



RESEARCH PAPER 5

**Protecting Farming
and a National Wildlife Sanctuary
vs.
Controlling Wildlife
in an Airport Wildlife Hazard Zone
A Circle That Can Never Be Squared**

August 2015

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The conversation

During Transport Canada’s public information sessions in June, 2013, Land Over Landings asked two different Transport Canada officials to provide clarification on the restrictions that would be placed on farming in the vicinity of a potential future Pickering airport. Both officials gave assurances that “all current farming activities will be grandfathered.”

Odd. In 1985, Progressive Conservative Transport Minister Don Mazankowski appointed PARC (Pickering Airport Lands Revitalization Committee) to “examine strategies for the federally owned lands which would ensure maximization of their agricultural potential and aid in the preservation of a sense of community.” Documenting the numerous constraints that an airport would/could impose on the area in terms of infrastructure and farming activities, the PARC report urged the federal government to “clearly abandon all plans for construction of an airport and to act to establish an agricultural preserve and private ownership of the lands.” One of the cited constraints was a Ministry of Transport airport wildlife control policy that restricted area farmers to ploughing and haying at night, to avoid attracting birds.¹ Even non-farmers know that you can only “make hay while the sun shines.”

The question

How had Transport Canada’s wildlife control policy evolved so much in three decades – from severe restrictions on farming to “carry on, no worries”?

A member of Land Over Landings’ Research Team was asked to review all publicly available federal reports and documents relevant to wildlife control, not only to answer this farming-restrictions question but also to address the broader issue of constraints that could be imposed within the Wildlife Hazard Zone in the Pickering Airport Site Zoning Regulation (PASZR).

We are indebted to researcher Karen for volunteering to take on the monumental task of reading and summarizing over 700 pages of documents. Her comments and conclusions have been featured throughout the body of this paper, and her summaries and notes can be found in **Appendices 1 to 4**.

Karen’s answer to the question was this:

“I have completed my review of the bird and wildlife documents and have found nothing to suggest that the approach to bird hazard management has changed from what was originally proposed. There is nothing to support the claim from the TC official that current agriculture land uses would be grandfathered. In fact, the airport operator is legally bound by the power of lawsuits to maintain and prove a level of wildlife/bird management that ensures public safety.”

Karen’s work predated by two years the Prime Minister’s announcement, on July 11, 2015, of the transfer of a further 5,200 acres of the Federal Lands to the Rouge National Urban Park. The new Park, dedicated to showcasing nature, culture, and agriculture, was, with that announcement, expanded to the very border of a potential future airport site.

1. PARC report, 1986

Given this latest development, the just-released 2015 draft PASZR is of particular interest and importance. Its Wildlife Hazard Zone (**Figures 1 and 2**) would regulate control of wildlife in:

- all the Federal Lands that will be included in the Rouge National Urban Park (RNUP) – thus overriding Parks Canada’s mandate to maintain and protect all ecosystems in as natural a state as possible inside the Park.² (The agency’s default is the protection of all wildlife inside the RNUP.)
- vast expanses of farmland, watersheds, and natural habitat well outside the RNUP boundary.

2. <http://www.pc.gc.ca/eng/docs/pc/poli/princip/sec2/part2a/part2a5.aspx>

Fig. 1: 2015 draft PASZR

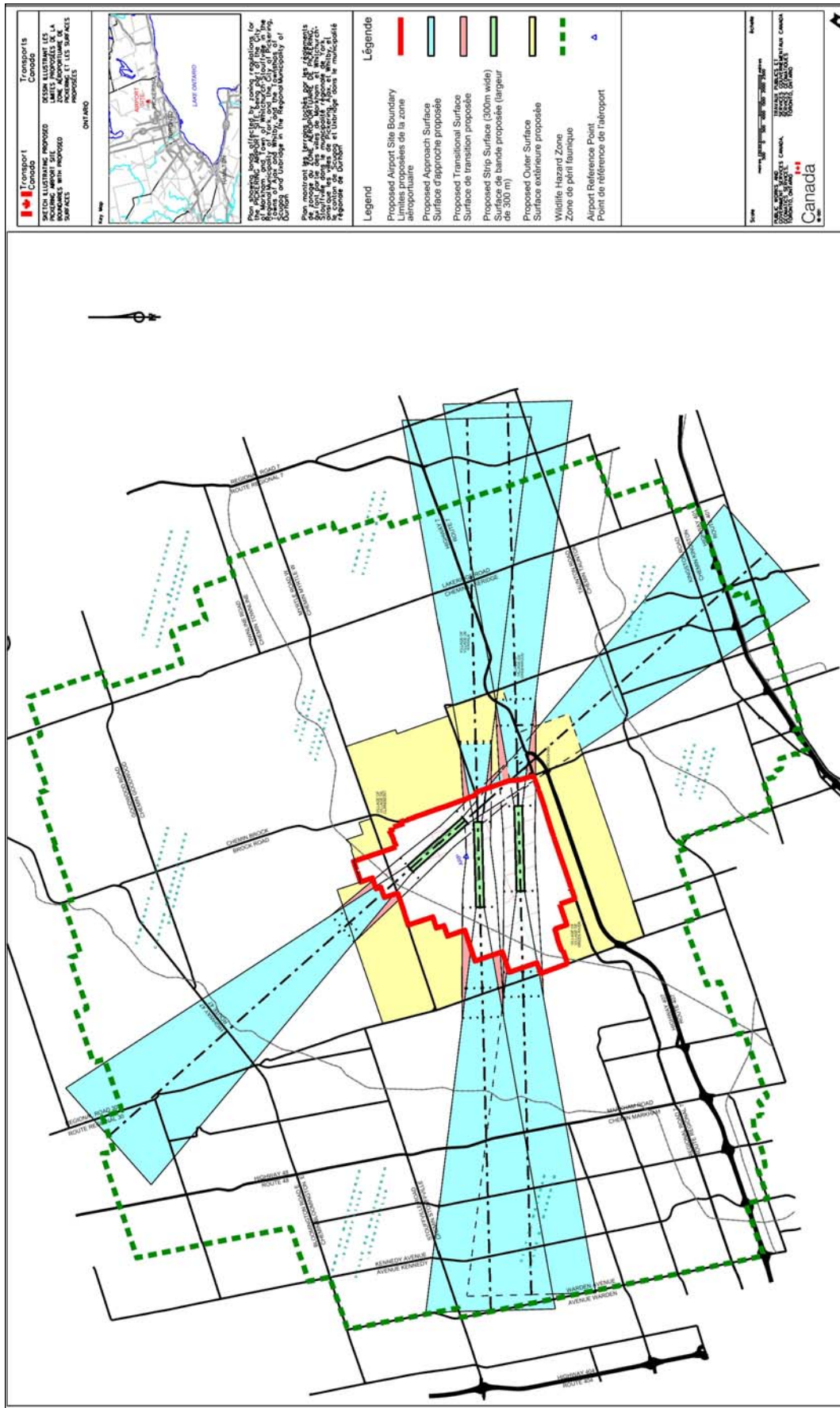
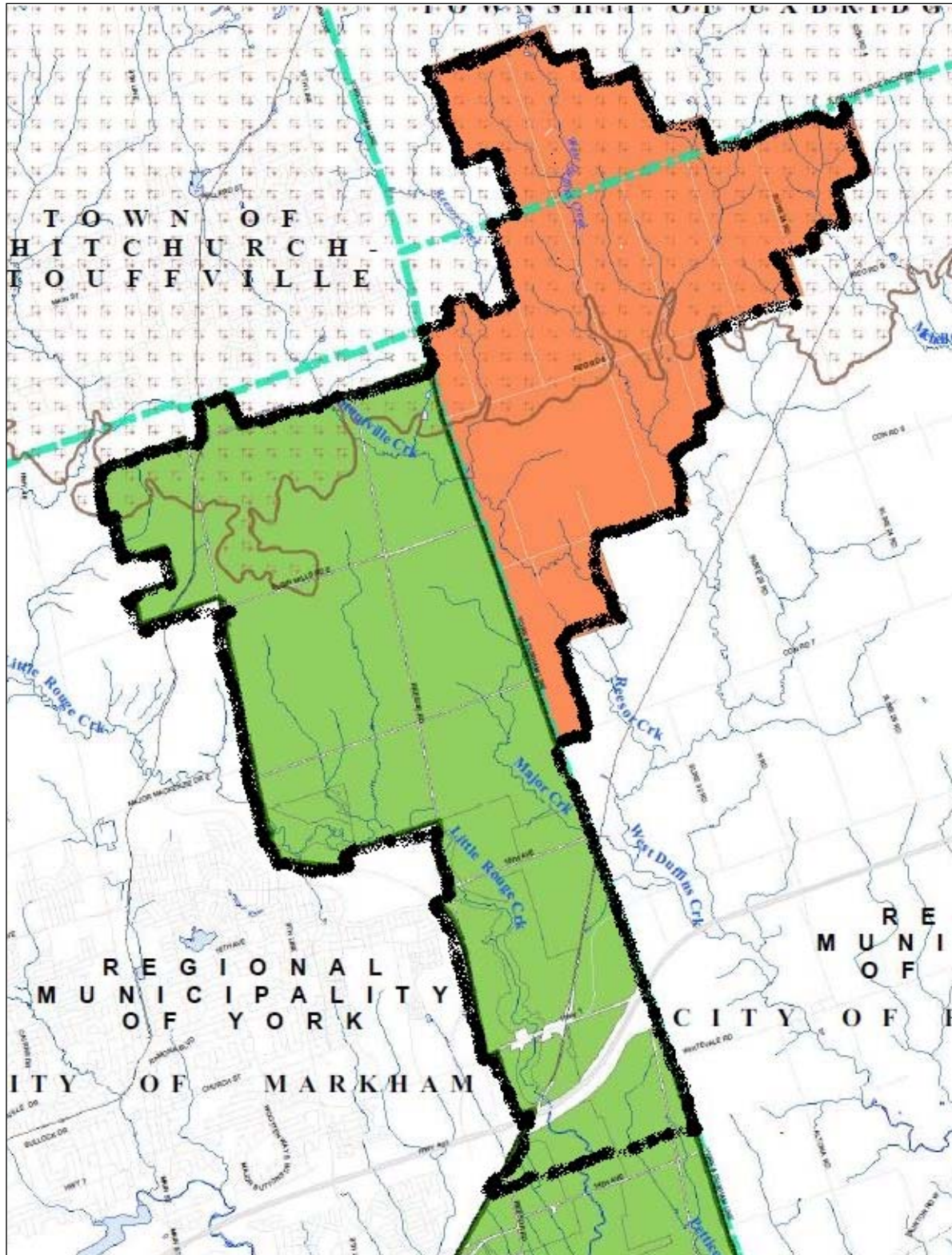


Fig. 2: Present/Future Rouge National Urban Park area inside 2015 draft PASZR wildlife hazard zone



Report Studied:**“Bird Use, Bird Hazard Risk Assessment, and Design of Appropriate Bird Hazard Zoning Criteria for Lands Surrounding the Pickering Airport Site”**

LGL Environmental Research Associates Ltd., 2002

See **Appendix 1** for the summary of the report’s content.

Karen’s overall findings

“The most recent report is quite dated, LGL 2002, and was updated using poor methods. They collected data between August and November 2001, thereby completely missing spring migration and breeding bird season; therefore this does not reflect an accurate characterization of the local bird community over a calendar year.

The LGL report notes recent land use changes and urbanization which will lead to conflicting demands in land use between an airport and neighbouring municipalities.

Regarding the proposed zoning, the report essentially argues that the proposed regulation [original 2005 PASZR] is too specific, too detailed, and cannot possibly encompass all of the potential land uses that could attract birds.

In my opinion, the existing landscape does present bird hazards; however, I don't think any of the hazards are unmanageable. Based on the legislation, they are able to enforce land use within a discreet area to achieve airport safety. Look at Billy Bishop Airport, which is less than 4 km away from the Leslie Street Spit, a location with over 100,000 breeding birds that rank high on the hazard list, and it is already an approved airport!!”

Our observations

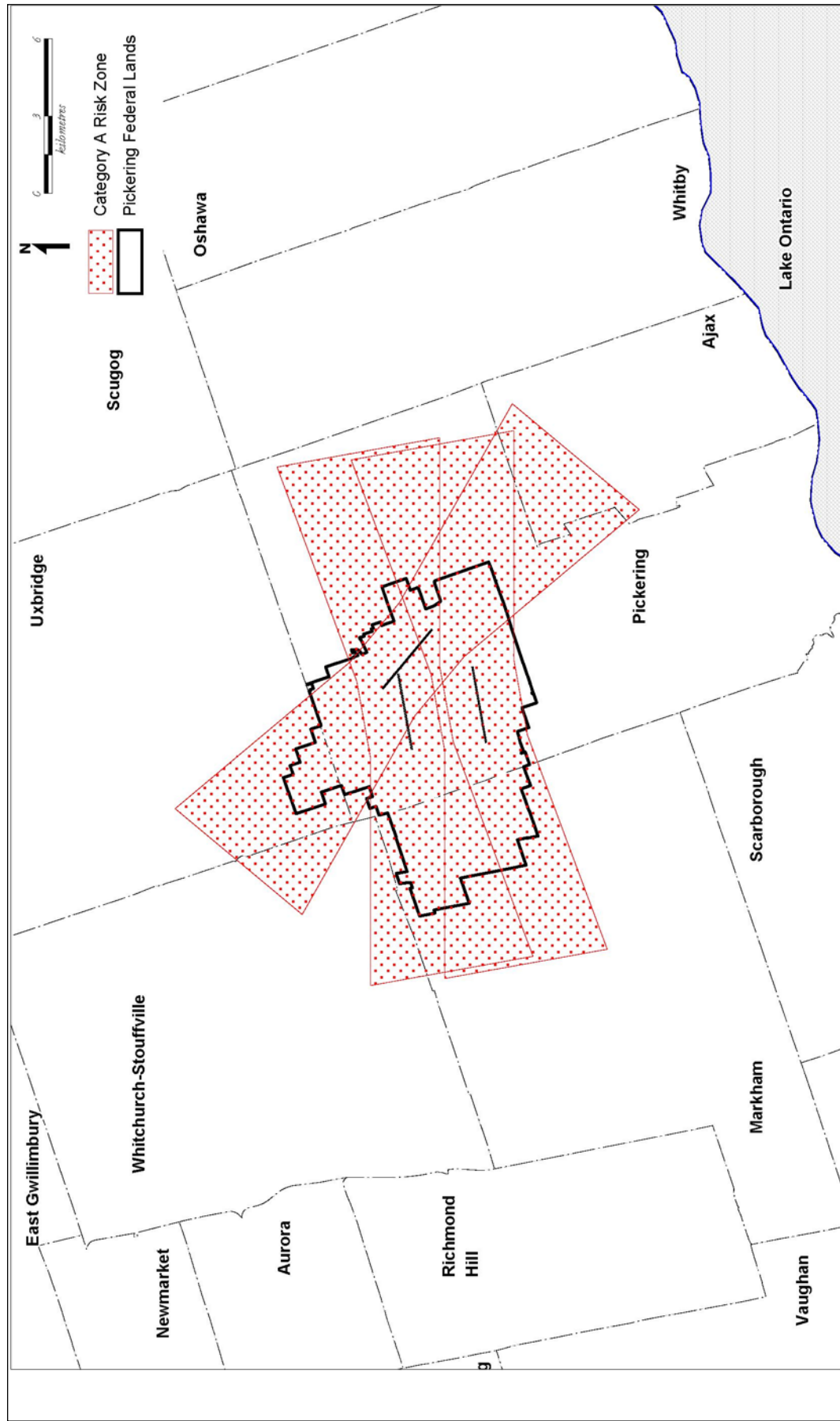
The LGL 2002 report recommends acceptance of a broad range of agricultural activities surrounding the Pickering airport, but this conclusion may be faulty, based on the fact that, as Karen points out, the researchers collected data only between August and November, missing the vital spring nesting season. For a legitimate assessment, the entire year would have to be studied (see **The Rise of the Geese** section below). The report disagrees with using the Airport Reference Point (the geometric centre of the runways) approach for bird hazard zoning, arguing that bird hazards within runway and aircraft-approach surface areas matter more. It recommends high risk “bird hazard zones” within 8.8 km of the end of runways (**Figure 3**), which, according to the runway layout in the 2015 draft PASZR, would extend straight through substantial areas of the RNUP in Markham, Pickering, and Uxbridge.

The 2015 draft PASZR goes even farther than LGL 2002, including within its Wildlife Hazard Zone areas as far as 15 km from the end of runways.

Our conclusion

Given that in the 2015 draft PASZR the distance from Brougham to the RNUP boundaries for both east-west and northwest-southeast runway configurations is approximately 7 km, LGL 2002’s recommended high-risk “bird hazard zone” for even the shortest Pickering airport runway would have to extend well inside the RNUP.

Fig. 3: Pickering Airport Category A Risk Zone (catastrophic loss, measured as either the complete loss of the aircraft or the loss of more than one life as a consequence of a bird strike event): LGL 2002, p. 24. Although the depicted east-west runways have been moved east and south in the 2015 draft PASZR, substantial areas of the RNUP Federal Lands still remain within the Category A Risk Zone.



3

Manuals Studied:

“Wildlife Control Procedures Manual”

Transport Canada, 2002

“Sharing the Skies: An Aviation Industry Guide for the Management of Wildlife Hazards” (2nd edition)

Transport Canada, 2004

“Aviation: Land Use in the Vicinity of Airports” (Part III: Bird Hazards)

Transport Canada, 2005

See **Appendices 2 to 4** for the summaries of the manuals’ contents.

Karen’s overall findings

“In terms of the bird/wildlife management documents, they recommend passive land use alterations to keep birds/wildlife out of the bird hazard management zones. Active management recommends trying to scare birds/wildlife out of the area, but ultimately details a list of lethal methods (and in my opinion, not all are humane).”

Our observations

These manuals, all non-site-specific Transport Canada documents, are used by all airport operators to determine the risk that specific land uses pose in attracting wildlife that threatens aviation safety in the vicinity of an airport. They also provide guidance on how to manage such threatening wildlife, detailing measures ranging from discouragement/removal to killing.

Some manuals tolerate a wider range than others of permitted land uses, including agricultural activities. But wildlife control around airports continues to be an active research field, so current policies may change.

Our conclusion

The establishment of an airport will always place some additional constraints on surrounding farming activities and other land uses, and on wildlife preservation within the airport’s regulated Wildlife Hazard Zone.

4 The Extreme Constraints Case

Unlike the more benign approach advocated in the LGL 2002 report discussed in section 2, Transport Canada's publications continue to recommend:

- applying numerous land-use constraints on areas close to airports to avoid attracting wildlife that pose a threat to aviation safety. These constraints include extreme measures such as: enforcing haying and ploughing at night; banning the growing of specific crops including fruits and vegetables; and causing significant destruction to natural habitat, including filling in wetlands.
- controlling wildlife present within the Wildlife (Bird) Hazard Zone with measures as extreme as killing.

5 A Reasonable Land-Use-Constraints Case (Apparently the Norm)

There seems to be a bias towards applying less-extreme wildlife controls first. Airport operators tend to focus on sufficient wildlife control measures to reduce incident risk to a level deemed adequate to ensure public safety. But if wildlife controls such as deterrence and removal fail, then additional constraints would be required on any land use found to be the root cause of the problem – even in areas outside the airport fence line.

But make no mistake – any serious aviation safety incident caused by wildlife always results in the adoption of more extreme and ultimately permanent control measures.

Example:

“...After Capt. Sullenberger's near catastrophic collision on Flight 1549 [‘Miracle on the Hudson’], New York's mayor Michael Bloomberg told the Wall Street Journal, ‘Look, the Department of Agriculture has to deal with the fact that all these geese are a danger to people flying. People are not going to stop flying and we have to make a decision. It's geese or human beings. And I can tell you where I come out on that.’ ...

...Now early each summer teams of USDA [United States Department of Agriculture] goose catchers, paid by local governments, scour municipal properties in a 450-square-mile area [an area nearly twice the size of Metro Toronto] encompassing the airports. At that time of year the geese are molting and can't fly. Once located, they and their offspring are easy to snag. They're then taken to slaughterhouses and quickly dispatched...”³

3. <http://news.nationalgeographic.com/news/2013/10/131108-aircraft-bird-strikes-faa-radar-science/>

6 The Rise of the Geese

Mixed farming predominated on the Federal Lands until the 1970s. The largest flocks of birds seen on the farmlands were gulls, hungrily “following the plough”. Flocks of geese were usually seen only during their spring and fall migrations.

There have been three significant changes in the past four decades on the expropriated lands:

- *Transport Canada’s policies throughout that time.* These policies allowed only annual farm leases, and stopped all maintenance and new construction of farm infrastructure to support agricultural activities. Lacking the security of long-term leases, farmers were limited in the types of crops they would grow. Their investments had to be profitable that same year. Multi-year-payback investments such as perennial crops and farm infrastructure construction and maintenance, such as field tile drains, fencing, and state-of-the art farm buildings to remain competitive with their neighbours outside the Federal Lands, largely disappeared. The traditional privately-owned mixed farming model, with diverse field crops and livestock, evolved into leased-land farming of primarily cash crops, including greatly expanded acreages of corn.
- *Environment Canada’s policies in the past 15 years.* These policies have promoted corn as a feedstock for ethanol bio-fuel, which has resulted in an increase in corn production in Ontario by at least one-third. To this day, the federal government continues to promote corn as a source of renewable fuel that significantly reduces the emission of greenhouse gases, so corn remains a common crop on the Federal Lands.
- *Farming trends.* Farmers are making greater use of no-till and similar cultivation technologies rather than moldboard ploughs, leaving more cereal-grain crop residue, including unharvested corn kernels, on the soil surface over winter.

Today, numerous flocks of geese, each numbering in the hundreds, are seen throughout the Federal Lands, feasting primarily on corn. There is so much food available that some geese now see no reason to fly south. They remain resident on the Federal Lands from harvest to spring planting.

The problem is, geese are ranked the highest wildlife hazard to aviation safety. And Transport Canada, through its Federal Lands management policies, has enabled the risk posed by geese to aviation safety to become greater on the expropriated lands than it was in the 1960s.

7

Can a National Park and an Airport Exist Side-by-Side?

According to Transport Canada’s public comments over the past two years, of course they can. Parks Canada will proceed to protect wildlife within RNUP, existing farming practices will continue, and wildlife within an airport site will be managed.

However, the core beliefs, regulations, and policies of Parks Canada and Transport Canada ultimately conflict when it comes to wildlife control:

- Parks Canada’s mission in general and the *Rouge National Urban Park Act* specifically require that the agency maintain a sanctuary as undisturbed as possible for all wildlife, including birds. The Park Superintendent is allowed to violate this requirement in the interest of “public safety”, but the perception is that this occurs in exceptional circumstances that are easily explainable to the general public (e.g., a bear terrorizing Park visitors). For a National Park to permanently allow routine control, or even eradication, of birds or other wildlife within its boundaries to accommodate an adjacent airport violates the agency’s mission, violates provisions of the *Rouge National Urban Park Act*, and violates a public norm.
- Transport Canada’s numerous wildlife control regulations and policies vary somewhat in risk-management details, but being adjacent to a huge wildlife sanctuary clearly exposes a future operator of an airport (who is responsible and liable for its safe operation) to a higher safety risk from birds, requiring more aggressive risk management actions than typical for a Canadian airport. If some form of wildlife should cause a serious safety incident, resulting in loss of an aircraft or human life, there would be a public outcry for imposition of more stringent controls to re-establish an adequate margin of public safety – possibly including permanent control/destruction of wildlife in a National Park, and permanent elimination of some farming activities in the area.

8

To Sum Up

A compromise between Transport Canada and Parks Canada would be necessary if a Pickering airport were to be built on the remaining Federal Lands – but Parks Canada would be the agency having to compromise. The question is: *could* it? How could a national wildlife sanctuary allow bird culls and the disruption of ecosystems within its borders without losing all support and credibility? The general public has a pretty clear understanding and expectation of what a national park is and should be. Preserving wildlife ranks high on the list of park obligations. The *Rouge National Urban Park Act* is clear on this:

Prohibited activities

- (2) Except as permitted under this Act, it is prohibited to
- [...]
 - (b) hunt a wild animal in the Park;
 - (c) remove a wild animal, a plant, a part of a plant or any other naturally occurring object or product of natural phenomena from the Park;

- (d) possess a wild animal, a plant, a part of a plant or any other naturally occurring object or product of natural phenomena that is in the Park or that has been removed from it;
- (e) disturb, harm or destroy a wild animal or disturb, damage or destroy a plant, a part of a plant or any other naturally occurring object or product of natural phenomena that is in the Park or that has been removed from it;

[...]

18. (1) The following definitions apply in this section.

“*hunt*” means to kill, injure, seize, capture or trap a wild animal, or to attempt to do so, and includes to pursue, stalk, track, search for, lie in wait for or shoot at a wild animal for any of those purposes.

The exceptions that are permitted don’t even hint at something that could be construed as an airport’s needs. Furthermore, the RNUP’s draft management plan declares, in its first key strategy⁴ that the Park:

“Celebrates and protects” – Rouge National Urban Park is a place where all Canadians can enjoy and celebrate the beauty of the Rouge watershed and play an active role in its future. Canadians will contribute to the protection and restoration of natural ecosystems, native wildlife, and ecosystem health, and the conservation of cultural resources vital to the park’s future. This will not only make Rouge National Urban Park a true “People’s Park,” it will also pave the way for a new degree of public engagement in Canada’s heritage treasures.

Unlike the spectral potential future airport, the Rouge National Urban Park is already firmly in place, protecting its wildlife, working with its farmers to introduce sustainable farming and more food crops, and welcoming delighted Canadians to its trails and special places.

How would the public feel about Transport Canada’s (or an airport manager’s) need to scare, trap, hunt, or kill the same native wildlife that Canadians are being invited to help Parks Canada protect?

The 2015 draft PASZR also poses a threat to the farmers of tens of thousands of acres of Canada’s most productive farmland within the Wildlife Hazard Zone. Most of the farms are privately owned, or will be on long-term lease from Parks Canada. Based on the assurance that, if an airport is built, “all current farming activities will be grandfathered”, farmers will feel encouraged to continue to operate and invest as if “business as usual” had been sanctioned. But Transport Canada still holds a mailed fist inside this velvet glove. It will have the power, as soon as an airport is built, to control various farming activities within the Wildlife Hazard Zone, forcing farmers to take a loss on some investments or even to assume new debt to restructure their operations. Is the federal government prepared to look after the interests of farmers and ensure that their business losses, when caused by airport wildlife control strategies, will be compensated?

The national park and the farms in and around it will co-exist nicely. Add an airport to that scenario and the result will become a circle that can never be squared.

4. Draft Rouge National Urban Park Management Plan, June 2014, p. 11

APPENDIX 1

Summary of “Bird Use, Bird Hazard Risk Assessment, and Design of Appropriate Bird Hazard Zoning Criteria for Lands Surrounding the Pickering Airport Site”

LGL Environmental Research Associates Ltd., report commissioned by: Public Works and Government Services Canada and Transport Canada, Ontario Region, 2002, 36 pp.

- This report is an update to the 1996-1997 Pickering Airport Lands Avifauna Study, conducted by Jacques-Whitford Environment Limited. The “bird study” is required to determine the extent of a Bird Hazard Zone in order to maintain a low level of risk concerning bird hazards to aviation.
- Bird hazard risk issues related to land use and aircraft in the vicinity of the future airport are complex. **In recent years, there have been significant changes in land use near the future airport site that have affected the behaviour of local and migrant birds.** The concurrent pressure of increasing urbanization near Pickering and throughout Southern Ontario will lead to conflicting demands for land use between the airport and the municipalities that surround the future site.
- Risks, and zoning restrictions, are analyzed according to the Risk Management Guidelines for Decision-Makers (CAN/CSA-Q850-97)/Q850 Guidelines.
- This report is intended to:
 - Be a principal reference document for the future risk information library;
 - Be a base-line document by which Stakeholder Analysis can be conducted during the Preliminary Analysis phase of Q-850;
 - Provide a model by which the frequency and consequences of risks can be estimated;
 - Provide a basis by which the risk control measures related to land-use can be formulated and later integrated with other mitigating measures adopted by the airport authority and the aviation community; and, importantly,
 - Provide the basis to measure the effectiveness of the zoning to mitigate the risks related to bird activity.

Recent changes in bird populations in the Pickering Airport Area

- Data collected between August and November 2001. [*KAREN: this is not a complete data set and excludes spring migratory and breeding birds. It is bizarre to think that this study would be used to describe bird populations and exclude those that nest in the area. There are species that will not be listed because August is significantly past their post-breeding dispersal. Also note that it is breeding birds that are federally protected by the Migratory Bird Convention Act (that is their nests/nest contents), plus those that are protected under the federal Species at Risk Act and the provincial Endangered Species Act. The data is also 12 years old, therefore should be redone and should include the whole year.*]

- The continuing urbanization of the southern area of the study lands, and the probability that the trend will continue was noted. This brings changes in the species and habitats of birds.
- Gull species are the focus (the original 1996-1997 study provided no quantitative data on non-gull species) and it is noted that numbers in the area appear to be decreasing, likely due to the closure of the Brock West landfill and three other area landfills.

Safety-risk Framework

The **Safety-risk Framework** links land-use to bird-related risks and aircraft operations. It categorizes the predictable relationships between:

- the different land uses found in urbanized and urbanizing settings near airports;
- bird species; and
- the different safety-risks to aircraft during various phases of aircraft flight.

The results are hazard and risk matrices that, when applied to any airport setting, provide risk-based guidance on appropriate land-uses, ranging from prohibited to acceptable.

This framework seeks to reduce the exposure of high-risk species of birds to aircraft by controlling land-use near airports, so that aircraft and aero engine manufacturers, airline operators, and airport operators can mitigate the probability and severity of the risks in their different ways.

Classification of Risk

The classification of damage or losses experienced by the aircraft or aircraft occupants is employed in the **Classification of Risk** framework:

- **Category A** – Catastrophic loss, measured as either the complete loss of the aircraft or the loss of more than one life as a consequence of a bird strike event.
- **Category B** – Major damage, measured as either: significant damage to the airframe, failure of one or more engines, one or more aircraft systems, serious injury to one or more aircraft occupants, or the loss of life of no more than one aircraft occupant.
- **Category C** – Minor damage to the airframe, engines, or aircraft systems.

In employing these risk classifications, worst-case circumstances are considered, and subsequently qualified in light of predicted frequencies, or ranges of frequencies.

Elements of Risk

The **elements of risk** are used to build the safety-risk framework:

- Identify and categorize **areas of exposure** by examining aircraft flight paths, and the differing degrees of risk associated with different phases of flight (exposure and vulnerability);
- Identify and categorize the various bird species that could strike aircraft with regard to **the potential severity of impact** (i.e. bird weight and behaviour);
- Identify **land-use** as it affects nesting, feeding, night roosting, and daily and seasonal flight patterns of hazardous species of birds identified in the previous step. The degree of risk associated with different land-uses can then be determined and applied to the areas associated with the various aircraft operations (probability of loss due to birds attracted by particular land uses).

Aircraft Operations

- Assumptions:
 - All runways will be aided by precision approach aids;
 - Aircraft will be transport-category aircraft powered by turbine engines, either jet or turbo-prop.

The **relevant phases of flight** include [note AGL = above ground level]:

- take off (take-off roll to 400 ft AGL)
- initial climb (400 ft AGL to 3,000 ft AGL)
- enroute climb (3,000 ft AGL to 10,000 ft)
- descent (10,000 ft to 3,000 ft AGL)
- approach (3,000 ft AGL to 400 ft AGL)
- landing (400 ft AGL to touchdown)
- missed approach (50 ft to 3,000 ft AGL)

The airport runways are the references from which the flight paths are mapped. The subsequent projections depict the lateral and vertical zones in which, predictably, aircraft operate, and which, therefore, are the “potential” hazard zones for bird strikes.

Aircraft are vulnerable to bird strikes in varying degrees during different phases of aircraft flight:

Category A (Highest potential loss)	Category B (Major Loss)
takeoff and initial climb	descent to the approach
missed approach	approach
	initial climb
	enroute climb

Hazardous Bird Species

- The consequence of a bird strike varies with the
 - weight and density of the bird,
 - impact speed, and
 - number of birds that are struck during a bird-strike event.
- The **bird hazard ranking system** is based on:
 - the size of the bird (weight is used because it is the density of the bird that causes the most damage);
 - their flocking characteristics (dense flocks of birds are usually more dangerous than single birds);
 - their flight behaviour (species that fly at altitudes of 1000-1500 ft AGL are a risk for aircraft approach and departure. Species that fly at higher altitudes during migration also pose a risk but are not considered in the report).

	Risk Level	Description (and example)	Level of Concern
High Low	Level 1	very large, flocking birds (geese, cranes, cormorants)	Can present significant safety hazards
	Level 2	very large, solitary birds (vultures) large, flocking birds (mallards, Great Black-backed Gulls)	
	Level 3	large, solitary birds (Red-tailed Hawk) medium-sized, flocking birds (American Crow)	
	Level 4	medium-sized, solitary birds small, flocking birds (European Starlings)	
	Level 5	small, solitary birds (Eastern Meadowlark) very small, flocking birds (swallows)	Generally do not cause significant accidents but can cause minor damage
	Level 6	very small, solitary bird (warblers, vireos, sparrows)	

Bird Hazards in the Pickering Area

- Emphasis is placed on the Bird Hazard Levels 1 to 4. Levels 5 and 6 are not considered because they do not pose a significant risk of a Category A or Category B incident.
- The **Bird Hazard Ranking System** is evaluated in terms of bird species that are known to occur in the area based on several consultant studies and personal knowledge. From this a list of potentially hazardous species has been compiled.
- The following list is species that are directly affected by land use patterns in the Pickering area (other species that pass through on migration are not influenced by local land use patterns) [*KAREN: I would disagree. Migrating birds can be very influenced by land use patterns*]. The table below ranks bird species by category of risk they present to aircraft.

	Risk Level	Pickering Area Hazardous Species
Higher Risk	Level 1	Canada Goose (very large, flocking)
	Level 2	Great Blue Heron (very large, solitary) Turkey Vulture (very large, solitary) Bald Eagle (very large, solitary) Mallard (large, flocking) Black Duck (large, flocking) Great Black-backed Gull (large, flocking) Herring Gull (large, flocking)
	Level 3	Red-tailed Hawk (large, solitary) Ring-billed Gull (medium, flocking) Rock Dove (medium, flocking) American Crow (medium, flocking)
	Level 4	Cooper's Hawk (medium, solitary) Northern Harrier (medium, solitary) Mourning Dove (small, flocking) European Starling (small, flocking) Red-winged Blackbird (small, flocking) Common Grackle (small, flocking) Brown-headed Cowbird (small, flocking)
Lower Risk	Level 5	Sharp-shinned Hawk (small, solitary) American Kestrel (small, solitary) Killdeer (small, usually solitary) Eastern Meadowlark (small, solitary) Snow Bunting (very small, flocking) House Sparrow (very small, flocking) Migrating sparrows (very small, flocking)
	Level 6	Many passerine species (very small, solitary)

Land-Use by Hazardous Species

This is a series of land-uses that could be found near the Pickering Airport and the level of risk that they could create for the safety of aircraft using the Pickering Airport.

High Risk	Moderate Risk	Low Risk	Potential Risk	No Risk
<i>Regularly attract large numbers of hazardous bird species. These birds often fly long distances to reach the high-risk land-use and these flights may take the birds through approach/departure paths.</i>	<i>Regularly attract smaller, but still substantial, numbers of hazardous bird species.</i>	<i>Attract small numbers of hazardous bird species on some days or on parts of some days.</i>	<i>Do not attract hazardous bird species if they are operated according to standard procedures. If they are not operated properly then they can attract birds.</i>	<i>Do not attract hazardous bird species or they attract them on only a few days in any particular year.</i>
<u>Putrescible Waste Landfills</u> A landfill located north of the Airport would create twice-daily flights by thousands of gulls from night roosts on Lake Ontario that would pass over the airport and/or through aircraft approach-departure paths. If a landfill was south of the airport and not near runway protected zones, then the risk to aircraft would be minimal.	<u>Open or Partially Enclosed Waste Transfer Stations</u>	<u>Dry Waste Landfills</u>	<u>Enclosed Waste Transfer Stations</u> If waste is spilled outside the transfer station or if the transfer trucks spill waste or leachate, then small numbers of birds can be attracted.	<u>Compost Facilities</u>
<u>Food Waste Hog Farms</u> Due to their attractiveness to hazardous species, their regular use, and their ability to attract gulls from long distances	<u>Cattle Paddocks</u> in many cases a lower ranking could be applied	<u>Marshes, Swamps and Mudflats</u>	<u>Wet/Dry Recycling Facilities</u> If waste was spilled outside by arriving or departing trucks, then birds would be attracted	<u>Natural Habitats include forests, woodlots, hedge-rows, and riparian habitats.</u> The airport site is so large that zoned lands will not be close enough to runways for those types of habitats to create risk.
<u>Wildlife Refuges, Waterfowl Feeding Stations</u>	<u>Sewage Lagoons</u>	<u>Commercial Shopping Malls, Plazas</u>	<u>Poultry Factory Farms</u> Poultry farms should be permitted only if dead birds are not discarded adjacent to the facility.	<u>Agricultural Fields</u> In general, most of the crops and practices pose little bird hazard to aircraft safety but some of these practices would be of concern if they occurred on airport property, very close to an airport runway.
<u>Racetracks</u>	<u>Municipal Parks, Picnic Areas</u>	<u>Fastfood Restaurants</u>	<u>Plowing/Cultivating</u> If gulls returned to the same field day after day, then the land-use would be ranked as moderate to high risk. However, the site-specific location varies from day to day, and any particular location is likely to be used for only a couple of days per season, it would be ranked as low risk.	<u>Haying</u> Unless close to an airport runway on the Airport Site.

High Risk	Moderate Risk	Low Risk	Potential Risk	No Risk
	<u>Golf Courses</u> Canada Geese are a Level 1 hazard but their seasonal use of golf courses means that they should be classed as a Moderate Risk Land-Use. Some golf courses that employ bird control measures may pose a lower risk.	<u>Outdoor Restaurants</u>	<u>Storm-water Management Ponds</u> The classification of a particular storm-water pond will be a matter of design and must be approved if it is located near the airport site.	<u>Rural Ornamental and Farm Ponds</u> Unless located on the airport lands.
		<u>Schoolyards</u>		<u>Residential Areas</u>
		<u>Community/-Recreation Centres</u>		<u>Other Land-Uses</u> Would require permission before being allowed.

Analysis of Proposed Bird Hazard Provision

This section makes recommendations regarding the then proposed zoning. It essentially argues that the proposed regulation is too specific, too detailed, and cannot possibly encompass all of the potential land uses that could attract birds.

Recommended Bird Hazard Provision

Most of the wording was adopted in the official zoning regulation:

6. **No owner or lessee of land within the limits of the bird hazard zone shall permit any part of that land to be used for activities or uses attracting birds that create a hazard to aviation safety and are therefore incompatible with the safe operation of the airport or aircraft.**

Recommendations for Airport Zoning at the Pickering Airport Site

- Recommendations for bird hazard zoning are based on distances from the runway ends rather than distances from an arbitrarily selected airport reference point as done in the 1996-1997 report.
- The altitudes of aircraft determine the level of risk from flying birds, and those altitudes are a function of where the aircraft is in relation to the end of the runway not where it is in relation to the location of the airport reference point.
- There is a problem in that the locations of the runways for the airport have not yet been determined. The assumption is that each of three runways will be about 3 km long and will be centred in the envelopes identified by Transport Canada.

- The area is divided into the Primary, Secondary and Special Bird Hazard Zones, with maps for each.
 - **Primary BHZ is the location of the area within which a Category A accident could occur. On approach that is approximately 8.8km from the end of the runway.** (Note Category B accidents are not considered in zoning because most non-migrating birds fly at less than 1500 ft AGL)
 - **Secondary BHZ is a 4km are around the Primary BHZ** that represents a bird behaviour buffer zone to account for variability in bird movements.
 - **Special BHZ is a 6km wide buffer north of the Primary BHZ** to prevent land use activities that might attract gulls.

Land-Use	Permitted in Hazard Zone		
	Primary	Secondary	Special
High Risk			
Putrescible Waste Landfills	No	No	No
Food Waste Hog Farms	No	No	No
Wildlife Refuges, Waterfowl Feed. Stns.	No	No	No
Racetracks	No	No	No
Moderate Risk			
Open or Partially Enclosed Waste Transfer Stations	No	No	Yes
Cattle Paddocks	No	No	Yes
Sewage Lagoons	No	No	Yes
Municipal Parks, Picnic Areas	No	No	Yes
Golf Courses	No	No	Yes
Low Risk			
Dry Waste Landfills	No	Yes	Yes
Marshes, Swamps and Mudflats	No	Yes	Yes
Commercial Shopping Malls, Plazas	No	Yes	Yes
Fastfood Restaurants	No	Yes	Yes
Outdoor Restaurants	No	Yes	Yes
Schoolyards	No	Yes	Yes
Community/Recreation Centres	No	Yes	Yes
Potentially Risky			
Poultry Factory Farms	?	?	?
Enclosed Waste Transfer Stations	?	?	?
Wet/Dry Recycling Facilities	?	?	?
Stormwater Management Ponds	?	?	?
Plowing/Cultivating	?	?	?
No Risk			
Compost Facilities	Yes	Yes	Yes
Natural Habitats	Yes	Yes	Yes
Agricultural Fields	Yes	Yes	Yes
Haying	Yes	Yes	Yes
Rural Ornamental and Farm Ponds	Yes	Yes	Yes
Residential Areas	Yes	Yes	Yes
Other Land-Uses	?	?	?

The zoning regulations as approved in 2004 and as per the map published by Transport Canada in June 2013 do not appear to have adopted the specifics of these recommendations, but rather provide the boundary of a “bird hazard area” with no subdivisions. The boundary appears very similar to those provided in the undetailed maps in this report.

Literature Cited

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Jacques Whitford Environment Limited. 1991. “Pickering Airport Lands Avifauna Study.” Report prepared for Transport Canada, Toronto, Ontario. 120 pp.

Transport Canada. 2001. “Sharing the Skies: An Aviation Industry Guide for the Management of Wildlife Hazards”, Transport Canada, Ottawa, Ontario. 357 pp.

APPENDIX 2

Selected Notes from “Wildlife Control Procedures Manual” Transport Canada, 2002, 270 pp.

Passive Management Techniques

- Habitat modification to make areas less attractive to high-risk species.

Wildlife is attracted by the presence of:

- garbage (edible waste),
 - fruit-producing trees and bushes,
 - seed-producing vegetation,
 - green weeds,
 - grass,
 - aquatic vegetation,
 - agricultural grains,
 - large numbers of rodents or small birds, and
 - large numbers of insects and earthworms.
- As a general rule, all physical features that hold standing water should be modified or eliminated. Pits or depressions that regularly collect water should be drained and backfilled; clogged waterways should be cleared.
 - **Many forms of agriculture – including fruit, vegetable, and grain farming, as well as many livestock activities – create food sources that attract wildlife. For this reason, agricultural practices in the vicinity of airports should be strictly monitored and – when possible – controlled.**
 - **Airport operators should carefully consider the potential risks associated with the leasing of airport lands before lease contracts are signed. Cereal grain, market vegetable, and other bird-attracting crops grown on such lands should be kept as far away from the runways as possible. Ploughing and harvesting activities, which attract flocks of birds to runway areas, should be relegated to hours of darkness or periods when the problem species are away from airports – during nesting season for gulls, for instance, and early spring and late autumn for migratory species.**
 - Transport Canada guidelines state that areas leased for agricultural purposes should be at least 1200 feet from runways. Under the guidelines, the following crops are acceptable (listed in order of preference):
 - hay,
 - alfalfa,
 - flax,
 - soy beans,
 - fall rye,
 - fall wheat,
 - spring wheat,
 - barley, and
 - other cereal grains except corn and oats.

- Trees and hedgerows should be cut back a minimum of 150 metres from runway or taxiway centre lines.
- Brushy areas removed from the immediate vicinity of the airport
- All water bodies should be cleared of emergent and submerged aquatic vegetation by cutting, dredging, or through the use of herbicides. The banks should also be cleared of cover vegetation such as cattails and brush. The banks of water bodies (particularly ponds, streams) should be graded to a 4-to-1 slope, which will discourage burrowing by Muskrats and damming by Beavers.
- Transport Canada recommends that certain practices not be permitted within 3.2 kilometres of airport reference points.

Case Study

One reported success [from an airport's point of view] was at a U.S. Air Force base where starlings had caused extensive damage to a C-130 during lift-off. The 250 dead starlings found on the runway were part of a large group that was feeding on Crane Fly larvae in areas nearby. Subsequently, these areas were sprayed with a mixture of insecticide (diazinon) and moth crystals (para-dichlorobenzene); the latter chemical was added as a starling repellent. The results were favourable and the starlings avoided the area. It is likely that they were driven away by the depletion of their food source, because subsequent studies have shown that starlings are not repelled by para-dichlorobenzene.

Active Management using dispersal techniques

Auditory

- Pyrotechniques
- Distress calls
- Alarm calls
- Predator calls

Chemical

Visual

- Scarecrows
- Falconry
- Dogs
- Radio controlled model planes

Active Management using exclusion techniques

- Fencing
- Netting

Active Management using removal techniques

- Chemicals used to kill wildlife fall into three categories:
 - acute toxins that kill after ingestion of a single lethal dose,
 - anticoagulants and decalcifiers requiring the ingestion of several doses over a period of days, and
 - fumigants that suffocate burrowing animals in the ground.
- Lethal chemicals are registered for killing pigeons, House Sparrows, and starlings and mammals.
- Methods used to poison birds include poison perches, bait stations, and egg oiling, which suffocates developing bird embryos.
- Kill traps and live traps
- Shooting with live ammunition
- Surfactants, such as PA-14, are added to water as it is sprayed at roosting sites. The surfactants allow water to penetrate bird feathers. Once the birds become wet, their body temperatures drop and, in cold weather, they are likely to die of hypothermia. Studies indicate water mixed with PA-14 has been successful in the control of both blackbirds and starlings. Spraying is typically done at night when birds are roosting

Ranking of Hazard Birds

1. Geese (all species)
2. Gulls (all species)
3. Hawks (buteos)
4. Ducks (all species)
5. Owls (all species)
6. Rock Dove
7. Eagles (Bald & Golden)
8. Sandhill Crane
9. Sparrows/ Snow Bunting
10. Shorebirds
11. Blackbirds/Starlings
12. Crows/Ravens
13. Swallows
14. Mourning Dove
15. Herons (all species)
16. Vultures (turkey)
17. American Kestrel

Bird Profiles

[briefly describes bird species/family, food and attractants and control methods].

APPENDIX 3

Selected Notes from “Sharing the Skies: An Aviation Industry Guide for the Management of Wildlife Hazards,” 2nd edition

Transport Canada, 2004, 357 pp.

- The principal objective of an airport wildlife-management program is to implement measures that will prevent collisions between aircraft and wildlife in the vicinity of the aerodrome. As such, these programs must be a fundamental part of an airport’s overall management plan – in some cases even a part of an airport’s business plan. Off-airport land management and use can contribute as much or more to the creation of wildlife hazards as those at the airport itself.
- The risk that a multiple bird strike will result in the crash of a large airliner, while statistically low, is slowly rising and cannot be ruled out. The loss of life would be catastrophic. Applying realistic figures, a 4 lb bird striking an aircraft traveling at 250 kts results in an impact force of approximately 38,000 lbs. At an airspeed of 400 kts, the force increases to 100,000 lbs.
- Real economic losses from wildlife-strikes are already mounting. Although difficult to estimate accurately, the total cost of wildlife-strike damage – according to the best available industry estimates – likely involves many millions of dollars a year for Canadian civil aviation alone.
- **The total cost of a wildlife strike is the sum of the direct costs, indirect costs, ancillary costs, hull-loss fatality costs and legal liability costs.**
- Transport Canada data show that, where phase of flight was reported, about 90% of wildlife strikes occurred during the takeoff and landing.
- Bird and mammal strikes will continue to be a safety issue for many reasons:
 - The number of aircraft and flight movements are increasing worldwide.
 - The populations of a number of high-hazard bird species are increasing.
 - The populations of some mammal species are on the rise.
 - **Urban encroachment on airports forces birds to use the relatively safe airport environment and its associated arrival and departure paths as the only remaining open space.**
 - **Wildlife-management procedures at airports are unlikely to succeed in keeping the airport completely free of birds and mammals.**
 - Detecting airborne birds in time to avoid a collision is often not feasible.
- Bird behaviours may create aviation hazards:
 - Bird-flight altitudes
 - Bird soaring and gliding
 - Towering conditions are often found at or near airports. Open and flat, airfields contain large expanses of concrete and asphalt which re-radiate stored heat, creating ideal conditions for the development of local thermals. As a result, towering birds – particularly hawks and vultures – often concentrate and circle above airfields.

- Soaring birds tend to make their daily movements at greater altitudes than other birds. During ideal thermal conditions, hunting hawks and vultures can maintain altitudes greater than 1,000 ft AGL. Soaring also allows birds to cover more lateral distance, as the activity allows them to save energy, therefore these species range over a much greater airspace in and around airports – vertically and horizontally – raising their profile as bird-strike hazards and putting them out of the reach of many wildlife-management techniques. Studies of gull movements to and from landfills found that flapping flight movements occur at under 300 ft AGL – while birds are more likely to glide at altitudes over 1,300 ft. Birds save energy by towering to gain altitude over the landfill before moving off to roosting sites.
- Migratory activity and movement
- **During migration, large concentrations of hawks and vultures congregate in areas that offer dependable thermals and updrafts.** In the late morning boils of hawks and kettles of vultures each containing hundreds and thousands of birds are not uncommon. Under ideal conditions, these birds can ride thermals to altitudes at which they can no longer be seen from the ground.
- The Aerodrome Safety Branch of Transport Canada maintains this country’s bird/mammal strike database. Annual summary reports of bird strikes have been published and distributed to stakeholders in essentially the same form since the early 1980s. These reports include information on:
 - strikes that occurred at Canadian sites,
 - strikes to Canadian aircraft at foreign locations, and
 - strikes to aircraft operated by the Department of National Defence in Canada and abroad.
- There are three components associated with wildlife-strike risk management:
 - reducing the overall exposure to wildlife hazards,
 - reducing the probability of striking wildlife, and
 - reducing the severity of a wildlife strike.
- **Canadian law has no specific requirement for airports to establish wildlife-management programs.** Responsible organizations and individuals expose themselves to potential liability should they not introduce measures to reduce the numbers of hazardous birds and mammals at and near airports.
- Particular care must also be taken when defining contracts between airport operators and tenants. **Failure to control tenant actions that create hazards may lead to liability for the airport operator should an accident occur.** The fact that the airport operator collects landing fees from the airline – and has invited the airline to use the site – imposes a significant responsibility on the airport operator to manage a safe facility.
- Airport operators can find themselves at odds with environmental regulations and local community environmental groups. Many measures that enhance aviation safety – such as glycol-based aircraft deicing – can be detrimental to the environment if poorly managed. The same holds true in **airport wildlife-management programs, which must strive to ensure safety through manipulation of wildlife habitats in accordance with applicable federal, provincial and municipal statutes.**

- The **Aeronautics Act** contains airport zoning regulations that prohibit the use of land outside the airport boundary – if that use is deemed hazardous to aircraft operations. The regulations address issues such as:
 - obstacle limitation surfaces (limitations on objects which may project into areas associated with aircraft approach, departure and runway movements),
 - protection of telecommunications and electronic systems,
 - aircraft noise,
 - restrictions to visibility,
 - site protection and line-of-sight requirements, and
 - bird hazards.

Aeronautics Act—Section 5.4 (2)

The Governor in Council may make regulations for the purposes of:

(a) preventing lands adjacent to or in the vicinity of a federal airport or an airport site from being used or developed in a manner that is, in the opinion of the Minister, incompatible with the operation of an airport;

(b) preventing lands adjacent to or in the vicinity of an airport or airport site from being used or developed in a manner that is, in the opinion of the Minister, incompatible with the safe operation of an airport or aircraft; and

(c) preventing lands adjacent to or in the vicinity of facilities used to provide services relating to aeronautics from being used or developed in a manner that would, in the opinion of the Minister, cause interference with signals or communications to and from aircraft or to and from those facilities.

APPENDIX 4

Summary of “Aviation: Land Use in the Vicinity of Airports”. (Part III: Bird Hazards)

Transport Canada, 2005, 47 pp.

This document provides the basis for airport zoning regulations at airports across Canada. As each airport’s zoning regulations are unique, so are the descriptions and scope of restricted activities.

- Airports are naturally attractive areas to many species of birds.
- Programs at Transport Canada operated airports effectively reduce this natural attraction of birds to airport lands, primarily through major habitat management and manipulation projects, as well as through day to day vigilance and the use of bird-scaring techniques.
- While these on-airport activities are effective, they can be neutralized by the presence of attractive land use or activities outside the airport boundary.
- The following information provides guidelines on the acceptability of different land use practices for the vicinity of airports and should only be included upon the expert advice of a bird hazard specialist. General land use practices have been evaluated on their relative attractiveness to the traditionally hazardous bird species.
- Provisions must be made for prohibiting the location of garbage dumps, food waste landfill sites, coastal commercial fish processing plants, and/or the planting of crops, that may either attract birds or adversely affect flight visibility, within 8 km of an aerodrome reference point.
- The following land use practices are **NOT RECOMMENDED FOR AREAS 3.2 KM OR LESS, FROM THE AIRPORT REFERENCE POINT** [content of tables reproduced as shown in original document]:
 - a) Agricultural practices

	Not Recommended	Suggested Alternative
Crops		
Grains	Barley Oats Wheat (particularly Durum) Corn Sunflower Clover	Rye Buckwheat Flax Canola Timothy Alfalfa
Fruits	Berries Cherries Grapes Apples	Vegetables (except potatoes)
Livestock		
Feedlots	Beef Cattle	Pasture-fed
Piggeries	Livestock	

- (b) Commercial Activities – Outdoor (Drive-In) Theatres
- (c) Managed and/or Supplemented Natural Habitats (Refuges, Sanctuaries)
Migratory Waterfowl Refuges/Feeding Stations/Crops
Designated Game Mammal Refuges

- Other activities that may attract birds:

Attraction	Activity	Suggested Remedial Action
Food Garbage	Restaurants (indoor/outdoor) Picnic areas	Improve maintenance/disposal Covered garbage containers
Freshly Tilled/Plowed soil	Cropping activities Sod fanning	Plow/Till at night
High Insect /Mouse Activity	Grass and hay cutting activities Baling of hay (before/after)	Cut/Bale at night Remove bales as soon as possible
Livestock Manure Piles	Barnyards Stables Racetracks Fairgrounds Game Farms	
Lagoons	Sewage Lagoons Storm water Retention Ponds	