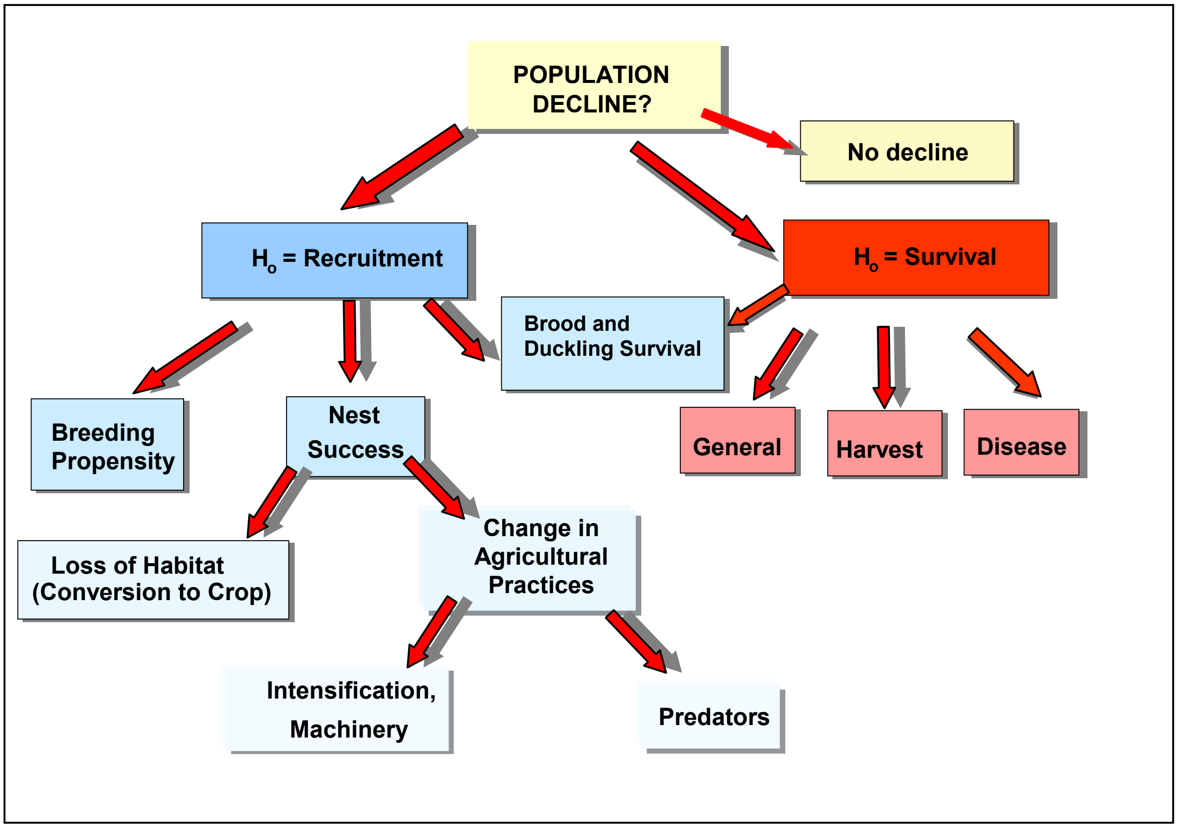

Figure 10. Decision tree of hypotheses and factors considered as possible causes of a decline in the northern pintail population. (Note: Although cross-seasonal effects not shown, it is presumed that they would be expressed through one of the mechanistic factors shown).

new information. If we could do all of this, there would be much support for a combined habitat/regulatory management program for pintails.

Management Actions And Investigations

We present here 3 sets of actions to address the decline in pintail numbers. The section is divided into landscape management actions, population management actions, and directed field investigations to reflect the key habitat management measures required, important wildlife management tools necessary, and recommended research efforts required, respectively. All management actions are assumed to have an adaptive evaluation component.

I. Landscape Management Actions

Priority 1: Reduce Cultivation And Spring Tillage In Key Pintail Breeding Areas On The Prairies

Justification Workshop participants identified low nest success on the prairies as the most plausible cause for the low pintail population. This is a result of the pintail's unique habit of nesting in sparse cover and the conversion of grassland habitat into cultivated land resulting in many pintails nesting in stubble where predators and spring tillage operations destroy most nests. Studies have shown that duck production is higher on grassland than on cultivated areas, higher in landscapes with reduced proportions of cultivated land, and higher on lands that are fall-seeded rather than spring seeded. The solution is the collective implementation of large-scale programs focused on reducing the area impacted by annual or spring tillage operations within key pintail breeding areas through the implementation of the program components identified below. Program components will be directed through the respective NAWMP joint ventures in Canada (PHJV) and the U.S. (PPJV), and projects will be adaptive in nature, with accompanying evaluations and improvements.

Photo: K. Guyn, Ducks Unlimited

Programs which replace cultivated land with permanent cover and maintain existing grassland areas will not only enhance pintail populations but will also help restore populations of other grassland birds (McMaster and Davis 2000). Because grassland birds have declined more than any other bird guild in North America (Peterjohn et al. 1995), they are an important group requiring conservation efforts on a continental scale. Therefore, this land management component of reducing spring tillage and increasing grass cover can provide opportunities for linkages with the North American Bird Conservation Initiative (NABCI).

Program Components

a) Convert Cropland into Permanent Cover: This component involves the conversion of cropland into permanent cover, such as pasture or idled grassland. Conversion of cropland into hayland may also be beneficial, although consideration of delayed haying dates and use of flushing bars may be required to maximize benefits to waterfowl and other birds. Examples of such programs are the Permanent Cover Program in Canada (Vaisey et al. 2000), the CRP in the U.S., and Cropland Conversion Programs under the NAWMP. This program component would involve both direct NAWMP/NABCI land securement and enhancement efforts, and agricultural policy initiatives.

Direct Program Resources for converting cropland need to be focused upon those areas within the prairie pothole region that presently or historically have supported high pintail breeding densities.

Policy Initiatives Agricultural policy changes to convert cropland should be vigorously pursued. We recognize that justification of such large-scale landscape-level agricultural conversion programs by governments will largely be based upon agricultural socioeconomics, soil and water conservation benefits, and possibly biodiversity and carbon sequestration.

b) Increase Use of Fall-seeded Crops: Spring cultivation should be reduced by using fall-seeded crops such as winter wheat and fall rye to provide an alternative to retain land in annual cropping, while reducing the destruction of nests. Outreach and extension efforts need to be continued and improved to increase farmer awareness and encourage use of fall-seeded crops. Market prices and improved winter-hardy strains will affect acceptability and extent of this component.

c) Maintain Existing Grassland Areas: Existing grassland areas must be maintained to ensure an incremental increase in secure nesting habitat for pintails on the prairie and yield a net increase in pintail recruitment. Although replacing lost grasslands and reducing spring tillage operations are important conservation measures, it is just as critical that we do not lose any existing grassland habitat. Much of the grassland remaining in the main pintail breeding areas in Prairie Canada has so far remained safe from the plow, but threats from irrigation and new cropping techniques put much of this land at potential risk. Grassland habitats and the wetland basins in these areas need to be protected through conservation programs for the benefit of pintails and prairie biodiversity in general. There are a number of current initiatives such as Prairie Conservation Action Plans that provide cooperative frameworks for preserving existing prairie grasslands in Canada. Tools such as easements, government policy initiatives, and other incentives should be pursued.

Photo: K. Guyn, Ducks Unlimited

Priority 2: Maintain Pintail Habitats Outside Of Prairie Breeding Areas

Justification Restoration of the pintail population requires habitat improvement in the prairies, especially in Canada. However, habitat and land management issues in areas outside of the prairie breeding grounds cannot be ignored. At a minimum, maintenance of existing high-quality habitats on wintering areas (e.g., Central Valley California, Gulf Coast of Texas and Louisiana, and Mississippi Alluvial Valley), staging areas (e.g., Klamath Basin, Rainwater Basin) and northern breeding areas (e.g. Alaska) is required to ensure that any incremental increase in the pintail population resulting from habitat improvement on the prairies is not compromised by habitat loss or degradation in other areas. Habitat changes on wintering areas or spring and fall staging areas may not have caused the overall population decline but they could be preventing its recovery. Although the consensus of the workshop participants was that low nest success in the prairies was the key problem for pintails, scientific uncertainty remains as to the potential impact of various other factors.

Program Components

a) Wintering Areas: One of the most notable potential habitat threats outside of the prairies is the conversion of rice fields, which provide quality winter habitat for pintails, to other agricultural products or urban centers. Wintering pintails are dependent on harvested rice fields for winter habitat in California, and also to a great extent in Arkansas, Louisiana, and Texas. Rice acreage has declined 40% in Texas in recent years, and some forecasts predict elimination of rice in that state within a decade. Cotton farming and urban development has expanded into the heart of the rice-growing region of the Sacramento Valley in California. Programs to discourage further shifts away from rice to other crops should be implemented, along with efforts to protect agricultural land from urban expansion.

Gulf Coast marshes also continue to be lost at a high rate. Managers need to continue to work with appropriate agencies and companies to halt and eventually reverse these losses.

b) Staging Areas: Spring staging areas are another priority concern. Shallow, ephemeral wetlands used by pintails for spring staging are, and continue to be, threatened. For example, habitats important to staging pintails in the Klamath Basin of northern California/southern Oregon are presently threatened because of water rights and decisions designed to benefit endangered fish species. Although the precise importance of spring habitat and potential cross-seasonal effects in the pintail life-cycle are uncertain, there have been large losses and additional current threats exist to these important pintail habitats. Fall staging areas across the continent also cannot be overlooked. Managers must maintain existing habitats and possibly restore lost habitats.

c) Northern Areas: Northern breeding habitats and staging areas must also be safeguarded. Resource extraction, such as oil/gas and timber, in the Northwest Territories and other northern regions may be threatening some boreal and tundra wetland habitats important to pintails. Vigilance must be maintained and threats evaluated. The long-term impacts of global warming are uncertain, particularly the potential impact rising sea levels may have on low lying breeding areas such the critical Yukon-Kuskokwim Delta in Alaska.

II. Population Management Actions

Adaptive Harvest Management (AHM)

Justification Our knowledge about the impact of harvest on pintail population dynamics is poor in comparison to that of mallards. AHM combines harvest management with learning. The sooner AHM for pintails is initiated, the sooner learning about pintail population dynamics at a broad scale can begin.

Program Pintail AHM, as proposed by Sheaffer et al. (1999), should be implemented as soon as practical. However, implementation of AHM for pintails is likely hampered by the general inadequacy of banding data sets and the efficiency of population surveys. Hence, these two problems should be addressed concurrently with implementation of AHM (see below).

Linking Pintail Populations Seasonally

Justification Pintail management will benefit by delineating specific migration routes to link breeding populations, staging areas, and wintering areas, taking into account the cross-seasonal nature of the pintail life cycle. Investigation of such linkages within the continental population of pintails is needed to facilitate future conservation efforts.

Program Three approaches are recommended to address this issue: 1) expand satellite tracking to add to that being done in the Pacific Flyway (e.g. Miller et al. 2000, 2001), and complement it with integrated field projects, to provide direct information on comparative migration routes, fall and spring staging areas, length of stay in these areas, specific uses made of these areas, and connections between nesting, wintering, molting, and staging areas and the chronology of use; 2) establish operational preseason banding of pintails on breeding areas to better establish linkages between breeding areas and wintering areas, and to allow improved estimation of vital rates and derivation of harvest); 3) establish stable isotopic signatures from feather samples (e.g. Hebert and Wassenaar 2001) taken on major breeding and wintering areas and, assuming sufficient geographic variation exists, attribute proportions of wings collected from hunters to various breeding/molting areas by Flyway.

Population Goal

Justification There was considerable discussion regarding the NAWMP population goal for pintails, and our ability to assess population status and trends. Pintail populations, could historically, be predicted using May Ponds, however, this relationship appears to have eroded since the 1970's.

Program Examinations of wetland and upland features that help explain pintail settling patterns should be conducted. For example, Type 1 ponds (ephemeral water less than 6 inches in depth and not expected to persist longer than about 3 weeks [USFWS and Canadian Wildlife Service 1987]) could be important to pintail biology, but these ponds are not counted during the aerial portion of the May Surveys each year (they are recorded on ground segments but are not reported). What may have changed is the historical correlation between some subset of total ponds (e.g. Type 1 ponds) and the reported ponds (May Ponds). Alternatively, changes in land management and farming practices may have diminished the quality of some ponds (e.g. cultivation of shallow ponds) and such factors should be evaluated in concert with other changes in the landscape.

Monitoring Population Size And Distribution

Justification Some fraction of the pintail population is missed during the annual May Survey, with the missed proportion increasing as the average latitude of the breeding population moves north as a result of drought in the prairies (M. Runge, USGS, unpubl. data). Recent satellite tracking data of pintails from California verify these results (Miller et al. 2000, 2001). Because a good estimate of the pintail BPOP is required for AHM, to support the NAWMP population objectives, and for proper stewardship of this species, this problem needs to be remedied.

Program Two approaches are possible: 1) expand the size of existing survey strata or add new ones in Alaska and elsewhere, to include areas now not surveyed that are shown to regularly contain pintails during the survey period; 2) adjust the timing of surveys if data continue to show that birds are being missed in surveyed strata; or 3) adjust the current BPOP estimates to account for the fraction of birds likely missed on existing survey strata by using the regression between BPOP size and average latitude of the breeding population (Sheaffer et al. 1999).

III. Directed Field Investigations

Workshop participants identified several topics where additional field investigations would be required to fill gaps in our knowledge and reduce uncertainty to better support pintail conservation measures. This list is not meant to be inclusive, but rather includes work that is of the highest priority to support the program described in this report.

Photo: K. Guyn, Ducks Unlimited

Enhance Pintail Banding Program

Justification There was a broad consensus that the U.S. Fish and Wildlife Service, the Canadian Wildlife Service, and the four flyway councils should implement an operational preseason (and perhaps winter) pintail banding program. This is needed to determine vital rates critical to the support of AHM for pintails, determine derivation of winter populations and harvest, obtain reliable survival rate and harvest rate estimates, and determine band reporting rates. Unfortunately, except for Alaska, existing banding programs target mallards, and trap sites are placed in optimal mallard habitats in regions supporting large mallard populations. These locations will not work efficiently for pintails. With the recently increased reporting rates associated with the advent of phone-in band reporting, redirection of some current efforts to increase pintail marking could be implemented without diminishing adequacy of the mallard banding program.

Program A pintail banding program needs to be developed and implemented as soon as possible. The most important regions, habitat types, and specific lakes and marshes for preseason trapping and banding of pintails need to be determined in Alaska, Northwest Territories, the prairie provinces, the Northern Great Plains in the U.S, and perhaps other areas. Consideration should be given to the potential effect of late summer botulism mortality on subsequent band recovery analyses. The value of postseason banding of pintails on wintering grounds also needs to be re-evaluated.

Expand Pintail Nesting Ecology Studies

Justification Additional nesting ecology studies need to be conducted across the pintail nesting range in Canada and the U.S., including northern areas, to increase our knowledge and confidence in recruitment rates and to rigorously test various hypotheses. Of particular importance are studies related to the pintail's apparent selection of grain stubble fields in which to nest, predisposing nests to destruction by farming activities and intense predation.

Program Nesting ecology field studies need to be comprehensive and of a magnitude appropriate to produce results relevant to continental population dynamics. The studies need to be of sufficient term to obtain data on the factors that produce annual, geographic, and habitat variation in propensity to nest, nest success, hen success, brood and duckling survival, and fledgling rates. Such studies should be coordinated to fully take advantage of the natural experiment possible with comparisons between northern and southern regions, eastern versus western prairies, and U.S. versus Canadian prairies. Adaptive management of habitat measures undertaken should include an evaluation of pintail response. Also, the concept of cross-seasonal effects of body condition (e.g., fat and protein content) needs to be addressed relating habitat conditions in wintering and spring migration staging areas to production of ducklings and ultimate recruitment rates.

Photo: K. Guyn, Ducks Unlimited

Examine Relationships Between Pintail Breeding Populations And Wetland And Upland Habitats

Justification Because the apparent relationship between May Ponds and pintail BPOP has deteriorated over the long-term, there is a critical need to determine the true nature of the relationship between wetland and upland habitats and pintail breeding populations. In particular, data presented at the workshop show that pintails do not necessarily distribute themselves, either in wet or dry years, where May Ponds (Type 3–5) are distributed. Therefore, pintails appear to be responding to other features of the landscape in the prairies of Canada and the U.S. We recognize that duck-pond relationships become obscured when the population is not stable over time, as is the case with the declining pintail population.

Program We recommend an analysis of long-term data sets that compare May Ponds with various pond types, including Type 1 ponds, in strata and transects where both are available. Detailed and yet extensive field investigations are needed to fully document the landscape features, both wetland and upland, to which pintails respond in the spring, and to determine length of time ponds persist relative to land treatments. The objective will be to develop better wetland predictors of pintail BPOP in the prairies.

Conduct Adaptive Habitat Management Programs

Justification It is critical to evaluate habitat management components implemented under the Priority 1 Land Management Actions aimed at reducing cultivated land and spring tillage on the prairies. Likewise, other programs considered to provide benefits for pintails, such as agricultural programs, need to be assessed in an adaptive manner. This feedback loop would enable alteration of habitat management alternatives in an adaptive manner to increase future effectiveness and illustrate program success. There remains scientific uncertainty as to the effectiveness of programs at various scales.

Program Conduct rigorous scientific evaluations of the effectiveness of land management programs designed to increase nest success and recruitment of pintails.

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