Feral Pigeon (*Columba livia domestica*) **Management Plan for Bermuda**

Government of Bermuda
Ministry of the Environment
Department of Environment and Natural Resources

Feral Pigeon (*Columba livia domestica*) **Management Plan for Bermuda**

Author

This plan was prepared by:

Mark E. Outerbridge, PhD.

Senior Biodiversity Officer, Department of Environment and Natural Resources

Contact: mouterbridge@gov.bm

Cover photo: Feral pigeon by Mark Outerbridge

Published by

Government of Bermuda

Ministry of the Environment

Department of Environment and Natural Resources

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Management plans delineate reasonable actions that are believed to be required to manage, recover and/or protect listed species. The Department of Environment and Natural Resources (DENR) publishes management and recovery plans, sometimes preparing them with the assistance of field scientists, other government departments, as well as other affected and interested parties, acting as independent advisors to DENR. Plans are submitted to additional peer review before they are adopted by DENR, and formulated with the approval of interested parties mentioned in Parts II and III of the plan. Objectives of the management plan will be attained and necessary funds made available subject to budgetary and other constraints affecting the parties involved. Management plans may not represent the views nor the official positions or approval of any individuals or agencies involved in the plan formulation, other than our own. They represent the official position of DENR only after they have been signed by the Director as approved. Approved plans are subject to modifications as dictated by new findings, changes in species status and the completion of management and/or recovery actions.

Literature citation of this document should read as follows: Outerbridge, M.E. 2016. Feral Pigeon (*Columba livia domestica*) Management Plan for Bermuda. Department of Environment and Natural Resources, Government of Bermuda. 29 pages.

An electronic version of this management plan will also be made available at www.environment.bm

ANDREW PETTIT

Director
Department of Environment and Natural Resources
Government of Bermuda

14TH JUNE 2016

Date

ACKNOWLEDGMENTS

I would like to express my gratitude to David Wingate, Andrew Dobson and Jeremy Madeiros for critically reviewing an earlier draft of this plan. I am also grateful to the Bermuda Audubon Society for sharing the feral pigeon data collected during the Annual Christmas Bird Counts.

EXECUTIVE SUMMARY

Current species status:

The feral pigeon is invasive on Bermuda and has been identified as a pest species under the Protection of Birds Act (1975). The Minister responsible for the Act can authorize the destruction of any bird species that is having a demonstrable detrimental impact on the environment, agriculture, or human health. This is done through a license which is issued on an annual basis to individuals through which conditions are set on control activities.

Management objective:

The main objective of this plan is to reduce the number of feral pigeons on Bermuda by trapping and shooting, in order to minimize their negative effects on fragile island ecosystems, public health and agriculture. Research, education and public cooperation are all key elements to the success of this culling programme.

The plan is an evolving document and will be revised periodically. Culling data will be continually recorded and new culling methods evaluated for effectiveness.

Actions needed:

1. Launch a pigeon awareness campaign highlighting the local impacts of this species on native wildlife and the health of human residents,
2. Reduce the number of feral pigeons on Bermuda by using a variety of culling and control methods,
3. Modify dairy farming practices so that grain feeds are less readily available to scavenging feral pigeons,
4. Develop best practices for the management of pigeon lofts and dovecotes on Bermuda,
5. Prohibit unregulated feeding of feral pigeons on public and private lands,
6. Assist the public with providing solutions to manage nuisance pigeons on private lands.

Management costs:

The total cost of management and/or recovery actions cannot be defined at this point. Developing budgets for each action are the responsibility of the leading party as outlined in the work plan.

PART I: INTRODUCTION

A. Historical overview

Domestic poultry were thought to have been introduced to Bermuda by the earliest settlers (circa 1612). Pigeons were specifically mentioned in the writings of Governor Butler (1619), *"And thes are the natives of the ayre; to which have bin added, by the late inhabitants, great store of turkeys and abundance of cocks and hens, which every daye growe wilde; numbers of tame chicks, and some fewe geese and house pigeons."* It appears that by the early 20th century domestic pigeons had become feral and were known to nest in holes and caverns of cliffs, however they were not considered to be abundant (Verrill, 1902). Banded pigeons have also arrived on Bermuda as vagrants from cities along the eastern coast of the U.S.A. (Wingate, 1977).

Beginning in 2004, a concerted effort was made to cull feral pigeons on Bermuda by the Department of Conservation Services. During that year, a total of 2843 birds were permanently removed from the environment (of which over 35% came from a single livestock farm). Feral pigeon culling has continued annually since that time (see Tables 1 and 2 in the appendix for culling summaries).

B. Conservation status

Feral pigeons are not protected on Bermuda and are deemed a pest species.

C. Taxonomy and description of species

Kingdom: Animalia
Phylum: Chordata
Class: Aves
Order: Columbiformes
Family: Columbidae
Genus: *Columba*
Species: *livia*
Sub-species: *domestica*

Feral pigeons are also known as rock doves, city pigeons, or street pigeons and are derived from domestic pigeons (*Columba livia domestica*) that have returned to the wild. The domestic pigeon was originally bred thousands of years ago from the wild rock dove (*Colomba livia*) which inhabits coastal and mountain cliffs throughout its natural range. Both are capable of interbreeding. The domestic pigeon has a deep chest and a broad tail with a dark band. Typical body colouration is gray with a white rump and two black bars on each wing (Fig. 1), which enables individuals to effectively blend with the background

when perched on rocky environments (Fig. 2). Domestic stock and feral birds can, however, exhibit many different colour variations. Eye colour is normally orange and the feet are pink. Wingspan is 62–72 cm (24–28 inches) and mass ranges from 238–380 g (8.4–13.4 oz). Females are virtually indistinguishable from males.

Mark Outerbridge

Figure 1. Typical appearance of a feral pigeon.

Mark Outerbridge

Figure 2. Three feral pigeons perched on the rocky outcrops of a cliff face.

D. Ecology

Habitat requirements

Pigeons have adapted to urban life, and are abundant in towns and cities throughout much of the world. They are also commonly found around farm yards, buildings (both abandoned and inhabited), caves and rocky cliff faces with ledges and cavities.

Feeding

Pigeons are primarily grain and seed eaters but they will also feed on livestock manure, insects, berries and will readily scavenge garbage and scraps of food dropped by humans.

Reproduction and life cycle

Pigeons are monogamous. Nests consist of sticks, twigs, and grasses clumped together to form a crude platform, typically constructed on a ledge or in cavities. Female pigeons can reach sexual maturity as early as seven months of age. One to three (usually two) white eggs are laid; incubation is shared by both parents and lasts for about 18 days. For the first few days after hatching, the chick (known as a squab) is fed exclusively on a substance known as crop milk which the parent birds regurgitate to their offspring. The young leave the nest at four to six weeks of age. Additional eggs can be laid before the first clutch departs the nest. Breeding can occur year-round, but peak reproduction occurs in the spring and fall. Pigeons breed when their food supply is abundant enough to support egg development; depending on the environment, a pigeon can lay up to six clutches per year (Johnston and Janiga, 1995). Lifespan is 3–5 years in the wild but individuals have been reported to reach 15 years in captivity.

Predators

Migratory birds of prey (e.g. peregrine falcons *Falco peregrinus* and red-tailed hawks *Buteo jamaicensis*) are known to capture and kill pigeons on Bermuda (Fig. 3). Cats and dogs may opportunistically prey on adult pigeons, and rats will prey upon chicks and eggs in nest cavities. All of these sources of predation are random and opportunistic in nature.

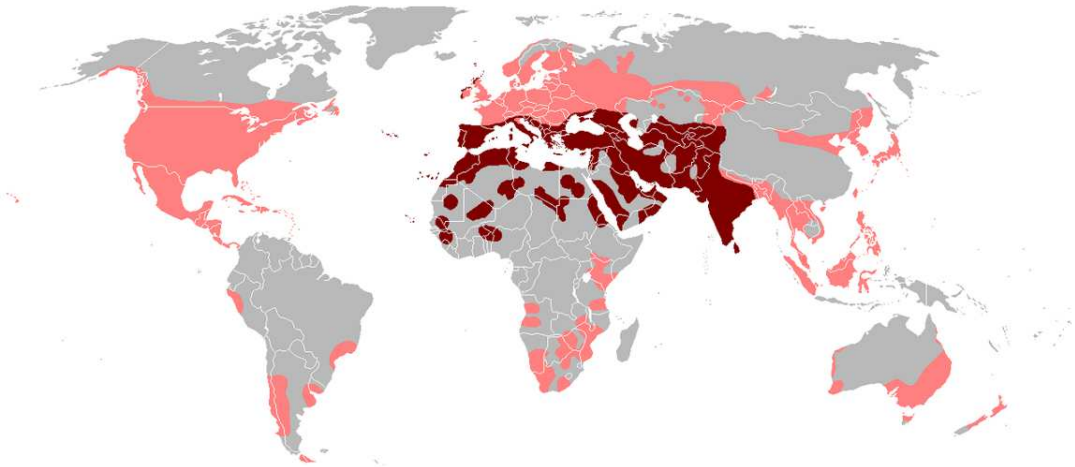
Tim Davidson

Figure 3. Young falcon with the remains of a pigeon meal.

E. Current status

Global distribution

Pigeons are native to western and southern Europe, North Africa, and South Asia; however they were introduced to various countries as a domesticated bird and have subsequently become naturalized throughout much of the tropical, sub-tropical and temperate regions of the world (Fig. 4).

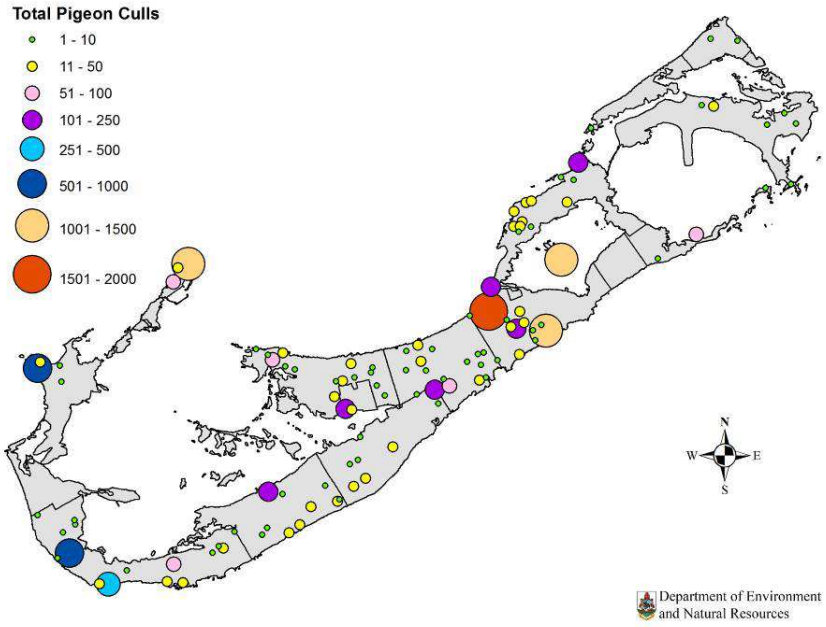


Map source: en.wikipedia.org/

Figure 4. Global range map of the rock dove *Columba livia*. Red represents the approximate native range; pink represents the introduced non-native range.

Local distribution and abundance

Pigeons are gregarious and can live in flocks consisting of hundreds of birds. Feral pigeons have an island-wide distribution across Bermuda; however abundance varies (Fig. 5). Large flocks are found in locations where food is plentiful (e.g. dairy farms) as well as where roosting and nesting sites are favourable (e.g. cliff faces). Examples of the latter include the south coastline of Harrington Sound, High Point in Southampton Parish and Black Watch Pass in Pembroke Parish. Present day estimates of abundance on Bermuda are not available but are considered to be in the thousands (J. Madeiros, pers. comm.). Between 1975 and 2015 an average of 337 pigeons (range 66–1238) were counted annually by observers participating in the Bermuda Audubon Society's annual Christmas Bird Count.



Map created by Mandy Shailer

Figure 5. Map of Bermuda showing pigeon culling efforts between 2004 and 2015.

Local impacts

The problems caused by feral pigeons on Bermuda include:

1. Nest site competition with white-tailed tropicbirds *Phaethon lepturus catesbyi* (known locally as longtails). Both species nest in cavities found on coastal areas and limestone cliff faces. Bermuda's breeding aggregation of white-tailed tropicbirds form the most northerly nesting colony of tropicbirds in the world, with an estimated 2000 nesting pairs (Dobson and Madeiros, 2008). Tropicbirds are seasonal nesters on Bermuda (Gross, 1912; Wingate and Talbot, 2003) and are presently listed under the Protected Species Act (2003).
2. High risk of *Salmonella* transmission to humans through untreated rainwater used for drinking which has been contaminated by pigeon droppings on rooftops (on Bermuda it is a common practice to collect rainwater from roofs for drinking). Pigeons have been identified as reservoirs and vectors for numerous human pathogenic bacteria, viruses, fungi, and parasites including *Salmonella spp.*, *Toxoplasma gondii* and Psittacosis (Weber, 1979; Long, 1981; Dautel et al., 1991; Martinov et al., 1997).
3. Reservoir and vector for several avian pathogens which can negatively affect native bird species (Gottdenker et al., 2005; Bunbury et al., 2008).
4. Droppings fouling grounds below roosting areas on public and private buildings, increasing maintenance costs and causing aesthetic problems.
5. Consuming farmer's seed crop on agriculture fields as well as animal feed on livestock farms. Feral pigeons have been observed selecting and ingesting enriched grains from cattle feed bins thereby denying dairy cattle the fortified diet (H. Kromer, pers. comm.).

Robin Marirea

Figure 6. Flock of feral pigeons roosting on the roof of a residential building.

Robin Marirea

Figure 7. Bermuda roof fouled with pigeon excrement (note accumulation in the rain gutter).

F. Current management actions

Shooting is presently the most common method of culling pigeons on Bermuda; however trapping has also been successfully used in the past. Between 2004 and 2015 a total of 11,727 pigeons were culled island-wide, of which 45% came from livestock farms (see Table 2 and Fig 14 in the Appendix). The average number of pigeons culled during that period was 977 per annum.

PART II: MANAGEMENT

A. Management goal

The purpose of this plan is to provide a framework for government led action to minimize the environmental and human harm caused by feral pigeons through activities that include coordination of resources, prevention of infestations, rapid response to public control requests, control strategies, research and education.

The aim of the plan is to control pigeon infestations within priority areas by using various population suppression methods, to limit their spread and reduce impacts in all other areas until such time as eradication is possible.

This plan is an evolving document and will be revised as needed. Ongoing accomplishments and new information will guide the refinement and revisions of goals and strategies in future versions of the plan.

The plan seeks to achieve this through:

1. **Coordination -** strengthen the coordination between government and non-government agencies.
2. **Early detection** - strengthen and support early detection mechanisms capable of identifying and reporting the appearance of pest species in Bermuda before they can become established and control becomes less feasible.
3. **Rapid response** - develop a rapid response capability to implement management and/or eradication.
4. **Control and management** - provide control of an established population through containment, abatement and other management strategies to minimize environmental, economic and human health issues.
5. **Research and risk assessment** - support or conduct research and risk assessment necessary to assess, prioritize and control the target species.
6. **Education and outreach** - provide current information to the general public and special interest groups about the target species, their negative impacts and the various methods of prevention and control.

B. Management objectives and criteria

These overall objectives translate into specific targets outlined below:

- Launch a pigeon awareness campaign highlighting the local impacts of this species on native wildlife and the health of human residents,
- Reduce the number of feral pigeons on Bermuda by using a variety of culling and control methods,

- Modify dairy farming practices so that grain feeds are less readily available to scavenging feral pigeons,
- Develop best practices for the management of pigeon lofts and dovecotes on Bermuda,
- Prohibit unregulated feeding of feral pigeons on public and private lands,
- Assist the public with providing solutions to manage nuisance pigeons on private lands.

C. Management strategy

Pigeons are capable of breeding rapidly in the presence of abundant food, therefore a long-term solution for managing this pest species should not rely simply on increasing mortality. Bermuda's management strategy should combine increased mortality for short-term control while simultaneously reducing reproduction for longer-term control. For example, the application of fertility control agents and/or the provision of artificial breeding facilities would be more effective as a means of maintaining populations at low levels after they have already been suppressed via other methods. Limiting food availability to scavenging pigeons is also a critical component of this strategy, as is enlisting the support of the local community. The public need to understand why pigeons require management on Bermuda and informed how they can assist in the management activities.

D. Tools available for strategy

REPORTING

The Department of Environment and Natural Resources (DENR) offers an online form for the public to report all instances of pest bird problems (http://environment.bm/feral-bird-control). DENR uses an integrated management strategy, during which technical officers assess the nature of each infestation and determine the most efficient method(s) to address the problem.

SHOOTING

Shooting was perhaps the most common method of historically controlling pigeons on Bermuda. Prior to present day gun legislation, farmers (and other residents) would have owned guns and carried out their own control measures; however the Firearms Act of 1973 prohibited gun ownership which likely helped to contribute to an increase in pigeon abundance.

The majority (90%) of the pigeon culling between 2004 and 2015 was done using firearms; however shooting is logistically challenging on Bermuda given that (1) the use of firearms has been strictly controlled since 1973; (2) the total land area is small (54 km^2) and over 70% of this area is developed – making Bermuda essentially a suburban

environment; (3) it has a population of ca. 65,000 inhabitants which makes it one of the most densely populated countries in the world.

The Bermuda Police Service is the only entity that grants permission to use firearms on Bermuda, and licensing is presently limited to police and military personnel, members of gun clubs and pest control officers from the Department of Environment and Natural Resources.

Pigeons are shot on Bermuda by a limited number of licensed individuals using 12 gauge shot guns and single shot .22 caliber air rifles. Shot guns have proven to be most effective when shooting (usually from a boat) up at pigeons roosting on cliffs as well as at flocks of birds in the air at coastal locations. Air rifles, in contrast, are used when targeting single birds at rest and birds in urban and suburban areas. Both gun types have high levels of pigeon mortality associated with their use.

Between 2001 and 2005 feral pigeons were successfully eradicated from the Galapagos Islands of San Cristobal (568 km^2), Santa Cruz (1000 km^2), and Isabella (4739 km^2) as well as from the Socorro Islands (172 km^2) in 1994 (DIISE, 2015). The total pigeon population on the Galapagos Archipelago was estimated to have been 650 at the start of the culling project (mostly confined to three urban areas and a limited number of agricultural areas). Shooting with a .25 caliber air rifle was reported to have been the most effective culling technique. Support for the eradication campaign from the community and local agencies was deemed a critical component to the success of the project (Phillips et al., 2012).

Useful for:

- Targeting individual birds or flocks in flight,
- Dispatching pigeons where traps have proven to be ineffective or where traps are continually being vandalized by the public,
- Dealing with trap shy pigeons.

Limitations:

- Can lead to increased wariness among surviving pigeons,
- Gun licensing is strictly controlled on Bermuda,
- Negative public perception towards guns and lethal control,
- Using firearms within the confines of a suburban environment.

TRAPPING

Bird traps are available in many different designs – however all traps should catch birds in a humane manner; this also allows for the safe release of non-target species that have been captured. Pigeons that have been trapped need to be killed humanly (e.g. cervical dislocation, swift blow to the head or gassed with carbon dioxide).

Traps which have successfully captured pigeons on Bermuda include the funnel trap (Fig. 8) and the single-catch closing net bird trap (Fig. 9) modified to close by pulling a

manual trigger. Both require baiting to attract pigeons. During one week of trapping, a total of 214 pigeons were captured using only four funnel traps at one dairy farm. After eight weeks of trapping approximately 1000 pigeons had been culled (Fig. 8) (R. Marirea, pers. comm.).

Robin Marirea

Figure 8. Pigeon funnel traps (note that the trap entrances have been blocked to prevent the birds from escaping until they can be removed).

Internet image

Figure 9. Single-catch closing net bird trap.

Useful for:

- Catching multiple birds,
- Quick deployment,
- Year-round use,
- Safe release of non-target species.

Limitations:

- A daily check of the trap is required (for the funnel traps)
- Traps can be vandalized by the public,
- Trapped birds can be released by the public,
- The traps are bulky and require a truck or van to distribute them,
- Complaints of cruelty by the public when caged birds are encountered,
- Handling and euthanasia of captured pigeons.

Net launcher

Internet image

Figure 10. Net launcher firing an entrapment net.

Net launchers (e.g. WCS Net Blaster) use compressed air to fire metal weights, which are attached to a net, over the target birds as they feed on the ground in front of the barrels. Some have reported a 90% capture rate on birds that are within 12–18 feet of the unit (www.wcsnetblaster.com). Non-target birds can be easily released from the netting unharmed. The WCS Net Blaster has been successfully used on Bermuda to remove ground feeding pigeons, catching as many as 51 pigeons during a single deployment.

Useful for:

- Catching large numbers of birds,
- Safe release of non-target species,
- Year-round use.

Limitations:

- A firearms license is required to operate a net launcher on Bermuda,
- Single deployment (un-trapped pigeons typically fly away),
- Requires a truck to transport all of the gear,
- Some net launchers cannot be operated on hard surfaces (e.g. cement or asphalt) making their use in urban environments impractical,
- Handling and euthanasia of captured pigeons.

REPRODUCTIVE INHIBITION

Products containing nicarbazin (e.g. OvoControl) have been used overseas to control the reproduction of treated birds so that populations decline through attrition (Avery et al., 2008). Nicarbazin interferes with egg development and hatchability when the appropriate dosage is administered daily. Bait is typically dispensed from automatic feeders installed in areas which minimize unintentional feeding to non-target bird species (e.g. on rooftops in urban areas).

Useful for:

- Non-toxic, humane control of target birds,
- Automatic feeder takes the labour out of the daily feeding effort,
- Controlling large flocks of birds.

Limitations:

- Bait must be consumed regularly and in a large enough quantity to achieve blood levels sufficient to accomplish contraception,
- Bait must be consumed during the nesting season,
- Time lag between implementation and observed decline in bird abundance.

ARTIFICIAL BREEDING FACILITIES

Feral pigeons can be encouraged to take up residence in well managed pigeon lofts or dovecotes which have designed feeding areas. Eggs are removed as soon as they are laid and sterilized or substituted with dummy eggs. Pigeons will incubate the dummy eggs for two to three weeks before realizing that the eggs will not hatch, at which time they are abandoned. If eggs are removed without substituting with dummy eggs the hen pigeon will re-lay immediately. This method of breeding control has been found to be effective in reducing flock size through attrition in some urban areas throughout the U.K. (see www.pigeoncontrolresourcecentre.org/html/reviews/artificial-breeding-facilities.html).

Useful for:

- Humane control of target birds,
- Controlling breeding flocks of feral pigeons within localized areas.

Limitations:

- Pigeon lofts and dovecotes require frequent management to remain effective as a population control measure,
- Not all feral pigeons will use the facilities to breed in thereby ensuring continued reproduction in the wild,
- Time lag between implementation and observed decline in bird abundance.

LANDING AND ROOSTING DETERRENTS

Bird spikes, pigeon netting, bird slopes, wire mesh, barrier coil, and pigeon wire make landing or standing on ledges difficult.

Internet images

Figure 11. Pigeon spikes (left) and pigeon wire (right) used to deter pigeons from roosting.

SONIC BIRD REPELLENTS

These repellents emit sounds to disorient, scare and confuse birds away from the treated area. Products typically play various sounds (e.g. real bird distress calls, predator sounds or high-pitch frequency sounds) over loud speakers.

VISUAL SCARE DEVICES

These devices include artificial scare or prowler owls, terror eye balloons and Irritape.

Useful for:

- Repelling birds from specific localities.

Limitations:

- Birds get accustomed to some of these products if used continually or in a single location,
- These forms of management only repel birds and do not contribute to the reduction in pigeon abundance.

Internet image

Figure 12. Example of a prowler owl for use on pigeons.

SEDATIVES

The Department of Environment and Natural Resources does not endorse the usage of edible poisons or sedatives because of ethical considerations with poison and the problem associated with the time delay between when a bird capable of flight ingests a sedative and when the sedative begins to take effect.

E. Step-down narrative of work plan

The required management actions are as follows:

1. Launch a pigeon awareness campaign highlighting the local impacts of this feral species on native wildlife and the health of human residents.

Actions Proposed:

- Explain the fact that feral pigeons compete for nesting habitat with white-tailed tropicbirds, act as a reservoir and vector for human and avian pathogens, and are a nuisance to farmers on Bermuda,
- Explain that there is a need to manage Bermuda's feral pigeons.

Work Team: Department of Environment and Natural Resources, Department of Communication and Information
Team Leader: Department of Environment and Natural Resources
Assistance: Local media outlets
Outputs: Media articles

2. Reduce the number of feral pigeons on Bermuda by using a variety of culling and control methods.

Actions Proposed:

- Continue with targeted shooting,
- Trial various traps to determine effectiveness,
- Trial feeding reproductive inhibitors in locations with large flocks of feeding pigeons (e.g. City of Hamilton, West Gate Prison in Dockyard),
- Trial the use of managed pigeon lofts and dovecotes in select areas,
- Diversify techniques and mobility of the culling programme to achieve maximum results.

Work Team: Department of Environment and Natural Resources
Team Leader: Department of Environment and Natural Resources (Biodiversity Section)
Assistance: Corporation of Hamilton, Department of Corrections
Outputs: Report on the trapping and culling results
List of Equipment: Traps, air rifles and shotguns, firearms ammunition, automated feeding dispensers and bait treated with nicarbazin, vehicles to transport equipment.

3. Modify dairy farming practices so that grain feeds are less readily available to scavenging feral pigeons.

Actions Proposed:

- Clean up all spilled grains,
- Store grain in bird-proof containers,
- Use covered cattle feed bins.

Work Team: Department of Environment and Natural Resources, dairy farms
Team Leader: Department of Environment and Natural Resources (Animal Management Section)
List of Equipment: Covered cattle feed bins

4. Develop best practices for the management of pigeon lofts and dovecotes on Bermuda.

Actions Proposed:

- Describe responsible public behavior with regards to the management of lofts and dovecotes (e.g. not releasing unwanted pigeons into the environment),
- Introduce legislation that controls the management of pigeon lofts and dovecotes.

Work Team: Department of Environment and Natural Resources, Attorney General Chambers
Team Leader: Department of Environment and Natural Resources (Animal Management Section)
Assistance: Public
Outputs: Legislative amendments, brochures describing responsible husbandry practices

5. Prohibit the unregulated feeding of feral pigeons on public and private lands.

Actions Proposed:

- Explain to the public how supplemental feeding contributes to the feral pigeon problem on Bermuda,
- Provide the public with areas specifically set aside for the purpose of pigeon feeding and confirm that feeding is permissible only in those areas,
- Introduce legislation which prohibits feeding feral animals outside of designated areas.

Work Team: Department of Environment and Natural Resources, Attorney General Chambers
Team Leader: Department of Environment and Natural Resources
Assistance: Public
Outputs: Media articles, legislative amendments
List of Equipment: Signage for installation at appropriate locations

6. Assist the public with providing solutions to manage nuisance pigeons on private lands.

Actions Proposed:

- Promote the proper use of deterrents, repellents and visual scare devices to deter nuisance pigeons,
- Promote keeping residential rooftops clean, chlorinating tank water regularly, boiling tap-water and installing an Ultra Violet (UV) treatment system for rooftop-collected water.

Team Leader: Department of Environment and Natural Resources
Assistance: Public
Outputs: Testimonials about the effectiveness of the devices
List of Equipment: Refer to pigeon control product websites in Appendix

PART III: IMPLEMENTATION

Task #	Task Description	Task Duration	Responsible Party
1.0	**Launch awareness campaign**		
1.1	Explain pigeon problem to public	one year	DENR
1.2	Explain the need for pigeon management	one year	DENR
2.0	**Reduce pigeon abundance**		
2.1	Continue with targeted shooting	ongoing	DENR
2.2	Trial different traps	one year	DENR
2.3	Trial reproductive inhibitors	one year	DENR
2.4	Trial use of artificial breeding facilities	one year	DENR
2.5	Modify management programme as required	ongoing	DENR
3.0	**Reduce food availability on livestock farms**		
3.1	Clean up all spilled grains	ongoing	DENR
3.2	Store grain in bird-proof containers	ongoing	DENR
3.3	Use covered cattle feed bins	ongoing	DENR
4.0	**Best practices for managing dovecotes**		
4.1	Describe responsible public behavior	ongoing	DENR
4.2	Introduce legislation	one year	DENR
5.0	**Prohibit unregulated feral pigeon feeding**		
5.1	Explain problem to public	one year	DENR
5.2	Provide designated pigeon feeding areas	one year	DENR
5.3	Introduce legislation	one year	DENR
6.0	**Manage nuisance pigeons**		
6.1	Promote use of repellents and scare devices	ongoing	DENR
6.2	Promote safe drinking-water practices	ongoing	DENR

APPENDIX

A quick review in April 2016 of online resources available for pigeon control products included the following websites:

http://www.pigeoncontrolresourcecentre.org

http://icwdm.org/handbook/birds/Pigeons/Pigeons.aspx

http://www.birdcontrolpro.com/control_pigeon.htm

http://www.pestproducts.com/pigeons.htm

http://ovocontrol.com

Table 1. Summary of annual pigeon culling efforts on Bermuda between 2004 and 2015.

Year	No. culled
2004	2843
2005	445
2006	750
2007	402
2008	538
2009	1045
2010	1016
2011	1211
2012	1191
2013	741
2014	842
2015	703

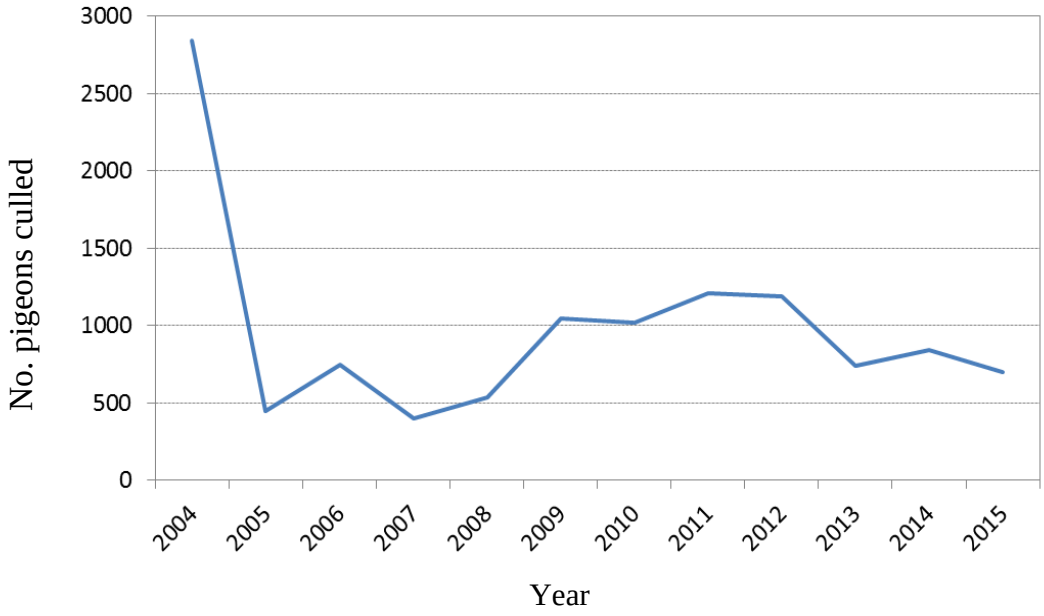


Figure 13. Graph showing number of pigeons culled annually on Bermuda between 2004 and 2015.

Table 2. Summary of pigeons culled by location on Bermuda between 2004 and 2015.

Location	No. culled
Farm (livestock)	5250
Cliffs	2494
Other*	1551
Cave	1266
Residence	666
Park	265
Farm (field)	121
School	63
Horse stables	51
Total	*11,727*

** includes waste management facilities, commercial properties, hotels and golf courses*

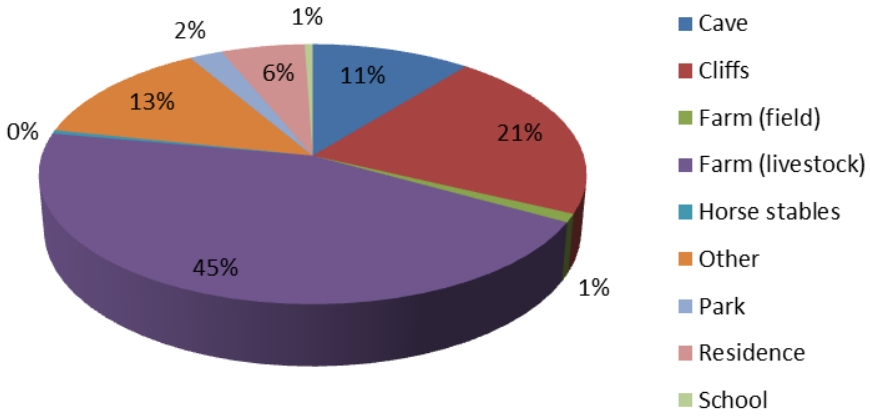


Figure 14. Pie chart showing the proportion of pigeons culled by location on Bermuda between 2004 and 2015.

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