Giant Ragweed (*Ambrosia trifida*) as a Food Source for Autumn Migrants and Winter Birds in the Grand River Basin

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Introduction

An intense interest in foods of birds in southern Ontario has led us to prepare a series of papers over the last 25 years, starting with Dance (1986).

During research for one of these papers, on the use of Black Alder (*Alnus glutinosa*) by birds in southern Ontario, it was observed that the seeds of Giant Ragweed *(Ambrosia trifida*), a prominent woodland edge and field species, were being consumed consistently by birds at a study site in the Nith River floodplain, Oxford County (Dance 2008).

Subsequent literature research and discussions with colleagues revealed the following:

- Giant Ragweed is a native plant with a widespread distribution across Canada and the United States;
- it favours riparian habitats, particularly where flooding and erosion have occurred — this apparently facilitates establishment of this annual plant from seed (Abul-Fatih and Bazzaz 1979a, b);
- Giant Ragweed is becoming an aggressive, invasive weed in cropland in

Figure 1. Size and shape of Giant Ragweed seeds.

"Knowing what a bird eats is fundamental if not central to understanding the mysteries of its survival"

(Heinrich 2003)

the mid- U.S. and Asia (Ishikawa *et al.* 2003, Kong *et al.* 2007, Shutte 2007);

- some colleagues (K. Parker pers. comm. and W.G. Wilson pers. comm.) think that it has become more widespread in the Grand River basin during the last two decades;
- Giant Ragweed was considered to pose only a minor threat as an invasive weed, to upland natural areas (White *et al.* 1993);
- the seeds of this plant have been known to have high nutritional value for millennia, as witnessed by native peoples cultivation and consumption of Giant Ragweed seeds in the Mississippi basin 3000 to 5000 years ago (McCann 1999);
- Giant Ragweed is also of broad ecological and economic interest since it has recently been confirmed to be the first weed species in Ontario to be resistant to Roundup (glyphosate) —

a herbicide in widespread use to control weeds in soybean and corn fields (Ontario Farmer 2010, 2011); and

- from a wildlife perspective, the high nutrient content of the seeds (Willson and Harmeson 1973) is of value to migrating and wintering bird species.

The size and shape of Giant Ragweed seeds are shown in Figure 1.

When first observed by us at one study site in 2005, Giant Ragweed grew in small patches. Following a significant flood in April 2008 (one of the two largest floods during the preceding 50 years [*Ayr News* 2009, *Waterloo Region Record* 2009, 2010]), we observed that the Giant Ragweed patches were several times larger in area during the growing season of 2008, than they had been in 2005. Presumably the scouring, silt deposition and attendant widespread seed transport had created suitable conditions for a localized expansion of the Giant Ragweed population. This situation seemed to be ideal for documenting the nature of bird species' use of the seeds and cover provided by the large dense Giant Ragweed beds present following the April 2008 flood.

Documentation of wild birds consuming Giant Ragweed seed in North America is limited but includes: Black-capped Chickadee (*Poecile atricapillus*), Tufted Titmouse (*Baeolophus bicolor),* Northern Cardinal (*Cardinalis cardinalis*) and Common Redpoll (*Acanthis flammea*) (Fox 1940, Shepherd 2007).

Other authors have reported Red-breasted Nuthatch (*Sitta canadensis*) and Red-winged Blackbird (*Agelaius phoeniceus*) foraging for arthropods on Giant Ragweed plants (Miller 1914, Fischer 1953).

Martin *et al.* (1961) reported on the occurrence of ragweed seeds in bird stomachs sampled across the United States. They did not differentiate between Giant Ragweed and Common Ragweed (*Ambrosia artemisiifolia*), which is more widespread and abundant in Ontario (Montgomery and Switzer 1967). There are also additional Ambrosia species within the United States which do not occur in Ontario.

The Martin *et al.* (1961) findings indicate that ragweeds in general are consumed by a variety of chickadee and titmouse, Emberizid, cardinal and ally and blackbird taxa.

Martin *et al.* (1961) also list ragweed among the plant taxa that bear their seeds high enough that they are not covered by snow, making it a taxon that has seeds available as bird food during much of the winter.

The principal purpose of the present study was to document the relative magnitude of use by autumn migrants and winter birds of a weedy herb which may increase in prominence in riparian habitats in the future. A secondary purpose was to document, in a preliminary way, the use of Giant Ragweed by spring migrants and breeding birds at two Southern Ontario sites.

Methods

Detailed notes were kept on the species, numbers, uses and behaviour of birds observed on or immediately adjacent to the plants and stands of Giant Ragweed. The observation period ranged between 5 September 2005 and 30 December 2010. Specific use(s) by birds were observed during 91 trips.

More than 95% of the observations were recorded in the Nith River valley, Blandford-Blenheim Township, Oxford County, Ontario. Many observations (September 2005 to December 2008) were near the confluence of Wolverton Creek (a coldwater stream) and the Nith River (17T 538500E 4790100N NAD 1983). Giant Ragweed stands line the banks of both Wolverton Creek and portions of the Nith River in this location.

The second principal location of observations was along the Nith River upstream and downstream of the Silver Bridge, located on Blenheim Road, south of County Road 29 in Blandford-Blenheim Township, Oxford County (17T 539951E 4787789N NAD 1983). The Nith River is a tributary of the Grand River. Less frequently observations were recorded in Cambridge, Ontario, near the mouth of the Speed River and its confluence with the Grand River.

The two principal study sites are within the extreme northern tip of the Norfolk Sand Plain (Chapman and Putnum 1973).

Most observations were made in the morning, shortly after dawn, when birds were active. Over 90% of the observation dates were between 21 September and 21 March.

Results

Ten bird species were observed consuming Giant Ragweed seed with Black-capped Chickadee and Northern Cardinal being observed the most frequently foraging on Giant Ragweed seeds (Table 1).

We observed seven bird species foraging on Giant Ragweed plants for arthropods (Table 2). More intensive observation effort during bird migration seasons would undoubtedly have revealed additional species searching for arthropods in the dense Giant Ragweed stands present in the riparian zone.

Table 1. Bird species observed consuming Giant Ragweed seed.

SPECIES	NUMBER OF DATES WHEN SEED CONSUMPTION WAS OBSERVED
Downy Woodpecker (*Picoides pubescens)*	14
Black-capped Chickadee (*Poecile atricapillus)*	49
Tufted Titmouse (*Baeolophus bicolor)*	1
Song Sparrow (*Melospiza melodia)*	6
White-throated Sparrow (*Zonotrichia albicollis)*	1
Dark-eyed Junco (*Junco hyemalis)*	1
Northern Cardinal (*Cardinalis cardinalis)*	24
Red-winged Blackbird (*Agelaius phoeniceus)*	18
Purple Finch (*Haemorhous purpureus)*	2
House Finch (*Haemorhous mexicanus)*	1
Total # Observation Dates	**91**

Twenty-four bird species which were observed making other use(s) of Giant Ragweed plants are shown in Table 3. Many of these bird species benefited from the cover and perch sites provided by Giant Ragweed. Since Black-capped Chickadees fed on Giant Ragweed seed so frequently, separate observations of cover use and perching by chickadees were not recorded.

Two species were found nesting in or under Giant Ragweed stands and two species appeared to consume the pollen of this plant (Table 3).

Table 2. Bird species observed foraging for arthropods on Giant Ragweed plants

SPECIES	NUMBER OF OBSERVATIONS
Golden-crowned Kinglet (*Regulus satrapa)*	2
Ruby-crowned Kinglet (*Regulus calendula)*	2
Nashville Warbler (*Oreothlypis ruficapilla)*	1
Yellow-rumped Warbler (*Setophaga coronata)*	1
Common Yellowthroat (*Geothlypis trichas)*	2
Song Sparrow (*Melospiza melodia)*	1
Red-winged Blackbird (*Agelaius phoeniceus)*	1

Table 3. Bird species showing other uses of Giant Ragweed

SPECIES	OTHER USES*
Canada Goose (*Branta canadensis)*	C(1)
Mallard (*Anas platyrhynchos)*	C(2)
Wild Turkey (*Meleagris gallopavo)*	N(3)
Killdeer (*Charadrius vociferus)*	C(1)
Spotted Sandpiper (*Actitis macularius)*	C(1)
Ruby-throated Hummingbird (*Archilochus colubris)*	PO(1)
Downy Woodpecker (*Picoides pubescens)*	PE(4)
Tufted Titmouse (*Baeolophus bicolor)*	PE(2), C(1)
Winter Wren (*Troglodytes hiemalis)*	P(1)
American Robin (*Turdus migratorius)*	C(1), P(1)
American Tree Sparrow (*Spizella arborea)*	C(4)
Chipping Sparrow (*Spizella passerina)*	C(1)
Fox Sparrow (*Passerella iliaca)*	C(1)
Song Sparrow (*Melospiza melodia)*	C(16), PE(22)
Swamp Sparrow (*Melospiza georgiana)*	C(2), PE(2)
White-throated Sparrow (*Zonotrichia albicollis)*	C(4), PE(3)
Dark-eyed Junco (*Junco hyemalis)*	C(6), PE(2)
Northern Cardinal (*Cardinalis cardinalis)*	C(6), PE(6)
Indigo Bunting (*Passerina cyanea)*	PE(1), PO(1)
Red-winged Blackbird (*Agelaius phoeniceus*)	C(5), PE(4), N(3)
Common Crackle (*Quiscalus quiscula)*	C(2)
Pine Siskin (*Spinus pinus)*	PE(2)
American Goldfinch (*Spinus tristis)*	C(3)
House Sparrow (*Passer domesticus)*	PE(1)

* Number of observations: C – provision of cover, N – nest cover, PO – pollen consumption and PE – perching

Discusssion

Four bird species were observed to make considerable use of Giant Ragweed seeds as a food source: Downy Woodpecker (*Picoides pubescens)*, Black-capped Chickadee, Northern Cardinal, and Red-winged Blackbird. The latter three species have been documented to utilize ragweed seeds previously in North America (Martin *et al.* 1961, Brewer 1963, Smith 1991, Ritchison 1997). We have found, however, no previous reports in the literature of Downy Woodpecker feeding on Giant Ragweed.

Woodpeckers are known to feed on fruit, nuts and plant seeds. Although Red-bellied Woodpeckers (*Melanerpes carolinus*) and Hairy Woodpeckers (*Picoides villosus*) were present in the study area and both species are known to feed on plant seeds (Backhouse 2005), neither of these species were observed on Giant Ragweed plants, nor consuming the seeds. Red-bellied Woodpeckers, in particular, were consistently present flying over the ragweed patches in winter.

Flocks of up to 600 Red-winged Blackbirds were observed feeding on Giant Ragweed seed during autumn migration, suggesting Giant Ragweed seeds can be valuable food for migrants to regain their energy stores. It is noteworthy that a flock of between 7 and 12 Red-winged Blackbirds were observed feeding on seeds or were seen immediately adjacent to Giant Ragweed stands on two winter dates: 16 January and 27 February 2010.The first three months of 2010 had very little snow and the Giant Ragweed seed crop had not been knocked down by snow, ice or floods.

Song Sparrows (*Melospiza melodia*) were observed eating Giant Ragweed seeds on six dates. The consumption of these seeds by Song Sparrows is probably much higher than reflected in the data since detectability of this activity is so difficult due to the dense cover present in a Giant Ragweed stand. Between 30 December 2009 and 20 March 2010 there were nine dates on which Song Sparrows were observed in the Giant Ragweed stands being studied. On these dates, the Song Sparrows were documented using the stand for cover and/or perching. Also, on 27 December 2008, four Song Sparrows were present together in a large Giant Ragweed stand.

The Tufted Titmouse is considered to be an occasional species in fall and winter in Oxford County. This is defined as very few records, normally absent. As far as breeding status is concerned, Skevington *et al.* (2010) indicated that there is no evidence of breeding in Oxford County.

The Tufted Titmouse overwinters successfully in the study area during mild winters, but can be locally extirpated by extreme weather events such as spring season ice storms (K.W. Dance unpublished data). South of the Great Lakes, in its original range, Tufted Titmice have been observed consuming Giant Ragweed seeds (Shepherd 2007).

In the present study, we had two dates on which a single Tufted Titmouse was observed. On 5 November 2008, a titmouse was observed perched on a Giant Ragweed plant, but when we arrived it moved away with a band of Black-capped Chickadees without seed consumption being observed. On 13 February 2010, a single Tufted Titmouse was observed using Giant Ragweed for perching, cover and foraging on its seeds. We saw the titmouse opening a Giant Ragweed seed on two occasions by pounding it with the beak while holding it on a Manitoba Maple (*Acer negundo*) branch. The Tufted Titmouse was part of a mixed flock using the Giant Ragweed patch, which included Black-capped Chickadees, Northern Cardinals and Song Sparrows.

Our observation of Tufted Titmouse feeding on Giant Ragweed seeds are not unexpected since this species feeds on larger seeds, including acorns and beech nuts (Grubb 1998); furthermore, this species is known to winter in river-bottom habitats that provide protection from severe weather (Dunn and Tessaglia-Hymes 1999).

When summarizing the importance of Ambrosia to wildlife, Martin *et al.* (1961) indicated that Common Ragweed (*Ambrosia artemisiifolia*) was of major consequence as wildlife food and Giant Ragweed was of little value. The reasoning for this was that the seeds of the latter are large and have a tough coat, so birds use it little. Martin *et al.* (1961) relied on bird stomach content analysis to determine food use. Stomach analysis, however, may underestimate the use of Giant Ragweed by bird species such as Black-capped Chickadee and Downy Woodpecker, which break through and remove the seed coat and consume the seed in pieces. We doubt that fragments of Giant Ragweed seed would be identifiable to species in bird stomachs.

The data on birds foraging for arthropods on Giant Ragweed plants (Table 2) should be considered preliminary since the level of observation effort during peak migration periods was quite low. We, however, did confirm seven bird species foraging for arthropods on Giant Ragweed plants. The results do suggest that the abundant insect emergence from the Nith River could provide a rich source of arthropod food to be found by birds on Giant Ragweed plants, as was the case on adjacent Black Alder trees (Dance 2008).

A considerable variety of birds (24 species) was found to use Giant Ragweed plants as perches, including singing perches, and as cover. Of interest were observations of a Wild Turkey (*Meleagris gallopava*) nest sheltered from above by dried Giant Ragweed stalks and Red-winged Blackbirds carrying food into pure stands of Giant Ragweed. We did not search for nests until winter, so as not to disturb the breeding blackbirds. In winter, we were not able to find the nests.

At close range, one of us clearly saw Indigo Buntings (*Passerina cyanea*) pluck pollen from Giant Ragweed flower heads. On a single date, one of us saw a

Figure 2. Height of Giant Ragweed ensures seeds remain available to birds in autumn (October 2008) (2a) and winter (24 January 2010) (2b) (red circles show locations of seed clusters).

Ruby-throated Hummingbird (*Archilochus colubris*), which also appeared to pluck pollen from a Giant Ragweed flower head. Illinois Wildflowers (2008) has reported the Honey Bee (*Apis mellifera*) gathering Giant Ragweed pollen.

Seasonal Availability of Ragweed Seeds

In the autumn and winter, Giant Ragweed seeds are available to birds by virtue of their location high above the ground (Figure 2). The height of Giant Ragweed plants relative to a 173 cm tall adult human is shown in Figure 2a (October 2008). Most seeds (in red circles) are located on the upper half of the Giant Ragweed plant. This makes the seeds potentially available to birds well into the winter, as snow depths increase. This assumes that the stalks remain sound and are not weakened or broken down by combinations of natural forces such as rain, snow, wind or river ice. The force of floodwater and ice shearing off Giant Ragweed plants can be seen within the red circle (Figure 3, 2 January 2009). Following this flood, there were no ragweed seeds available to birds from standing stalks for the remainder of the winter. The stalks and seed heads (outlined in red) are shown in comparison to one of the junior authors (184 cm tall) standing in one of the primary study areas (Figure 2b, 24 January 2010). Seeds on upright stalks remained available to birds until at least 20 February 2010, since there was little snow cover and floods and ice movement had not sheared off Giant Ragweed plants.

Figure 3. Force of floodwater and ice on Giant Ragweed plants.

The seasonal availability of Giant Ragweed seed on standing stalks depends on three primary factors: (1) resilience of stalks relative to weather, floods and ice, (2) depletion of the seed crop as a result of consumption by seed predators and (3) numbers of seeds that fall out of the seed holding receptacles.

Harrison *et al.* (2003) report that mice and ground beetles are predators of Giant Ragweed seed; furthermore these authors found that in Ohio during winter, 43% of the seeds are depredated and that for the entire year the percentage rises to 88% of seeds. In Ohio, rodents were the dominant predators of ragweed seeds during fall and winter.

Although significant effort was not expended to determine the quantity of seed remaining on standing Giant Ragweed stalks in late winter, we did make notes on this factor during three winters. On 20 March 2009, standing stalks had no seeds. On 13 February 2010, some plants had only two or three seeds left. Despite this observation, flocks of 12 chickadees and 12 cardinals were feeding in ragweed stands on 20 February 2010. On 29 January 2011, forty standing Giant Ragweed plants were examined and were found to have an average of 1.3 good seeds and 4.1 hollow seeds left per plant. The literature reports the number of seeds produced by a Giant Ragweed plant to be 275 in Canada (Bassett and Crompton 1982) and 247 per plant in Japan (Ishikawa *et al.* 2003).

Unless the seeds are buried by sedimentation, damaged by abrasion and mould or consumed by other seed predators, Giant Ragweed seeds can be an important food source for spring season migrants. We had spring season records of the following bird species feeding on Giant Ragweed seed on the ground or within tangles of fallen stalks: Black-capped Chickadee, Song Sparrow, Northern Cardinal and Red-winged Blackbird.

This "weed" species was observed to provide bird food on dates between 13 September and 27 March; thus in some years Giant Ragweed seeds are consumed by wintering birds and both autumn and spring migrants.

Nutritional Value of Giant Ragweed Seeds

Local sources of food that are available throughout the cool and cold seasons are essential to small active birds. Many species operate on extremely thin margins of metabolic safety and can starve to death in hours if deprived of food or subjected to harsh weather that causes them to burn more metabolic "fuel" than they can quickly replace. Birds cannot afford to store heavy food materials within their bodies for long periods and usually need a constant supply of nutrients to sustain activity.

Several publications were found which contain information on the nutritional characteristics of Giant Ragweed seeds. These publications indicated Giant Ragweed seeds as having high nutritional value; key nutritional information is summarized below:

- Seeds of Giant Ragweed contain about 19% edible oil content (W.J. Beal Botanical Garden 2007).

- Giant Ragweed seeds contain more metabolized energy by weight than corn (University of Missouri 2008). Giant Ragweed seeds consist of 47% crude protein and 38% crude fat (Harrison *et al.* 2003).
- Although slightly more than eight sunflower (*Helianthus annus*) seeds weigh one gram, it takes 28 ragweed seeds to attain this weight (Willson and Harmeson 1973)(Table 4). One gram of ragweed seed contains 29% more calories than does one gram of sunflower seed and the protein content of ragweed kernels is more than twice that of sunflower (Willson and Harmeson 1973).
- Lipid percent in the kernel of ragweed is 43% higher than that of sunflower (Willson and Harmeson 1973).

The data reported by Willson and Harmeson (1973) are of interest because they compared the metabolic content of Giant Ragweed seeds from Illinois with those of commercial sunflower seed, which is a main component of most bird seed mixes because of its high nutritional value. In feeding experiments, Willson and Harmeson (1973) found that when the diet of Northern Cardinals was considered by weight, Giant Ragweed was predominant. They also found that at cold temperatures (0°C) cardinals chose seeds yielding calories at high rates such as hemp (*Cannabis sativa*) and Giant Ragweed, over three other seed choices.

In addition to the need for adequate winter food sources for resident birds, suitable food sources in feeding areas spaced along migratory flyways are equally as important. If migrating birds are forced to fly too far between stopovers, they can become stressed and starve (Proctor and Lynch 1993).

Large flocks of hungry Red-winged Blackbirds are a frequently observed phenomenon in river valleys in late summer and autumn. Heinrich (2003) stated that flocks of Red-winged Blackbird functionally are like a giant vacuum cleaner, consuming large quantities of food. Red-winged Blackbird flocks were observed feeding in large numbers (often 80 to 600 birds) at three different Giant Ragweed patches located within the two principal study areas. Feeding was observed on 18 dates, 14 dates being during autumn migration: 13 September to 23 October. Single dates of occurrence in January and February were also recorded. Red-winged Blackbirds

Table 4. Nutritional Value of Giant Ragweed Compared with Sunflower.

	NO. SEEDS/g	CALORIES/ KERNEL	CAL/g KERNEL	% PROTEIN IN KERNEL	% LIPID IN KERNEL
Giant Ragweed	28	141.8	7355	34	42
Commercial Sunflower	8+	368.0	5256	15	24

Source: Willson and Harmeson, 1973

can find Giant Ragweed populations along much of the length of their fall migration routes since this plant has been documented to be a dominant herb in the riparian habitats used by birds between Ontario and the Rio Grande Valley (Baltosser 1986, Johnston 1942 and Zimmerman and Tatschl 1975).

Although the Nith River valley has been observed to be an important autumn migration route for Blue Jays (*Cyanocitta cristata*) (K.W. Dance, unpublished data), this species was not observed to consume Giant Ragweed seed, nor to perch or seek cover among the stems of this plant.

Winter Bird Populations Sustained by Giant Ragweed

Much of the present paper is devoted to a discussion of the variety of bird species which were observed making some use of Giant Ragweed. An additional question is: how many individual birds are placing some reliance on Giant Ragweed as a winter food source?

For many species (*e.g.* Downy Woodpecker, and sparrow species), we usually observed only a few (less than five) individuals feeding among the Giant Ragweed patches. There were occasions, however, when we were able to accurately count the number of individuals of a particular bird species entering or leaving a Giant Ragweed patch. Our observations indicate that the Giant Ragweed patches can support considerable numbers of Black-capped Chickadee and Northern Cardinal (Table 5).

Black-capped Chickadee

Average winter flock size of Black-capped Chickadees at the Giant Ragweed stands was around 6.6 individuals, with typical flocks ranging from 6 to 8 members. Large flocks are considered to comprise of 8 to 10 individuals (Smith 1991).

Where there is an "unusually rich food source" flock ranges may overlap and the birds will mingle, forming what is called a "compound flock" (Smith 1991). Examples of unusually rich food sources included deer carcasses and well-stocked bird feeders.

There were 11 selected dates when 10 or more chickadees were observed feeding together, in a Giant Ragweed patch (Table 5). The largest number was 26 chickadees, accurately counted, as they moved out of a Giant Ragweed patch via a narrow vegetated corridor flanking the riverbank.

By Smith's (1991) definition these would have been large flocks. On three of the 11 dates, two smaller flocks were seen to combine in or around a Giant Ragweed patch, to form what Smith (1991) has defined as a compound flock. It seems reasonable to conclude that the Giant Ragweed stands can be considered to be an unusually rich food source, since large and compound Black-capped Chickadee flocks were observed to be associated with the ragweed stands. The data from two sites and three different winters, confirm the importance of Giant Ragweed seeds as food for wintering Black-capped Chickadee flocks (Table 5).

Table 5. Number of Black-capped Chickadee and Northern Cardinal in large flocks entering or leaving a patch where feeding on Giant Ragweed was observed*

SPECIES	NUMBER OF INDIVIDUALS	DATE	COMMENTS
Black-capped Chickadee	10	18 November 2005	
	16	27 November 2005	also gleaning on willow trees, eating Black Alder seed
	12	10 December 2005	
	10	12 February 2006	
	11	23 November 2008	
	10	5 December 2008	2 flocks noted together
	10	24 January 2010	
	12	7 February 2010	2 flocks noted together
	26	13 February 2010	
	12	20 February 2010	
	11	6 March 2010	two flocks: 7 + 4
Northern Cardinal	11	5 December 2008	
	11	28 November 2009	
	13	29 November 2009	
	11	12 December 2009	
	12	5 January 2010	
	12	10 January 2010	
	11	16 January 2010	
	10	30 January 2010	
	12	20 February 2010	

* large flock defined as 10 or more individuals

Northern Cardinal

There were nine dates during two different winters that Northern Cardinal flocks of as many as 10 to 13 individuals were recorded feeding in or immediately adjacent to Giant Ragweed patches (Table 5). Smaller flocks were observed on other dates and in areas away from the ragweed stands. Our data suggest that winter survival and flock maintenance depended to some extent on the Giant Ragweed seed as a food source.

Osborne (1992) reports autumn/winter flock sizes ranged between four and 60 in Texas. In Ontario, where temperatures are more extreme and wild food resources can be patchy due to snow cover, a flock of 60 Northern Cardinals would be considered to be very

large. Brooman (1954) records that 35 Northern Cardinals were counted along a short stretch of the Thames River bank within Elgin County on 1 January 1946. Kelly *et al.* (1963) report that winter flocks of 20 to 55 Northern Cardinals were observed where food supply was plentiful in the Detroit-Windsor area between the mid-1940s and 1950s.

A search of inventory data from three winter bird population studies (WBPS), which the senior author and others have conducted in three urban natural areas located in York and Waterloo Regions, reveals that typical winter flock sizes of cardinals are often in the range of three to six individuals (Dance 1989, Dance and Geddes 1993, Dance and Dance MS). All three of these natural areas were close to bird feeders, which would have provided supplemental food to the winter flocks of Northern Cardinals. Two were at inland sites with no river corridor present, while the third included riparian habitat of a small river, but there was no Giant Ragweed present.

At Lakeside Park, located in the Region of Waterloo, and where winter bird data were collected routinely between 1981 and 1993, average numbers of Northern Cardinals present in the 14.2 ha study area were in the range of three to six. On 11 dates, however, between eight and 17 cardinals were counted. This study area had up to 42 stocked bird feeders present around its perimeter (Dance and Geddes 1993).

Smith *et al.* (1981) reported on WBPS results from seven Toronto ravines (with plot sizes of 5 to 20 ha). These authors indicated that counts of two to three Northern Cardinals were typical. On one date in one ravine, a maximum count of nine Northern Cardinals was obtained.

Dunn and Tessaglia-Hymes (1999) confirm that flocks of 50 or more cardinals are expected only by feeder owners in the United States. The vast majority of feeder owners see fewer than five at once, with one or two cardinals being more typical. These authors reported on counts at bird feeders throughout the U.S. and Canada.

Our observations of flocks containing 10 to 13 Northern Cardinals associated with the Giant Ragweed patches at two sites along the Nith River, suggest the presence of a rich food source which attracts relatively large numbers of overwintering cardinals.

Studies have shown that dispersing cardinals tend to follow river systems (Dow 1994). It is therefore not unexpected that relatively large flocks of cardinals would be found to be concentrated around abundant energy-rich food sources in winter, within the riparian areas where Giant Ragweed can be found.

Summary

To some, Giant Ragweed may be an undesirable invasive native weed in their gardens and croplands, but based on the observations of this study at natural sites in floodplains, it appears that this species provides several valuable functions particularly to winter birds, but also for spring and autumn migrants. Winter

birds are typically concentrated around areas that provide shelter or food or both (as Giant Ragweed stands do). Based on our observations, birders should consider adding Giant Ragweed stands as productive areas to search when doing general birding in winter, leading naturalist club outings for winter birds or Christmas Bird Counts. For land owners and managers of riparian habitats, it is important to consider the nutritional value of Giant Ragweed seeds to the survival of birds and mammals during harsh winter months.

Flannery (2005) predicts that as the climate warms, rainfall will increase. The incidence of flooding is also predicted to increase if the climate warms. It is expected that Giant Ragweed will benefit from disturbances caused by more flooding, since its seeds will be carried farther upslope to be deposited in rich sediments left by the receding waters. It may be that riparian zone bird communities will benefit from an expansion in the extent of Giant Ragweed stands in the future.

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