Effects of the Physical Presence of Transmission Lines

The physical presence of **transmission lines** can have an effect on **wildlife**. These potential effects include long-term changes to **habitat**, bird strikes, access issues, noise effects and associated avoidance behaviour, and **electric and magnetic fields**.

*An artificial nesting platform alongside a **right-of-way***

Two key concepts are associated with the long-term presence of transmission line rights-of-way in wildlife habitat: **edge effect** and **habitat fragmentation**. While the mixture of habitats created by rights-of-way can allow greater density and diversity of wildlife to be present, transmission lines may also produce a negative edge effect for some species which require large, undisturbed habitat.

Rights-of-way can create an edge effect, which refers to the border between different types of habitat and it is regarded as an important component of wildlife habitat. **Vegetation** composition changes in the newly created edge because plant species that do well in high light conditions become more widespread and abundant while interior species not accustomed to higher light intensity are eliminated.

Changes to habitat composition will also change habitat quality for plants and animals which can have a positive, negative or neutral effect depending on the species[7].

Habitat fragmentation refers to plant communities that have become divided or isolated. Individual transmission line projects may fragment the landscape by dividing large blocks of forested habitat into smaller blocks which can result in a decline in species within the remaining forests. The northern spotted owl is one example of a raptor dependant on old growth forest that is negatively affected by fragmentation[8]. Woodland caribou, which require large tracts of relatively undisturbed habitat may also be negatively affected by any habitat fragmentation effects caused by transmission line rights-of-way[9].

Manitoba Hydro continues to be involved in ongoing caribou-related studies including conducting aerial surveys and radio collaring of woodland caribou.

Edge effect refers to the border between different types of habitat

Do rights-of-way form a barrier to wildlife movement?

Whether a species is vulnerable to **habitat** change is directly related to its ability to adapt to changes in habitat. Relatively few animals find the **right-of-way** to be a barrier. Rights-of-way may displace or impede movements of some birds, marten and other small mammals that inhabit small territories or home ranges in mature forest or that have difficulty crossing non-forested gaps[10].

Small animals will avoid using a right-of-way itself, but instead concentrate along the edge. Birds, furbearing mammals, and ungulates (moose and deer, for example) are commonly seen feeding and travelling along rights-of-way.

Rights-of-way are not barriers for wide-ranging species such as moose and bear

Narrow linear clearings do not act as barriers to movements of wide-ranging species such as moose and black bear and may even create travel corridors for predators such as wolves, enhancing their movement and hunting opportunities within their range[11].

To enhance **wildlife** movement across the right-of-way, **mitigation** measures may include establishing wildlife corridors, or uncleared strips across the right-of-way. Slash piles may also add to habitat for small animals.

Wolves may use rights-of-way to enhance their movement and hunting opportunities

During winter, a right-of-way may create a tunnelling effect when passing through dense forest which may result in an accumulation of drifting snow. Depending on the time of year, time needed to compact the snow, and the type of animal moving in the right-of-way, snow-drifting can have a small negative effect on the movement of animals. In a positive way, it may create better thermal cover for small mammals that tunnel and burrow under the snow.

Will right-of-way access have an affect on wildlife and wildlife habitat?

New **rights-of-way** have the potential to create additional local access. Snowmobile, ATV and other means of access may result in the introduction of non-native plant species and the increased potential for accidental fires. There are other positive and negative effects on **wildlife** and wildlife **habitat**, including new access for hunting, trapping, fishing and gathering activities. When the potential for effects from increased access is an issue, an Access Management Plan will be prepared to identify and minimize access issues and concerns.

Access created by transmission line rights-of-way may affect a variety of activities from fishing, hunting and trapping to gathering plants, berries and fuel wood, wild rice harvesting, outfitting, mining claims, forestry and tourism.

Transmission line rights-of-way are not public roads and are not intended or designed for public travel. Fens, bogs, streams, rivers, rock outcrops and other terrain can make rights-of-way very difficult to negotiate with most motorized vehicles, particularly during spring, summer and early fall. Winter use is more common[12] and is directly related to factors such as

- The presence of intersecting roads or nearby communities
- The remoteness of the area
- The type of terrain
- The presence of alternate travel routes

Increased access to resources such as big game or fish can be viewed both positively and negatively. Manitoba Hydro does not encourage travel along rights-of-way but it can be expected that some travel for varying purposes will occur. Signage is strategically placed to deliver information for safety or education purposes.

Signage is often part of an Access Management Plan

What will be the effect on trapper access to wildlife populations?

Increased access along a **transmission line** may occur depending on the terrain and remoteness of the transmission lines, the number of traplines crossed by the transmission line, the total number of trappers concentrated in an area, and the availability of other travel corridors. In some areas the **right-of-way** will benefit trappers by providing them with the opportunity for easier winter access to a trapline. Remote access from a new right-of-way may even allow some trappers to gain access to previously inaccessible **wildlife** populations.

Annual fur sale in Thompson, MB

The **edge effect** of rights-of-way on plant communities will provide new **habitat** for hares and other small mammals, which in turn will attract furbearing predators and improve the potential for increased production of wildlife. The total production of animals and available harvest opportunities for different species depend on the quality and quantity of wildlife habitat crossed by the transmission line right-of-way and the total number of trappers accessing the right-of-way. For example, increased human access to rights-of-way and related hunting and trapping-related mortality could result in an abandonment of these areas by some furbearers[13].

Manitoba Hydro is very interested in better understanding furbearer behaviour and trapper success along newly constructed and existing transmission lines. To help achieve this, a pilot study has been initiated to work with local trappers in northern Manitoba. Various aspects that could have influence on furbearers are being observed including small mammal populations, furbearer behaviour, weather statistics and trappers harvest. Results of this study could help future Site Selection and Environmental Assessments for transmission lines whereby helping to minimize negative impacts and increase positive ones.

Will the transmission line right-of-way cause an increase in hunting and fishing access and harvest pressure?

During construction of the **right-of-way**, hunting and fishing access may increase while winter trails are usable. After construction, rights-of-way may create increased opportunities for access and resource harvesting. The increase in harvest pressure from increased access and its effect on **wildlife**, is directly dependent on the density of harvestable species in the area and on the number of hunters and fishers which take advantage of this new access.

Over the long-term, the right-of-way will provide winter access and limited summer access depending on the type of terrain the right-of-way crosses. An increase in hunting may occur due to the presence of a **transmission line**. Long-term access could have a small, local negative effect on animal populations. For example, birds of prey such as eagles are more vulnerable to increased harassment along some accessible rights-of-way.

A trapper's cabin in northern Manitoba

Many navigable waterways have access points, and a stream or river could be fished along its length regardless of a new access point created by the line. However, new transmission lines could increase access in previously inaccessible fishing areas and potential for increased access could increase the harvest of fish.

If the potential for increased access is an issue, an Access Management Plan may be developed towards minimizing the potential adverse effects of access. It will identify the location of access corridors, how they will be developed and managed to minimize effects to wildlife habitat, and when and how they will be decommissioned. It may also identify if and when right-of-way clearing and maintenance methods will be managed to limit future access.

Mitigation can involve additional efforts by Natural Resource Officers to patrol access trails or rights-of-way during the hunting season to monitor hunting pressure. Other measures that might be applied include education of the work crew before the start of construction, imposing firearms restrictions within work camps, road closures, hunting season changes, and co-operative agreements to manage wildlife and hunting near rights-of-way.

Do transmission lines cause bird mortality?

There is a possibility of bird collisions with any man-made obstacle, including **transmission lines**. In general, proposed routes try to avoid crossing or paralleling water bodies or other **habitat** where large numbers of birds gather during the breeding or migratory seasons.

Proposed transmission line routes generally avoid areas where birds gather in large numbers

Bird mortality from collisions with lines or electrocution is biologically significant when it results in a measurable change, for example in population size. The effect of **bird strike mortality** can be judged biologically significant only if it results in population decline. Manitoba Hydro does not have any indication that this scale or type of effect is occurring, but is actively studying the issue. **Mitigation** measures minimize the potential for biological effects.

Data on bird mortality from transmission lines is difficult to obtain. Methods generally include visually monitoring bird movements and dead bird searches. A partial list of factors which influence bird collisions with transmission lines are shown in Table 2.

Estimates of bird deaths in the USA from electrocution are in the range of thousands per year while collisions are in the range of hundreds of thousands to 175 million per year[14]. However, estimates of bird deaths vary considerably. Bird-wire collisions are rarely reported for many thousands of kilometres of transmission lines in North America, or are limited to a particular location or season. There are documented cases of problem sites. For example, one study near prairie wetlands and lakes in North Dakota estimated 124 bird deaths per kilometre per year[15].

Table 2: Factors which may determine the number of bird collisions expected with a transmission line

General Category	Factor	Suspected High Collision Risk Situation
Bird Biology	Species	Nocturnal fliers and those with awkward flight characteristics
	Wing loading	Heavier body and smaller wings restricts manoeuvrability
	Age	Immature birds
	Health	Sick or injured birds
	Migration	Migrants as opposed to residents
	Sex	Birds involved in nuptial displays, gender related size/movement patterns
Flight	Flight intensity	Large numbers crossing **rights-of-way**
	Altitude	Lower than uppermost wires
	Size of flocks	Large flock with small spacing between birds
	Time of flight	Nocturnal or diurnal flights during inclement weather
Transmission Line	Tower type	Guyed structures, tall towers at river crossings
	Voltage	Lower voltage line
	Conductor	Small diameter single conductor
	Number of lines	Double circuit lines with wires at different heights
	Overhead ground	Multiple wires with small diameter
	Line length	Long line running through high use area
	Age of line	Newly constructed lines before birds can habituate to it
	Aircraft warning lights	Non-flashing lights on towers in established flyways
Environment	Weather	Fog, snow, rain, sleet, high winds
	Habitat	Attractive habitat on or surrounding right-of-way
	Human activity	Hunting, other activities which startle birds
	Location	Lines located perpendicular to narrow, low altitude flyways

Manitoba Hydro takes into consideration areas of high bird traffic during the routing of transmission lines and to the extent possible, avoids wetlands, lakes or other high bird traffic areas. When unavoidable, potential problem sites are identified and mitigation measures such as bird diverters are used to prevent bird-wire collision.

Past studies have shown that, in general, bird deaths due to collisions with power lines are considered an unimportant source of mortality at the population level[16]. However, under certain circumstances collision losses can be biologically significant, for example, if the species is threatened or endangered[17]. No such examples are known of in Manitoba.

In Manitoba, data collected by the Manitoba Wildlife Rehabilitation Organization (MWRO) from 1989 – 1992 indicate that over this four year period, transmission line collisions accounted for 2.5% (49 cases) of all bird injuries brought to the organization. However, distinctions were not made between transmission line, distribution line or telephone line collision injuries. Birds of prey accounted for 40% of those collisions. Volunteers with MWRO successfully rehabilitated and released about 15% of all these cases.

A family of mallard ducks

Bird mortality from transmission and distribution lines can be compared to mortality from other sources. The first attempt to estimate bird mortality from human causes in the U.S. suggested 1.9 percent of the then bird population were killed by human causes and the majority were hunting-related. More recent estimates suggest that vehicle strikes and building and window collisions each account for tens to hundreds of millions of bird deaths annually. Communication towers and wind turbines are two types of structures increasingly studied regarding bird mortality. Current estimates suggest bird mortality in the range of tens of millions for communications towers and in the thousands for wind turbines. Other sources include oil spills or other contaminants, cat predation, aircraft and train strikes[18].

Waterfowl such as ducks, geese, herons, and cranes are among the most common bird strike casualties[19]. This is because their large, heavy bodies are less manoeuvrable, and because they tend to make high speed feeding runs in the morning and at dusk when low lighting conditions are most common. Grouse, and in particular ptarmigan, may also be particularly vulnerable to collision mortality. Alternately, raptors and ravens may be less likely to become victims of power line collisions because they fly at slower speeds and are more manoeuvrable[20].

A sandhill crane is spotted in a right-of-way

An osprey nest on a transmission line structure

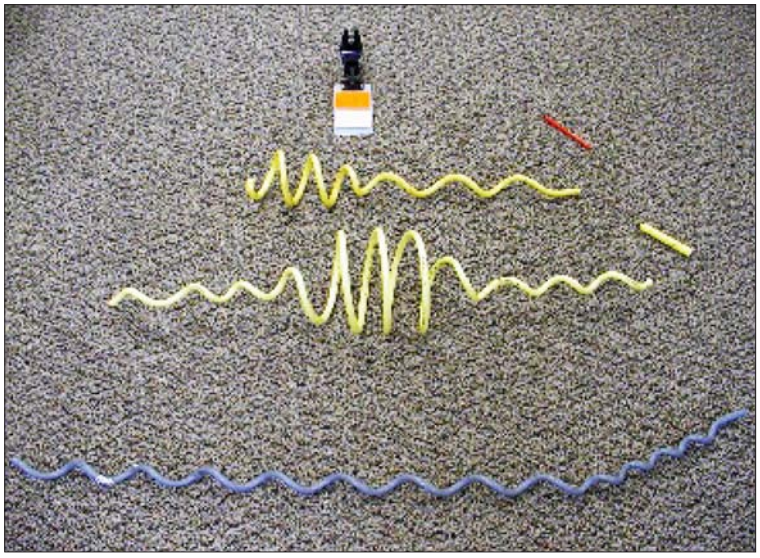
In addition to collisions, bird mortality may occur through electrocution. Research has shown that electrocution of birds rarely occurs on high voltage transmission lines because conductors are far enough apart to prevent simultaneous contact of the bird's extremities with adjacent conductors or contact from a conductor to a ground.

In an attempt to better understand and address both bird collision and electrocution problems, research is being conducted by the Electric Power Research Institute and others at the Audubon National Wildlife Refuge, North Dakota and it is anticipated the research will be published in 2011. Preliminary findings show a stronger leaning towards vehicle collisions than transmission or distribution line collisions[21]. Manitoba Hydro practices are regularly updated to reflect the most current research and best practices.

What can be done to reduce mortality from bird strikes?

Avoidance of critical areas of bird concentrations is the most effective **mitigation** measure to reduce **bird strike mortality**. During transmission line planning it is important to identify ecologically sensitive areas such as staging areas for waterfowl, so they can be inventoried to establish the degree of sensitivity, and if necessary, avoided. Bird diverters and devices are increasingly being shown to reduce collisions.

Up to 90% of collisions may occur on the **sky wire**. Compared to **conductors**, its narrow diameter makes it difficult to see in low light, fog and other reduced visibility conditions[22]. However, sky wires serve an essential function in reducing the likelihood of damage to transmission lines from lightning strikes. Marking the transmission lines or sky wires can make the lines more visible to birds in flight[23]. Results from 18 studies demonstrated a 45% reduction in collisions when conductors or sky wires were marked[24]. In another study, collisions decreased by 60% after sky wires were marked[25].



Common collision mitigation devices (from top to bottom): Firefly flight diverter, bird flight diverter, swan flight diverter, and spiral damper

The effectiveness of the device can depend on factors related to environmental conditions, species and transmission voltage[26]. Manitoba Hydro uses a variety of diverters and markers to reduce bird strikes.

Other possible mitigation methods for reducing bird strikes include

- Routing lines parallel to lines of flight and prevailing winds
- Setting lines against such background as hills or cliffs to give birds a clear view of the lines
- Modifying **habitat** near transmission lines to change the attractiveness to birds, such as trees growing near or above the height of power lines, causing birds to gain altitude and clear the transmission lines
- Modifying habitat to reduce **disturbance** to birds; for example, creating feeding and resting habitat on the same side of the transmission line to minimize reasons for birds to cross

Do birds use the structures?

Transmission line structures can enhance **habitats** for birds by providing additional breeding and roosting sites, and hunting and feeding perches. Many species of birds nest on utility distribution and transmission structures including hawks, eagles, and osprey.

Some species make extensive use of transmission lines in boreal areas. In Manitoba, ospreys, bald eagles, hawks and ravens are known to nest on transmission line **towers**[27]. Eagles are more prominent nesters on northern transmission lines than ospreys. Other species such as pileated and other woodpeckers, American kestrel, wood duck, and in some instances, northern flying squirrels, frequently use wooden hydro poles as homes. Transmission line workers have observed successful hatching and fledging in nests located on transmission line structures. The return of nesting birds each year anecdotally suggests transmission lines do not negatively effect these bird activities.

Some nests on transmission lines may create a potential electrical hazard when nests are built on wires and **insulators**. **Mitigation** techniques are available to minimize this problem, including

- Construction of artificial platforms
- Use of bird perch deterrents such as porcupine wire below insulators
- Removal of nests prior to egg-laying, or careful transplanting of the nest, eggs or young to nearby trees or platforms

Artificial platforms reduce electrical hazards and enhance habitat for breeding and roosting

A bird's nest being removed prior to egg-laying

Do transmission lines make noise that disturbs wildlife?

Not all **wildlife** species are sensitive to the low hum of some power lines that can be noticeable to people. Overall, it appears unlikely that line noise results in any significant effects to wildlife.

Transmission line noise may be distinguished as three types:

- 120 Hz AC hum
- **Corona** discharge
- Wind hum from wires and structures

Under high humidity, static noise from transmission lines is greater than in dry weather.

The level of noise emitted by transmission lines is related to **conductor** size and configuration, voltage and weather conditions. For example, on a calm, dry sunny day, the average level of noise along the transmission line is about as loud as whispering. On a windy day, wind can be heard blowing through the wires.

There is limited research on the effects of transmission line noise on wildlife. However, we know that hundreds of bird species appear to be unaffected by transmission line noise because they actively perch, roost, and nest near or on the lines and **towers**. Owls, for example, often use transmission line towers as perch sites and to search for mice and voles. Although owls depend on sound to locate prey under the snow, transmission line noise does not appear to hinder hunting at these locations[28].

One study in Norway demonstrates that while reindeer may hear corona noise from power lines, the noise may not necessarily disturb the animals. It is likely that sudden, loud noises have stronger effects on reindeer than the low-intensity corona noise[29].

Anecdotal information from transmission line maintenance and construction workers suggests transmission line noise has not deterred caribou, moose and other animals from feeding along transmission line **rights-of-way**. Current Global Positioning System collar studies on woodland caribou in Manitoba may provide new information about the effects of noise and other potential **disturbances** on caribou populations.

Noise from transmission lines does not appear to disturb wildlife

What are the effects of electric and magnetic fields on wildlife?

Electric and magnetic fields (EMF) are invisible fields of energy arising from the flow and use of electrical energy. Both electric and magnetic fields are present near **transmission lines**. Numerous research programs have studied the effects of EMF on wild and domesticated animals. Overall, this research has not found any relationship between EMF and the health, behaviour or productivity of animals. Additionally, studies of crops and other plants have reported no adverse effects on growth or viability.

EMF are a combination of both electric and magnetic fields. An example of an electric field is static cling on clothing. An example of a magnetic field is the pull of a magnet. The EMF levels measured near any source depend on a number of factors, but largely on the distance at which the measurement is taken. Both electric and magnetic field levels decrease with increasing distance from the source, just as the heat from a candle or stove decreases as you move further away.

Research has not shown a relationship between EMF and the health or behaviour of animals

A large body of research has been conducted in Canada and other countries for almost forty years on a wide variety of topics related to the potential for AC electric and magnetic fields to affect health. This research includes

- Observational studies of people, which evaluate the relationship between estimated magnetic field exposures and diseases
- Studies of laboratory animals exposed to high EMF levels for long periods of time and studies of cells and tissues exposed to EMF in the laboratory

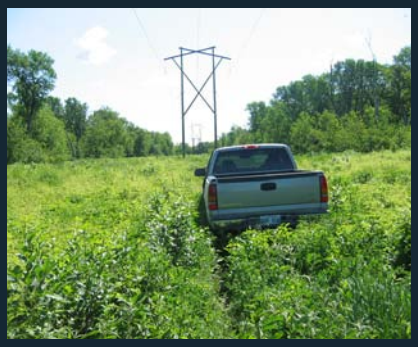
Numerous scientific and health agencies have evaluated this body of research, including the World Health Organization, the International Agency for Research on Cancer, and the Health Protection Agency of Great Britain. In Canada, the topic has been evaluated by the Federal Provincial Territorial Radiation Protection Committee (FPTRPC). The FPTRPC is an intergovernmental committee assembled to harmonize the standards and practices for EMF within federal, provincial and territorial jurisdictions. Health Canada refers to the FPTRPC as the authority on issues related to EMF.

The conclusions of these scientific agencies have been generally consistent. Overall, they concluded that the research does not show that electric or magnetic fields are a known or likely cause of any disease, including cancer.

While Manitoba Hydro is sensitive to public concerns regarding possible health effects from electric and magnetic fields, there is at present no scientific evidence to justify modification of existing practices or facilities for the generation, transmission and distribution of electricity. Manitoba Hydro continues to develop and maintain a reliable technical database and undertakes the following actions to ensure the safety of the public and its employees:

- Responding to enquiries and concerns from the public and employees
- Monitoring worldwide research programs on electric and magnetic fields
- Maintaining active communications and make technical information available to interested parties, including the public and agencies responsible for public health and the environment

Effects of Transmission Line and Right-of-Way Maintenance

Effects of Transmission Line and Right-of-Way Maintenance

Transmission line maintenance includes regular inspection and repairs to the lines and structures. Line maintenance activities are conducted by ground and by air. Whenever possible, Manitoba Hydro conducts maintenance when the risk of **disturbance** to **wildlife** and wildlife **habitat** is low and attempts to mitigate any environmental or ecological effects. Generally, disturbances from line maintenance are infrequent and don't have a lasting effect on wildlife or wildlife habitat.

For inspection and maintenance access, Manitoba Hydro assesses which vehicles will cause the least disturbance while allowing the necessary work to be completed. For example, if a transmission line is accessible by road, a light truck may be used.

There are times during emergency repairs when access to the lines may cause damage to trees, shrubs and the surrounding terrain. And, on occasion, tracked vehicles may disturb the land when accessing transmission lines for routine maintenance. Stream crossings are particularly sensitive to movement of equipment. Manitoba Hydro applies strict maintenance and environmental protection practices to reduce or eliminate potential effects.

Manitoba Hydro also conducts ground patrols using all terrain vehicles, ***soft track vehicle*** *(pictured left) snowmobile (pictured right), or by foot*

What type of disturbances could wildlife experience during line maintenance?

Line maintenance work is infrequent and is only likely to temporarily disturb or displace **wildlife**, if at all. **Disturbances** can be related to noise from equipment or from maintenance worker activities. When it does occur, unfamiliar noise may keep animals (mainly birds and large mammals) away from the immediate area during maintenance activities. However, line maintenance workers often spot wildlife along **rights-of-way**.

Depending on the type of animal, the time of day, time of year and other factors, wildlife may experience different effects from **transmission line** maintenance. These effects may also be influenced by the type and the scale of maintenance activities.

For example, in rare cases, the use of aircraft may frighten birds causing them to leave nests. In most northern areas, birds do not gather in large numbers near transmission lines.

At times, line maintenance workers provide information on animal sightings along or near transmission line rights-of-way (such as the wolves pictured here) to local Natural Resources Officers

When is line maintenance conducted?

Manitoba Hydro typically conducts **air patrols** of transmission lines two or three times per year by airplane or helicopter.

Ground patrols are typically conducted once a year.

Non-scheduled patrols are conducted by air or ground as required.

How does Manitoba Hydro minimize the effects of line maintenance on wildlife?

To minimize the effects of maintenance activities on **wildlife** and wildlife **habitats**, Manitoba Hydro seeks input from **transmission line** maintenance staff, Manitoba Conservation, trappers, hunters, fishers and others to understand local habitat and wildlife sensitivities as well as any logistical constraints.

*Bird nest along **right-of-way***

For example, Manitoba Hydro uses information about areas where nests are active or large groups of wildlife are gathering to determine maintenance schedules and avoid these areas during active times. When line maintenance is conducted, nests are not removed unless they interfere with the lines or if the safety of the workers is in question.

Manitoba Hydro's maintenance procedures and **mitigation** methods are continuously updated to reflect current knowledge and study.

What is vegetation management?

To keep trees and shrubs from interfering with **transmission lines**, and to make sure workers can access the lines to maintain and repair them, Manitoba Hydro has to maintain the **rights-of-way**. This is called **vegetation** management. Machine-cutting, hand-cutting and **herbicides** are used to control **danger trees** but low growing plants are encouraged and can be beneficial to **wildlife.**

How vegetation is maintained depends on what is growing and how fast. It may also depend on how sensitive the site and individual plants are to change. Manitoba Hydro considers site-specific factors to determine vegetation control methods and minimize any negative effects on the surrounding environment.

Handcutting

When is vegetation management conducted?

Vegetation management is typically conducted during the summer by foot, ATV or **soft track vehicle**. Transmission lines in isolated areas are typically maintained in winter when the ground is frozen.

When possible, line and vegetation maintenance are done at the same time to reduce effects on **habitat**.

Workers use machine-cutting, hand-cutting or selectively apply herbicides to control vegetation and to encourage lower growing shrubs, grasses and herbs. Mechanical treatments such as selective hand-cutting or **"K-G" blading** during winter are the most common types of vegetation maintenance in northern Manitoba.

Mulching

K-G blading

Global warming is bringing more broadleaf plant species into northern boreal forests. As this occurs, herbicide use may become more common in areas where chemical vegetation management is permitted.

Herbicides are used to target tall growing species, leaving shorter species such as hazel, alder and lower growing shrubs and grasses to flourish. By encouraging lower growing plants, taller trees are less likely to grow.

Herbicides can be applied to individual trees or sprayed depending on the density of trees in the area. The herbicides used by Manitoba Hydro are themselves selective and only affect broadleaf plants leaving other nearby trees and plants to grow and thrive. They are rarely used in northern boreal forests.

Manitoba Hydro follows national and provincial guidelines when using herbicides. To use them, Manitoba Hydro must obtain a provincial permit, and must inform local people in advance. Herbicides are always applied by trained and licensed applicators.

Manitoba Hydro has explored the control of danger tree species through **allelopathy**, where specific plants emitting chemicals that discourage the growth of other plants are encouraged.

Stump treatment involves the application of a herbicide solution to a recently cut tree stump to prevent tree roots from sending up new shoots or suckers

What effects does vegetation management have on wildlife and wildlife habitats?

Transmission line and **right-of-way** maintenance have less of an affect on **wildlife** and wildlife **habitat** than construction activities. However, all forms of **vegetation** management change wildlife habitat by producing stable, low-growing vegetation. These rich low growing plants often benefit wildlife by providing food and cover and may increase foraging and nesting opportunities[30].

Improper use of **herbicides** for controlling vegetation can have a negative effect on primary fish production. Manitoba Hydro's environmental protection practices reduce the likelihood of herbicide-related effects. If herbicide use is required, Manitoba Hydro follows provincial and federal regulations for application and handling to mitigate potential effects. For example, herbicides are not applied within the **buffer** zone of any water body and are stored in secured locations at least 100 metres (328 feet) from any water body.

Although mechanical mowing in winter removes all trees and shrubs present on a site, it minimizes the effects on nesting birds, though nesting habitat may be temporarily disrupted.

Low growing shrubs, grasses and herbs are encouraged through vegetation management

Monitoring the Effects of Transmission Lines

Monitoring the Effects of Transmission Lines

Manitoba Hydro conducts monitoring to gain further insight into potential effects of **transmission lines**, to measure the effectiveness of the **mitigation** measures being used, and to identify any unanticipated effects in order to adapt practices. Monitoring practices for each transmission line project are conducted in accordance with the conditions of project licenses and are identified in an **Environmental Protection Plan**. Monitoring may involve site inspections and information gathering from environmental inspectors, community environmental monitors, local residents or even pilot programs or other studies. By following environmental protection practices, utilizing an Environmental Protection Plan and conducting follow-up inspections, Manitoba Hydro minimizes the possibility for long-term effects on the environment.

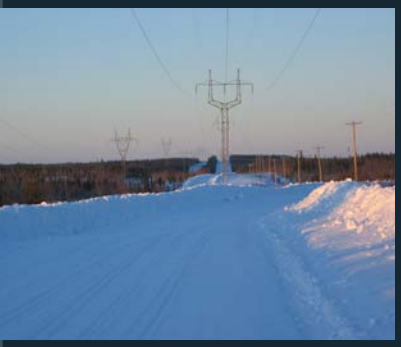
Depending on the nature of a project, Manitoba Hydro may establish a variety or combination of monitoring plans such as compliance monitoring, baseline monitoring and environmental effects monitoring. Monitoring activities are described in Table 3.

Data gathered from monitoring studies provides important information about the behaviour of different ***wildlife***

Table 3: Transmission line monitoring practices

TYPE OF MONITORING	DESCRIPTION	EXAMPLES
Baseline	Pre-construction monitoring to help identify any potential avoidable effects and appropriate mitigation measures of transmission line construction	• Land analysis of proposed transmission line route, water crossings • Botanical and rare plant surveys • Assessment of heritage resources and potential effects
Compliance	Monitoring to ensure commitments made to regulatory authorities and others are implemented	• Visual inspection of environmental conditions by air and ground patrols • Examination of transmission line water crossings to identify any potential effects such as soil erosion or contamination
Environmental Effects	Monitoring that assesses the environmental effects of transmission lines and verifies the effectiveness of mitigation methods	• Stream crossing inspections to assess the status of natural **vegetation** and check for signs of erosion • Monitoring the use of artificial nesting structures placed near **rights-of-way** • Evaluating the effectiveness of bird diverters

Glossary




Allelopathy - a plant's ability to emit chemicals that influence the growth of other plants

Alternating Current (AC) – the oscillating back and forth flow of electrical current. AC is the common household electrical current and is used in transmission lines

Anchor – device used to secure the tensioned cables or guy wires that support a transmission tower to the ground

Bird strike mortality – fatal collision between a bird and man-made structure, including transmission lines

Borrow pit – area where construction materials (usually sand or gravel) are excavated for construction purposes

Buffer – area of land separating two distinct land uses that acts to soften or mitigate the effects of one land use on the other

Conductor – any material that will readily carry a flow of electricity; in the context of transmission lines, each of the three wires comprising a circuit is referred to as a conductor

Corona – electrical discharge around a conductor that can electrically charge air molecules

Danger trees – trees that are too high or are dead, diseased and are likely to be blown over by wind, posing a danger to the normal operation of a transmission line

Deciduous – refers to plants, especially trees, which shed their leaves at the end of every growing season

Dieback – death of shoots, branches and roots of trees and plants, generally starting at the tips and usually resulting from insect or fungal attacks on a damaged or cut limb

Direct Current (DC) – flow of electrical current in a single direction; DC is used in some transmission lines

Disturbance – disruption or change in the normal functioning of an organism or system

Edge effect – the transition between two ecological communities and the resulting effect

Electric and Magnetic Fields (EMFs) – invisible lines of force surrounding any wire carrying electricity. EMFs are produced by all electric tools and appliances, household wiring and power lines. Electric fields are measured in volts per metre; magnetic fields are measured in milliGauss

Environmental Protection Plan – a user-friendly guide that describes the implementation of a project which may involve environmental effects. It may includes information such as a brief project description, construction schedule, summary of environmental sensitivities and mitigative actions, listing of federal, provincial or municipal approvals, licenses, or permits that are required for the project, a description of general corporate practices and specific mitigating actions for various construction and maintenance activities, emergency response plans, training and information, and environmental/engineering monitoring plans and reporting protocols

Feller-buncher – harvesting machine used to clear vegetation with an attachment that can rapidly cut and gather several trees before felling them

Furbearer – mammal species such as marten, fox or beaver that are trapped for the useful or economic value of their fur

Guy wire – supporting wires that are used to stabilize some transmission line structures

Habitat – area where a plant or animal lives. The primary attributes that define habitat for a terrestrial plant or animal are vegetation, soils, surface water, ground water, permafrost, disturbance regime (e.g. highly variable water fluctuations, frequent large fires) and vegetation age. A combination of similar habitat attributes is similarly referred to as a habitat type

Habitat fragmentation – occurs when natural or human features such as rivers or roads break up habitat into smaller fragments

Herbicide – product used to inhibit or kill plant growth

High Voltage Direct Current (HVDC) – used to transmit large amounts of power efficiently over long distances

Insulator – material that resists the passage of electricity

Invasive plant – plant species which may spread into, and takes over, an ecosystem to the detriment of other species; often the result of a disturbance

K-G blade – blade that is front-mounted on tractors and used to shear woody growth without disturbing root masses; often used on frozen ground conditions

Marshalling yard – open area used to stock-pile, store and assemble construction materials

Merchantable timber – timber that is salvaged where economically feasible, consistent with construction and environmental protection requirements and Manitoba Conservation work permits

Mitigation – actions taken during the planning, design, construction and operation of works to reduce or avoid potential adverse effects

Ordinary High Water Mark – usual or average level to which a body of water rises at its highest point and remains long enough to change the characteristics of the land

Registered Trapline – allocated to trappers who maintain a right to trap within the designated boundary of the trapline

Right-of-way – strip of land controlled and maintained for a transmission line, road or other linear feature

Riparian – habitat along the banks of rivers and streams

Sediment – material, including soil and organic material, that is deposited on the bottom of a water body

Sky wire – metal cables strung above transmission line conductors designed to channel lightning to the ground; also called a groundwire

Soft track vehicle – tracked vehicle (also called track-type tractor or soft-flex vehicle) that runs on continuous tracks instead of wheels and is used to help navigate difficult terrain where wheeled vehicles are not practical

Salvage – Refers to the practice of saving cut timber that may otherwise be discarded

Sustainable Development – environmentally sound and sustainable economic development that meets current needs without sacrificing the ability of future generations to meet their own needs

Towers – transmission line structures which provide support for conductors and ensure clearance from the ground

Traditional Knowledge – Refers to the wisdom that primarily Aboriginal peoples have accumulated during their lives, by learning from Elders and others, and from personal experience acquired while interacting with the environment

Transmission Line – linear arrangement of towers and conductors which carries electricity from generating stations and transmission stations to meet electrical needs

V blade – ”v”-shaped blade that is front-mounted on tractors used to clear vegetation

Vegetation – general term for all plants or plant life of an area or region; it refers to the ground cover provided by plants

Wildlife – free-ranging birds, mammals and fish living in their natural environment

Endnotes




1 Patton, D.R. (1992). Wildlife habitat relationships in forested ecosystems. Timber Press, Portland.

2 Ehnes, James and ECOSTEM Ltd. (2006). Indirect Terrestrial Habitat Loss And Conversion Adjacent To Existing Transmission Line Rights-Of-Way In North-Western Manitoba. Prepared for ND LEA Engineers & Planners Inc. and Manitoba Hydro.

3 Manitoba Hydro. (2003). Wuskwatim Transmission Project Volume 1: Environmental Impact Statement.

4 Fisheries and Oceans Canada. (1996). Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat.

Fisheries and Oceans Canada. (2010). Manitoba Operational Statement: Overhead Line Construction. Version 3.

5 Fisheries and Oceans Canada. (2010). Manitoba Operational Statement: Maintenance of Riparian Vegetation in Existing Rights-of-Way. Version 3.

Fisheries and Oceans Canada. (2010). Manitoba Operational Statement: Overhead Line Construction. Version 3.

Fisheries and Oceans Canada. (2010). Manitoba Operational Statement: Temporary Stream Crossing. Version 1.

Fisheries and Oceans Canada. (2010). Manitoba Operational Statement: Timing Windows. Version 3.

Fisheries and Oceans Canada. (2010). Manitoba Operational Statement: Ice Bridges and Snow Fills. Version 3.

6 Manitoba Hydro. (2003). Wuskwatim Transmission Project Volume 1: Environmental Impact Statement.

7 Manitoba Hydro. (2003). Wuskwatim Transmission Project Volume 1: Environmental Impact Statement. (Appendix F - Terrestrial Ecosystem / Habitat Effects Assessment).

8 Jalkotzy, M.G., P.I. Ross and Effe M.D. Nasserden. (1997). The Effects of Linear Developments on Wildlife: A Review of Selected Scientific Literature. Prepared for Canadian Association of Petroleum Producers. Arc Wildlife Services Ltd., Calgary, Alberta.

9 Brown, G.S., F.F. Mallory and W.J. Rettie. (2003). Range size and seasonal movement for female woodland caribou in the boreal forest of northeastern Ontario. Rangifer Special Issue no. 14:227-233.

Rettie, W. J. and F. Messier. (2000). Hierarchical Habitat Selection by Woodland Caribou: Its Relationship to Limiting Factors. Ecography 23:466-478.

Manitoba Conservation. (2005). Manitoba's Conservation and Recovery Strategy for Boreal Woodland Caribou.

10 TetrES Consultants Inc. (2003). Wuskwatim Transmission Project: Wildlife Environment Supporting Document, Volume 4. Prepared for Manitoba Hydro and Nisichawayasihk Cree Nation.

11 Jalkotzy, M.G., *et al.* (1997).

TetrES Consultants Inc. (2003).

12 Wildlife Resource Consulting Services MB Inc., I. Martinez-Welgan, M. Wisener and ND LEA. (2003). Motorized Access Along Transmission Line Rights-of-Way in Manitoba. Summary Document (Work in Progress). Prepared for Manitoba Hydro, Winnipeg, Manitoba.

13 TetrES Consultants Inc. (2003).

14 Manville AM. (2005). Bird Strikes and Electrocutions at Power Lines, Communication Towers, and Wind Turbines: State of the Art and State of Science - Next Steps Toward Mitigation.

15 Faane CA. (1987). Bird behavior and mortality in relation to power lines in prairie habitats. Fish and Wildlife Technical Report 7.

16 Bevanger, K. (1994). As cited in: Heck, N. (2007). A Landscape-Scale Model to Predict the Risk of Bird Collisions with Electric Power Transmission Lines in Alberta.

17 Heck, N. (2007). A Landscape-Scale Model to Predict the Risk of Bird Collisions with Electric Power Transmission Lines in Alberta.

18 Manville, AM. (2005).

Erikson WP, G.D. Johnson, D.P. Young Jr. (2005). A Summary and Comparison of Bird Mortality from Anthropogenic Causes with an Emphasis on Collisions.

19 AltaLink. (2005). Bird Collisions with Electric Power Transmission Lines: Frequently Asked Questions (FAQs). Calgary, Alberta.

20 Avian Power Line Interaction Committee. (1994). Mitigating Bird Collisions with Power Lines: The State of the Art in 1994. Edison Electric Institute, Washington, D.C.

TetrES Consultants Inc. (2003).

21 Bridges, J.M. Personal communication to R. Berger. 07 August 2008.

22 Avian Power Line Interaction Committee. (1994).

23 Alonso, J.C., J.A. Alonso and R. Muñoz-Pulido. (1994). Mitigation of bird collisions through groundwire marking. Biological Conservation 67:129 – 134.

Avian Power Line Interaction Committee. (1994).

24 Beaulaurier, D. (1981). Mitigation of bird collisions with transmission lines. Bonneville Power Administration, US Department of Energy, Boulder, Colorado.

25 Alonso, J.C., *et al*. (1994). As cited in: Heck, N. (2007). A Landscape-Scale Model to Predict the Risk of Bird Collisions with Electric Power Transmission Lines in Alberta.

26 AltaLink. (2005).

27 Stocek, R.F. (1981). Bird related problems on electric power systems in Canada. 110T 210. Prep. for Canadian Electrical Association, Montreal by R.F. Stocek, Maritime Forest Ranger School, Fredericton.

Toner, T. and R. Bancroft. (1986). Osprey nesting on transmission lines: I. Nest relocation manual, II Nest relocation research report. Report #225-T-407 to the Canadian Electrical Association. (1986).

28 Nero, R.W. (2010). Wildlife Biologist (Retired), Manitoba Conservation. Personal Communication with R. Berger, November 23, 2010.

29 Flydal, K., I.R. Kilde, P.S. Enger and E. Reimers (2003). Reindeer (Rangifer tarandus tarandus) perception of noise from power lines. Oslo, Norway. Rangifer 23(1):21-24.

30 Asplundh Environmental Services. (1977). Environmental and economic aspects of contemporaneous electric transmission line ROW management techniques. Prep for Empire State Electric Energy Research Corporation, New York by Asplundh Environmental Services, Willow Grove.

Canadian Electrical Association. (1991). Investigation of the stability of plant communities on transmission line rights-of-way. Canadian Electrical Association, Montreal, QC.

Plus4 Consulting Inc. and Resource Ecosystem Services. (2003). Wuskwatim Transmission Project: Forestry Environment Supporting, Volume 5. Prepared for Manitoba Hydro and Nisichawayasihk Cree Nation.