ENVIRONMENTAL AND ECONOMIC IMPACT STUDY

Wild Turkey Introduction to Nova Scotia

Submitted to the Nova Scotia Federation of Anglers and Hunters, Nova Scotia Department of Natural Resources and the Nova Scotia Habitat Conservation FUND.

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Executive Summary

The Nova Scotia Federation of Anglers and Hunters (NSFAH) is dedicated to the conservation and propagation of wildlife in Nova Scotia and is pursuing a mandate to increase hunting opportunities through sustainable resource management. NSFAH has chosen to begin this mandate by conducting an environmental and economic impact study of a potential wild turkey introduction to Nova Scotia. Eastern wild turkeys (*Meleagris gallopavo silvestris)* are one of the most sought-after game species in North America and their introduction to Nova Scotia has the potential to create new hunting opportunities, grow rural economies and generate additional licensing revenue.

Wild turkeys were once found throughout North America, with native populations existing as far north as New Brunswick. The arrival of European settlers in the 1700s and 1800s in North America pushed many ecosystems to their biological limits. Following extensive changes in land-use such as agriculture and timber harvesting and the existence of un-regulated market hunting, many animals including wild turkeys were extirpated from their home ranges. During this time, Nova Scotia's ecosystems underwent significant change, with species such as woodland caribou, passenger pigeons and eastern wolves being completely eradicated by the early 1900s.

Since the 1900s, species such as whitetail deer and ringneck pheasants have been introduced successfully to Nova Scotia, increasing the provinces biodiversity and creating recreational opportunities that are enjoyed by thousands of individuals each year. Whitetail deer also provide an important source of country food for both rural and First Nation communities. Wild turkeys have been successfully re-introduced across North America creating significant economic and cultural benefits wherever they exist. The introduction of wild turkeys and the eventual existence of wild turkey hunting in Nova Scotia would generate an increase in annual hunting related expenditures of $7,695,168 (20% increase) creating jobs and improving rural economies throughout the province. Nova Scotia has benefitted from the introduction of other game species and stands to benefit from the introduction of wild turkeys as well.

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1.0 Introduction

The eastern wild turkey (*Meleagris gallopavo silvestris)* is the largest and most abundant game-bird in North America. Once found throughout North America, wild turkey populations began declining in the late 1600s shortly after the arrival of Europeans (Dickson, 1992). By the early 1900s wild turkeys were extirpated from most of their home range. Habitat loss from timber harvesting and agricultural expansion coupled with unregulated market hunting led to the disappearance of all but a few isolated wild turkey populations.

Conservation efforts began in the early 1900s with the prohibition of market hunting. Wild turkey conservation efforts became organized in the 1940s, beginning with the release of pen-raised birds (Dickson, 1992). From the 1950s on, conservation techniques improved, and wild turkey populations were restored to much of their native home range by the early 2000s (Fundy Engineering, 2012). Wild turkeys are now one of the most sought-after game species in North America, attracting legions of dedicated hunters each year. Restoration of wild turkeys has been heralded as a great conservation achievement and is a testament to the hard-work of state and provincial wildlife managers and volunteer organizations (Hughes and Lee, 2015).

The Nova Scotia Federation of Anglers and Hunters (NSFAH), founded in 1930, is a volunteer-based group dedicated to the conservation and propagation of wildlife in Nova Scotia. NSFAH is pursuing a mandate to increase hunting opportunities in Nova Scotia through conservation and sustainable resource management. As part of this mandate, NSFAH has chosen to examine the impacts of a wild turkey introduction to Nova Scotia [NS]. A similar project was completed in 2001, when the NSFAH in partnership with the National Wild Turkey Federation (NWTF) submitted a formal introduction request to the Nova Scotia Department of Natural Resources

(DNR). NSFAH's request included a habitat suitability report that concluded that NS contains suitable habitat for the proliferation of wild turkeys (NWTF, 2001). DNR denied the request in 2003 after a politically charged public debate, citing agriculture crop damage concerns.

In Canada, wild turkeys have been introduced or re-introduced to British Columbia, Alberta, Manitoba, Ontario and Quebec. In the northeastern United States, nearby Maine, Vermont and New York have all witnessed the successful re-introduction of wild turkeys. In neighbouring New Brunswick [NB], a wild turkey introduction proposal triggered a formal environmental assessment [EA] in 2010. The EA was reviewed by the NB provincial government and was denied permission. These examples provide excellent case studies that can help inform decision-makers in NS. The NB case demonstrates the reality of agriculture perceptions which must be addressed in NS.

This report consists of seven sections, beginning with a species overview which discusses the biophysical characteristics of wild turkeys, including lifecycle development, habitat preferences and management. The second section focuses on wild turkey hunting, management practices and recovery efforts in both Canada and the United States. A historical overview of wild turkey introductions in Ontario and Maine and a summary of the hunting industry in NS will provide context. The third section will cover the environmental impacts associated with wild turkeys and will discuss potential impacts in NS. The fourth section is an analysis of agricultural impacts and concerns. The results of an online stakeholder survey will be presented and analyzed in the fifth section. The sixth section reviews the economic survey results, providing an analysis of hunter spending patterns, investments (time and money) and will discuss the expected economic impacts created by a wild turkey introduction. The last section will provide concluding remarks and recommendations for the NSFAH to move forward with their proposal.

2.0 Species overview: Eastern wild turkey (Meteagris gallopavo silvestris)

The eastern wild turkey *(Meteagris gallopavo silvestris)* is the largest and most abundant of the five sub-species of wild turkeys in North America (Dickson, 1992). Wild turkeys were extirpated from much of their native home range following the European colonization of North America with wild populations only remaining in the most remote locations (Kennamer et al., 1992). "Wild turkey decline is linked to a combination of habitat loss, destruction of mature nut-producing trees, unregulated harvest, overgrazing livestock, nest flooding, unfavourable climatic changes and predation" (Fundy Engineering, 2012).

Habitat loss, over-harvesting and increased competition for grassland habitat with the introduction of grazing livestock among other human activities led to an extirpation of wild turkey throughout most of it's native range. Through extensive re-introductions and habitat restoration efforts by government wildlife divisions and non-governmental organizations such as the National Wild Turkey Federation (NWTF) wild turkeys now exist in 49 states and 7 provinces (Fundy Engineering, 2012). The effectiveness of re-introduction programs was significantly improved with the development of the net launcher in the 1970s (Dickson, 1992; Hughes and Lee, 2015).

Figure 1: Volunteers with the Michigan Chapter of the NWTF relocating wild turkeys.

The arrival of Europeans brought change to both the flora and fauna composition of ecosystems throughout North America. Prior to European settlement, both the state of Maine and the province of New Brunswick contained native wild turkey populations (Fundy Engineering, 2012). These regions, along with Nova Scotia are considered Acadian Forest ecosystems (Simpson, 2010), leading some to believe wild turkeys once existed in NS (NSFAH, 2003). In NB, the disappearance of hard-mast producing trees such as American beech and red oak, and unregulated market hunting contributed to the extirpation of wild turkeys by 1926 (Fundy Engineering, 2012).

Figure 2: Beech trees produced a valuable source of hard mast for wild turkeys.

"Eastern wild turkey are opportunistic omnivores and their diet reflects the types of plant and animal foods that are available" (Schroeder, 1985). Eastern wild turkey are large non-migratory ground-nesting birds that utilize a variety of habitat throughout their lifecycle. The subspecies name *silvestris* means 'forest' turkey" (Indiana Department of Natural Resources, 2007) highlighting their historical preference for forested habitats. It was once thought that eastern wild turkey required extensive tracts of hardwood forest to thrive (Dickson, 1992), however recent research has indicated that wild turkeys can adapt to a wide variety of habitats (Lovett, 2011).

“While habitats used by wild turkeys vary greatly across the continent, habitat must always include trees for roosting, early successional habitat for nesting and brood rearing, year-round food sources, and access to a permanent water source” (Hughes and Lee, 2015).

Wild turkeys occupy various habitat niches throughout the year and throughout their lifecycle. During the winter months turkeys may favour mature stands of conifers for thermal protection, while in the summer months fields are preferred for their source of succulent vegetation and insects (Healy, 1992). During the fall, open mature-forests become the preferred habitat of wild turkeys which feed on oak acorns, beech nuts and a variety of hard mast (Healy, 1992). The disappearance of mature American beech in Maine and New Brunswick is believed to have played a significant role in the extirpation of turkeys from those areas during the late 1800s and early 1900s. Young turkeys are able to digest hard mast as soon as they encounter acorns and nuts in the fall. Wild turkey populations respond to a variety of landscape changes, and many factors contribute to habitat selection, including population density, access to food and the prevalence of predators (Hughes and Lee, 2015).

Figure 3: Hen with her brood. Wild turkey poults begin learning (imprinting) behaviors from hens immediately. Imprinting that occurs during their first five weeks is especially critical.

Over-wintering success of eastern wild turkeys is limited by three factors; availability of food, access to water and the presence of suitable roosting trees. In the north-eastern extent of their

range, wild turkeys utilize mature hemlock stands during winter months, especially during moderate to severe weather conditions (Healy, 1992). Turkeys are known to select the largest trees available and will roost as high in them as they can comfortably perch (MacKey, 1984). Turkeys are well adapted to modern landscape uses such as agriculture, and will often occupy woodlots that are adjacent to standing corn and waste grain (Healy, 1992). While wild turkeys do exist in regions without agriculture, the presence of agricultural crops (including waste grains and manure-spreads) have proven to be beneficial during severe winters. (Healy, 1992).

Male wild turkeys (gobblers) weigh on average seven to nine kilograms and females (hens) weigh on average four to five kilograms (Hughes and Lee, 2015). "Sex differences become apparent at about four months of age because of height, plumage color, and head and neck characteristics" (Pelham and Dickson, 1992). Male turkeys "have little feathering on their heads which may range in color from white to blue to red. They also have a structure of modified feathers, called a 'beard', growing from the lower part of their neck" (Hughes and Lee, 2015). Most beards become visible on males by the time they reach six to seven months of age (Pelham and Dickson, 1992).

Wild turkeys, like grouse and quail are *gallinaceous* birds, which are characterized by strong feet and legs adapted for scratching; short, rounded wings adapted for short, rapid flight; well-developed tail used as a rudder; short, stout beak useful for pecking; and sexual dimorphism (male and female)" (Pelham and Dickson, 1992). Depending on their surrounding habitat, wild turkeys can avoid predators by running or flying. They can run 20km/hour and fly upwards of two kilometers in a single flight (Pelham and Dickson, 1992). Wild turkeys are well-known for their keen eye sight and acute hearing, making them a challenging quarry for even experienced hunters.

Wild turkeys live in hierarchical social groups called flocks. The hierarchy of flocks is determined by a pecking order, "wherein each bird dominates, or pecks, those of lesser social rank" (Healy,

1992). During the winter months, flocks grow as the most suitable overwintering habitat is utilized. “The organization of large winter flocks is complex: males and females have separate hierarchies, and there are pecking orders within and between flocks of the same sex” (Healy, 1992). Male turkeys remain in sibling groups throughout their lifetime, while female siblings disband following winter (Healy, 1992). Wild turkeys are well adapted to northern winters, with turkeys being observed to stay roosted for weeks without feeding.

Social hierarchical displays can be observed during the spring breeding season, where the dominant male turkeys try and court females. The onset of breeding season can be observed by the breakup of fall and winter flocks (Hughes and Lee, 2015). Breeding behaviour is triggered primarily by increasing daylights hours, but unusually warm or cold weather may advance or delay breeding activity (Healy, 1992). Male wild turkeys use a combination of strutting and gobbling to attract potential mates and to alert subordinate males of their presence (Healy, 1992). “Gobbling begins well before mating and can often be heard on the first warm day of late winter” (Healy, 1992). Once hens have successfully mated, they disperse from their flock to find nesting sites away from the flock (Healy, 1992).

Environmental factors such as weather events, predation and habitat loss all impact wild turkey populations. “Precipitation is apparently the ultimate climatic factor limiting the distribution of wild turkeys in North America. Temperature seems to play a secondary role. The northern limit of distribution is set by a zone where deep, fluffy snow cover persists through most of the winter” (Healy, 1992b). “Hens can recover quickly from the stress of winter starvation” (Healy, 1992b) and some studies suggest that reproduction success rates increase following harsh winters. Poults less than a week old have shown remarkably adaptability to extreme weather events as they are able to survive off their yolks sacs (Virginia Department of Wildlife, 2013).

Early regenerative shrubs, trees and herbaceous vegetation (e.g. clearcut regeneration) can provide optimal brood rearing habitat. Evidence suggests "that turkeys apparently do best in habitats that contain a large variety of successional stages and species, ranging from pioneer herbaceous plants to old-growth, mast producing trees, and where human intrusions are minimal and conservation ethics are favorable" (Wunz and Pack, 1992). Hens will utilize abandoned fields, regenerating clearcuts and dense understory forests for nesting. After poults hatch, hens will utilize over-head cover to protect poults from avian predators (Wunz and Pack, 1992). On an annual basis, 90% of the wild turkey's diet consists of plant food and the remainder consists of insects (Schroeder, 1985). Insects are a particularly important food source for young turkey poults, accounting for between 80% and 90% of total food intake for their first two months of age (Hurst, 1992).

Wild turkey predators include mammals such as bobcats, lynx, fishers, coyotes and foxes and birds such as hawks, owls and eagles (Miller and Leopold, 1992). The most notorious of all wild turkey predators are raccoons and skunks, which often target nests (Miller and Leopold, 1992). "Nesting hens, nests, and young poults are particularly vulnerable to predation (Vangilder et al., 1987). Overall, half of all nests are lost to abandonment or predation and more than half of all poults die because of predation within 2 weeks of hatching (Miller and Leopold, 1992). In areas with high quality habitat, predation rates were lower. Similarly, Porter (1980) observed that wild turkeys that had access to adequate nutrition, experienced lower predation rates. According to Niedzielski and Bowman (2016) "studies in the United States have demonstrated the flexibility of turkeys to a variety of managed habitats including pine plantations and agricultural land" (Schroeder, 1985). It was previously believed that wild turkeys required extensive networks of unaltered hardwood forests to survive (Indiana DNR, 2007). This assumption has been disproved, with wild turkey populations becoming established in many coniferous dominant regions (Dickson, 1992).

3.0 Turkey Hunting and Management

The sport of wild turkey hunting has become one of the most enjoyed and frequently pursued hunting activities in North America. Wild turkey hunting seasons occur in the spring and fall, with the spring season attracting the most hunters. The spring hunt is particularly attractive for hunters, as it doesn't interfere with the fall and winter seasons for the pursuit of deer and other game species. Spring turkey hunts creates economic activity during a traditionally inactive period for hunters. Wild turkey population growth has been aided by hunters, many of whom complete wild turkey habitat improvement projects on public and private lands each year. Wild turkey hunting can create considerable tourism related economic activity (Fundy Engineering, 2012).

In Maine, wild turkeys were known to exist in three counties during the time of European settlement. By 1880, over 90% of available turkey habitat in Maine had been converted into farmland. The rapid conversion of forests to crop-land coupled with unregulated market hunting led to a complete extirpation of wild turkeys from the state of Maine by 1880 (Maine Fish and Wildlife Division, 2017). "Attempts to reintroduce turkeys to Maine began in 1942 when the Department of Inland Fisheries and Game released 24 farm-raised turkeys" (Sarnacki, 2012). Releasing farm-raised turkeys as a conservation measure was tried throughout the United States in the 1940s and 1950s, without any success. In 1977, the Maine Fish and Wildlife Division (MFWD) reintroduced 41 wild turkeys from Vermont and released them in York county. This exercise was repeated in 1978, and the population slowly expanded over the next few years.

By 1984 the wild turkey population in had expanded enough to allow the trap and transfer of 33 turkeys from York county, which were released further north. By the spring of 1986 the first wild turkey season was permitted in York county. Turkey hunting licences were distributed based on a

lottery system through the 1990s, with a state-wide season opening in 2006. Since 2006, the sport has grown in popularity in Maine, growing from 20,000 licence sales to 37,375 by 2013. Recreational turkey hunting in Maine created over $15 million USD in expenditures in 2013 and created 230 full-time jobs (Southwick Associates, 2013). "To hunt wild turkey in Maine, you need a permit ($20 for Maine residents and $54 for non-residents). The spring wild turkey season is April 30 – June 2; and the fall season spans from September 27 to October 26th", ending before the general rifle season for deer.

In Canada, wild turkeys have been re-introduced in Ontario, Quebec, British Columbia (BC), Saskatchewan, Alberta and Manitoba. New Brunswick also has isolated and growing populations as the result of natural migration of birds from Maine. BC was the first province to undertake re-introduction efforts, with turkeys introduced to James Island in 1910. Following re-stocking efforts in Washington, Idaho and Montana, wild turkey populations spread northward into southern BC. Hunting organizations in Manitoba started introducing wild turkey through trap and transfer programs in 1958, followed by Ontario and British Columbia in the 1980s and Quebec in the early 2000s (Wilson, 2016). Hunting groups in both Nova Scotia (2001) and New Brunswick (2012) applied for government approval to introduce wild turkeys but were met with pushback from their provincial agriculture federations and were denied permission to introduce.

In pre-settlement Ontario, the eastern wild turkey was a vital component of the region's forest ecosystem (Ontario Ministry of Natural Resources [OMNR], 2014). Following the widespread conversion of forest habitats into agricultural production wild turkeys were completely extirpated from the province by 1909. In the early 1980s, a proposal to re-introduce wild turkeys to Ontario was submitted to the OMNR. The proposal was modelled on the trap and transfer programs that were successfully used in Vermont and Indiana (OMNR, 2014).

Early re-introduction programs were studied and closely monitored using radio-tags. In Walsingham, Ontario, sixteen hens and five males were radio-tagged and released in 1984 (Weaver, 1989). The release site in Willingham was chosen based its perceived habitat suitability. "The released birds experienced low survival and reproductive success" during the first year (OMNR, 2007), which was largely attributed to the stress of trap and transfer from the mid-western United States (OMNR, 2007). "However, one additional release of 15 birds was made in the area in 1986 and the remaining birds rapidly adapted. Within five years the wild turkey population in the area was estimated to be greater than 1000 birds" (OMNR, 2007).

Beginning in the spring of 1987, wild turkeys were trapped in New York, Maine, Missouri and New Jersey and were released in small groups to various locations throughout Ontario. By 2002, 4400 turkeys were trapped and released in Ontario to over 270 different sites (OMNR, 2014). It is currently estimated that the provincial wild turkey population is over 70,000 (OMNR, 2014) and over 7000 wild turkeys are harvested annually in the spring hunt. As a conservation measure, hunters are only permitted to harvest male turkeys (gobblers) during the spring season.

Climate change is thought to be playing a contributing factor in the expansion of wild turkey populations in Ontario. "Due to the influences of forestry, agriculture, and milder climatic conditions, the occupied range of wild turkeys in Ontario is now considerably larger than the estimated historic range" (OMNR, 2007). As milder winters become more frequent it is expected that wild turkey populations will continue to expand northward. As wild turkey populations grow in Ontario, hunting will play a key role in the management of the species. Hunting statistics such as annual efforts, sightings and harvest reports provide wildlife managers with valuable information used in the management process. The presence of spring and fall hunts has been identified as an important measure towards limiting turkey – human interactions. The OMNR

(2007) suggests that having two seasons will increase wild turkey's wariness of humans, thus limiting the potential for negative encounters to happen.

From a recreational stand point, the re-introduction of wild turkeys in Ontario has created additional spending and participation in the sport of hunting. "Hunter numbers, licences sold, and harvest have increased steadily since the first spring turkey hunt in 1987. From 2001-2006 hunter numbers and licences sold increased at an average rate of 19% and 20% respectively" (OMNR, 2007). In recent years the growth in turkey licence sales has begun to plateau, however it still represents a growing sector within the outdoor recreation industry.

The Maine and Ontario examples provide an overview of the experiences of two successful introductions of wild turkeys in recent decades. During this time, turkey hunting has grown in popularity and represents a substantial proportion of hunting retail sales, licence sales and hunting related expenditures. In areas where wild turkey hunting exists, representatives from the tourism and outfitting industries have praised the introduction of wild turkeys as an important part of their business model. In NS members of the outfitting and tourism industry believe turkey hunting could produce similar positive impacts in NS.

3.0.1 Hunting in Nova Scotia

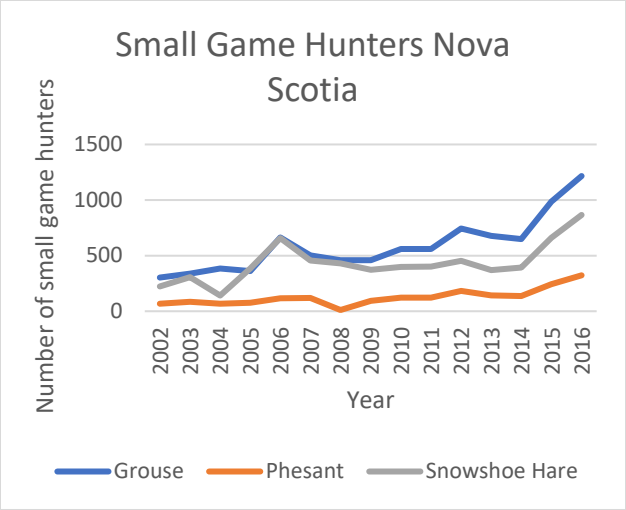
Hunting in NS is a recreational and traditional pastime for 60,000 Nova Scotians annually. The most popular game species is the whitetail deer, with 46,000 licences sold in 2016. Small game hunting for species such as ruffed grouse and snowshoe hare has increased in popularity in recent years. Other species such a black bear and ringneck pheasants are also pursued by thousands of hunters each year. Moose hunting in NS is highly regulated and limited to a lottery-based hunt in Cape Breton each year. Mainland moose populations have fallen below conservation requirements

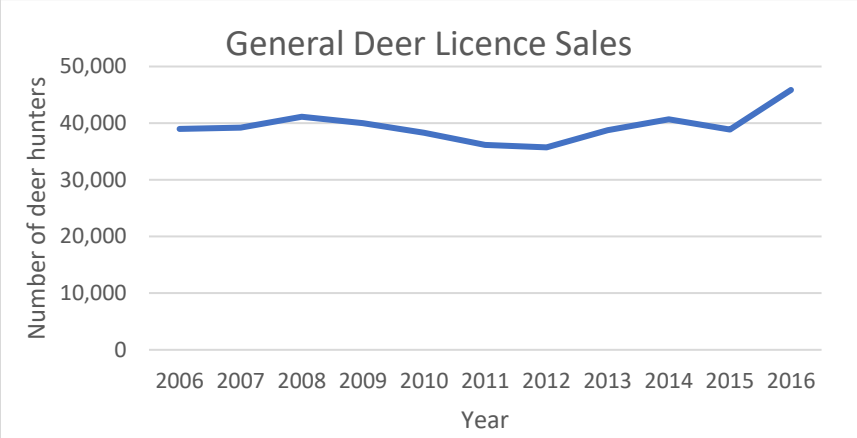
since the early 1980s and hunting for mainland moose is now prohibited. The harvesting of game provides Nova Scotians with a valuable source of country food and creates a connection between people and the environment.

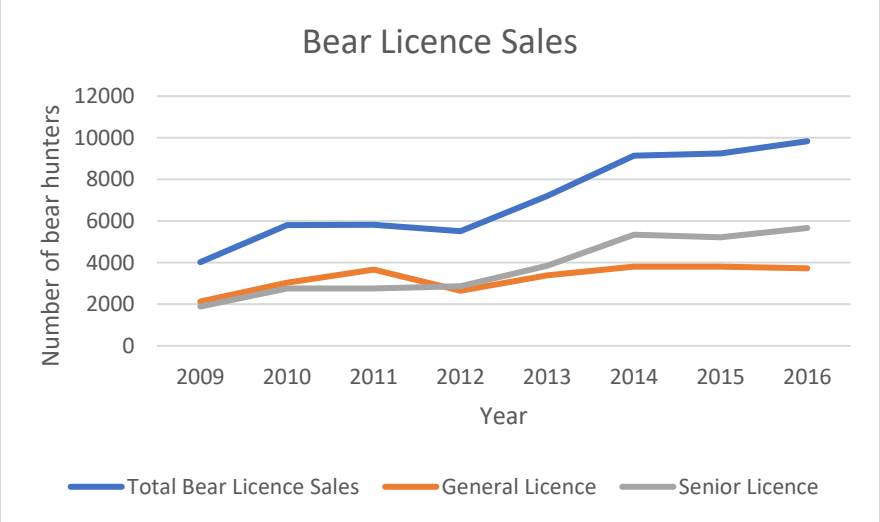
Hunters view themselves as conservationists and stewards of the land, contributing $250,000 annually to conservation initiatives through the Nova Scotia Habitat Conservation Fund. Hunters are also organized through various wildlife organizations such as the Cape Breton Wildlife Association, the Ruffed Grouse Society and Ducks Unlimited. These groups represent the interests of hunters and are heavily involved in promoting the sport of hunting and conservation. The Canadian Wild Turkey Federation (CWTF) now has five chapters in NS – a testament to the demand for this species of game. In 2017 CWTF chapters held five fundraising dinners and silent auctions, attracting almost 1000 individuals and raising thousands of dollars. Money raised from these dinners went to youth hunter education programs and towards initiatives such as *Women Who Hunt.* While the sport of hunting has traditionally been a male dominated activity, female hunters represent the fastest growing demographic.

Since the early 2000s, opportunities for hunting in Nova Scotia have expanded to include new seasons, such as the early muzzleloader season for deer and an early farmland hunt for Canadian geese. New weapons such as the crossbow are now permitted for use on a range of species and bag limits for deer in some areas have increased. Amid these new opportunities, an equally sized list exists for proposed activities that failed to meet the test of political satiability. A proposed spring bear hunt for example was denied and the introduction of Sunday hunting was met with strong resistance. The multitude of attempts to expand hunting opportunities is attributed to the organization of hunters and conservationists throughout the province. A proposed introduction of wild turkey to NS in 2003 was denied permission, pending further supporting evidence.

3.0.2 Hunting is growing in popularity in Nova Scotia







4.0 Environmental Impacts

Any change to the composition of flora and fauna within an ecosystem will create environmental impacts (both positive and negative). How these impacts will be viewed will depend on the perspective of each stakeholder, therefore impacts can be viewed as either positive or negative. For example, the conversion of a river valley into agriculture ground could be viewed positively by farmers, but negatively by salmon anglers. An environmental change that increases deer populations could be viewed positively by hunters and negatively by foresters. Therefore, understanding environmental impacts requires two forms of analysis. First, impacts must be viewed from a scientific perspective, which should attempt to understand and predict impacts without prejudice. Secondly, how those predicted environmental impacts will perceived by various stakeholders is fundamental and necessary to guide the stakeholder engagement process.

The starting place for understanding environmental impacts therefore is that ecosystems and their components must be kept in good condition if proposed human activities that interact with ecosystems are to be sustainable (Sinclair et al., 2017). It should also be recognized that all environmental impacts are cumulative in nature unless convincingly demonstrated otherwise (Duinker, 1994). Ensuring sustainability requires that future developments satisfy present needs without compromising the ability of future generations to meet their own needs (Lamy et al., 2002). Understanding the impacts of environmental change requires an understanding of how those impacts are felt in both ecological and social terms. The addition of wild turkeys to the natural landscape of Nova Scotia will alter the species composition of those ecosystems and will change the inherent social values placed on those ecosystems. This section will discuss the environmental and social impacts involved with this proposal, and how those impacts will be viewed.

Wild turkeys have been introduced and re-introduced to dozens of states and provinces, providing numerous examples of what types of social and environmental issues are likely to develop following a proposed introduction. The most common concern held by stakeholders is the potential threat of wild turkey crop predation. Environmental concerns, such as ecosystem disruption, loss of other wildlife species and plant destruction are often raised during the proposal stage. Identifying concerns helps to identify stakeholders, which in the case of a potential NS wild turkey introduction would be prospective turkey hunters, farmers and environmentalists.

Introducing a new species to NS represents one path for NSFAH to pursue their goal of increasing hunting opportunities. This alternative requires an extensive stakeholder engagement process and requires a thorough impact assessment. While this proposal is likely to spark public debate, it also stands to produce the most social, economic and ecological benefits of all other options. The introduction of wild turkeys in jurisdictions outside NS has resulted in the creation of hundreds of wildlife conservation groups that complete meaningful projects each year. These organizations have completed habitat improvement projects that have helped increase the populations of various other game species such as ruffed grouse and whitetail deer and have helped introduce thousands of new conservationists to the environment and the sport of hunting.

The introduction of game species to NS has occurred periodically over the last century. In the 1920s, whitetail deer were introduced following the extirpation of woodland caribou from mainland NS. During the 1930s, ringneck pheasants were introduced to the Annapolis Valley. In 1947, 18 moose from Alberta were introduced to Cape Breton following the extirpation of moose in the late 1800s. All three of these species now support recreational and aboriginal harvests. The impacts of past species introductions are not well-understood or studied in NS. The absence of scientific data prior to these events makes it difficult to contextualize what their overall impacts

have been. The impacts of the disappearance of species such as woodland caribou, passenger pigeons, and eastern wolves from NS are also poorly understood. Species such as the eastern coyote have migrated to NS, becoming established throughout the province by the 1980s. During this same period the change in land use practices driven primarily by agriculture, urban development and forestry has altered ecosystems substantially.

Through all these changes, a quantifiable measure of impacts seems to be absent. The absence of baseline data puts the NSFAH in a position where all decisions and actions must face a great deal of uncertainty. Walters (1986) cautions resource managers to avoid the trap of precautionary management in the face of uncertainty. Rather, he suggests approaching management "as an adaptive learning process, where management activities themselves are viewed as the primary tools for experimentation" (Walters, 1986). NSFAH and DNR can begin this process by improving monitoring programs.

The introduction of wild turkeys to NS ecosystems will be an impactful event (i.e. an act that creates change). This impact however is likely minimal in comparison to a plethora of natural resource and landscape management decisions that occur by government and private landowners on a continual basis (e.g. forest harvesting, livestock grazing and urban sprawl). The addition of another species to the Nova Scotian landscape will be viewed by many as a positive impact. Furthermore, private landowners in Nova Scotia have completed hundreds of habitat improvement projects on their properties to enhance the populations of game species, it is quite likely this trend would continue and increase following the introduction of wild turkeys to NS.

As the over-arching goal of this project is to increase hunting opportunities, the question has been raised surrounding wild turkey introductions and other game species, primarily ruffed grouse. It was once believed, and has been proven to be inaccurate, that wild turkeys prey on ruffed grouse

eggs. Some hunters in the United States have pointed out declines in ruffed grouse populations have coincided with growing wild turkey populations, however the decline in ruffed grouse has occurred because of habitat changes across the broader landscape. As forest harvesting has decreased since the 1980s, the amount of regenerative growth (vital for ruffed grouse) has declined. Forests across the north eastern United States have matured since then, which has favoured the proliferation of wild turkeys. Another dominant factor is the growth in agriculture production, particularly grain crops such as soybeans and corn. These crops produce an abundance of waste which is left behind after harvest. Wild turkeys, with their keen eye-sight and large-size can exploit waste grain in open fields without increased predator mortalities. Ruffed grouse however, prefer to feed beneath forest canopies to avoid predation from birds of prey.

Supporters of wild turkey introductions often cite the fact that wild turkeys consume ticks as part of their diet. As the numbers of ticks (and incidents of Lyme disease) rise in NS, some stakeholders believe the introduction of wild turkeys will produce societal health benefits. Measuring the impacts that wild turkeys will directly have on tick populations is a difficult – if not impossible task. It is however, quite likely that indirectly the presence of wild turkeys in the forest-agriculture habitats of rural Nova Scotia will reduce ticks by reducing the rodent populations such as mice and rats. Rodents are a host for ticks, and the increase in corn and soybean waste grain in NS is likely contributing to rising rodent and tick populations. Research on wild turkey crop predation indicates that 77% of all agriculture crops consumed by turkeys are waste grains. Wild turkeys feed during the day, while rodents feed at night, therefore it is likely that wild turkeys will outcompete rodents and other animals for this food-source.

The introduction of wild turkeys to Nova Scotia will result in a shift in private land-management practices. While it is not commonly known by the public, hundreds of Nova Scotians complete

habitat improvement projects on their private woodlots each year. Many landowners value the recreational components of their properties over the long-term commercial values. Many deer hunting enthusiast's build food plots, selectively harvest timber and plant mast-producing trees (apples, oaks etc) targeted at increasing the carrying capacity of their property. It is quite likely that these landowners and perhaps hundreds more will complete similar projects on their properties to support wild turkey populations. Organizations such as the Quality Deer Management Association [QDMA] have observed increased populations of game species and general bio-diversity on properties where landowners conduct habitat improvements. The introduction of wild turkeys to Nova Scotia is likely to increase land-owner stewardship and conservation practices.

Wild turkeys exist as both predator and prey during their lifecycle and inhabit a variety of habitats, thus enhancing the biodiversity of ecosystems wherever they are introduced. In Maine, opossums were extirpated from most areas in the state by the 1980s. Following the re-introduction of wild turkeys, opossum populations began to recover and are now abundant throughout Maine. Possums are effective nest predators (Miller and Leopold, 1992), utilizing eggs as a rich source of protein during the spring when other food sources are not yet available.

The introduction of wild turkeys to Nova Scotia would create the addition of a prey species for many animals, birds and reptiles. As with any major environmental assessment, it is important to understand impacts as they apply to valued-ecosystem components [VECs]. VECs are species that are valued for their social, cultural, economic or aesthetic values. VECs may also include species identified by the scientific community as important and sensitive to environmental change (Beanlands and Duinker, 1983). In the case of a wild turkey introduction, VECs can be divided as species that represent cultural and social values such as bald eagles, recreationally important species such as ruffed grouse and whitetail deer and threatened and endangered species. Some

species such as the Mainland Moose (*Alces alces americana*) are an example of a species that would qualify as a VEC under all categories.

The most important category of VECs to consider prior to introducing wild turkeys are those that are listed as threatened, endangered or vulnerable. In Nova Scotia, the presence of wild turkeys in the natural environment would provide a prey source for two endangered species, the American Pine Marten (*Martes americana*) and the Canada Lynx (*Lynx canadensis*) and one vulnerable species the Peregrine Falcon (*Falco perigrines anatema).* The presence of wild turkeys as mentioned earlier is likely to change the behaviour of landowners, who often complete habitat improvement projects directed at improving game species populations. Wild turkeys depend on hard-mast producing trees such as oak and beech and require mature forests for roosting. Managing for these ecosystem niches will result in improved habitat for other species that utilize mature forests such as those species mentioned above.

When weighing the positive impacts associated with a wild turkey introduction (e.g. providing food for endangered species) it is important to predict how the populations of those species will change in the event wild turkeys are not introduced. It is likely that Pine Marten and Lynx will continue to decline without a shift in forestry management practices. In Nova Scotia where most woodlots are privately owned a broad change in forest management is unlikely to occur in the absence of economic or recreational incentives. While the introduction of wild turkeys is unlikely to create a 'watershed moment' in forest management, the introduction of another game species represents a cost-effective means for providing landowners incentive to shift management practices. Wild turkeys prefer mature-hardwood stands, particularly those that are selectively harvested on a periodic basis.

5.0 Wild Turkeys and Agriculture: Perceptions and Concerns

The discussion of wild turkeys in the media paints a polarized picture between farmers on one end and hunters on the other. In NS, the Nova Scotia Federation of Agriculture (NSFA) is opposed to the introduction of wild turkeys. In an October 2017 newsletter, they stated "NSFA has advocated against the introduction of wild turkeys to Nova Scotia due to their destructive nature. Farmers in regions that have wild turkey populations have indicated crop damage and subsequent crop losses after the species was introduced" (NFSA Quarterly Newsletter, 2017). The expansion of wild turkeys in regions where agriculture is economically important has generated some concern among farmers (Tefft et al., 2005). In the United States, where the issue of wild turkey crop predation has been studied extensively, the consensus is that "actual damage caused by wild turkeys is significantly less than perceived damage in all states where on-site examinations have been conducted" (Miller et al., 2000).

During the early 2000s when a wild turkey introduction was first proposed, the NFSA was opposed to the idea, citing disease transmission between wild turkeys and domestic turkey and poultry operations as a major concern. In response to these concerns the Nova Scotia Department of Agriculture and Fisheries hired a panel of experts to review the legitimacy of these claims. The expert panel, led by Dr. Ted Leighton of the Canadian Cooperative Wildlife Health Centre concluded in their report *Health Risk Assessment of the Introduction of Wild Turkeys (Meleagris gallopavo silvestris) to Nova Scotia* that the introduction of wild turkeys posed a low threat to agriculture operations (NS DNR, 2004). The panel was advised by veterinary authorities that any potential threat could be mitigated through pre-introduction tests (NS DNR, 2004).

During the 2003-2004 review process, six groups in NS formally opposed the introduction of wild turkeys:

- Tusket River Environmental Association
- Nova Scotia Egg Producers
- Annapolis County Federation of Agriculture
- Nova Scotia Fruit Growers Association
- Federation of Nova Scotia Naturalists
- Nova Scotia Bird Society

In other regions with established wild turkey populations, crop damages are the most common complaint. In areas with wild turkey populations, there has never been a confirmed or suspected case of wild turkey's transmitting disease to domestic livestock. With the concerns of disease transmission put to rest, proponents of a wild turkey introduction must address the concerns of crop loss. As previously discussed, wild turkeys are omnivores and opportunistic feeders. Where crops are readily available for consumption wild turkeys will exploit them. The question is, to what extent do these damages occur. There is a wildlife crop damage fund that operates outside the crop insurance program, but it would appear that only a small fraction of wildlife crop damages are accounted for.

A review of wildlife crop damage compensation between 2013 and 2017 has indicated that most damage claims were in response to whitetail deer crop predation. During this period, $642,960.10 in crop damages were reimbursed by the province. One quarter of these claims have been listed as 'other' indicating a gap in understanding. Interestingly, in 2013 and 2014 there were no damage claims submitted for whitetail deer crop predation and almost 50% of all whitetail deer crop loss reimbursements were allocated in a single year (2015) to a single farmer for apple crop loss in the amount of $122,000. Black bears and coyotes were the only species to make the list in each of the last five years, accounting for 14.77% and 6.61% of damage claims respectively. As stated above,

one quarter of all crop damage was caused by 'other' species, indicating the need for improved crop loss monitoring programs in the province.

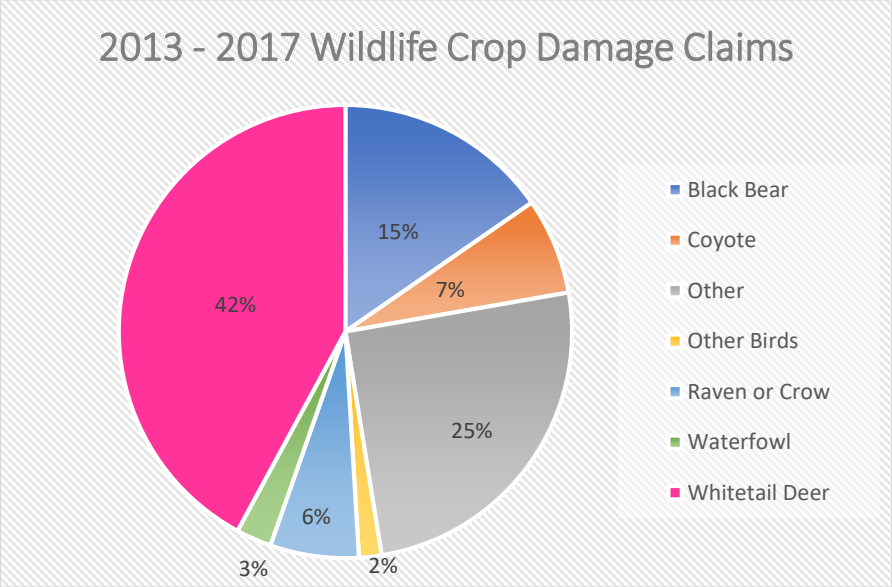


Figure 4: Wildlife Crop Damage Claims. Source Nova Scotia Department of Agriculture 2017.

As indicated in the chart above (figure 2) most wildlife crop damage claims have been caused by whitetail deer. Whitetail deer are an introduced species to NS and therefore the prospect of another introduced species impacting crop survival is likely to be met with concern. It is important however to consider a few important points when making the connection between turkeys and deer. Whitetail deer were introduced to Nova Scotia as a game species to replace woodland caribou. It is likely that the development of agriculture in the province played a contributing role in the extirpation of one species and the proliferation of the other. Whitetail deer are native to southern New Brunswick, and with the spread of agriculture and forestry it is likely deer would have migrated to Nova Scotia without the aide of sportsmen (e.g. in the case of coyotes).

Many supporters of wild turkey introductions and conservation in North America believe that wild turkeys are often falsely accused of crop damage caused by other animals. Wild turkeys utilize open spaces such as fields as a means of protection from predators such as coyotes and bobcats,

which are unlikely to enter open spaces during daylight. Because wild turkeys are dark colored and tall, they are highly visible to farmers. “The observation of turkeys in crop fields often prompted farmers to report damage without actual confirmation” (Tefft et al., 2005). Several studies have been completed in the United States to examine the actual impacts of wild turkeys on agriculture crops. Paisley et al. (1994) conducted a five-year study on wild turkey food habits and agricultural crops from 1988 – 1993, determined that the diets of turkeys using agricultural fields were made up of 68% insects and invertebrates. Paisley et al. (1994) concluded that “although agricultural habitats were important to wild turkeys during the growing season, the consumption of harvestable agricultural crops by wild turkeys was low”.

Crop predation by wild turkeys has been studied in Indiana, Wisconsin, Ohio, Pennsylvania and Ontario (Tefft et al., 2005). “These studies concluded that wild turkeys are often blamed for crop damage because of their high visibility and numbers observed on farms; however, damage attributed to turkeys was often caused by other wildlife, principally deer and raccoons” (Tefft et al., 2005). In the state of Ohio, Swanson et al. (2001) investigated turkey crop damage complaints over a two-year period and determined that only 7% were attributed to wild turkeys.

Wildlife crop predation occurs to some degree anywhere crops are grown. Farmers in Nova Scotia can access compensation through the Wildlife Crop Damages Fund. However, despite having access to compensation, it appears very few farms utilize or rely on the fund, indicating that most wildlife crop predation in Nova Scotia is not reported. An analysis of crop loss compensation disbursements between 2013 and 2017 indicates that wildlife crop damage is managed and monitored in an ad-hoc fashion. The under-utilization of the crop loss compensation program could be an indication of one or all three of the following scenarios: (1) wildlife crop damages represent

an insignificant portion of farm income (unlikely); (2) wildlife crop damages are difficult to assess and monitor; and (3) the crop loss compensation program has limited access funds.

Over the past decade several trends have emerged in the agriculture industry that deserve consideration when discussing a potential wild turkey introduction. The introduction of relatively new crops such as wine grapes, high-bush blueberries and haskap berries have created strong employment numbers. The Nova Scotia wine industry has witnessed tremendous growth and has created value-added spin-offs in other sectors such as tourism. The number of acres growing storable grain crops such as corn and soybeans have increased by 50% and 300% respectively (Statistics Canada, Report on NS Agriculture 2006 – 2011). This has been accomplished despite an overall growth in farm acreage of 3%. Both these crops produce considerable amounts of waste product during combine harvesting which is later consumed by wildlife. As the production of corn and soybean increases, so to will the impacts of those crops on local wildlife populations. For example, the introduction of corn into an ecosystem may increase the local black bear population, and in doing so may create further wildlife crop predation issues elsewhere.

In summary, the impact of wild turkeys on agriculture crops is minimal in comparison to other animals such as deer and the perceived damages greatly outweigh the actual incurred damages. It is fair to assume however, that wild turkeys will consume agriculture crops if they are introduced to NS. Mitigating this issue begins with a better understanding of wildlife crop damage as it currently occurs in the province. The discrepancy in annual wildlife crop damage claims, such as the absence of whitetail deer damage in 2013 and 2014 indicates that other factors such as weather and market prices may have a greater influence on the likelihood farmers apply for compensation than the severity of wildlife crop losses. The introduction of wild turkeys to Nova Scotia, and the eventual existence of a wild turkey hunt has the potential to create added economic revenues for

the agriculture sector. In many places where wild turkeys exist, farmers lease or rent their land to hunting groups, individuals and outfitters.

In an online stakeholder survey conducted during September and October, 124 participants identified themselves as farmers. In total 71% of farmers who responded to the survey supported the introduction of wild turkeys, 21% were against and 4% were unsure. 44% of farmers were concerned about potential crop loss, while 42% had no concerns regarding the introduction of wild turkeys was the threat of crop loss (see figure 5):

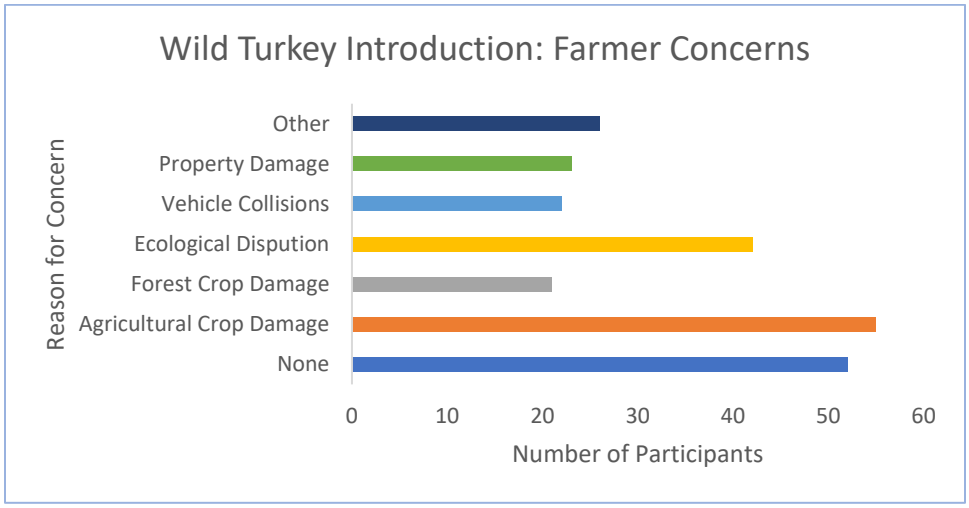


Figure 5: Results from an online stakeholder survey in September-October 2017.

Surprisingly, support among farmers for the introduction of a spring bear hunt was similar to the support for the introduction of wild turkeys. Considering black bears caused 15% of all crop damage claims between 2013-2017 (approx. $100,000) it is surprising more farmers weren't in favour of increase harvest. This could be due in part to the charisma of large mammals such as bears. In recent years the agriculture community and hunters have worked together to introduce early fall goose hunts on farmland. Some farmers (> 5%) indicated that trespassing, garbage dumping, and increased poaching incidents were of concern. These issues should be addressed by hunting organizations and DNR to improve relations between hunters and farmers

6.0 Stakeholder Survey Results

In the fall of 2017 (September and October) and online stakeholder survey was distributed to stakeholder organizations across Nova Scotia to gauge support and concerns surrounding a potential wild turkey introduction. The survey was distributed to hunting and angling groups, environmental groups (including the Ecology Action Center) and agriculture groups such as the Nova Scotia Federation of Agriculture. In total 1152 participants completed the survey (figure 6)

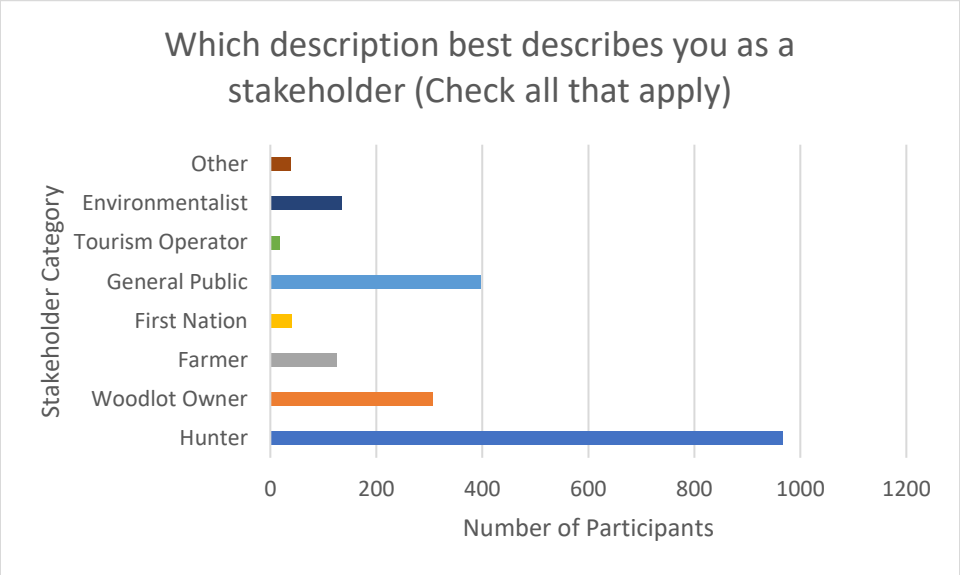
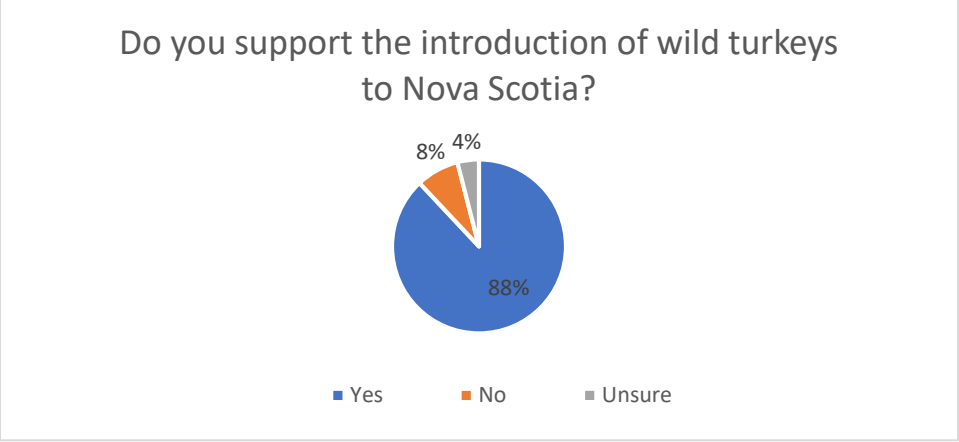


Figure 6: Profile of survey participants

Support for a wild turkey introduction was high among all participants (Figure 7):



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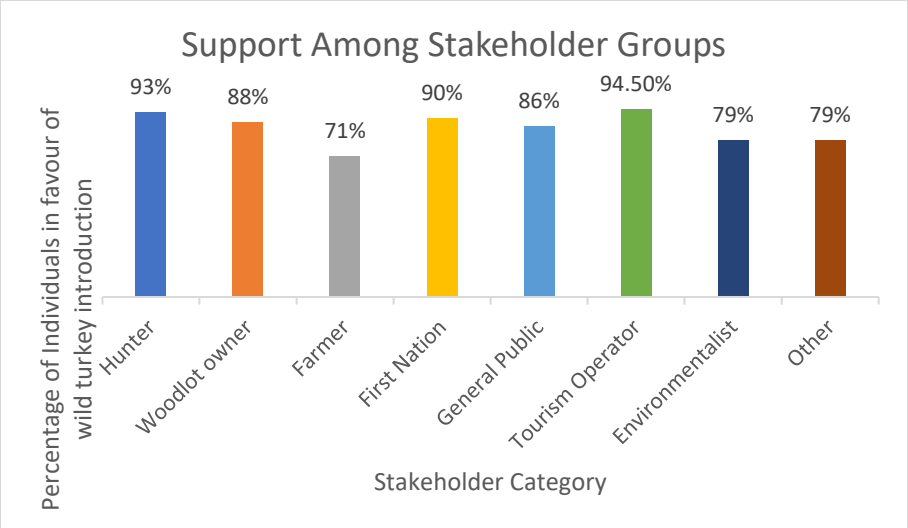


Figure 8

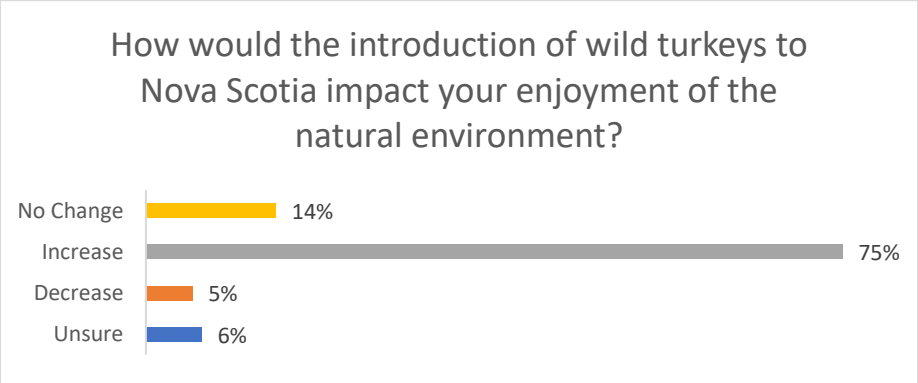
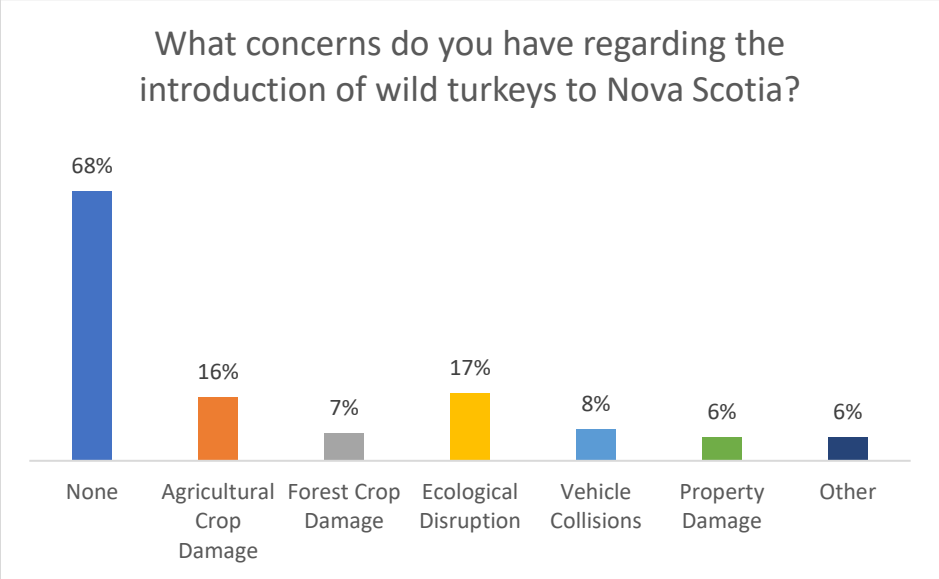


Figure 9: 82% of hunters believed a wild turkey introduction would increase their enjoyment.



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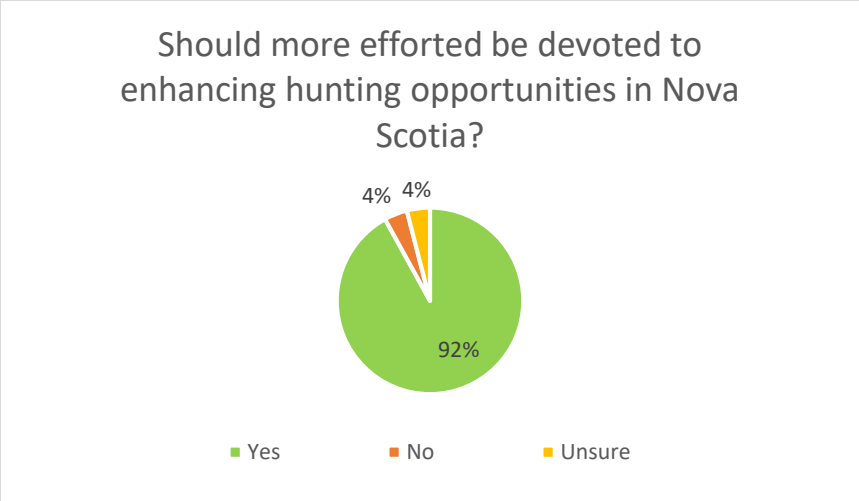

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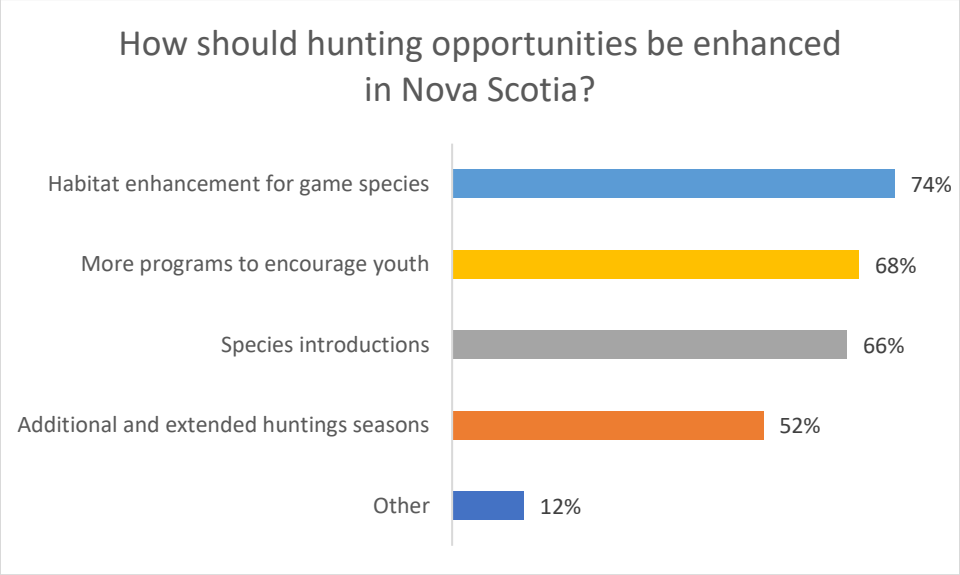


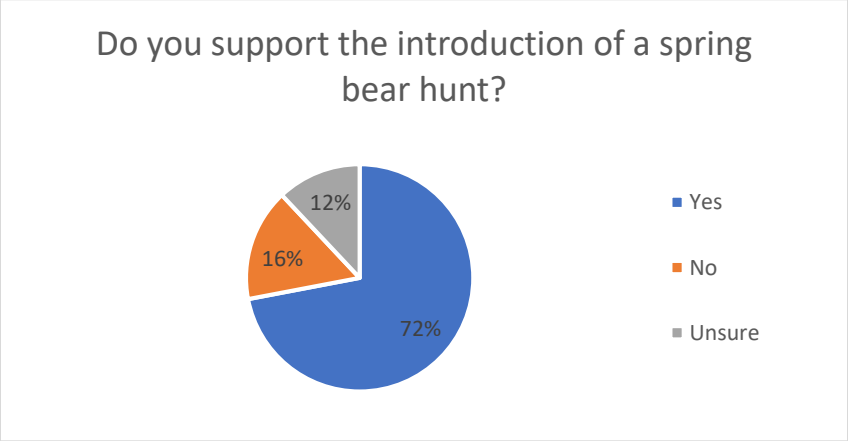
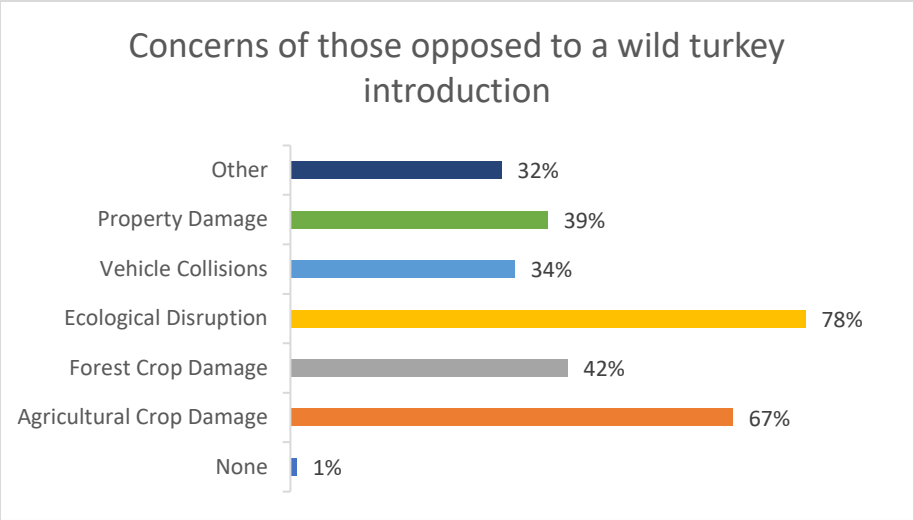


Figure 12: Worth noting, 89% of respondents that identified as 'tourism operator' were in favour of a spring bear hunt.



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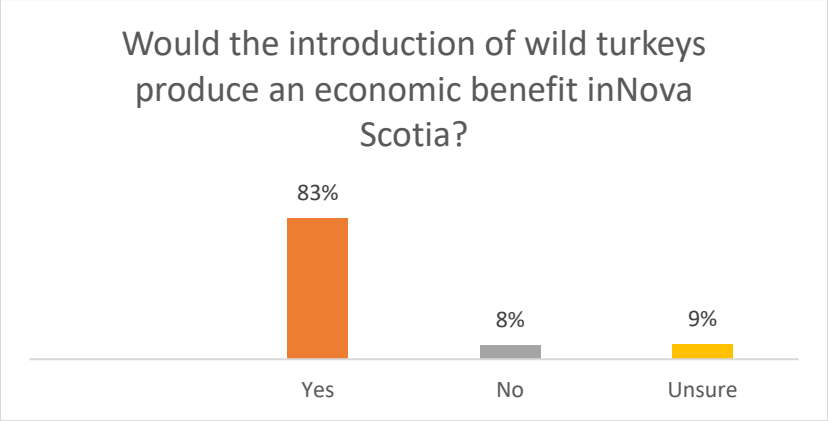


Figure 14: 89% of tourism operators said 'yes'.

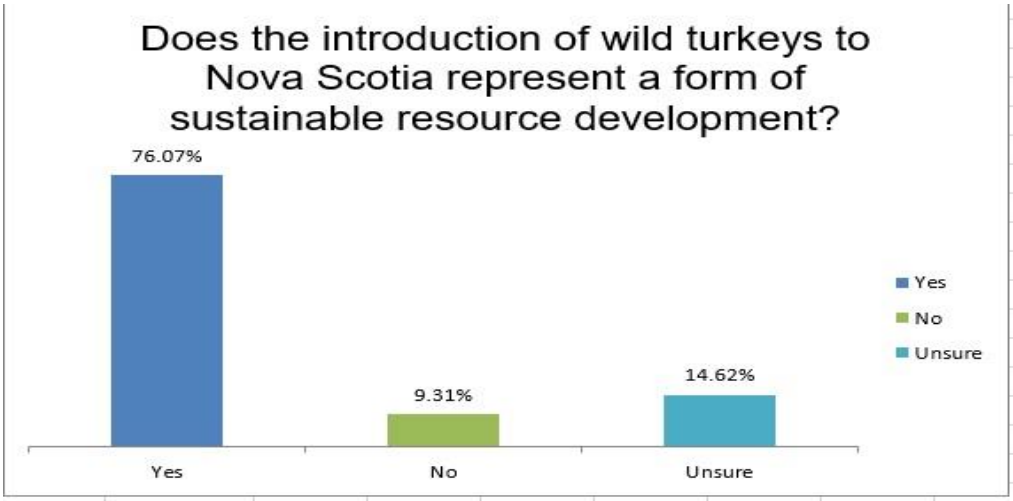
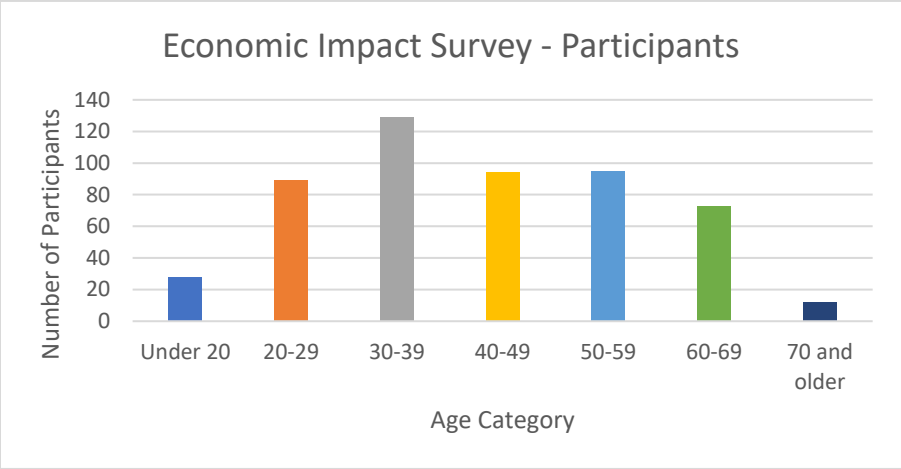


Figure 15

6.0.1 Key Findings: Stakeholder Survey

- Most participants (88%) supported the introduction of wild turkeys to Nova Scotia.
- Support was highest among tourism operators (94.5%), followed by hunters (93%) and First Nation respondents (90%).
- While support was the lowest among farmers, the majority (71%) were still in favour.
- 92% of all respondents believed that more effort should be devoted towards enhancing hunting opportunities in Nova Scotia.
- The most popular option for improving hunting opportunities in Nova Scotia was habitat improvement (74%), improving youth access (68%), and species introductions (66%).
- 71% of respondents were in favour of a spring bear hunt. 77% of hunters were in favour.
- The two most common concerns held by those in opposition to a wild turkey introduction were ecological disruption (77%) and agricultural crop loss (67%).
- Tourism operators were the most supportive group of respondents with 94.5% in favour of a wild turkey introduction and 88% in favour of a spring bear hunt. 100% of tourism respondents believed more effort should devoted towards enhancing hunting in Nova Scotia. 89% also believed the introduction of wild turkeys would produce economic benefits.
- 76% of respondents believed that a wild turkey introduction represented a sustainable form of resource management, while 83% believed it would create economic benefits.
- 88% of respondents who identified as First Nations believe that a wild turkey introduction represents a sustainable form of resource management.

7.0 Economic Survey Results



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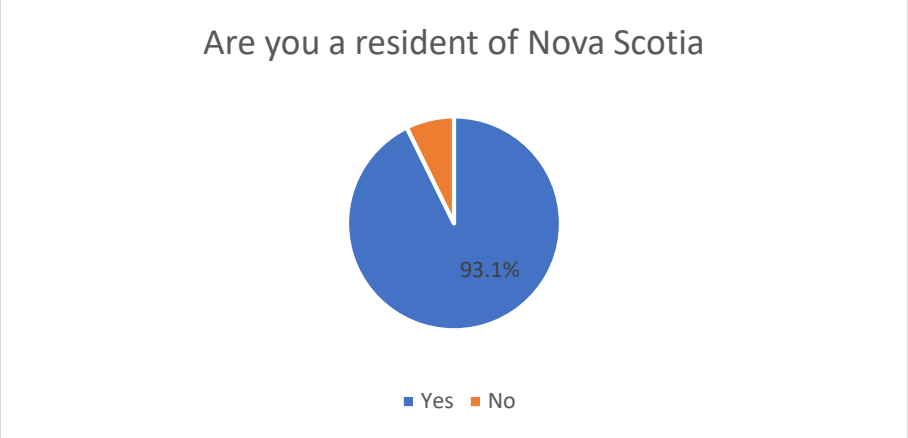

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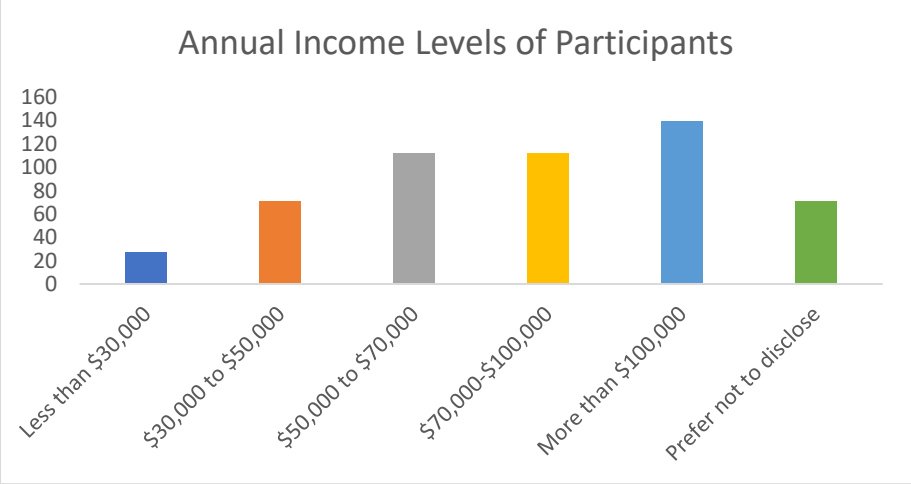

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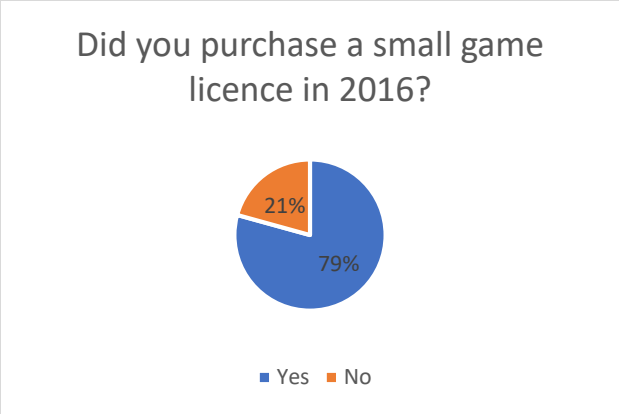

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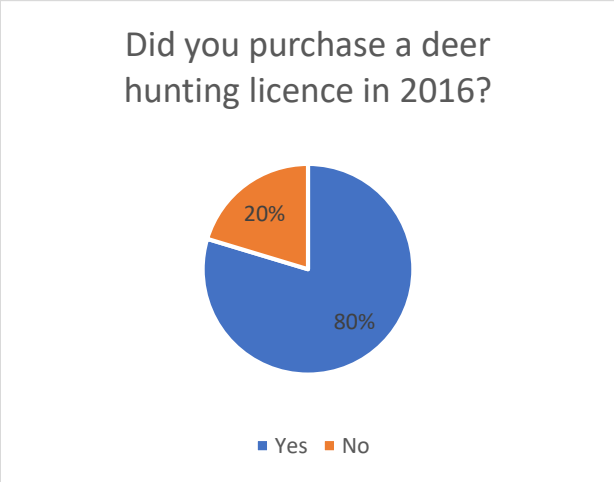

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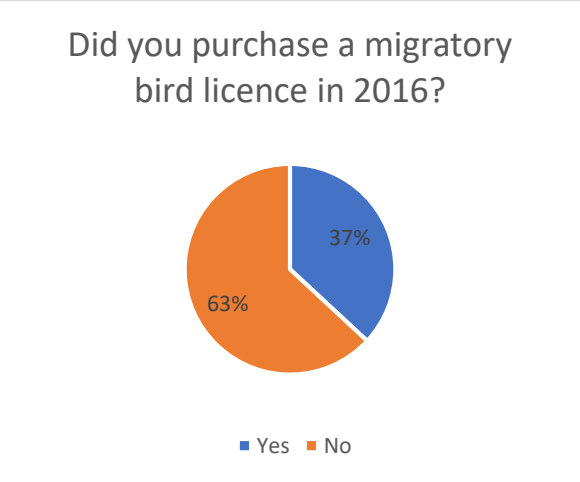

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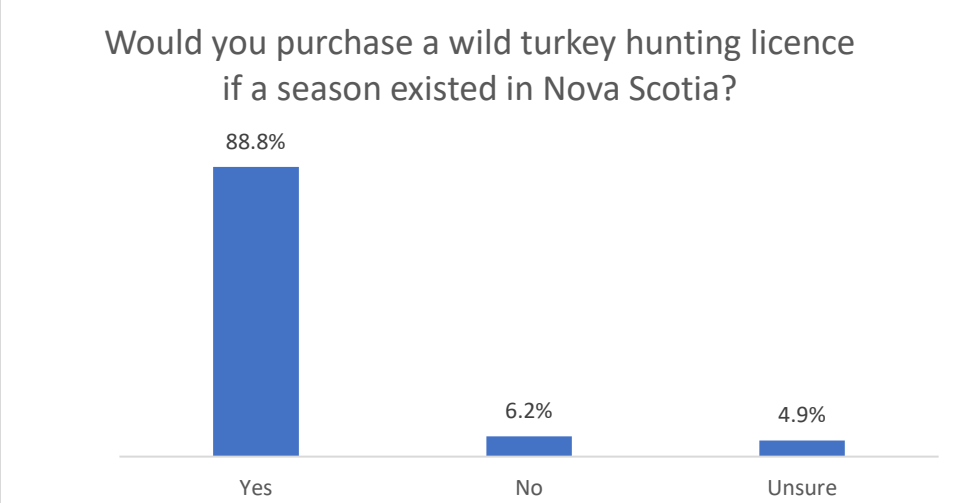

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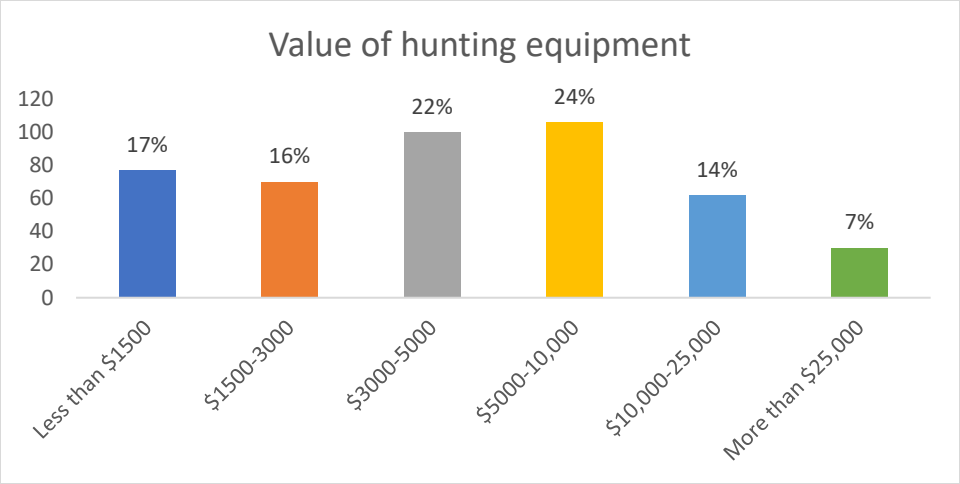
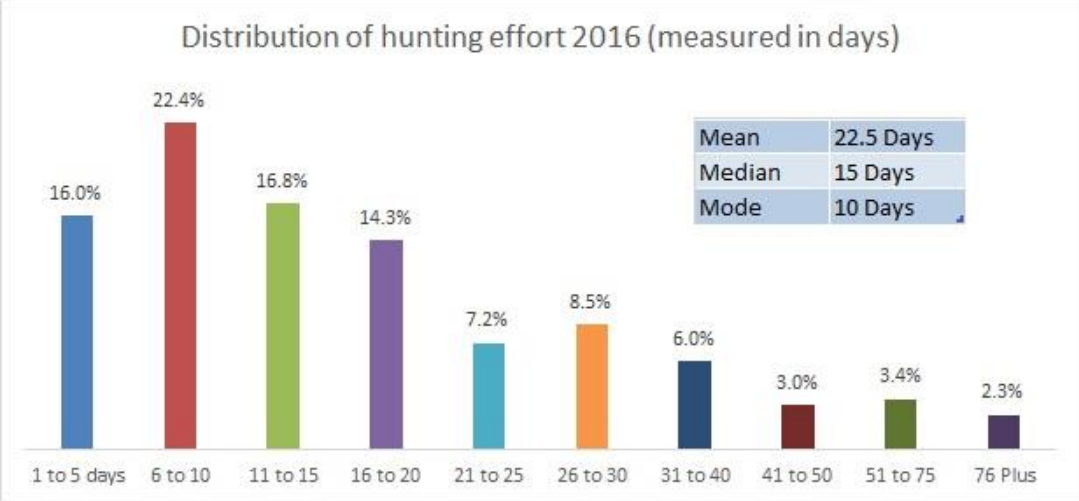


Figure 23 : The median value for participants hunting equipment was $5750.



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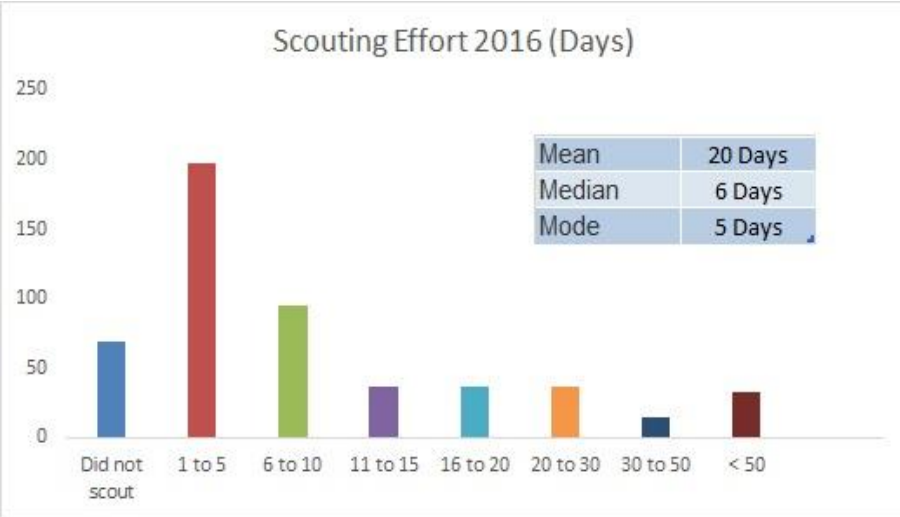

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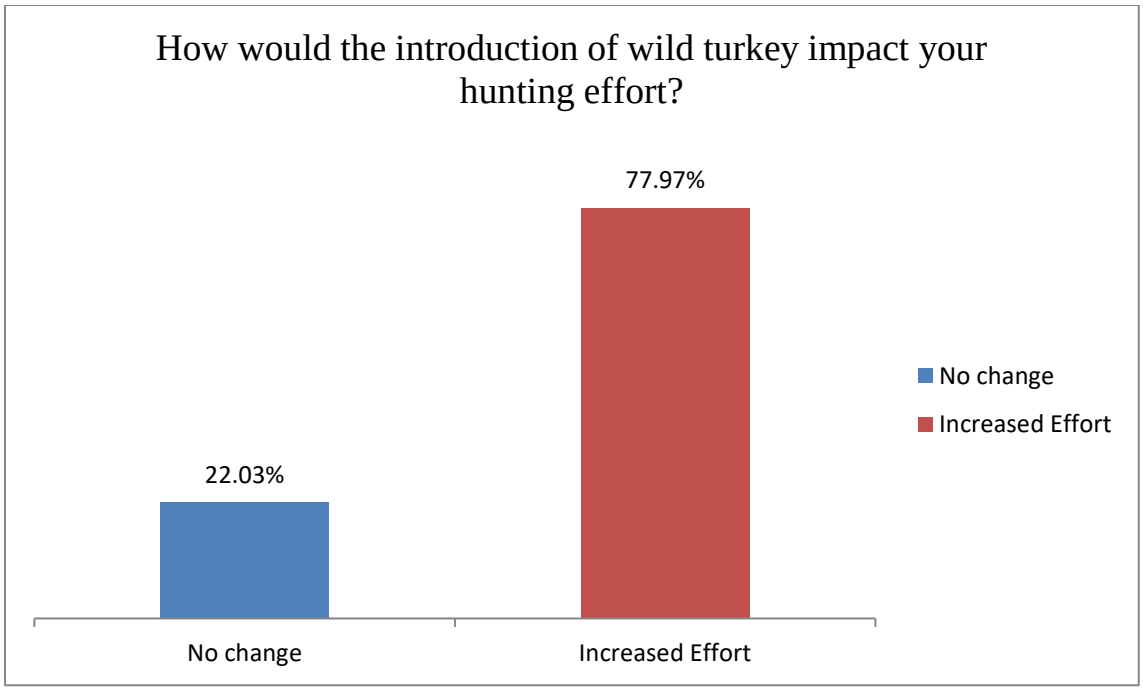

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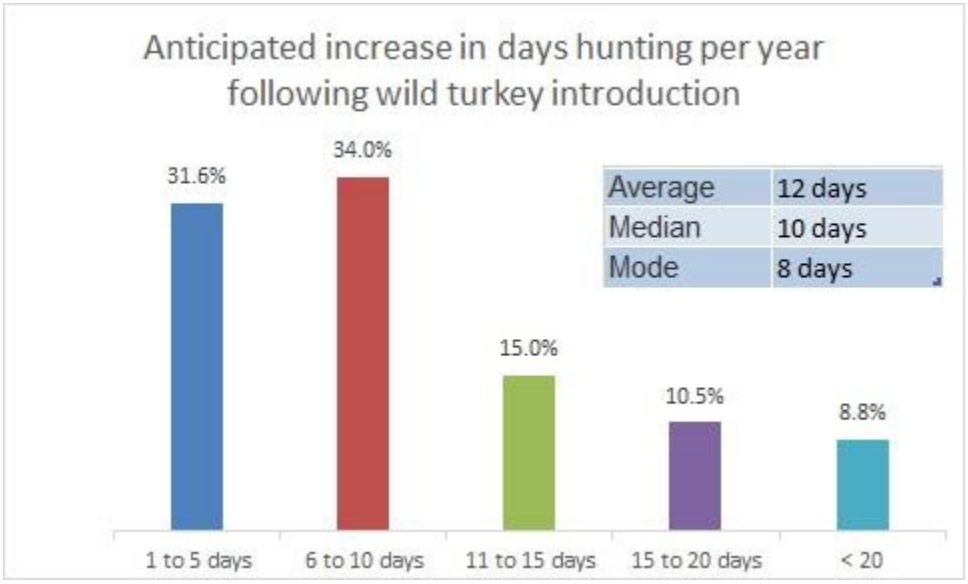

Figure 27: The spring turkey hunt limits the likelihood of hunters choosing wild turkey hunting over traditional hunting pursuits.

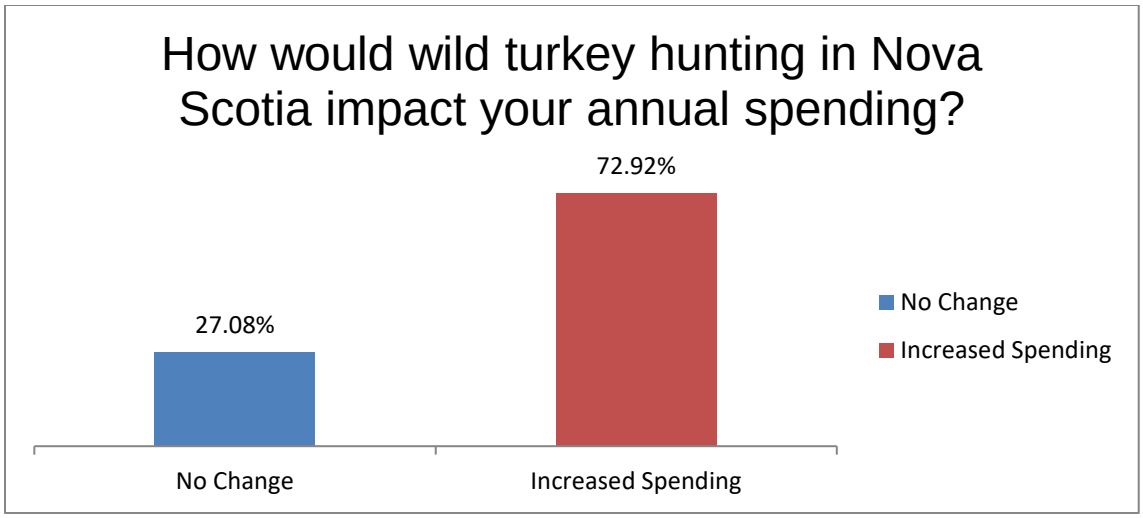

Figure 28: For those anticipating increased spending, they estimate an additional $445 in annual expenditures following the introduction of a wild turkey hunt.

7.0.1 Key Findings: Economic Survey

- Those in favour of a wild turkey hunt were willing to spend $35 per season on licences and tags. This is similar to the current general season deer licence and is likely an attractive price point.

- Of those in favour, 83% indicated they would hunt both seasons, 11% just the fall and 6% would hunt only the spring.

- The average participant spent $1175 in 2016 on hunting equipment and $1414.09 on fuel, accommodations, food and miscellaneous expenses. Total spending per participant was $2589.75 in 2016.

- The median average for days spent hunting and scouting was 21 in 2016. On average hunters who participated in the study spent $123.32 for every day spent hunting or scouting.

- 60,000 hunters pursued game and purchased hunting licences in 2016. The expenditures by this group in 2016 on hunting related activities is an estimated $38,845,250[1], representing a major boost to the Nova Scotian economy.

[1] Total expenditures were calculated using the Pareto Distribution method, where 20% of all individuals produce 80% of the impact. Recognizing the bias inherent in respondents (Generally the more committed hunters) the Pareto Distribution Method serves as the most appropriate technique for measuring economic impact.

- An estimated 40,000[2] hunters would purchase a wild turkey licence, with 83% of those hunters purchasing both a spring and fall licence, the remaining 17% would only purchase a licence for one season. Estimated total government revenues from licence sales would be $1,400,000.00 (assuming a $35 per licence fee).

- 78% of hunters would increase their number of days hunting and scouting per year if wild turkey hunting existed in Nova Scotia. On average, this group anticipates an additional ten days in the field per year. This could result in 31,200 hunters spending additional time pursuing their sport.

- The increased participation of hunters following a wild turkey introduction would increase annual expenditures by 20% or $7,695,168.

- 75% of non-resident hunters who completed the survey would purchase a wild turkey permit. The average willingness to pay price for a non-resident turkey licence was $85.00.

- The establishment of wild turkey populations throughout Maine and Ontario has required decades of conservation efforts on behalf of both government agencies and volunteer organizations. It would likely take five years to establish isolated populations large enough to support a recreational harvest.

- The number of permits available to harvest wild turkeys should reflect the population levels in those areas. Initial hunting licences could be awarded through a phone-in lottery system (e.g. moose in Cape Breton). This would provide groups incentive to complete the necessary conservation work required to establish viable populations.

- The establishment of local wild turkey populations could be accomplished through the introduction of 15 turkeys (9 hens and 6 gobblers) annually over-three periods. Once local populations are established in Nova Scotia, those populations could supply turkeys for other nearby regions.

- According to officials with the NWTF and CWTF the cost per turkey for a trap and transfer program is $500 (includes transportation, equipment purchases and professional services).

- CWTF has established a strong and growing presence in Nova Scotia and has the fundraising capacity to cover any costs associated with the trap and transfer of wild turkeys from neighbouring provinces.

- Wild turkey hunting represents a terrific opportunity for NSFAH, CWTF and the NS Department of Natural Resources to increase the number of hunters in NS. Young hunters 12 years to 16 years old should be allowed to purchase wild turkey licences. This should attract the net generation of conservationists. The prohibition of deer hunting for licenced and trained youth greatly reduces the retention of young hunters to continue with the sport.

[2] Assuming the population has been established province-wide.

8.0 Conclusion

The introduction of eastern wild turkeys to Nova Scotia is an excellent opportunity for the province to boost outdoor recreation, enhance tourism opportunities and generate new government revenues. The prospect of a wild turkey hunt would create an incentive for people to join existing volunteer organizations (e.g. NSFAH and CWTF) that promote conservation and environmental stewardship. The establishment of wild turkey hunting in Nova Scotia would result in an additional $7,695,168 in annual hunting related expenditures (20% growth) creating new opportunities for businesses such as outfitters, retail stores and tourism operations.

Overall support for a wild turkey introduction is high among all stakeholder groups. Some concerns and opposition exist regarding the possibility of increased crop damages. In regions where wild turkeys exist, crop damage from wild turkeys represents less than 1% of total annual losses. A review of wildlife crop damage compensation in Nova Scotia between 2013 – 2017 indicates that monitoring of wildlife crop damage is completed in an ad hoc and reactive manner. It is likely that most crop damage as it currently occurs in Nova Scotia goes unreported, representing a serious opportunity cost for farmers who are eligible for compensation. There is an opportunity for NSFAH and CWTF to work with agriculture partners to develop better wildlife crop damage monitoring programs.

Groups such as NSFAH and CWTF must proactively seek to improve the current relationship between hunters and farmers. Many hunters pursue game on agricultural land, and many farms provide excellent wildlife habitat. The goal of this project is to increase hunting opportunities in Nova Scotia, therefore introducing wild turkeys at the expense of agriculture-hunter relations would be regressive. NSFAH and CWTF must work with the agricultural community to gain the social licence required to allow a wild turkey introduction.

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