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James J. Dinsmore
Iowa State University

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Invasive Birds in Iowa: Status, Problems, and Threats

JAMES J. DINSMORE

Department of Animal Ecology, Iowa State University, Ames, Iowa 50011

A total of 18 invasive bird species has been introduced into or have expanded their range to include Iowa. These include ten non-North American species, one North American species that has been displaced and now is established in Iowa, and seven native species that have been released to reestablish Iowa populations. Twelve of those are regularly occurring species in Iowa, and they comprise 3.0% (12 of 404) of the species known from Iowa and 5% (10 of 199) of Iowa's nesting avifauna. These percentages are similar to those found in neighboring states. Several more species are likely to become established in the near future. Two invasive species, European Starling (*Sturnus vulgaris*) and House Sparrow (*Passer domesticus*), are among the most numerous species found in Iowa and have negative effects on other species. Most of the other invasive bird species seem to have little effect on other bird species. Two species, Mute Swan (*Cygnus olor*) and Eurasian Collared-Dove (*Streptopelia decaocto*), are close to becoming established in Iowa. Both have the potential to be harmful to other bird species.

INDEX DESCRIPTORS: birds, invasive species, exotic species, introduced species, Iowa's avifauna.

The recent, widespread publicity surrounding the problems caused by invasive species in North America has prompted numerous reviews of the topic (e.g., Simberloff et al. 1997, Cox 1999, Van Driesche and Van Driesche 2000). Much of the recent attention has been focused on invasive plants and invertebrates, with less attention given to vertebrates. Despite this recent focus, there has long been interest in invasive vertebrates, including birds, in North America. Much of this started with the explosive range expansion of the House Sparrow (*Passer domesticus*) and European Starling (*Sturnus vulgaris*) in the late 1800s and early 1900s along with the numerous releases of game species during the 1900s. In more recent years, attention has shifted somewhat to the release of numerous species of cage birds into the wild. In Iowa, several species [e.g., Ring-necked Pheasant (*Phasianus colchicus*), Rock Dove (*Columba livia*), and House Sparrow] are among the earliest and best known invasive species. Besides those species, a diverse group of invasive game and nongame species has been found in Iowa. These include several non-native species that have reached or been introduced into the state, and several previously extirpated native species that have been reintroduced into the state.

This paper summarizes our knowledge of invasive bird species in Iowa. Besides reviewing the invasive species that have reached Iowa, I will also point out some effects that these introduced species have had on other bird species in Iowa and identify future concerns.

METHODS

Two recent books (Jackson et al. 1996, Kent and Dinsmore 1996) provide a comprehensive summary of the current status of Iowa's birds. I have reviewed those books and many of the papers cited in them to get an overview of the issue of invasive birds in Iowa.

In this paper, I consider the term invasives to include: a) species that are not native to North America and have been released in Iowa or elsewhere on this continent and have expanded their range to include Iowa, b) species that are native to North America and have been released outside of Iowa but have expanded their range to include Iowa, and c) species that were once found in Iowa but have been extirpated and subsequently reintroduced into the state. For an

additional four native species that have not been extirpated from the state, birds from populations outside of Iowa have been released in the state in an attempt to augment the native population. I have not discussed these four in detail but include them here because these introductions are, in effect, similar to the invasive species discussed here. I realize that my definition of invasives is somewhat broader than that used by others. Of major importance is the direct role of humans in transporting these birds either to Iowa directly or to release sites from which they eventually reached Iowa. In addition, the birds that were released in or reached Iowa were either members of: 1) a species that was totally new to the state or 2) a population of a species that was different from that that was originally found in Iowa. For example, Trumpeter Swans (*Cygnus buccinator*) released in Iowa came from Alaska, Montana, and numerous other sources (Andrews 1999). I believe that because all of these releases involve the transfer of individuals to sites in Iowa far from where those individuals now occur, they should be considered invasives.

I consider a species to be established in Iowa if a breeding population has persisted for at least five years. This is an arbitrary decision, and it is possible that some populations that fit this criterion will eventually die out.

To determine how Iowa compares with other states, I examined the bird lists of four adjacent midwestern states: Missouri (Robbins and Easterla 1992, Jacobs and Wilson 1997, M. Robbins, pers. comm.), Illinois (Bohlen 1989, D. Bohlen, pers. comm.), Minnesota (Janssen 1987, A. Hertz, pers. comm.), and Nebraska (S. Dinsmore, pers. comm., R. Silcock, pers. comm.). I considered both those invasive species that are established nesting species in each state and other invasive species that although not established nesters, regularly occur in the state. I also determined how many species have been authentically reported in each state (i.e., the state list) and how many species have been reported nesting in each state.

RESULTS

Invasive Species in Iowa

A total of 18 Iowa species was found to fit into one of three patterns of invasive species (Table 1). Not all of these have estab-

Table 1. Invasive bird species of Iowa.

1. Non-North American species-10 species	
a. Established in Iowa	
Ring-necked Pheasant	Established statewide
Gray Partridge	Established in northern half of Iowa
Rock Dove	Established statewide
European Starling	Established statewide
House Sparrow	Established statewide
Eurasian Tree Sparrow	Established locally in southeastern Iowa
b. Occurs regularly in Iowa but breeding population not established	
Mute Swan	Regular visitor, some feral nesting
Eurasian Collared-Dove	Nesting locally
c. Unsuccessful stocking attempts in Iowa	
Chukar	Released several times, populations not established
Reeves' Pheasant	Released in 1960s, populations not established
2. Range Expansions by North American species-1 species	
Established in Iowa, not known to have nested in Iowa previously	
House Finch	Established statewide
3. Native species released by humans in Iowa-7 species	
a. Reestablished as breeding species in Iowa	
Canada Goose	Established statewide
Greater Prairie-Chicken	Established locally in south-central Iowa
Wild Turkey	Established statewide
b. Attempts to reestablish populations in progress, but breeding populations not established	
Trumpeter Swan	Released statewide, too early to evaluate
Osprey	Released at several sites but no evidence of successful breeding
Peregrine Falcon	Released at several sites—nesting in Des Moines and Cedar Rapids
Sharp-tailed Grouse	Released in western Iowa, but not established yet

lished nesting populations in Iowa. Details on the histories of these species in Iowa are given in Appendix A. The three patterns are:

1) Species that are not native to North America and have been released either directly in Iowa or elsewhere in North America and subsequently have reached Iowa. (10 species)

Six of these species are now established in Iowa (Table 1) and include several of the most conspicuous invasive species in the state. Two game species, Ring-necked Pheasant and Gray Partridge (*Perdix perdix*), are now well established. Three species were released in other states and expanded their range so that they now occur in Iowa. Two of these (European Starling, House Sparrow) are now found throughout Iowa and the third, Eurasian Tree Sparrow (*Passer montanus*), is

confined to a small area in southeastern Iowa. The arrival of the sixth, the Rock Dove, is undocumented, but presumably it was brought to Iowa with early settlers (Schorger 1952).

Two other non-North American species are established elsewhere in North America and have reached Iowa but are not established in the state. Several Eurasian Collared-Doves (*Streptopelia decaocto*) have been seen in Grinnell since 1997 (Fuller 1999) and others have been reported from several other sites in Iowa. It is likely that this species will become established in Iowa in the near future. The other species, Mute Swan (*Cygnus olor*), breeds along the Atlantic Coast and in Michigan and has been reported in Iowa almost yearly. It too seems poised to establishing a population in Iowa in the future.

Finally, two species, the Chukar (*Alectoris chukar*) and Reeves' Pheasant (*Syrnaticus reevesii*), have been released in Iowa in an attempt to establish them as game species. In both cases, these releases were unsuccessful (Dinsmore 1994, Kent and Dinsmore 1996).

2) A North American species that was released outside its normal range and has expanded its range from that site. (1 species)

The House Finch (*Carpodacus mexicanus*) is native to western North America. A few were released on Long Island, New York in 1940, and the species became established there (Elliott and Arbib 1953). From there, its range gradually expanded west, reaching Iowa in 1982. By about 1991, the species was established throughout Iowa (Cecil and Dinsmore 1995).

3) Species that are native to Iowa and have been reintroduced in the state. (7 species)

Most commonly, these releases have been used to try to reestablish breeding populations of species that formerly were found in Iowa but have been extirpated. In Iowa, these include three cases in which populations have been successfully reestablished. These have resulted in the restoration of two popular game species, Canada Goose (*Branta canadensis*) and Wild Turkey (*Meleagris gallopavo*), throughout Iowa. A third species, Greater Prairie-Chicken (*Tympanuchus cupido*), seems to be successfully reestablished in a limited area of southern Iowa.

Several other releases have not been so successful or it is too early to tell if they will be successful. The most publicized has been the attempt to restore Peregrine Falcons (*Falco peregrinus*) to Iowa. Once found nesting on cliffs in eastern Iowa, the native populations disappeared by the late 1960s. Single pairs currently nest in Des Moines and Cedar Rapids, but fairly significant human intervention has been required to maintain those pairs. Recent efforts have been directed at trying to get breeding pairs established on cliffs along the Mississippi River (Washburn 2000). Successful nesting by peregrines in these more natural environments would solidify the status of peregrines as restored to Iowa. Another raptor, the Osprey (*Pandion haliaetus*), currently nests in Wisconsin not far north of the Iowa border and probably once nested along the Mississippi River in northeastern Iowa. For several years young Osprey have been released near Waterloo, Iowa City, and Des Moines (Pat Schlarbaum, pers. comm.). It is too early to know whether these releases will be successful in establishing a breeding population of this regular Iowa migrant. A third effort has involved the Trumpeter Swan which once nested in the prairie regions of northern Iowa and disappeared in the late 1800s. Nearly 200 swans have been released in Iowa (Andrews 1999). In 1999, the first pair of seemingly wild Trumpeter Swans nested in Clinton County (Andrews 1999), a landmark on the road to restoring this species to Iowa. Again, it is too early to call this program a success in restoring Trumpeter Swans to Iowa. Finally, Sharp-tailed Grouse (*Tympanuchus phasianellus*) once nested in Iowa but disappeared in the late 1800s or early 1900s. Sharptails were

Table 2. Time pattern when invasive species were established in Iowa.

Time period	No. of species	Species
Pre-1900	2	Rock Dove, House Sparrow
1900–1950	3	Gray Partridge, Ring-necked Pheasant, European Starling
1950–2000	5	Canada Goose, Greater Prairie-Chicken, Wild Turkey, House Finch, Eurasian Tree Sparrow

released in Iowa in 1990, 1995, and 2001. A few sharp-tails, apparently from the 1995 release, were found near Anthon in Woodbury County in 1999 (Ed Weiner, pers. comm.) but it is too early to consider this an established population.

Time Pattern of Invasive Species in Iowa

Of the 18 invasive species discussed above, 10 seem to be established in Iowa (Table 1). Half of these were established in the past 50 years with the other half split about evenly between the late 1800s and the early 1900s (Table 2). All five species that became established prior to 1950 are non-North American species, whereas four of the five more recent arrivals are North American species. These include three species native to Iowa that have been reintroduced to the state (Canada Goose, Wild Turkey, Greater Prairie-Chicken).

Game versus Non-game Species

Of the 18 species considered in Table 1, 44% are game species in Iowa (excluding Trumpeter Swan although it conceivably could be hunted some day) and 56% are non-game species. Somewhat greater percentages of game species (5 of 8, 63%) than non-game species (5 of 10, 50%) have become established in Iowa. Although none of the three non-established game species are likely to become established in the near future, all five of the non-game species have a possibility of becoming established in Iowa.

Attempts to Augment Native Populations

In several instances, birds have been released in Iowa to try to augment natural populations of species native to and still established in Iowa. In all cases, these involved individuals from populations outside of Iowa. Brief descriptions of these releases are provided in Appendix B.

Numerous attempts have been made to establish breeding populations of Ruffed Grouse (*Bonasa umbellus*) at a number of sites, mainly in southern Iowa, where the species was once found but has been extirpated. Some of those releases have been unsuccessful, but small breeding populations of Ruffed Grouse have been established at several sites (Garner 1999a). More commonly these augmentation attempts have been unsuccessful. These include attempts to establish breeding populations of Mallards (*Anas platyrhynchos*) in southern Iowa in the 1970s (Korthas 1978), numerous and largely undocumented releases of Northern Bobwhite (*Colinus virginianus*) at sites throughout Iowa, and the release of 427 Barn Owls (*Tyto alba*) in the 1980s (Ehresman et al. 1988) in an attempt to revive Iowa's small breeding population. In all three of these situations, the impact of the released birds on native populations has probably been minimal. For instance, despite the wide publicity that the Barn Owl

releases received, none of the released birds has ever been documented to breed in Iowa.

Natural Range Expansions

In addition to the species mentioned above, several other bird species have undergone rather extensive natural range expansions in recent decades. Five have established breeding populations in Iowa and a sixth, although not established as a nesting species, has nested several times and, by virtue of its Old World origin, is ecologically much like an invasive species in Iowa. Because humans have not been directly involved in their transport, these six have not been considered as invasives here but are mentioned to draw attention to additional species that are essentially new to Iowa's breeding avifauna. For several of these species, one could argue that anthropogenic changes in the environment have been a factor contributing to their range expansion.

Two of these species were native to Iowa and were extirpated by about 1900. Both have shown recent population increases and now nest in the state. The Bald Eagle (*Haliaeetus leucocephalus*) started nesting again in Iowa in 1977 and currently there are more than 100 active nesting pairs in the state (Ehresman 1999, B. Ehresman, pers. comm.). Sandhill Cranes (*Grus canadensis*) returned as nesting birds in 1992 after a 98-year absence (Poggensee 1992) and currently nest at several sites in eastern Iowa.

Three other species were not known to nest previously in Iowa. The Mississippi Kite (*Ictinia mississippiensis*) seems to be established in the Des Moines area. It has been found there yearly since 1991 with single nests found in 1995 (Walsh 1996), 2000 (Dinsmore 2000), and 2001 (Dinsmore, pers. obs.). Ring-billed Gull (*Larus delawarensis*) populations have shown dramatic increases in recent decades and seem to do well near humans (Ryder 1993). Ring-billed Gulls have nested in the Spirit Lake region since 1994 (Waltz 1994). The Great-tailed Grackle (*Quiscalus mexicanus*), historically found in the Southwest, underwent a dramatic range expansion in the 1900s, reaching Iowa in 1983 (Dinsmore and Dinsmore 1993a). It now nests at scattered sites across roughly the western half of Iowa (Dinsmore and Dinsmore 1993b).

The sixth species, the Cattle Egret, is native to the Old World but reached South America in the late 1800s, apparently without any human intervention. It has since undergone an explosive range expansion, reaching Iowa in 1961 (Weller 1961). It has nested in the state a few times and is a regular migrant in Iowa.

DISCUSSION

Invasives as a Component of Iowa's Avifauna

To date, invasive bird species have had a noticeable but relatively modest effect on the overall avifauna known from Iowa. The ten nesting species represent 5% of the 199 bird species known to have nested in Iowa (Table 3). When the two species that are regular components (but not nesters) of Iowa's avifauna are included, a total of 12 species of invasives are found in Iowa. These represent 3.0% of Iowa's total avifauna (Table 3), again a relatively minor component.

To determine how Iowa compares with other states, I examined the bird lists of four adjacent states (Missouri, Illinois, Minnesota, Nebraska). In general, the invasive species component of the avifauna of these five states was fairly similar. A core group of five invasive species (Ring-necked Pheasant, Rock Dove, European Starling, House Finch, and House Sparrow) is established in all five states. A variety of other species are established or occur in one or more of the states. The total number of invasive species and the percentage of the total state list that consists of invasive species are similar in

Table 3. Invasive species as a component of the avifaunas of Iowa and four adjacent states.

State	Total Species	Total Invasives	Nesting Species	Nesting Invasives
Iowa	404	12 (3.0) ¹	199	10 (5.0)
Illinois	420	14 (3.3)	206	12 (5.8)
Minnesota	425	12 (2.8)	255	9 (3.5)
Missouri	397	14 (3.5)	187	7 (3.7)
Nebraska	445	12 (2.7)	217	9 (4.1)
averages	418.2	12.8 (3.1)	212.8	9.4 (4.4)

¹Percentage of the total in parentheses

all five states (2.7–3.5%, Table 3). The percentage of the breeding avifauna comprised of invasive species is more diverse among the states, ranging from 3.5 to 5.8%. Compared to these five, Iowa is about average for total number of invasive species and the percentage of the total state list that is invasive species. When invasive species that have established nesting populations are considered, Iowa is above average, both in terms of number of nesting invasive species and the percentage of the nesting avifauna that these species constitute (Table 3). Nationally, Hawaii and Florida have the greatest percentage of their breeding avifauna made up of invasive species (18 and 9%, respectively, Temple 1992). According to Temple, in most states, invasive species constitute less than 5% of the breeding avifauna, suggesting Iowa is slightly above average nationally.

Although relatively few species of invasive birds are found in Iowa, the relative abundance of a few of those species and their potential impact on Iowa's native avifauna is somewhat troubling. Two invasive species, House Sparrow and European Starling, almost certainly rank with Red-winged Blackbird (*Agelaius phoeniceus*) among the three most abundant bird species in Iowa. Two other invasive species (Ring-necked Pheasant, House Finch) also rank among the more abundant bird species in the state, whereas the other invasive species generally are relatively uncommon. Thus, numerically at least, invasive species are a fairly important component of Iowa's avifauna. The effects or potential effects of these species on other Iowa bird species are discussed below. Fortunately, to date, I am not aware of any native species that has been extirpated due to interactions with an invasive species nor are there any native species that seem threatened with that fate in the near future.

Effect of Invasive Species on Native Species

One of the most interesting questions relative to invasive species is: "What effect do they have on native species?" Among the birds, the answer is varied, with some species having a marked effect on other species and others seemingly having no as-yet identified influence on the native avifauna.

1) Non-North American Species

With six non-North American species now established in Iowa and two more having the potential to become established, this group raises perhaps the greatest threat to Iowa's native bird species.

Ring-necked Pheasant: The Ring-necked Pheasant is well established throughout Iowa. It is the most important upland game species in the state and is important economically in many rural areas during the hunting season. The greatest effect it has on other species is the potential to interact adversely with the Greater Prairie-Chicken (Vance and Westemeier 1979). In Illinois, another agricultural state with a remnant prairie-chicken population, biologists have had to

control pheasant populations on areas where prairie-chickens are found (Westemeier 1988). Pheasants are known to lay their eggs in prairie-chicken nests and, in other ways, aggressively interact with them. The recently reestablished populations of prairie-chickens in Iowa occupy regions with few pheasants so such interactions presumably are infrequent. Prairie-chickens in Iowa may be confined to such low-pheasant abundance areas in the future or, if their numbers increase, steps may have to be taken to reduce pheasant/prairie-chicken interactions. It is unclear what effect, if any, pheasants had on the extirpation of Iowa's native prairie-chicken populations in the mid 1900s. Pheasants may occasionally parasitize Gray Partridge nests (Carroll 1993).

Gray Partridge: Gray Partridge are found mainly in northern Iowa and especially in heavily farmed regions. No negative interactions have been noted between this species and other bird species.

Rock Dove: Rock Doves typically inhabit buildings or other human-built structures and, in general, many humans dislike them. Their droppings may ruin stored grain, and their nests can clog up storm drains on buildings, leading to significant damage. Rock Doves are also known to carry several disease organisms that could be transferred to humans (Johnston and Janiga 1995). In general, the negatives associated with Rock Doves are mostly associated with interactions with humans, and no significant negative interactions have been noted between Rock Doves and other birds.

European Starling: The starling is one of the most abundant and least liked birds in Iowa. In late summer and fall, they commonly feed on grain crops and animal feed in feedlots. They also foul stored grain and buildings with their droppings. In terms of interactions with other species, starlings are well known to displace other cavity nesting birds from nest sites including Northern Flicker (*Colaptes auratus*), Red-headed Woodpecker (*Melanerpes erythrocephalus*), Red-bellied Woodpecker (*Melanerpes carolinus*) (Ingold 1994), and Eastern Bluebird (*Sialia sialis*).

House Sparrow: Like the starling, the House Sparrow is one of the most abundant and least liked birds in Iowa. It is disliked by humans for its ability to foul buildings with its droppings and bulky nests. It also may consume grain from storage buildings and feedlots. It too has the reputation of aggressively driving other birds out of nest sites and may limit some species such as House Wren (*Troglodytes aedon*), Black-capped Chickadee (*Poecile atricapillus*), and Eastern Bluebirds from natural nest cavities.

Eurasian Tree Sparrow: Little information is available on this close relative of the House Sparrow. Its populations in Iowa are small compared to the House Sparrow so its impact on buildings and stored grain presumably is minor. It probably also drives off other species from potential nest sites but nothing has been documented on this topic.

Mute Swan: The Mute Swan is considered a pest along the East Coast and in several midwestern states where breeding populations are established (Ciaranca et al. 1997, McPeck and Adams 1994). It is aggressive to other, native waterfowl and may even attack humans. It also harms aquatic vegetation when it forages (Ciaranca et al. 1997). Many people view it as a beautiful species so control programs are unpopular but have been attempted in some states. If it does become established in Iowa, it should, at the least, be closely monitored and perhaps controlled. It is unclear whether Mute Swans could hinder attempts to reestablish a nesting population of Trumpeter Swans in Iowa. If there is any hint of a negative interaction between those two species, control measures should be taken to insure the survival of the native species.

Eurasian Collared-Dove: This Old World species is a recent arrival, first appearing in Florida, apparently in the early 1980s (Romagosa and Labisky 2000). It is now established in several states and has been present in Grinnell for several years. It seems likely that even-

Table 4. Summary of stocking efforts for ten Iowa species¹.

Species	No. of sites	No. of releases	No. of birds	No./release	Years	Result
Trumpeter Swan	23	31	181	5.7	1994–1999	Uncertain
Canada Goose	ca. 40	?	ca. 12,750	?	1964–1996	Successful
Osprey	3	8	35	4.4	1997–2000	Uncertain
Peregrine Falcon	8	15	154	10.3	1989–2000	Uncertain
Reeves' Pheasant	12	27	4,791	177.4	1963–1968	Unsuccessful
Ruffed Grouse	36	41	1,339	23.7	1962–1990	Some success
Greater Prairie-Chicken	5	12	660	55.0	1980–1994	Successful
Sharp-tailed Grouse	3	3	184	61.3	1990–2001	Uncertain
Wild Turkey	247	256	3,415	13.3	1960–1999	Successful
Barn Owl	44	?	427	?	1983–1987	Unsuccessful

¹Sources of information. Trumpeter Swan: Andrews 1999; Canada Goose: Bishop 1978, Zenner and LaGrange 1999; Osprey: Pat Schlarbaum, pers. comm.; Peregrine Falcon: Edwards 1999, B. Ehresman, pers. comm., P. Schlarbaum, pers. comm.; Reeves' Pheasant: Hlavka 1965, 1966, Hlavka and Klomglan 1968; Ruffed Grouse: Garner 1999a; Greater Prairie-Chicken: Edwards and Bogenschutz 1999; Sharp-tailed Grouse: Kent and Dinsmore 1996, Ed Weiner, pers. comm.; Wild Turkey: Garner 1999b; Barn Owl: Ehresman et al. 1988

ually it will become established in Iowa. Already, there is concern that it will compete with the Mourning Dove (*Zenaidura macroura*) and other species for food. There is also concern that it could transmit diseases to Mourning Doves and other North American doves (Romagosa and Labisky 2000).

2) North American Species

The eight species in this group include three native species that are reestablished in Iowa, four other native species that may become reestablished here, and one non-native species.

Of the seven species that are native to Iowa, four (Trumpeter Swan, Osprey, Peregrine Falcon, Sharp-tailed Grouse) are not established yet so it is too early to evaluate their impact on other species. However, Trumpeter Swans are known to be strongly territorial and could have an impact on other waterfowl, including Canada Geese. Of the other three, Greater Prairie-Chickens have a small population in Iowa and likely have little effect on other species. The other two, Canada Geese and Wild Turkeys are fairly common statewide. The Canada Goose, like the Trumpeter Swan, is highly territorial and may limit other waterfowl from some wetlands.

The non-native House Finch has been implicated in having negative effects on other birds. Data from two studies suggest that House Finches have had a negative effect on House Sparrows, at least in part because of the House Finch's aggressive behavior (Kricher 1983, Wootton 1987). Interestingly, the Purple Finch (*Carpodacus purpureus*), which is commonly mentioned as potentially suffering negative effects from the House Finch, did not seem to be displaced by them, at least during winter (Wootton 1987).

Disease and Genetic Considerations

A concern with nearly any invasive species is the risk that it may carry diseases that could be harmful to one or more native species. To date, I am not aware of any such problem among the species that have reached Iowa, but the risk is always there (see Eurasian Collared-Dove, above). The release of birds in Iowa from wild but outside-of-Iowa origin or from captive populations carries both disease and genetic risks. These birds may carry diseases that Iowa birds have not previously been exposed to. In the cases where birds have been released to augment natural populations of Mallard, Ruffed Grouse, Northern Bobwhite, and Barn Owl, the natural populations of these species could be at risk. An additional concern with these

four species is the potential genetic impact non-native birds may have on the native population they are augmenting. The Ruffed Grouse have come from Indiana, Michigan, and Wisconsin (Garner 1999a), the Barn Owls from a host of states (Ehresman et al. 1988), and the Northern Bobwhite from numerous captive sources of mixed background. Although the risk is probably slight, these new birds could introduce genes into the wild populations that could have deleterious effects on the native populations of these species. These risks should be carefully evaluated before such releases are made.

Sanctioned Releases of Birds in Iowa

I have tabulated information on stocking efforts for 10 species for which authorized releases have been made in Iowa (Table 4). For other species, good records of their release in Iowa are not available or the species expanded its range into Iowa. It is apparent that the stocking efforts vary greatly, from fewer than 100 birds released for two species of raptors to more than 1,000 released for four species, and more than 10,000 for one species. Interestingly, efforts to establish the species with the second greatest number of individuals released (Reeves' Pheasant) were unsuccessful whereas far fewer Greater Prairie-Chickens resulted in an established population. Methods for releasing birds have changed greatly in recent decades, evolving from literally dumping birds out of a cage to modern-day "soft" releases where birds are held in an enclosure on site some time before they are released (e.g., Edwards and Bogenschutz 1999).

The Future

1) Immediate Concerns

Almost certainly, additional invasive species will occupy Iowa in the future. The two most pressing issues now are the arrival and potential establishment of the Mute Swan and Eurasian Collared-Dove in the state. Both seem to be at the point of getting a foothold in the state and unless some control action is taken soon, I believe that both will become established in the state. I think that it will be very difficult and perhaps impossible to control the Eurasian Collared-Dove. It seems to have great dispersal ability (Romagosa and McEneaney 1999) and already is showing up throughout Iowa. Virtually all of the sightings that I know of are from small towns or urban areas. It will be difficult to control a species that feeds at bird feeders and is considered by many people as a symbol of peace. I am not optimistic.

I believe that there is a chance to control the Mute Swan, but again human nature may make it difficult to accomplish any control. Currently relatively few Mute Swans reach Iowa so they should be controllable. Mute Swans are conspicuous birds so they should be seen and recognized relatively quickly once they appear. Arguing against control is a strong public sentiment to protect swans. Mute Swans are often held in zoos, private estates, or similar sites. Many people enjoy seeing Mute Swans so it will be hard to get the general public to agree to remove them from Iowa. I believe that public agencies need to begin a program to educate the general public of the dangers of this species becoming established in Iowa. The most pressing concern is the possibility that Mute Swans could interfere with the ongoing program to reestablish Trumpeter Swans in the state. Although it does not seem feasible at present to try to control Mute Swans that are held on private lands or city parks, it does seem reasonable to try to control swans that attempt to nest on wildlife management areas and other such areas. It is on those areas that the species presents the main threat to native species, and it seems reasonable that steps should be taken to quickly remove them before the species becomes established.

2) Potential Invasive Species

In addition to the 18 species discussed above, several other potential invasive species have been reported in Iowa. It is unlikely that any of these will become established in Iowa in the near future, but in the long term, almost certainly some of these or other invasive species will become established in Iowa.

Waterfowl: Waterfowl are commonly kept in captivity by aviculturists and frequently escape. One or two such birds are reported in Iowa nearly every year. In recent years, Egyptian Goose (*Alopochen aegyptiacus*), Lesser White-fronted Goose (*Anser erythropus*), and Whooper Swan (*Cygnus cygnus*) have all been reported in Iowa (Kent 1998, Dinsmore 1998, Kenne 2000). Although it is a long shot, it is possible that a non-native species of waterfowl could become established in Iowa. For example, several Whooper Swans were reported in the Midwest in 2000, and they have been reported breeding on the East Coast (Brock 2000). This close relative and Eurasian counterpart of the Trumpeter Swan is a threat to hybridize with or otherwise jeopardize the reintroduction of that native species to the Midwest. Invasive waterfowl pose a variety of threats including hybridization, competition for nest sites, and diseases to native species (Weller 1969).

Ringed Turtle-Dove (Streptopelia risoria): This domesticated form of dove is established in a few southern states. It has been reported in Iowa several times, but with the severity of Iowa's winters, it is unlikely it could become established in the state.

Monk Parakeet (Myiopsitta monachus): This native of South America, was brought to North America in the 1960s and is now well established in Florida and several other states (Van Bael and Pruett-Jones 1996). An established population in Chicago may be the source of the single report from Iowa, one seen in Davenport in winter 1973–74 (Petersen 1974). The Chicago population indicates that this species could survive Iowa's winters so the risk of it becoming established in Iowa is real.

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APPENDIX A. BRIEF SUMMARIES OF THE HISTORY OF 18 INVASIVE BIRDS SPECIES KNOWN FROM IOWA

Canada Goose

Once a common nesting species in Iowa, Canada Geese disappeared from the state about 1900. After several unsuccessful attempts at reintroducing them into Iowa, birds of the giant race were successfully introduced into northern Iowa starting in 1964. Through a combination of additional releases and range expansion, by 1990, Canada Geese were found throughout Iowa (Zenner and LaGrange 1998).

Trumpeter Swan

Once found nesting in the wetlands of north-central and north-western Iowa, Trumpeter Swans were sought for their meat and skins. The last known nest was found in Hancock County in 1883, and, by the mid 1900s, the Trumpeter Swan was considered endangered in much of North America. In 1994, the Iowa DNR began a program of releasing Trumpeter Swans to try to reestablish a wild breeding population. By 1999, 181 swans had been released, mostly in northern and eastern Iowa, and one pair that appeared to be wild had nested successfully (Andrews 1999). This success suggested that the program had a reasonable chance of meeting its goal.

Mute Swan

This native of Eurasia was introduced to eastern United States in the late 1800s where it was popular in parks, zoos, and private estates. Some of these birds escaped and established feral populations which have persisted (Ciaranca et al. 1997). A feral population was established in Michigan in 1919 and now is found statewide (McPeck and Adams 1994). The first report of an apparent wild bird

in Iowa was one that was shot in Muscatine County in 1962. Besides those that live in semi-wild situations, a few are reported in Iowa every year. Mute Swans have attempted to nest in Iowa several times, most recently in Ida County. The presence of a few free-flying birds in Ida County (Bruce Ehresman, pers. comm.) raise the threat that this species could become established in Iowa.

Osprey

Well known as a migrant in Iowa, there is some question as to whether this species has ever nested in the state. The authenticity of the only written report of breeding, a report of a nest near Cedar Rapids in May 1892 (Bailey 1918), has long been questioned. Ospreys nest along the Mississippi River north of La Crosse, Wisconsin, and it seems likely that at least occasionally a pair nested along the Mississippi River in Iowa. In 1997, several groups began work to try to establish a breeding population of Osprey in Iowa. Since then, young Osprey have been released in Black Hawk, Johnson, and Polk counties (P. Schlarbaum, pers. comm.). It is too soon to know whether these attempts will be successful in establishing a breeding population in Iowa. In late summer 2000, a pair of Ospreys built a nest near Cayler Prairie in Dickinson County. In 2001, that nest was occupied through mid June when it apparently was abandoned after a severe storm (D. Harr, pers. comm.).

Peregrine Falcon

Peregrine Falcons once nested on cliffs along the Mississippi and other large rivers in Iowa. The last known nesting pair in Iowa disappeared in the mid 1960s (Washburn 1998). In 1989, the Iowa DNR began a program of releasing young Peregrine Falcons in Iowa. At first birds were released in urban areas (Des Moines, Cedar Rapids, Davenport, Muscatine, and Mason City) and resulted in pairs nesting in Cedar Rapids and Des Moines in most recent years. These urban nests have required considerable human intervention and have suffered fairly high mortality (Edwards 1999). More recently, workers have attempted to reestablish nesting peregrines on the bluffs along the Mississippi and other rivers (Washburn 2000). Successful nesting by those birds is needed to consider the program a success. Peregrines released in the Midwest come from five different subspecies and several continents (Tordoff and Redig 2001).

Chukar

Native to southern Asia and southeastern Europe, Chukars have been released throughout North America. Chukars have been stocked in Iowa a number of times including releases in southwestern Iowa in 1939 and 1940 and near Davenport in 1970 (Dinsmore 1994). Chukars are seen from time to time, but no established wild populations are known in Iowa (Kent and Dinsmore 1996).

Gray Partridge

This Old World species was widely stocked across northern United States and southern Canada in the early 1900s (Carroll 1993). Iowa's first successful release was in Palo Alto County in 1905. Within a few years, a wild population was established, and, by 1940, populations were established in northwestern and north-central Iowa (Dinsmore 1994). In the late 1970s and 1980s, partridge populations increased and they expanded their range to cover most of the state, peaking about 1989. Since then, their numbers have declined, and they have disappeared from much of southern Iowa (Bogenschutz 1999).

Ring-necked Pheasant

Native to China, Ring-necked Pheasants were brought to North America in the late 1700s. Iowa's first pheasants originated from about 2000 that escaped from a game farm near Cedar Falls around 1900. Additional releases were made and, by about 1920, pheasants were established in northern Iowa (Dinsmore 1994). Their range gradually increased and with additional releases in southern Iowa in the 1960s and 1970s, they eventually became established throughout Iowa. Ring-necked Pheasants are now found statewide and are the most abundant upland game species in Iowa (Bogenschutz 1999).

Reeves' Pheasant

This large pheasant, native to northern China, was stocked in Iowa in the early and mid 1960s. More than 4,600 were released in Lucas and Monroe counties but, despite some breeding success, wild populations were not established (Dinsmore 1994).

Greater Prairie-Chicken

Greater Prairie-Chickens were abundant in Iowa in the late 1800s when they were hunted for sport and market. By the early 1900s, their numbers had declined significantly and the last established population disappeared in the 1950s (Stempel and Rodgers 1961, Dinsmore 1994). Several attempts to restock prairie-chickens in Iowa in Monona County in the early 1980s were unsuccessful. Later attempts in Ringgold County from 1987 to 1994 and in Adair County in 1993 and 1994 appear to have been successful (Edwards and Bogenschutz 1999). Currently small populations are established at least in Ringgold County in southern Iowa.

Sharp-tailed Grouse

Native to Iowa, Sharp-tailed Grouse apparently disappeared by the early 1900s. Recently, several attempts have been made to restock the species in Iowa. In 1990, 37 birds from Kansas were released near Onawa in Monona County but soon disappeared. A second group of 69, again from Kansas, was released near Mapleton in Monona County in 1995 (Kent and Dinsmore 1996). A few sharptails, apparently from that release, were found near Anthon in Woodbury County in spring 1999 and were still present in 2001 when another 78 sharptails from South Dakota were released near Anthon (Ed Weiner, pers. comm.).

Wild Turkey

At the time of European settlement, Wild Turkeys were found throughout the forested regions of Iowa, especially in eastern and southern Iowa. They were eagerly sought for food and, by about 1910, had disappeared from Iowa. The earliest attempts to restock Wild Turkeys in Iowa used game-farm birds and were unsuccessful as were releases of turkeys from Texas, Nebraska, and North Dakota in the 1960s. The first successful restockings used wild birds caught in Missouri. Releases in Lee County in 1965 and 1966 and in Lucas County in 1968 were the start of the modern Wild Turkey flock in Iowa. Those birds gradually expanded their range. Also, some were trapped and released at other sites in Iowa. By the late 1980s, Wild Turkeys occupied most of Iowa (Dinsmore 1994, Garner 1999b).

Eurasian Collared-Dove

The Eurasian Collared-Dove has the potential to be the next House Sparrow or European Starling in North America. Apparently native to southern Asia, this species spread westward into Europe in the early and mid 1900s where it became well established by the 1960s. It became established in the New World in the 1970s when

some aviary birds escaped or were released in the Bahamas (Romagosa and McEneaney 1999). Apparently those birds were the source of birds that reached Florida in the early 1980s. Within a decade, the species was well established in Florida and had also appeared in several other states. Collared-Doves were also found at Joliet, Illinois as early as 1982 (Romagosa and McEneaney 1999) and may be the source of some of the birds appearing elsewhere in the Midwest. The first report of the species in Iowa was in 1997 when several were found at Grinnell (Fuller 1999). Since then, Eurasian Collared-Doves have been found at several other sites in Iowa, and it appears that the species has a strong potential to become established in the state.

Rock Dove

The history of this species in Iowa is an enigma. Native to the Old World, Rock Doves arrived in the New World as domestic animals in the 1600s. Some of these birds eventually escaped and established feral populations. There are records from Illinois and Wisconsin as early as the late 1700s (Schorger 1952), but there is little record of their arrival in Iowa, in part because early naturalists and scientists considered Rock Doves as something like a domestic chicken and did not report them. One of the first times it is mentioned in the literature was by Spiker (1933) who discussed Rock Doves nesting at a quarry near Anamosa and on bluffs along the Iowa River near Iowa Falls. Currently, Rock Doves are found statewide, usually in close association with humans. Typically, they are found in towns and cities, often near grain elevators, or on farms. As the number of farms in Iowa has decreased in recent years, Rock Dove populations also seem to have decreased (Sauer et al. 2000).

European Starling

This Old World species was introduced into North America in 1890 when some were released in New York City (Kent and Dinsmore 1996). Those birds thrived and expanded their range, reaching Iowa in 1922. By April 1936, starlings had been reported from every county in Iowa (DuMont 1945). Starlings are found throughout Iowa and are one of the most abundant bird species in the state.

House Finch

Native to western North America, for many years House Finches were illegally sold as cage birds. In 1941, to avoid prosecution, a pet dealer on Long Island, New York, released some House Finches. These birds survived in the wild and gradually expanded their range to the west (Elliott and Arbib 1953). By the 1980s they had reached the Midwest and were first reported in Iowa in 1982. The first nests were found in 1986, and by about 1991, the species was found statewide (Cecil and Dinsmore 1995). House Finches are now a common bird in urban areas throughout Iowa but are missing from most rural areas.

House Sparrow

This Old World species was first introduced in Brooklyn, New York, in 1851 and 1852. By 1869, House Sparrows had reached Iowa and additional birds were released in the state in Davenport, Cedar Rapids, Dubuque, and Iowa City (Barrows 1889). House Sparrow numbers increased rapidly and, by the early 1900s, it was considered the most abundant bird species in Iowa (Anderson 1907). With the decline of the number of farms in Iowa, House Sparrow numbers have probably decreased but it still ranks as one of the most abundant bird species in the state.

Eurasian Tree Sparrow

This close relative of the House Sparrow was introduced in St. Louis in 1870. By the mid 1900s it had spread into nearby parts of Illinois (Barlow 1973) and, in the 1970s and 1980s its range expanded into several midwestern states (Svingen 2000). It was first reported in Iowa in 1987 when one was seen at West Branch in Cedar County (Veal 1987). By 1989 it was found near Burlington in Des Moines County and was reported nesting there in 1993. Since then it has gradually expanded its range north into Louisa, Muscatine, and Johnson counties and seems to be well established in several of those counties (Kent and Dinsmore 1996).

APPENDIX B. BRIEF HISTORIES OF ATTEMPTS TO AUGMENT THE NATURAL POPULATIONS OF FOUR IOWA BIRD SPECIES

Mallard

Although Mallards are a common nesting species in Iowa, especially in northwestern and north-central Iowa, there have been some attempts to augment their numbers by releasing Mallards from captive stocks. In the mid 1970s, Mallards from an Illinois source were released in southern Iowa to try to establish a breeding population there (Korthas 1978). This attempt was not successful.

Ruffed Grouse

Once a fairly common species across much of eastern Iowa, this woodland grouse has disappeared from much of its Iowa range and presently is largely confined to northeastern Iowa (Dinsmore 1994). The original decline was probably due to a combination of habitat loss and heavy hunting pressure. The natural populations that have persisted in northeastern Iowa have been hunted for several decades but continue to survive. The Iowa DNR has released Ruffed Grouse at a number of sites in eastern and central Iowa in an attempt to reestablish Ruffed Grouse populations (Garner 1999a). Some of those attempts have been successful, although in most cases the new populations seem to be quite small.

Northern Bobwhite

Historically, Northern Bobwhite were probably found over much of the state although their greatest populations were in southern and eastern Iowa. In the last several decades, their numbers have shown a gradual but steady decline, both in Iowa and also rangewide. Currently they are found mainly in southern Iowa (Bogenschutz 1999). There have been many attempts to augment bobwhite numbers, both in their established range and in unoccupied areas. Many of these attempts have been made by sportsman or youth groups, often without authorization of conservation agencies. Most of these releases have been unsuccessful, and the birds have succumbed quickly to predators, weather, or other forms of mortality.

Barn Owl

Native to Iowa, Barn Owl populations have long been very small in the state. From 1983 to 1987, in an attempt to augment the dwindling native populations, the Iowa DNR released 427 Barn Owls in Iowa. None of these birds are known to have nested in Iowa (Ehresman et al. 1988). Predation by Great Horned Owls (*Bubo virginianus*) and a scarcity of good Barn Owl habitat are the most likely reasons for the failure of this effort. In recent years, a few Barn Owl nests have been found in Iowa in most years.