
Missing Link?

Understanding the Role of Municipalities in Species at Risk Management

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Abstract

Habitat loss from development and site alteration threatens the survival of many populations, especially the 572 species listed as extirpated, endangered, threatened and of special concern in Canada. Since municipal planning regulates land use and development, it may be an appropriate conduit to address species at risk issues. The purpose of this study is to understand the current role of municipal governments in managing species at risk through examining the municipalities affected by the expansion of Highway 69. Widening the road may stimulate development in the area, considering that southern Ontario faces challenges with conserving environmentally sensitive areas and fertile farmland. Through reviewing official plans and conducting eleven semi-structured interviews with municipal and provincial staff, the study identifies four major issues with managing species at risk: limited public awareness, incomplete science applied to policy, minimal resources and a reactive process. These issues limit municipalities' ability to manage species at risk. At the municipal level, species at risk are only considered at the time of development; however, the process does not account for limited data. Improving municipal involvement in managing species at risk requires better data and provincial support, as well as citizens' engagement. Implementing biodiversity principles into municipal planning may prevent species from becoming 'at risk'. Municipalities, as the level of government nearest to the people, may improve protection and recovery of species at risk through employing a variety of tools that regulate land use and create awareness. Municipal involvement may be one of the missing links in managing species at risk.

Providing Context: Species at Risk Management

Every form of life is unique, warranting respect regardless of its worth to man, and, to accord other organisms such recognition, man must be guided by a moral code of action.

United Nations' World Charter for Nature (1982, p.1)

Every species has intrinsic value regardless of its relationship with humans; however, anthropogenic activities that result in overexploitation, pollution, introduction of invasive species and habitat loss threaten the viability of many populations. In Canada, these actions have resulted in the listing of 572¹ species as extirpated, endangered, threatened or of special concern (COSEWIC, 2009). According to Kerr and Deguise (2004), 80% of species at risk in Canada result from habitat loss largely due to the conversion of natural areas into agricultural land. In Canada, the prairie chicken is extirpated but is making a comeback in the United States because farmers are setting aside habitat for the bird (CBC, 2009). This suggests that the most effective manner to protect and recover a species at risk is to protect its natural habitat. Protecting and recovering species at risk and their habitat requires engaging multiple private and public actors, as species do not adhere to jurisdictional boundaries or property lines. To date, limited research has been conducted on municipal involvement in species at risk issues. Municipal planning may be an appropriate conduit to address the needs of species at risk because of available tools (e.g. land use bylaws) to regulate future land use and development. To analyze this further, we must examine the current role of municipalities in protecting and recovering species at risk.

Species at risk represent a loss of biodiversity. Dasmann (1968) introduced the term, biodiversity to cover the anthropogenic scale of the natural system (i.e. genetic, species and ecosystem diversity). According to the Ontario Biodiversity Strategy (pg. 1), "Biological diversity refers to the variety of life, as expressed through genes, species and ecosystems, that is shaped by ecological and evolutionary processes." Biodiversity warrants protection from all levels of government due to the essential ecological goods and services (e.g. clean water and air, productive soils and other forms of green infrastructure) rendered, and more importantly, biodiversity has intrinsic value in itself (UN, 1982). As Fallding (2004, p. 45) indicated, "Natural processes and ecological systems underpin our society, its social and economic structures and its urban fabric." Biodiversity plays an important part in how individuals and communities interact with their environment. Maintaining genetic diversity ensures the natural landscape is resilient to harmful anthropogenic activities and various environmental stressors (e.g. climate change); however, unsustainable practices decrease biodiversity, and consequently affect the delivery of ecological goods and services. The United Nations passed the Convention on Biodiversity at the Earth Summit in Rio de Janeiro in 1992 to maintain biodiversity. Sustaining biodiversity for future generations involves engagement from all citizens.

Ignoring biodiversity may result in severe population decline of specific species. This warrants further protection from government to prevent extirpation or extinction. As a result,

¹ A summary of Committee on the Status of Wildlife Species in Canada's assessment listed 572 species as extirpated, endangered, threatened and special concern. The extinct category increases the total to 585. These numbers exclude assessment after April 2009.

both the federal and provincial governments manage species at risk. The federal government and some provincial governments developed legislation to prohibit activities affecting species at risk and their habitat. For example, in 1971, Ontario implemented the first species at risk legislation in North America, the *Endangered Species Act*. Most legislation includes mandatory recovery actions for threatened and endangered species in hopes of delisting species as ‘at risk’. Implementing species at risk policies attempts to preserve biodiversity.

Protecting and recovering species at risk should also occur at the municipal level. The Ontario *Planning Act* and Provincial Policy Statement (PPS) ensure municipalities are engaged in protecting natural heritage², which includes habitat of endangered and threatened species. Municipalities may apply land-use planning, zoning, bylaws, policies, and park and protected area designations to address species at risk and the natural environment. In addition, municipalities may engage in public awareness and communication with developers. As the level of governance directly involved with local populations, municipalities may improve landowner stewardship and awareness (Eaton and Boate, 2003). Their relationship with residents may foster local engagement in conservation activities (Eaton and Boate, 2003). Municipalities may play many roles (e.g. protector, communicator and collector of species data) in managing species at risk.

Limited research has been conducted to understand the role of municipal government in species at risk issues. For the case study, I chose the Highway 69 corridor (Figure 1). Ontario Ministry of Transportation (MTO) started expanding the highway into four lanes from Nobel to Estaire (approximately 152 km) in 2005 (expected completion in 2017). Expanding the highway may provide greater development opportunities, considering that southern Ontario faces challenges with conserving environmentally sensitive areas and protecting fertile farmland (MTO, 2005). Through a review of official plans and interviews with municipal and provincial implementers of species at risk policies, I examined the municipalities affected by the expansion to understand their current role in protecting and recovering species at risk. The interviews provided insight into how different levels of government perceive the role of municipalities in managing species at risk. Understanding the current role of municipalities in protecting and recovering species at risk may contribute further knowledge to the multi-jurisdictional governance structure that regulate species at risk and wildlife policy (i.e. regulations and initiatives); moreover, may assist with understanding the capacity in which municipalities manage species at risk.

² According to the Provincial Policy Statement (MMHA, 2005, p. 33), natural heritage features and areas means, “Features and areas, including significant wetlands, significant coastal wetlands, fish habitat, significant woodlands south and east of the Canadian Shield, significant valleylands south and east of the Canadian Shield, significant habitat of endangered species and threatened species, significant wildlife habitat, and significant areas of natural and scientific interest, which are important for their environmental and social values as a legacy of the natural landscapes of an area.”



Figure 1. The municipalities affected by the expansion of Highway 69 in northeastern Ontario consist of an upper tier municipality (represented in italics) and single tier municipalities.

Setting a Foundation: Biodiversity, Fragmentation and Connectivity

Biodiversity serves a larger ecological function. Human health and ecosystem health are linked (Rapport, 1989). Biodiversity provides the benefit of food, clean water and air, shelter, material for industry, etc. Complex interactions between abiotic and biotic components provide essential ecological goods and services. Human activities (e.g. building a road) modify the landscape in a shorter timeframe than natural processes (e.g. climatic processes). Development threatens ecosystem health, and consequently threatens the well being of humans. Poorly planned development places a stress on the natural environment through habitat loss and fragmentation (Dramstad et al. 1996). Fragmentation degrades habitats and threatens the survival of vulnerable species. For example, reptiles (e.g. Eastern Massasauga Rattlesnake) are susceptible to population decline from fragmentation. Preserving biodiversity requires developing in a manner that does not fragment the landscape.

Habitat loss and fragmentation result in the loss of biodiversity in terms of the numbers of species and the genetic variation present within specie populations (Bailey, 2006; Fahrig, 2002). Habitat loss may occur in the absence of habitat fragmentation; however, fragmentation involves the loss of habitat (Parker and Mac Nally, 2002). Reducing the amount of habitat available leads to fewer individuals and exposes smaller subpopulations to greater risk of local extinction (Parker and Mac Nally, 2002). Species richness (the diversity of species) declines with the lowest diversity found in the urban centres. Urban areas consist mainly of pavement and buildings with 20% vegetation (McKinney, 2002). Most of the vegetation supports little diversity because of erosion, trampling and pollution. For example, residential community consist of 25% pavement, 20% housing and 55% nonnative species, such as grass, trees and shrubbery; furthermore, nonnative species increase in the urban core (McKinney, 2002). Species' ability to adapt to these environments varies immensely (Parker and Mac Nally, 2002). McKinney (2002) list species as either an urban avoider, species sensitive to human disturbance; urban adapter or edge species that live in between two habitat types; and urban exploiter, species that can withstand disturbed areas. Urban avoiders are most at risk during development.

Fragmentation refers to many interrelated processes: reduce patch size (physically and through edge effect), increase number of patches and increase distance between patches (Fahrig, 2003). Fragmentation decreases connectivity, and consequently, limits the movement of species (MNR, 2009). Edge species or generalists thrive in ecotones (a region between two different biological communities); however, species reliant on a specific habitat are the most vulnerable (MNR, 2009). In addition, fragmentation decreases landscape connectivity. Movement of species may be restricted because of the distance to other patches or the disturbance (e.g. roads). Distance and the type of matrix affect species' ability to detect patches (Baguette and Van Dyck, 2007). Limited movement between patches reduces gene flow. Increased species isolation compounded with other stresses, such as climate change, put some species at greater risk of disappearing from a region.

Focusing on specific natural features, instead of the whole landscape presents major issues. Some older settlement patterns did not account for the natural environment (e.g. wetlands) and its processes. As a result, the province implemented a new planning approach

focused on protecting specific natural features (e.g. endangered and threatened species habitat); however, without considering the whole landscape, development led to fragmented areas. The protected leftovers are remnant patches, isolated areas with limited ecological function. Developing natural heritage systems may maintain connectivity or restore linkages between features. The effects of fragmentation are based on the size of the habitat and the type of disturbance (e.g. road built) but environmental stressors, such as climate change may intensify the impact. Although some skeptics³ exist, most conservation biologists perceive connectivity necessary for preserving biodiversity. Lacking functional corridors may isolate some species, making them vulnerable to local extinction (Berry et al. 2002). Developing natural heritage systems with structural corridors provide a solution for maintaining connectivity between patches. This requires coordinating efforts between property owners and different levels of government. Legislation, policy and tools for protecting biodiversity and species at risk provide the basis for such cooperation and coordination in North America.

³ For example, Bailey (2006) argues that further research is needed to understand connectivity, because many factors are at play (e.g. habitat quality, the size of the corridor, etc.), especially when habitat is restored. Restoration of a diverse landscape does not guarantee the survival of populations, especially if the population is disturbed, because of changes in the ecological structure and function.

Managing Species at Risk: Policy Framework and Public Perceptions

No single jurisdiction can effectively protect wildlife because species do not adhere to political boundaries (Wood and Flahr, 2004). Currently, the federal and provincial governments manage species at risk; however, legislation governing municipal land use planning and development consider endangered and threatened species. According to Section 92A (1) and (3) of the *Constitution Act* (1867), jurisdiction over the environment is split between the federal and provincial governments. Both the federal and provincial governments confirmed their commitment to species at risk by signing the Accord for the Protection of Species at Risk in 1996 (Wood and Flahr, 2004). The Accord, a framework for cooperation between governments, stipulate that the federal government would enact legislation to protect species nationally, and each province and territory would protect species at risk within its jurisdiction (Wood and Flahr, 2004). As a result, the federal and provincial governments have complementary legislation, regulations, policies and programs, which involve listing species and restricting specific land use activities (Wood and Flahr, 2004).

Both the federal government and Ontario approach to managing species at risk involves stewardship programs and regulatory tools. Stewardship refers to voluntary actions, such as species conservation, habitat improvements and mitigation activities that foster care for the environment. In 2000, Environment Canada implemented the Habitat Stewardship Program for Species at Risk (HSP). The HSP financially assists individuals with protecting species at risk habitat, mitigating threats and implementing recovery strategies or action plans. In 2007, the Ontario Ministry of Natural Resources (MNR) developed the Species at Risk Stewardship Fund that supports activities similar to HSP, such as outreach, education, recovery actions, habitat improvements, surveys and monitoring activities in Ontario. In addition to the stewardship programs, the federal and provincial governments implement policy instruments, such as statutes that protect large areas (e.g. *Canada National Parks Act*); maintain biodiversity (e.g. *Canadian Wildlife Act*); and manage species at risk (e.g. *Species at Risk Act* and *Endangered Species Act*) (Wood and Flahr, 2004). Legislation related to species at risk affords the greatest protection.

Municipalities are not responsible for managing species at risk but policies governing land use and development provide protection to natural heritage, including the habitat of threatened and endangered species at risk. Some municipalities are responsible for developing municipal plans that guide the type of land use and development, as well as approving planning applications. Municipal activities must comply with the Ontario's *Planning Act* and Provincial Policy Statement (PPS). Prior to 1996, MNR reviewed municipal documents and planning applications; however, the Ontario Ministry of Municipal Affairs and Housing (MMAH) revised the approach to a 'One Window Planning Service' whereby MNR provides information and technical advice about available resources.

Species at Risk Act and Endangered Species Act

The federal *Species at Risk Act* (SARA) and Ontario's *Endangered Species Act, 2007* (ESA) demonstrate the governments' commitment to protect species at risk. Each statute ensures the responsible government lists species, protects habitat and recovers species. SARA and ESA have common sections: species listing, habitat protection, recovery actions and flexibility tools. SARA and ESA are similar, except for a few differences related to timelines for listing, definition of habitat and available flexibility tools.

Designating a species determines whether or not the government provides protection and recovery. Listing involves an inventory, status report and an assessment by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or the Committee on the Status of Species at Risk in Ontario (COSSARO)⁴. In Ontario, consulting the public on listing of a species takes less time than the federal process. In special circumstances, when a species is in imminent danger, the Minister of Environment Canada (at the discretion of COSEWIC) may make a recommendation to the Governor in Council to conduct an emergency listing. In Ontario, the Minister of the MNR is responsible. Citizens and environmental organizations actively criticize the government for the limited number of species listed. Some groups sued the Minister of the Environment for failing to conduct an emergency listing (e.g. *Western Canada Wilderness Committee v. Minister of the Environment* and *Routhwaite v. Minister of the Environment*). The Minister may limit listings to prevent enacting provisions (e.g. restricting land use). This suggests the process for listing species needs improvement.

Once species are listed, the statutes guarantee its protection. Section 32 of SARA and Section 9 of ESA forbids the killing, harming, harassing, capturing or taking of a species listed as endangered, threatened or extirpated; furthermore, SARA and ESA prohibit individuals from possessing, collecting, buying, selling or trading endangered, threatened and extirpated species. Also, SARA and ESA protect habitat of endangered and threatened species, as well as extirpated species reintroduced into the wild. SARA and ESA define habitat differently: SARA defines critical habitat as the minimum amount of land required for a species' population to carry out its life activities, whereas the ESA protects direct and indirect habitat, and consequently, protects habitat more broadly than SARA.

Besides establishing the process for listing and protecting species, SARA and ESA ensures the government implements initiatives (e.g. recovery strategies) to delist species. SARA and ESA provide mandatory recovery activities for extirpated, endangered and threatened species. A recovery strategy establishes numeric and distributional recovery goals, as well identifies habitat of the species. Similar to listing, environmental organizations criticize the federal government for the limited number of recovery strategies developed and for not identifying critical habitat.⁵ The government may hesitate to identify critical habitat because the legislation limits land use activities.

Planning Act, Provincial Policy Statement and Natural Heritage Guide Manual

Provincial land use planning tools provide protection for species at risk. The Ontario *Planning Act* sets out ground rules for land use planning in Ontario by describing the process

⁴ COSEWIC and COSSARO are legal entities that are established under each Act and consist of subject matter experts that are responsible for classifying the status of a species.

⁵ Ecojustice, a nongovernmental organization, have filed three lawsuits against the Government of Canada within the past two years because of failure to identify critical habitat in recovery strategies.

for administering applications and the responsibility of the players. Though natural heritage or species at risk are not directly mentioned, Section 2 a) and c) of the Act describe protecting ecological systems and conserving natural resources as provincial priorities; moreover, Section 51.24 a) and h) require municipalities to consider provincial interests and the conservation of natural resources when considering a draft plan for subdivision.

Section 3 of the *Planning Act* allows the MMHA to develop a policy statement to guide land use planning and decisions. The PPS “provides policy direction on matters of provincial interest related to land use planning and development” (MNR, 2005, p.1). It “provides for appropriate development while protecting resources of provincial interest... and the quality of the natural environment” (MNR, 2005, p. 1). All municipal decisions must adhere to the PPS regardless if the municipality developed its official plan and bylaw prior to the implementation PPS. PPS categorizes the habitat of endangered and threatened species as natural heritage. Section 2 of the PPS directs the management of resources. Section 2.1.3 prevents modifying significant habitat of endangered and threatened species. Section 2.1.6 of the PPS prevents modifying adjacent lands of significant habitat. In special circumstances, municipalities may permit development or site alteration on adjacent if the environmental impact study demonstrates no negative impact to the health of the species population.

Based on the PPS, MNR developed the Natural Heritage Guide Manual to assist municipalities with land use planning regarding natural heritage systems. Municipal powers over planning and land use decisions vary between jurisdictions. For example, some municipalities are delegated planning authority for approving subdivision, whereas others may only sever lots. Before municipalities approve any land use application, they examine their municipal plan or the Natural Heritage Information Centre (NHIC) database to determine if a natural heritage feature occurs on site. NHIC provides municipalities with species names and generalized locations based on element occurrences. NHIC lists endangered and threatened species as ‘sensitive species’ and does not provide specific locations. Site occurrences of sensitive species trigger an environmental impact study. Also, the area within 120m of the site occurrence triggers the study. The applicant must hire a qualified individual (i.e. consultant) to conduct the field investigations. The qualified individual may confirm the presence, status and population health of the identified species, and establish the location of significant habitat. Provided that the environmental impact study (EIS) demonstrates that modifying the property will not have a negative impact, the application may proceed; however, if the potential negative impact cannot be avoided, the proposal does not proceed.

Municipal Tools

Municipalities may improve species at risk management through employing a variety of tools that foster stewardship or create awareness. Court cases, such as *Spraytech v. Town of Hudson* (2001), suggest that municipalities may protect the environment and public health. Land use planning, zoning, bylaws, policies, and development of parks and protected areas may be applied to conserve species at risk. Municipalities may implement tools (e.g. official plans, site plan controls and development permit systems) to carry out provincial policies. The PPS ensures that official plans address the habitat of threatened and endangered species. In fact, many municipalities with the assistance of MNR map natural heritage sites and attach the map as an appendix to the official plan; however, identifying natural heritage sites may be problematic because boundaries of species change and the available species data is

limited. Municipalities may include additional policies to protect and recover species at risk in the official plan.

Additional tools at the discretion of the municipalities include land use bylaws, zoning, site development controls and the Development Permit System. Bylaws act as a mechanism to implement the official plans. Through zoning and bylaws, municipalities may coordinate land use to prevent incompatible uses and set standards by indicating building specifications. Natural heritage features may be rezoned as a special zone (permits specific activities), environmental protection zone or an area requiring development permits. To ensure that the precise location of natural heritage site is not revealed, areas may be zoned broadly. Zoning may limit development on a parcel of land and combined with other bylaws, such as setbacks, may reduce encroachment on habitat while allowing development. Site development controls establish measures for preventing negative impacts on natural heritage features and areas, as well as measures for maintaining, restoring or improving the natural heritage system. For the site development controls, the official plan and the land use bylaw must designate the area for site plan control. The Development Permit System (DPS) is a new planning tool that combines zoning, site plan and minor variance processes into one application and approval process. Once municipalities establish development permit systems, a range of conditions on the issuance of a development permit may be imposed. These tools make the municipality a perfect candidate for assisting with species at risk management.

Public Perceptions

Attitudes, beliefs and behaviours regarding species at risk management vary immensely because of differences in cultural, economic, environmental and social values. Species at risk legislation reflects societal values; however, much of the literature focuses on the land use restrictions and the ineffectiveness of species at risk policies (Dwyler et al. 1995; Polasky et al., 1997; Doremus, 2003). Conserving species limits human actions on specific land, and consequently, affects the economic benefits, creating conflict between species conservation and land use activities (Doremus, 2003). The government prioritizes the recovering of species at risk over economic costs (Polasky et al. 1997).⁶

Many actors share responsibility for managing species. Harshaw (2008) conducted a survey study to determine how citizens of British Columbia felt about species at risk. Many displayed a biocentric attitude and considered endemic species a priority for protection and recovery in British Columbia (Harshaw, 2008; Meuser et al., 2009). Publicly supported conservation initiatives are more likely to succeed than ones that do not reflect public opinion (Meuser et al., 2009).⁷

Though individuals support managing species at risk, they may hesitate to support policy instruments that restrict their actions. Policy instruments, such as species at risk legislation (i.e. SARA and ESA) are intended to affect individuals' behaviours, in order to

⁶ Polasky et al. (1997, p.9) described the case, *Tennessee Valley Authority v. Hill*, 437 US 153 (1978), in which the judge indicated, "It is clear from the Act's legislative history that Congress intended to halt and reverse the trend toward species extinction -- whatever the cost."

⁷ An inconsistency exists between what people say and how they act. According to Sears et al. (1985), attitude has three components: cognitive, affective and behavioural. Though individuals recognize the need to protect species at risk, willingness to act may vary. This is consistent with other environmental literature (Warnback and Hilding-Rydevik, 2009).

protect and recover species at risk (Pal, 2005). Studies of the United States' *Endangered Species Act*, 1973 (US ESA) demonstrate that landowners fear legislation. Legislation may act as a disincentive to species conservation. Fernandex-Gimenex et al. (2005) examined the attitudes of landowners in southeastern Arizona. Most respondents perceived the US ESA as negative because of the land use restrictions. Many expressed support for conserving species; however, felt the government did not take their concerns into account when implementing the legislation. Public uncertainty about the land use controls may create landowner anxiety.

Restricting land use may limit citizens' receptiveness to the legislation. The court interprets the legislation as prohibiting activities that modify habitat in a manner that may lead to species death or the destruction of a species (Dwyler et al. 1995); therefore, the legislation prohibits landowners with species at risk or habitat on their property from modifying the landscape. The law prohibits landowners to engage in activities that would otherwise be lawful, because of potential harm to sensitive habitats. This kind of governmental prohibition only impacts individuals with endangered and threatened species on their property. In some circumstances, property value may diminish due to the regulatory controls. As a result, SARA and ESA provide limited compensation when extraordinary impacts arise from preventing the destruction of critical habitat.

The Ontario Landowners Association, for example, is not receptive to the ESA and discourages governmental involvement in controlling land use as demonstrated by slogans on their website, such as 'This is our land, back off government'. United States' National Association of Home Builders addressed landowner anxiety by encouraging the destruction of habitat of species at risk:

The highest level of assurance that a property owner will not face an ESA issue is to maintain the property in a condition such that protected species cannot occupy the property... This is referred to as the "scorched earth" technique (Lueck and Michael, 2003, p. 27).⁸

Landowners may pre-emptively act to avoid the restrictions (this is commonly referred to as first-mover advantage) (Lueck and Michael, 2003). Lueck and Michael (2003) studied pre-emptive actions to prevent habitat of Red Cockaded Woodpecker in North Carolina. Since woodpeckers require old-growth pine stands, landowners may prevent the pine from reaching maturity to ensure that woodpeckers do not inhabit their property. The US ESA prevents "taking" and "harm", which include altering and modifying habitat, but fails to address developing on potential habitat. Pre-emption explains why the Red Cockaded Woodpecker population continues to decline on private land even though the US ESA has protected the bird for over 30 years (Lueck and Michael, 2003). The Ontario Landowners Association support such activities with pictures on their website of landowners cutting down potential habitat to prevent species at risk from inhabiting their land to maintain their property value.

Some individuals view the current management strategy as ineffective because of the economic costs associated with recovery programs. SARA and ESA afford recovery actions in an attempt to delist species; however, in the past 36 years, the United States has only delisted 12 species. According to Doremus and Pagel (2001), four of the delisted species

⁸ Cited in Lueck and Michael (2003) as National Association of Home Builders, Developer's Guide to Endangered Species Regulation (1996)

were inappropriately listed and the other eight species were threatened by activities that were easily controlled through regulation. For example, the effects of persistent organochlorine pesticide residues threatened the survival of Brown Pelican (*Pelecanus occidentalis*), the American Falcon (*Falco peregrinus anatum*) and the Arctic Peregrine Falcon (*Falco peregrinus tundrius*); however, the 1972 DDT ban eliminated the threat (Doremus and Pagel, 2001). Species threatened by habitat loss from development rarely qualify for delisting (Doremus and Pagel, 2001). In the United States, a single species recovery program may cost US \$50,000-500,000 annually (Shogren et al. 1999). The cost may rise to US \$1,000,000 with a captive breeding program (Shogren et al. 1999). Considering the cost and ineffectiveness of recovery programs, efforts should focus on feasible and proactive solutions (e.g. establishing parks or reserves) to protect species from extinction (Shogren et al. 1999).

Designing the Study: Method

Managing species at risk warrants further investigation in a manner that permits a detailed examination of how municipal and provincial governments perceive the role of municipalities in recovering and protecting species at risk. As a result, I examined the municipalities along Ontario's Highway 69 corridor (see Appendix A). I analyzed the official plans of the municipalities affected by the expansion of Highway 69 to provide a foundation about how species at risk are considered at the municipal level. As well, I interviewed municipal and provincial officials to understand the perceived role of municipalities in species at risk issues. I coded and compiled the information into a summary matrix, as well as further researched the emerging themes.

Reviewing the official plans of all the municipalities affected by the expansion of Highway 69 provided a foundation about how species at risk are considered at the municipal level. I examined the municipal plans for mention of species at risk and their habitat. I based the search terms on the language used in the PPS, Canada's *Species at Risk Act* and Ontario's *Endangered Species Act*. Key words included: species at risk, endangered, threatened, special concern, species, animal, plant, wildlife, habitat, natural heritage and conservation. I summarized and compared the information to determine the commonalities and differences between the municipalities. This assisted with developing the questions for the interviews.

To understand how municipal and provincial governments perceive the role of municipalities in recovering and protecting species at risk, I conducted interviews. I interviewed planning directors or planners of the municipalities affected by the expansion of Highway 69, as well as the relevant district offices of the MNR and MMHA and Housing to participate. For example, a consultant participated in the study based on the recommendation of a municipal planner. I chose a semi-structured interview approach to allow the interviewees to focus on what they thought was relevant to the role of municipalities in managing species at risk. I conducted interviews over the phone, instead of in-person because of financial constraints. Phone interviews provided more flexibility than a mailed out survey. In addition, the respondents are less likely to attempt to answer the question in a manner that is desirable to the interviewer over the phone; however, I could not engage in observation and previous studies demonstrate the quality of data is inferior to in-person interviews (Bryman and Teevan, 2005).

The interviews lasted 30 – 50 minutes. I recorded the interviews with the permission of the participants. I developed an open-ended survey in advanced that consisted of 'questions about knowledge'⁹ and 'informant factual questions'¹⁰. Due to the different knowledge sets between provincial and municipal interviewees, I developed two sets of questions (see Appendix B). I designed these questions to collect information about the individuals' level of knowledge (or awareness) and determine the current perception of municipal involvement in species at risk issues. The language was comprehensible and relevant for each group, while contributing to answering the research question about the role

⁹ Questions about knowledge: The participants answer questions that test their knowledge, similar to informant factual questions (Bryman and Teevan, 2005, p. 96)

¹⁰ Informant Factual Questions: The informants answer questions in which they are familiar with; asking employees factual questions about their work (Bryman and Teevan, 2005, p. 96)

of municipalities in species at risk issues. In total, I interviewed eleven individuals: five from municipalities (i.e. two junior planners, two senior planners and a Chief Administrative Officer), four from the Ontario Ministry of Natural Resources (i.e. district species at risk biologists, district planner and harmonization advisor), one from the Ontario Ministry of Municipal Affairs and Housing (i.e. planner of northeastern Municipal Services) and one consultant employed by municipalities in the jurisdiction. I provided interviewees from the municipalities and the consultant with the same questionnaire and provided MNR and MMAH with the other.

After each interview, I summarized the relevant sections and compiled the information into a summary matrix¹¹. I analyzed the findings to determine the emerging themes. I researched the themes further, using electronic databases. The analysis indicated various encouraging and limiting factors for municipalities to engage in species at risk protection and recovery. Through the analysis, I identified the gaps and areas that require further research.

Limitations

I studied the municipalities affected by the expansion of Highway 69. Initially the focus on the project was municipal involvement in the protection and recovery of the Eastern Massasauga Rattlesnake. Since the Georgian Bay area supports the largest population of Eastern Massasauga Rattlesnake and is undergoing construction for Highway 69, the municipalities presented an ideal geographic region for a case study; however, when speaking to municipal staff, I realized the scope was too narrow. Many municipalities are not directly involved with protecting and recovering specific species. Specific questions about a particular species are better suited for recovery biologists at MNR or field researchers. Instead of choosing a new study site, I broadened my scope to include all species at risk. Though northern Ontario does not face the same challenges as southern Ontario, the expansion of the highway may encourage development in the future. The research applies to Georgian Bay area; however, future studies may examine municipal involvement in managing species at risk.

Soliciting engagement for interviews presented issues because of timing and a lack of interest on the part of the contacted official. In some instances, the municipality did not have a planning department (i.e. they hire a consultant for the development of official plans and bylaws). In one of these cases, the Chief Administrator was interviewed instead; however, in the end, individuals responsible for planning species at risk at the provincial level, including the architects of the legislation (*Endangered Species Act*), as well as its municipal agents (i.e. planning departments and consultants) were interviewed to understand the role of municipalities in species at risk issues.

¹¹ Summary Matrix: The answers are compared and the commonalities and differences between the interviewees are determined. The summary matrix is in table form in order for easy comparisons between the different interviewees.

Characterizing the Study Site: Highway 69 Corridor

The planning issues faced across Ontario vary immensely, especially between less populated communities in the north and growing communities in the south. Ontario is geographically the second largest province covering 1 million km² (Baldwin et al. 2000) The province consists two-thirds of forest with a quarter million lakes, thousands of rivers and streams, and a large portion of the Great Lakes. Many species inhabit the diverse landscape. 40% of the species at risk in Canada occur in Ontario, specifically in Southern Ontario because of intensive land use activities (MNR, 2005). This study focuses on less populated communities in Northeastern Ontario between Severn and Sudbury as the four laning of Highway 69 presents new opportunities for increased development in this area.

Landscape Features

Abiotic factors, such as the bedrock, surficial geology, climate, soils and hydrology shape the Georgian Bay's biotic landscape. Georgian Bay is located on the central portion of the Canadian Shield referred to as Grenville Province. Metasedimentary rocks that form the Laurentian Highlands dominate the area. The elevation is approximate 250 metres above sea level. Natural processes, such as climate, affect the bedrock and surficial geology. Winds and low-pressure conditions that sweep across the Great Lakes cause increased precipitation compared to the rest of the province. As a result, in the winter, Georgian Bay is characterized as a 'snowbelt'. The climate, as well as the geological material leads to the formation of soil. Georgian Bay's soil consists of hummo-ferric podzol, which is well drained, iron-rich and acidic. The combination of these factors (i.e. geology, climate, soils and drainage) forms a forested landscape that is rich in biodiversity. (Baldwin et al, 2000).

The ecological matrix is mainly forest and wetlands with patches of agriculture or urban land cover, whereas southern Ontario is an agricultural and urban matrix with patches of forests and wetlands (MNR, 2005; Sudbury, 2005). Developing wildlife corridors and core areas is less critical. Georgian Bay consists of coniferous forests and wetlands (MNR. 2005). This landscape supports a diverse range of species, such as the Eastern Massasauga Rattlesnake, Caspian Tern, Lake Sturgeon and Map Turtle (MNR, 2005).

Municipalities

Municipalities affected by the expansion of Highway 69 may be divided into one single-tier municipality (i.e. Sudbury), two districts (i.e. Parry Sound and Sudbury, which consist of incorporated municipalities and various lower tier municipalities with different municipal powers (see Appendix A, Figure 1). Municipalities in Northeastern Ontario present an interesting case study because of the variation in size, growth pressures, planning capacity and other factors. Between municipalities, variation exists between the amount of natural features and the amount of planning resources available. The lack of financial resources presents issues for councils to implement tools to protect the natural environment; however, the province expects each jurisdiction to uphold the legislated provincial mandates. Planning authorities may adopt approaches relevant to the local situation provided that the approach achieves the same objectives.

Applying Municipal Tools: Official Plan

Responsibility over land use provides municipalities with great power over environmental issues (Kwasniak, 2003). Municipalities, as authorities over zoning and subdivision, develop land use plans and policies, such as official plans to guide land use control. According to Section 16.1.a of the Ontario's *Planning Act*, an Official Plan, "Shall contain goals, objectives and policies established primarily to manage and direct physical change and the effects on the social, economic and natural environment of the Township." I examined the official plans to determine if municipalities consider species at risk. Many municipalities affected by the expansion of Highway 69 are unincorporated townships that fall under the jurisdiction of a planning board; however, nine municipalities have official plans (Table 1). In some circumstances, a municipality (i.e. Severn and French River Municipality) may be regulated by more than one official plan.

Table 1. List of municipalities and the applicable documents

Area	Official Plans
Simcoe County	Official Plan of the County of Simcoe – 2007
Township of Severn	Township of Severn – 2006
Township of Seguin	Township of Seguin Official Plan – 2007
Municipality of McDougall	Municipality of McDougall – 2004
Carling Township	Carling Township - 2008
Archipelago Area Planning Board	Township of Archipelago – 2009
Sudbury East Planning Board	Sudbury East Planning Board Official Plan – 2003
French River Municipality	Consultation stage for drafting an official plan
Sudbury	Greater Sudbury Official Plan, 2008

I searched the official plans for specific key terms (Table 2) and summarized the relevant sections. The search terms were based on the language used in the PPS, Canada's *Species at Risk Act* and Ontario's *Endangered Species Act*. I excluded irrelevant search terms that did not directly relate to protecting species at risk because the purpose of the review of the official plans was to examine if municipalities afforded specific protection for listed species. For example, I excluded regulations regarding wetlands, even though they provide habitat for many species.

Table 2. List of areas with Official Plans and search for key terms

Area	Species at Risk	Endangered	Threatened	Special Concern	Species	Animal	Plant	Wildlife	Habitat	Natural Heritage	Conservation
Simcoe County	-	x	x	-	x	-	-	x	x	x	X
Township of Severn	-	x	x	-	x	-	-	x	x	x	X
Township of Seguin	-	x	x	-	x	-	-	x	x	x	X
Municipality of McDougall	-	x	x	x	x	-	-	x	x	x	X
Carling Township	-	x	x	x	x	x	-	x	x	x	X
Archipelago Area Planning Board	-	x	x	x	x	-	-	x	x	x*	X
Sudbury East Planning Board	-	-	-	-	-	-	-	x	x	x	X
Sudbury	x	x	x	-	x	-	-	x	x	x	X

Please note: Animal and Plant represent a species at risk is identified in the Official Plan (e.g. Eastern Massasauga Rattlesnake).

*Natural feature is used instead of natural heritage.

Official plans of the municipalities affected by the expansion of Highway 69 demonstrate similarities and differences (Appendix A). All of the official plans address endangered and threatened species only at the time of development, realizing the importance of limiting development and site alteration to preserve habitat. The term natural heritage includes the habitat of endangered and threatened species; however, the Sudbury East Planning Board applies the term more broadly to include the significant habitat of all wildlife, including habitat of endangered and threatened species. Another commonality in the official plans was preserving adjacent or surrounding lands to maintain ecological function. Preserving adjacent lands is consistent with Section 2.1 of the PPS, which indicates that development or site alteration may occur on adjacent lands if the proponent can prove no negative impact will occur. Most municipalities considered adjacent lands within 50 metres of the habitat of endangered and threatened species, except for Simcoe County and the Township of Severn, which includes habitat within 120 metres. The proximity of these areas to the Oak Ridge Moraine, an environmentally sensitive area that is under significant development pressure, may account for the larger radius. PPS and official plans require the proponent wishing to develop on adjacent land to conduct an Environmental Impact Study to demonstrate that developing or altering the site will have no impact on the species and the ecological features that the species depends on. Most official plans include details about the Environmental Impact Study, as well, address areas that may overlap with the habitat of species at risk, such as wetlands and fish habitat. This may provide additional protection for species at risk. The similarities between the official plans are expected because the PPS sets the general policy directions of these documents.

Some municipalities (i.e. Archipelago Planning Board, Sudbury East Planning Board and Sudbury) included maps that identify the natural heritage sites. Official plans that included maps stipulated that the natural heritage sites might change without formal amendments to the plans (e.g. the map will change to account for new findings or changing habitat). Sudbury's official plan indicated that maps exist; however, maps were not included as an appendix to the official plan because of the sensitivity regarding the occurrence of natural heritage¹². Other municipalities may have maps but chose not to include them in the official plan. Although municipalities have natural heritage maps, many municipalities apply the generalized data (which indicates the location of species at risk within approximately one square kilometre) from the Natural Heritage Information Centre website to determine if a location may have a species at risk. Carling Township also includes the names of species at risk in the area. The differences between official plans may stem from a greater understanding of species at risk in the area or a greater public interest in species at risk.

¹² Exact locations of species at risk are sensitive because it may increase the risk of possessing, collecting, buying, selling and trading. According Sudbury's official plan, "Endangered species and threatened species are of particular significance due to their low numbers and likelihood of disappearance without protection. Often the disappearance of a particular species is closely linked to the loss of habitat... The City maintains records... sensitivity of these records prevent them from being displayed in the Official Plan." (Sudbury, 2006, p. 95).

Implementing Species at Risk Policies: Issues

Interviewing municipal and provincial government officials provided greater understanding of the issues regarding managing species at risk in Ontario. Through the interviews, I examined the challenges of implementing species at risk policies. I did not directly compare the responses because the questions varied for municipal and provincial staff; however, I grouped the information from the interviews into issues: public awareness: Integration of Science into Policy, Capacity and Reactive System.

Public Awareness

Provincial staff: *The biggest struggle is that people don't know what to do. It's not only education about the species, but it's also education about what they can do to help the species or what they are doing that's harming the species because people don't even realize that they are doing something that is bad.*

Limited awareness of species at risk results in public apathy. Engaging individuals to participate in species at risk management requires knowledge. The municipal interviewees represent the interests of their community; however, studies (e.g. Doremus, 2003; Fernandex-Gimenex, 2005; Harshaw, 2008; and Lueck and Michael, 2003) demonstrate a range of attitudes, beliefs and behaviours about species at risk. Limited knowledge may contribute to misconceptions and negative views regarding species management. Providing education about maintaining genetic diversity is needed to ensure the resiliency of the natural environment to harmful anthropogenic activities and various environmental issues (e.g. climate change). The natural environment provides valuable ecological services, including food, water and shelter; however, unsustainable practices threaten biodiversity and thus the ecological services and goods provided. Citizens can only be actively involved in managing species at risk when they are aware and informed; educating is the first step in engaging.

The public recognizes the value of biodiversity but may lack knowledge of the impact of specific actions on the environment. Harshaw (2008) conducted a survey in Southern British Columbia to understand public opinions, attitudes and beliefs about species at risk to guide management strategies. The respondents felt a strong responsibility and supported classroom education and public awareness campaigns more than incentive programs for landowners with species at risk on their property. Furthermore, 81% of the respondents indicated that toxic chemicals threaten species at risk, whereas only 71.2% thought that housing/urban development as a threat. Misconceptions may stem from a lack of communication between scientist and citizens, which may contribute to misinformed decisions.

Municipal staff: *The cottage owner is the best expert when it comes to their property. They know every inch and nook and cranny. The level of which they have awareness about species at risk... I don't know. I guess that most of their knowledge comes when they want to do something and we tell them that there is a shopping list of things that they need to do.*

Limited communication may lead to landowner anxiety about restrictions imposed by the legislation. For example, one of the interviewees indicated that most property owners support environmental protection; however, support diminishes when it restricts what he or she may do on their property. Some landowners may destroy potential species at risk habitat (Dwyler et al. 1995; Lueck and Michael, 2003; OLA, 2009). Under the PPS, an endangered and threatened species on a property prevents land development or site alteration; however, Section 17 of the ESA provides flexibility through issuing permits. Landowners may engage in activities that provide an “overall benefit”¹³. Understanding the legislation may negate landowners’ fear of restrictions on their property. For example, the Norfolk County Alternative Land Use Services (ALUS) Pilot Project demonstrates the congruency between land use activities and preserving wildlife habitat. Farmers participating in the program commit to use their land in a manner that protects the natural capital. The program compensates the farmers for delivering environmental goods and services. Farmers act as stewards providing conservation services. The ESA provides landowners with more flexibility than the previous legislation. Effectively communicating the impacts of the ESA may minimize landowner anxiety.

Through public education, protection and recovery initiatives may receive more support. For example, the State of Maine’s Beginning with Habitat program provides municipalities with ecological information, such as species data. The initiative assumes municipalities with access to ecological information will implement environmental policies to protect biodiversity. Kartex and Casto (2008) examined the effectiveness of the program. Their study demonstrated that implementing environmental policy depends on citizens’ engagement in the ecological information opposed to the engagement of planning staff. The study also emphasizes public participation in managing species. (Kartex and Casto, 2008).

Public engagement is necessary to make species at risk a priority. In the United States, much of the litigation on species at risk pertains to the low ranking species that are popular (e.g. bald eagle); however, awareness campaigns about high-ranking species (i.e. more at risk) may make the species a priority for the public (Restani and Marzluff, 2002). In turn, the Fish Wildlife Service would be pressured to fund recovery programs for neglected species (Restani and Marzluff, 2002). Interviewees’ opinions varied regarding who should be informing citizens about species at risk. For example, one of the interviewees indicated that the federal government has the best capacity to engage many Canadians about species at risk. Another interviewee indicated that the involvement of the media is crucial, because they cater to a wide audience. Public awareness may increase the biological soundness of recovery and improve species at risk management.

Integration of Science into Policy

Our understanding of species at risk evolves with improving data; however, integrating scientific principles into public policy presents challenges because conserving biodiversity depends on how well public policy complements the scientific knowledge (Eisner et al. 1995; Rohlf, 1991). Policy instruments are tools intended to coerce individuals to conduct or avoid specific actions (Pal, 2005). Pal (2005) separates policy instruments into five broad

¹³ Permits may include conditions that result in an overall benefit to the species or to society (i.e. protect human health and safety or a significant social or economic benefit). The legislation is new and no permits have been issued.

categories (coercion level increases): self-regulation, exhortation, expenditure, regulation and public ownership. Regulatory tools, such as SARA, ESA and PPS restrict some individuals from engaging in land use activities to protect species at risk.

Though SARA, ESA and PPS shape individuals' behaviours, public opinions affect the implementation of the statutes and corresponding regulations. An array of factors, such as economic and ecological importance, charisma, evolutionary distinctiveness and endemism, affect the listing of a species. In a survey to determine individuals' priorities for managing species at risk in southern British Columbia, respondents preferred endemic species¹⁴. Public opinion is an important component of conservation policy, because publically supported initiatives are more likely to succeed. (Meuser et al. 2008).

Incomplete data is one of the barriers to manage species at risk. Carden (2006) examined the limitations of integrating science into law. First, environmental law requires concrete data; however, environmental data is evolving. Adminstrating legislation is a political process that depends on scientific data. SARA and ESA apply population trends to determine a species status. Scientific data does not provide a blueprint to make decisions. Applying science to law and policies requires understanding scientific principles to make concessions for gaps in data and the inherent uncertainties that stem from a complex system that is not fully understood. Though scientific knowledge improves with better landscape data, the science applied at the inception of determining a species status or recovery program may not be precise enough to determine population trends or understand the interactions (e.g. the interaction between the biological and physical components) (Pal, 2005). As a result, gaps exist when applying scientific data to a policy decision. Second, environmental law segregates issues or disciplines (e.g. law, science, public policy, etc.) but species at risk legislation requires understanding the interconnected and dynamic processes that shape the natural environment. Economic, cultural and societal values (e.g. engagement of land use activities) affect species at risk management. Since planning integrates all those values to shape the physical landscape, incorporating species at risk management at the municipal level may be appropriate. Through understanding the inherent weaknesses of integrating scientific information into policy, better approaches may be taken.

Capacity

MNR Staff: *The biggest struggle that we have in Ontario is that we don't know where all the species occur... we are looking at three aspects: one is drawing a line on a map and saying this is habitat. The second is a description... and third is key features... the primary issue is that we don't know where all of those are. It's not so simple that we can draw a line on a map, which is what everyone wants... We don't have the technology or data to do that.... The next concern is when we have species with a broad range...*

¹⁴ Endemism: species only or mainly occurring in one geographical region. Meuser et al. (2008) focuses on British Columbia or species occurring in BC and nowhere else in Canada. The paper suggests that COSEWIC listings are biased towards endemic species. COSEWIC listings, which are based on scientific data, are congruent with public opinions. Since endemic species have restricted ranges, the small range size is a predictor of current and future threats.

Most interviewees mentioned lack of data and limited resources as the main barriers to implementing species at risk legislation.¹⁵ Improving data would assist with land use decisions; however, most habitats are undefined. Identifying habitat requires monitoring species over many years to understand their life cycle pattern (i.e. habitat needs may vary through a species' life cycle) (McKinney, 2002). Some species, such as Hognose Snake, do not adhere to specific habitat features. As a result, defining habitat boundaries require extensive surveys. MNR does not have the resources to conduct extensive surveys for all species. The lack of data and mapping limits municipalities' ability to implement the policies to prevent development and site alteration on endangered and threatened species.

Municipal Staff: *Our planning department here implements broad base provincial policies at the local level...MNR have excellent brochures and pamphlets for people who want to engage in stewardship on their property... We use their mapping quite a bit... Every consent application, we screen ahead of time and we use their website. That is the trigger for any environmental study.*

Species at risk occurrence and mapping are tools that the municipality may apply to make a decision regarding development and site alteration (Carden, 2006). This may be problematic due to the lack of data regarding species and habitat. Lack of data available about habitat limits municipalities' abilities to implement initiatives and coordinate efforts with neighbouring municipalities. Development or a site alteration project may occur on a property with a natural heritage feature because of gaps in available data. With ecological information, municipalities may implement the policies to protect species (Kartex and Casto, 2008).

Municipal Staff: *In our official plans, we have areas identified as 'significant habitat'. We don't know what they are. It's provided to us from the Ministry of Natural Resources. I don't know what it necessarily is. I basically have a dot on a map saying that it is significant habitat. It could be a sighting occurrence or something along those lines. So they [maps] are not that helpful or used very often but it is there in our official plan nonetheless.*

Small municipalities may lack the financial resources to hire a biologist on staff but have a great amount of control over land use activities. This presents a question as to whether municipalities are the appropriate body to make decisions regarding development and site alteration on significant habitat when staff may lack the knowledge of scientific theories (Carden, 2006).¹⁶ Prior to 1996, MNR assisted in developing official plans and approving subdivision proposals; however, the system transformed into a one-window approach to prevent duplicating efforts. MNR provides technical expertise through mapping and data (i.e. Natural Heritage Information Centre) but managing species at risk involves complex decision-making with incomplete data. Though decisions are based on the 'best available

¹⁵ One municipal interviewee indicated that the lack of resources for species at risk management was not an issue, regardless of more funding, the municipality would not engage in species at risk management because it's the provincial responsibility. Another municipal interviewee indicated that staffing was not an issue but reinforced the lack of data presents issues.

¹⁶Not applicable to all municipalities. In some circumstances, municipal staff may include biologists, etc. Each municipality has different capacities.

data'¹⁷, gaps in knowledge may lead to biased judgments that incorporate individuals' values. With limited data, a rational basis for decision-making is needed because postponing mitigation measures may result in irreversible damage (Theobald et al, 2000).¹⁸ According to the Ontario Biodiversity Strategy, better information, clearer guidelines and technical support about natural heritage features are needed to ensure that the provincial policies are implemented into land use planning without encumbering municipalities (MNR, 2005). Improving the current system requires increasing staffs' knowledge about species at risk.

Reactive System

Municipal Staff: *The official plan is saying we'll undergo impact studies during planning applications and so on. It is really development driven. If someone is proposing development, a review is needed. If no one is proposing development, significant development, a review is not done because we do not have the resources. So the policies and tools are there more of a reaction to [development] instead of proactive to speak... To be proactive, you'd have to go out there and do mapping of all the habitats, especially when dealing with endangered species.*

Managing species at risk deals with specific threats instead of preventing or anticipating threats, creating a reactive system (Cort, 1996). Many of the interviewees indicated that the current system only considers species at risk at the development stage because of limited data regarding species at risk. Thomas Gunton's planning cycle theory applies to the current system to protect natural heritage features: a lag exists between realizing the problem and implementing the planning initiative (Gunton, 1985). Managing species at risk at the time of development is reactive. Instead of municipalities controlling the situation, they act in response to it.

The current system perpetuates the planning trap by applying incremental planning. The risk of extinction pressures the government to act, resulting in the remedy of the immediate problem without much consideration for the future. According to Carden (2006, p. 230) "[We] muddle through one crisis after another without truly understanding the nature of the problems, solving them, or gaining insight into why the process is not effective." The limitations may stem from the lack of comprehensive data. The need to act immediately to prevent extinction creates a management system comparable to an emergency room. As Carden (2006, p. 235) indicated,

"Another shortcoming of the ESA is that it is a reactionary piece of legislation that waits until the situation hits crisis-level before responding. This emergency-room mentality means that often we treat the symptom (e.g., decline in species population) rather than the disease (e.g., overexploitation, habitat loss)."

¹⁷ In some circumstances, may not have conclusive data but apply the available information to base the decision.

¹⁸ The needs of species at risk require a multi-disciplinary approach that recognizes individuals' role in an ecosystem. A multidisciplinary framework may better address the competition over interests that create conflict.

The current strategy is ineffective. Restani and Marzluff (2002) study demonstrates that the effectiveness of the current strategy to managing species at risk in the United State is poor because limited species are taken off the list with implementing recovery action. Since implementing the US ESA in 1973, the government has only delisted 12 species, four of which were improperly designated (Doremus and Pagel, 2001). Species threatened by development rarely qualify for delisting (Doremus and Pagel, 2001). Since most species are on the list due to habitat loss, they may remain on the list forever (or until extinction) (Kerr and Deguise, 2004). The need to act is vital; however, this need should not exclude forward thinking about goals for specific population or preventing species from becoming at risk.

Planning acts as a means of staying ahead of social trends to avoid the planning cycle trap. Avoiding the trap requires addressing the challenges (e.g. limited data) and strategic planning. As Carden (2006, p. 205) said, “A more inclusive, multidisciplinary, and flexible process, founded in good science and appreciative of people’s place within a given ecosystem, will not only enjoy broader public support but will also be more effective in achieving species and ecosystem conservation goals.” Instead of municipalities reacting to development applications, they need to control the situation to prevent species at risk.

Bridging the Gap: Development, Species at Risk and Municipalities

Through examining the issues with implementing species at risk policies, I gained a better understanding of how municipalities, as well MNR and MMAH view municipalities in species at risk management. Research and interviews suggest integrating biodiversity principles into planning is necessary.

Current Role of Municipalities

Provincial staff: *There is not a direct responsibility for municipalities other than when they are the proponents. So, if they are doing an activity where they may contravene the act, then they are subject to the same provisions as anybody else. Where they can play role is in terms of education and outreach tool because they are the first point of contact for their constituents, so we are trying to partner with them, in turns of informing the public.*

Managing species at risk involves many players. The interviewees were asked, “Which groups do you think should be most responsible for species at risk protection and recovery?” Each ranked various players¹⁹ from most to least responsible. All the interviewee had a different response; however, each recognized the importance of all the players in managing species at risk. Most interviewees mentioned the municipal role with respect to development. Municipalities regulate land use and review development and site alteration plans to ensure that the projects do not conflict with policies (e.g. natural heritage policies). Municipalities are not legally obligated or accountable to protect and recover species at risk. Although the onus is on the landowner to ensure that their property does not contain habitat before developing or altering the site, the municipal involvement is undeniable (Cort, 1996; Theobald et al, 2000). Although the official plans comply with the PPS by restricting development and site alteration on habitat of endangered and threatened species, municipal role is limited because species are only a priority at the time of development. In addition, existing policies do not account for limited awareness and data, which restrict implementation. The system is reactive and uncoordinated between different municipalities. Improving management requires better education for the public and implementers, as well as strategic planning that incorporates biodiversity principles into municipal policies.

All municipal interviewees indicated that species at risk are a priority when reviewing development or site alteration applications. As a result, the process considers species at risk on specific properties.

¹⁹ The players included local governments, the provincial government, the federal government, First Nations, individual citizens, industrial/commercial users and private landowners.

Municipal staff: *It [species at risk management] is really development driven. If someone is proposing development, a review is needed. If no one is proposing development, a review is not done because we do not have the resources. So the policies and tools are there more of a reaction to [development] instead of proactive to speak.*

The lack of information regarding species occurrences inhibits municipalities to implement initiatives regarding biodiversity. Limited data may result in planning approaches that focus on protecting specific natural features (e.g. endangered and threatened species habitat). This may lead to fragmentation, whereby the landscape consists of remnant patches that have limited ecological function (natural processes, products or services that the natural environment provides) and are isolated from the natural landscape (MNR, 2009). Remnant patches are poor quality habitats that become population sinks, unable to support native species (McDonald et al. 2008; McKinney, 2002). Focusing on specific natural features, instead of the whole landscape, is ineffective at maintaining populations.

In many circumstances, limited data is perceived as a challenge to implementing species at risk policies; however, understanding the scientific principles may assist with implementing frameworks to address species at risk and biodiversity before the development stage. Currently, the lack of scientific knowledge at the municipal level may act as a constraint to applying available data and forming appropriate judgments for species at risk management. Species at risk occurrence and mapping are tools to assist with decision-making but do not provide a blueprint (Carden, 2006). The information is incomplete but evolving as technology improves landscape analyses. Individuals responsible for land use decisions need to recognize the weaknesses of the data to make appropriate decisions. This requires understanding the scientific principles to properly assess (Carden, 2006). Regardless, overcoming the reactive system requires increasing knowledge regarding natural heritage, including endangered and threatened species. Improving scientific knowledge of implementers through increase workshops may improve species at risk management at the municipal level.

Many municipal bodies control development; the political hierarchy of municipalities result in development that is diffused throughout time (Cort, 1996; Theobald et al, 2000). Though municipalities follow the provincial mandate, each makes decisions without considering how its actions will affect neighbouring municipalities, resulting in a cumulative effect on the natural landscape over time (Theobald et al, 2000; Kartex and Casto, 2008). According to Kartex and Casto (2008, p. 467), “This severely undermines the possibility of achieving the landscape – scale continuous habitat blocks and corridors that ecologists now argue are essential to preserving the integrity and resilience of entire population and communities of organisms.” Municipal coordination is fundamental to an undisruptive settlement patterns.

The natural heritage is an integral part of what makes each municipality unique (Eaton and Boate, 2003). Through effective planning, municipalities may protect natural heritage, reinforcing municipal involvement in species at risk management; the current system is uncoordinated and only requires municipalities to consider biodiversity at the time of development. This results in the reactive system that applies incremental planning, which fails to meet the objectives of the PPS or the Biodiversity Strategy. A new approach is

needed to encourage municipalities to develop natural heritage systems to maintain or restore linkages between features.

Biodiversity in Planning

Managing species at risk in Ontario is reactive and uncoordinated because of the lack of data and knowledge. Improving education about biodiversity and describing species at risk as a symptom of unsustainable practices may assist with fostering a stewardship approach to species at risk management. Anthropogenic activities, such as development, threaten species survival. Unmanaged development patterns may fragment valuable habitat, contributing to the growing number of species listed as 'at risk'. Biodiversity is generally ignored in North American planning periodicals (Tamminga, 1996, p. 245); however, understanding the natural landscape is the primary step to prevent population from declining.

Integrating biodiversity principles into land use planning and management is needed, regardless of the challenges. Challenges of integrating biodiversity principles into planning may stem from limited or incomplete scientific data, conflicting objectives of plans that relate to both conservation, economic and social development, and addressing biodiversity at the time of development (Fallding, 2004). Overcoming the limitations of incorporating biodiversity principles depends on innovative solutions. Two case studies illustrate how municipalities may incorporate biodiversity principles into planning: Town of Markham, Ontario, and Los Angeles and San Diego, California.

Communities face different pressures. Intense development without strategic planning fragmented Southern Ontario, acting as a precautionary tale for the north. An exception, Town of Markham, Ontario conducted a natural features study. Ecologists, planners and landscape architects developed a Plan for the Environment. The plan provides a framework for protecting, restoring and linking natural features to maintain valuable habitat and ecological diversity. The plan applied theory, field inventories and observations to prescribe ecological blocks and connect corridors. The Town of Markham demonstrates that extensive planning may be effective at maintaining ecological patterns and processes. (Tamminga, 1996).

Shearer et al. (2005) explored how uncertainties related to urban growth in the rapidly developing area between Los Angeles and San Diego might influence the natural systems. According to Shearer et al. 2005 (p. 359), "As urbanization removes or degrades habitat, these large and largely unbuilt properties are increasingly important for maintenance of regional biodiversity." Shearer et al. (2005) conducted a geographic vulnerability analysis to examine how the regional response may change with different forces. Regardless of the uncertainties (e.g. climate change), Shearer et al. were able to create a growth strategy. This study emphasizes that landscape approach is vital because protecting individual features or species is not enough to achieve meaningful conservation.

Provincial Staff: *A big problem that we have right now is a lot of species at risk are snakes, little slimy creatures, insects, things that people don't care about, so the stewardship thing is fundamental because education is the main key to recovering species.*

All these case studies demonstrated the need to foster landowner stewardship²⁰. For example, Fisheries and Oceans applied a stewardship approach in the Fraser River, Lower Mainland of British Columbia because urban development to meet the needs of the escalating population threatened fish habitat (Heitkamp, 1996). From applying a stewardship approach, Fisheries and Oceans learned that stewardship requires comprehensive planning for human settlements and strategic planning (e.g. developing plans, such as the Fraser River Action Plan) to ensure that the needs of the community and the fishes are met (Heitkamp, 1996). Through planning for biodiversity, species may be protected from becoming at risk, preserving wildlife for future generations.

Conclusion

Our actions undermine the value of the natural environment when development only considers the economic gains. Unsustainable anthropogenic activities combined with limited value placed on biodiversity threaten species' survival. The current process to manage the 572 species at risk in Canada does not acknowledge the problems (i.e. why populations are declining); instead, it attempts to preserve remnant patches with limited ecological value. The system applies incremental planning, reacting to rather than strategically managing situations. We are urged to act without considering the future. Though we cannot hesitate, we need to amend the current system. Improving the process may involve better public awareness campaigns to foster landowner stewardship and better access to species information; furthermore, provinces need to take a proactive stance to ensure that preserving biodiversity is a provincial priority reflected in the PPS and consequently all official plans in Ontario. Municipalities will implement land use tools if biodiversity is a provincial priority.

Limited knowledge may contribute to misconceptions and negative views about species; however, educational programs may improve attitudes and foster engagement in managing species at risk. For example, the Eastern Massasauga Rattlesnake's recovery team developed an awareness campaign to educate citizens about the species' natural history, distribution and status. This has encouraged public participation in the monitoring program; individuals have submitted 280 species observations (Clayton and Upton, 2004). The current educational resources (i.e. the website, brochures and pamphlets) in Ontario are minimal and ineffective communication tools. A municipal interviewee said, "Most homeowners/ property owners are not knowledgeable on it [species at risk]. Now in the... area, a lot of people are knowledgeable on the [Eastern Massasauga] Rattlesnake problem because it is in the media all the time... The media plays a stronger role than the governments are [at informing the public]." Whether through media or other means, the provincial government needs to improve the tools to educate and engage citizens to be stewards.

Provincial documents, such as the Ontario Biodiversity Strategy promote implementing biodiversity principles into municipal policies to maintain species diversity (MNR, 2005). Biodiversity principles may be included at different planning phases (see Table 3). Currently, municipalities are not obliged to integrate biodiversity policies into

²⁰ In the article, Hietkamp (1996, p. 252) applied the Fisheries and Oceans definition of stewardship. "Stewardship refers to co-operative forms of planning and management of environmental resources in which all users and managers share the responsibility for management and conservation. Stewardship embodies a new ethic of caring for local ecosystems in the interests of long-term sustainability. Stewardship includes but goes beyond voluntary efforts by community groups. Stewardship requires sharing of decision-making authority, of responsibility for ecosystem protection and of the benefits of a given resource. Stewardship provides priorities for the management of local ecosystems for sustainability."

official plan. This may be problematic because a study in the United States demonstrated that the amount of environmental information incorporated into municipal plans depends if the governing state reviews the document (Cort, 1996). In Ontario, incorporating biodiversity policies into the PPS would ensure that municipalities implement such policies in their official plans.

Table 3. Biodiversity may be incorporated at different planning phases (adapted from Fallding, 2004).

	Planning Activity	Scale	Matters to Consider
Strategic phases (plan making)	Preparing regional/local strategies	Regional/local	Review regional information to provide context to understand it for location of land use and infrastructure, development issues, land characteristics and landscape processes.
	Making local plans (provides the framework for development)	Local	Identify biodiversity values, and information that is required for planning. Set board objectives and land use trade-offs. Determine approval framework. Make board policy decisions for land use regulation, development and management.
	Making a master plan (subdivision layout)	Precinct/estate	Review options for arrangement of land use (e.g. conservation subdivision design).
Development Assessment Phases (Plan Implementation)	Assessing subdivision of land	Street/subdivision	Set long-term location of roads and infrastructure, and the pattern of land use. Provides opportunities for subsequent development and biodiversity loss.
	Assessing development	Lot	Design development to recognize biodiversity. Provide framework for long-term management.
Management Phase	Managing land	Site/building	Management practices and actions such as vegetation clearing or planting. Actions at this stage are strongly influence by earlier planning decisions.

Municipalities may adopt various conservation strategies at different planning phases: conservation ordinances, open-space plans and zoning provisions for open space, natural areas and habitat. Municipalities may also purchase open-space lands and land easement, or prioritize land and work with neighbouring towns to conserve high-value habitats. In addition, municipalities may assist with landowner education and outreach, since they are the first point of contact when proponents want to develop or alter their property. (Kartez and Casto, 2008).

Conservation relies on scientific data but reflects societal values (Theobald et al., 2000). Science may inform decisions; however, individuals must decide the appropriate course of action considering all the factors (e.g. socio-economic perspective) (Carden, 2006). The public should be involved in management due to the essential ecological goods and services (e.g. clean water and air, productive soils and other forms of green infrastructure) rendered. As municipalities are the level of governance directly involved with local populations, they may improve landowner stewardship and awareness (Eaton and Boate, 2003). An interviewee from the province indicated, “[Municipalities] can play a role is in terms of education and outreach tool because they are the first point of contact for their constituents, so we [MNR] are trying to partner with them, in turns of informing the public. Municipalities’ relationship with residents may foster local engagement in conservation activities (Eaton and Boate, 2003). Municipal involvement may be the missing link in managing species at risk and biodiversity.

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Appendices

Appendix A: Municipal Structure

Table A. The areas affected by the expansion of Highway 69. Please note that Population and Land Area are derived from Statistics Canada, 2006 and * represent areas with official plans.

District/ County	Planning Board	Municipality/ Township	Pop Size	Land Area Km ²	Pop / km ²	Municipal Powers	
Simcoe County*	-	Township of Severn*	12,030	534.78	22.5		
District of Parry Sound	-	Township of Seguin (amalgamated Townships Foley and Humphery)*	4,276	586.17	7.3	Consent only	
	-	Municipality of McDougall*	2,704	262.69	10.3	Consent and subdivision	
	-	Carling Township*	1,123	243.94	4.6	Consent and subdivision	
	-	Shawanaga (unincorporated township)	193	31.90	6.1	Planning Board does consents and subdivision approvals	
	Archipelago Area Planning Board		Township of Archipelago	512 (year round)	589	0.9	Consent and Subdivision
			Wallbridge Township (unincorporated township)				Planning Board does consents
			Henvey Township (unincorporated township)	15	85.14	0.2	Planning Board does consents
			Mowat Township (unincorporated township)				Planning Board does consents
District of Sudbury	Sudbury East Planning Board*	-					
		Delamere (unincorporated township)				Planning Board does consent and subdivision	
		French River Municipality	2,659	734.26	3.6	Planning Board does consent and subdivision	
		Cox Township (unincorporated township)				Planning Board does consent and subdivision	
		Servos Township (unincorporated township)				Planning Board does consent and subdivision	
		Township of Burwash (unincorporated township)				Planning Board does consent and subdivision	
		Sudbury*	21,392	38,504	0.6	The City has approval authority for everything except condos, official plans.	

Appendix B: Interview Questions

Two sets of questions were developed because of differences in knowledge between municipal and provincial staff about species at risk and land use planning.

Interview Questions for Planning Departments:

The purpose of the interview is to gain a better understanding of what municipalities are currently doing to protect and recover species and to explore their potential role in helping to manage species at risk. For question 4, 5 and 6, please consider what works and what requires improvement.

- What policies, programs and tools are in place to consider wildlife habitat and species at risk at the municipal level?
- What kind of communication takes place between the provincial or federal government and your municipality about species at risk (e.g. sightings, recording)?
- How do the three levels of governments coordinate efforts regarding species at risk (e.g. prevention, habitat mapping, awareness programs, etc.)?
- To what extent are private landowners engaged with species at risk issues?
- Species at risk management requires many players. Which groups do you think should be most responsible for species at risk protection and recovery?
Of the following groups, which are the most responsible and which the least (please rank them in order from most to least responsible): local governments, provincial government, federal government, first nations, individual citizens, industrial/commercial users and private landowners.
- To what extent are species at risk a planning priority? To what extent is the prevention of species becoming at risk of extinction a planning priority?
- What factors encourage municipalities to engage in species at risk management? What factors discourage municipalities from engaging in species at risk management?
- What would it take to increase municipal engagement in species at risk issues?

Interview Questions for Provincial Staff:

The purpose of the interview is to gain a better understanding of the current and potential role of municipalities in species at risk management.

- What kind of communication takes place between the federal, provincial and federal governments about species at risk (e.g. sightings, recording)?
- How do the three levels of government coordinate efforts regarding species at risk (e.g. habitat mapping, awareness programs, etc.)?
- To what extent has the Provincial Policy Statement been affected by the *Endangered Species Act*?
- Legislation for species at risk is developed at the federal and provincial level but what are the expectations for municipal involvement in species at risk issues?
- What policies, programs and tools are in place to consider wildlife habitat and species at risk at the municipal level?
- To what extent are species at risk a planning priority? To what extent is the prevention of species becoming at risk of extinction a planning priority?

- What factors encourage municipalities to engage in species at risk management?
What factors discourage municipalities from engaging in species at risk management?
- Species at risk protection and recovery requires many players. Which groups do you think should be most responsible for species at risk protection and recovery?
Of the following groups, which are the most responsible and which the least (please rank them in order from most to least responsible): local governments, provincial government, federal government, first nations, individual citizens, industrial/commercial users and private landowners.
- In general, are the current efforts sufficient for species at risk management? Where should efforts be focused for species at risk management?

Appendix C: Glossary

The terminology is taken directly from Canada's *Species at Risk*, Ontario's *Endangered Species Act* and Ontario's Provincial Policy Statement:

Development: means the creation of a new lot, a change in land use, or the construction of buildings and structures, requiring approval under the Planning Act, but does not include:

- a) activities that create or maintain *infrastructure* authorized under an environmental assessment process;
- b) works subject to the Drainage Act; or
- c) for the purposes of policy 2.1.3(b), underground or surface mining of *minerals* or advanced exploration on mining lands in *significant areas of mineral potential* in Ecoregion 5E, where advanced exploration has the same meaning as under the Mining Act. Instead, those matters shall be subject to policy 2.1.4(a).

Ecological Function: means the natural processes, products or services that living and non-living environments provide or perform within or between species, ecosystems and landscapes. These may include biological, physical and socio-economic interactions.

Endangered species: a wildlife species that is facing imminent extirpation or extinction

Extirpated species: a wildlife species that no longer exists in the wild in Canada

Habitat: b) in respect of other wildlife species, the area or type of site where an individual or wildlife species naturally occurs or depends on directly or indirectly in order to carry out its life processes or formerly occurred and has the potential to be reintroduced

Natural heritage features and areas: means features and areas, including *significant wetlands*, *significant coastal wetlands*, *fish habitat*, *significant woodlands* south and east of the Canadian Shield, *significant valleylands* south and east of the Canadian Shield, *significant habitat of endangered species* and *threatened species*, *significant wildlife habitat*, and *significant areas of natural and scientific interest*, which are important for their environmental and social values as a legacy of the natural landscapes of an area.

Natural heritage system: means a system made up of *natural heritage features and areas*,

linked by natural corridors which are necessary to maintain biological and geological diversity, natural functions, viable populations of indigenous species and ecosystems. These systems can include lands that have been restored and areas with the potential to be restored to a natural state.

Negative impacts: in regard to other *natural heritage features and areas*, degradation that threatens the health and integrity of the natural features or *ecological functions* for which an area is identified due to single, multiple or successive *development* or *site alteration* activities.

Recovery strategy: a strategy to recover species at risk

Significant: in regard to the habitat of *endangered species* and *threatened species*, means the habitat, as approved by the Ontario Ministry of Natural Resources, that is necessary for the maintenance, survival, and/or the recovery of naturally occurring or reintroduced populations of *endangered species* or *threatened species*, and where those areas of occurrence are occupied or habitually occupied by the species during all or any part(s) of its life cycle

Site Alteration: means activities, such as grading, excavation and the placement of fill that would change the landform and natural vegetative characteristics of a site. For the purposes of policy 2.1.3(b), *site alteration* does not include underground or surface mining of *minerals* or advanced exploration on mining lands in *significant areas of mineral potential* in Ecoregion 5E, where advanced exploration has the same meaning as in the *Mining Act*. Instead, those matters shall be subject to policy 2.1.4(a)

Species at risk: means an extirpated, endangered or threatened or species of special concern

Species of special concern: a wildlife species that may become a threatened or endangered species because of combination of biological characteristics and identified threats

Threatened species: a wildlife species that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction