LARCH SANCTUARY

ECOLOGICAL INTERPRETIVE PROGRAM

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1.0 THE LARCH PROJECT – CONSERVATION AND SUSTAINABILITY IN A NEIGHBOURHOOD SETTING

1.1 Introduction

Welcome to the Larch Sanctuary!

Edmonton's River Valley system, embracing both the North Saskatchewan River and numerous major tributaries, has been referred to as the "jewel of Edmonton". It is not only a source of water needed for human use and the support of ecological systems, it is the last, major vestige of continuous wooded land in a relatively undeveloped form running through the City. It provides ecological linkages and major wildlife dispersion corridors across otherwise, impermeable developed areasin the City to reach out to the adjacent tablelands. The Whitemud Creek is a major tributary of the North Saskatchewan River, and fulfills many of the above functions of terrestrial and aquatic ecological connectivity in the southwest portion of the City.

A place of great beauty, the name of Whitemud Creek was noted in 1858, by Dr. James Hector of the Palliser Expedition. The white-coloured mud found along the creek's banks and in the immediate vicinity, was used to whitewash the Hudson's Bay Company buildings.

Together with the City of Edmonton and the Edmonton & Area Land Trust we've protected the Oxbow lands in perpetuity. Specifically, we achieved our goal of having this land designated as a Natural Area, a much more protective zoning than is typical for valley areas.

1.2 The Natural Area

The Larch Natural Area is a 1.4-km stretch of the valley of Whitemud Creek, located near its confluence with Blackmud Creek just south of 23rd Avenue, in a part of Edmonton that is facing rapid urban expansion and residential/commercial development. Despite its proximity to this activity, the Larch property retains a remarkable degree of naturalness. Of special interest in this portion of the Whitemud Creek Valley is the elevated Oxbow, a remnant of the earlier river that once sat at a higher elevation than the present creekbed. Maintained by spring flooding and groundwater discharge this unique ecological featurei provides a ey habitat for various species of waterfowl and semi-aquatic furbearers.

The heterogeneity of land and vegetation – old growth coniferous forests, deciduous and mixed-wood forests, meadows and riparian communities – gives the property an extraordinarily rich setting for animal and plant biodiversity.

The Larch property possesses a number of ecologically important natural features, including:

- Old coniferous forest along the Whitemud Creek ravine;
- Deciduous forest on bank slopes and valley containing a diversity of canopy and ground vegetation;
- Shoreline vegetation and aquatic environment of Whitemud Creek itself;

- An “oxbow” waterbody that provides excellent habitat for numerous waterfowl species;
- Excellent habitat for a diversity of birds, mammals,, herptiles and invertebrates.
- Relatively undisturbed forest and riparian ecosystems on both sides of the Creek ravine .

The topography varies considerably throughout the Valley, from a relatively flat stretch in the north, to precipitous slopes along the creek banks and on the ravine slopes where it is incised with deep gullies. All of these features provide not only a high degree of visual interest, but also an opportunity for people to seek seclusion, quietness and distraction from the noise and activity of urban life. In addition to these important values, the area provides an opportunity for viewing and learning about plant and animal life, and the ecosystems in which they exist. The west top-of-bank and the oxbow trails also offer exceptional views of Whitemud Creek ravine and surrounding areas.

The primary goals for the natural area are:

- to promote a sustainable and ecologically healthy mixed-wood forest and associatedbiodiversity in the ravine adjacent to the Natural Area, while offering a high quality opportunity for recreational walking and ecological appreciation, with walkways linking to other nearby natural areas; and

- to ensure that construction and development of any adjacent subdivisions are carried out in such a way as to protect the environment and to promote environmentally sustainable neighbourhood features.

1.3 Sustainability and Ecological Protection as a part of Neighbourhood Design

You can discover more about this subject at the Web site: larchpark.ca.

1.4 Hiking Trails and Interpretive Displays

A system of guided walking trails has been established throughout the Natural Area, both in the valley and along the top of the bank. A spur of the trail system also leads through the neighbourhood and towards the Magrath Natural Area on Rabbit Hill just west of Larch Park.

The self-guided walking trails in the Natural Area have been designed to allow hikers to experience the ecology of the forest, while providing interpretive material on the geological history of the valley.and the plants and animals that abound in it.

Five interconnected hiking trails are located in the valley area of Larch Park.

Along each of the trails, strategically set display signs describe site-specific and general features of the valley, including: its history, beginning with the geology and origin of the river and river valley, its human history, its forest and biodiversity. Each of the topics covered at the display stations are discussed in more detail on this website.

1.5 Contact Us

We would be pleased to hear from you if you have any comments on the natural area, its trail network, or the information presented on this website. We would be particularly interested in hearing from you about observations of any unusual or rare plants or animals within the natural area.

To comment, please see the "Contact Us" page of this website.

2.0 GEOLOGICAL HISTORY OF THE RIVER VALLEY SYSTEM

2.1 Formation of the River Valley

Far below this point, beneath several kilometers of rock, lies Edmonton's Precambrian basement. The City of Edmonton is situated upon a succession of strata deposited by various geological processes over the buried margin of the ancient Precambrian basement of North America (the Canadian Shield). Over millions of years, the forces of erosion wore down the rocks of the Canadian Shield to the north and of the Cordillera to the west. Most of Alberta is underlain by a 2 to 3 km thick blanket of erosional debris which has been converted during burial into a series of sedimentary rocks such as conglomerates, sandstones, and shales.

Before the Rocky Mountains were built up, the Pacific Ocean occasionally flooded into this region. That is why we can find marine sedimentary rocks at deep levels.[2] The ages of these pre-Cambrian rocks have been determined scientifically, and revealed that the original sedimentary and volcanic rocks of the Alberta basement were laid down some 3,500 to 2,500 million years ago.[2]

These rocks were later metamorphosed and partly melted during the period 2,300 to 1,700 million years ago when they were deformed during the collision of primitive continental and oceanic crustal plates. These rocks were forced down into the lower crust, 10 to 20 km below surface where temperatures reached 400° to 600°.[2]

They are composed of metamorphic and igneous rocks, which result from their formation under high temperatures and pressures of the same magnitude as exist deep below mountain ranges today. We therefore can deduce that the shield below Alberta largely represents the eroded roots of an ancient Precambrian mountain chain.[2]

In the Paleozoic era (570-245 million years ago), Alberta was actually located between latitudes 30° north and 30° south. This was due to continental drift, the "floating" plates of rock that moved around the surface of the earth, colliding and detaching so that they form the different land masses of the earth we see today. The province had been carried to this sunny location by the drifting of the North American plate. Alberta then was a tropical paradise.

Discoveries by geologists observing fossils in the rock layers have determined that a tropical sea then covered Alberta. Under such conditions, marine life flourished and the ocean floors were covered by thick deposits of calcium carbonate mud. This mud ultimately became limestone. As time went by, the buried organic material was attacked by bacteria in the sediments and subjected to high temperatures. The organic debris was gradually broken down and transformed into hydrocarbons, which in turn formed vast reserves of oil and natural gas.

Later, in the Mesozoic Era (245 – 67 million years ago) the environment of the Edmonton region rapidly changed as the region moved toward the northwest, passing into latitudes of a considerably cooler climate. In the sea, ammonites and clams thrived. Marine dinosaurs and fish swam in abundance. On the land, rich vegetation flourished, with forests thriving in the abundant rainfall and volcanic ash which frequently descended, fertilizing them. Abundant rotting vegetation accumulated and was buried in swamps. This rotting organic material has now become the various fossil fuel commodities in the Edmonton region, including peat and coal. Alberta, and the city of Edmonton, were therefore endowed with a good supply of solid fossil fuels during the early periods of European settlement.[2]

The Edmonton region continued to move ever further northward, receiving less direct sunlight and cooling more. Many species of plants and animals, adapted as they were through millions of years of evolution to warmer climates, became extinct during this period. Tropical vegetation gave way to grasses and sedges that were more suited to a cooler environment. The dinosaurs became extinct roughly 67 million years ago. The region became a grassland savanna for the ancestors of camels and hyenas.

2.2 The Ice Age

About one million years ago, the Arctic ice cap began to grow. Its margin moved southward across the northern continents, while mountain glaciers grew and flowed down toward the Pacific Coast and onto the plains of Western Canada [2].

There were actually four major glacial advances of Arctic ice into northern Canada. The major events of the Ice Age actually took place over about 900,000 years. Between each major continental ice advance, the ice recessed during a warmer, interglacial phase. So it was not until about 21,000 years ago during the last glacial advance that Alberta became covered by ice. It buried the Edmonton area under an ice sheet more than 1 km deep. Before that, Alberta consisted of plains and hills, with bison, muskoxen, horses, woolly mammoths and mastodons wandering around the grasslands and the thin boreal scrub bush.

The gravel and sands were deposited before the last glaciation by an ancient braided river that once flowed across Alberta. When the glacier advanced over the land and occupied the Edmonton area, this broad pre-glacial river valley was filled in with unsorted sediment-containing rock fragments ranging in size from clay to sand to gravel to boulders.[3]

As these great sheets of ice flowed out and across the plains, they carried masses of rock and debris torn from the mountains or from northern Alberta and beyond. Great slices of bedrock were bulldozed out by the ice and dumped far away. Pitted ground in the Edmonton region owes its existence to the slow melting of enormous isolated blocks of ice buried within the glacial debris.[2]

As the ice melted, rivers of cold water fed lakes dammed by ice. These lakes supported populations of algae. The sediment composed of the algae is the origin of the black, organically rich soils which exist in Alberta. Occasionally, the ice dams would break and cold melt water would rush in, carving a deep channel across the plains in a matter of days.[2]

About 12,000 years ago, toward the end of the last Ice Age, a dramatic event occurred. As the ice layer began to melt, the ice at the bottom of the layer began to melt and flow to the southwest. But a gigantic ice dam blocked much of the water and created an enormous Lake, which we now call glacial Lake Edmonton. The meltwater covered the area from Morinville to Leduc and from Stony Plain to Fort Saskatchewan for about a century.

The lake was walled in on three sides by sheets of ice and dotted by icebergs, truly an inhospitable place. “When the lake disappeared, it did so in a flash of geological time. As the ice dam began to stand at its southern edge, water found a low point under it on the height of land between the North Saskatchewan and the Battle River basins and began to flow south. The force of the flow ate at the ice above and the ground below, rapidly enlarging this sub glacial drain until, in a torrent of water and ice and rocks and soil, the lake poured out of its icy basin and into the Battle River, carving a deep channel as it went.”[3, quote from Barbara Huck and Doug Whiteway, p. 88-89]. According to one theory, the flood duration lasted only a few weeks, moving several thousand cubic kilometers of rock and sediment from the plains before the huge flows exhausted the subglacial meltwater reservoir. [2]

The route that the meltwater poured is still visible today as a narrow valley southeast of the Edmonton International Airport. These events set the stage for the appearance of the North Saskatchewan River.

"With the disappearance of glacial Lake Edmonton and the retreat of the Laurentide ice sheet, the glacial North Saskatchewan River began to establish the course we know today, eroding through the alluvial silt, glacial till and preglacial River gravel of the Empress Formation. Within a thousand years, it had reached the Cretaceous bedrock. For the next 3,000 years, the River continued to carve the valley walls at a rapid rate, creating a series of lower benches leading to the modern floodplain." [4, quote from Barbara Huck and Doug Whiteway, p. 88-89]

Water flowing over the old glacial lakebed eventually established a preferred channel, and thousands of years of erosion formed the River Valley system we see today.

Since the end of the Ice Age, there has been slow erosion by rivers which are even today modifying a deglaciated landscape. While the 1.5-km thick ice sheet was covering the region, the land was pressed down under a tremendous load. When the ice sheet melted, the land rebounded upward in a series of "jerks". We see evidence of this uplift in the form of alluvial terraces along the river valleys. With each uplift, there was increased downcutting by the rivers and creeks as the floodplains were dissected.[2]

The River valley walls are composed of unstable sands, silts and gravels, which periodically collapse in large and small landslides. Evidence of this erosion can be seen on the banks of the Whitemud Creek below us.[1]

Over the course of time, animals returned to the valley as the climate became warmer. They included woolly mammoths, mastodons, lions, sabertooth cats, muskox, camels, bison, ground sloths and wolves. These animals wandered through the new River Valley and its ravines.

2.3 Evolution of a Watercourse

There are natural levels of suspended particles in all rivers, streams and lakes. Some waters have a lot, while some clear waters have almost none. The particles come mainly from erosion of the banks or surrounding lands. They vary in size from large (sand) to tiny (silt). Particles suspended in the water of a waterbody are called "sediment". The larger particles sink faster than the tiny ones; and particles are carried more by fast water than by slow water.

The water of rivers runs at different speeds. River water can be laminar (smooth and slower), turbulent (faster with small currents), or shooting (rapids). The fast water of a river will carry sediments a long way. This is called "sediment transport".

When the river water reaches the still water of a lake, the sediments sink and accumulate on the bottom. Since the larger ones settle first, we often find the coarser sediments (large particles) near the shore, and the finer sediments nearer the middle.

Rivers are the same. Sediments gradually settle in the slower stretches of the channel. They normally settle on the inner part of a curve in the river, where the water goes slower. As the sediments build up, the water is pushed toward the other side. Eventually, this creates a loop in the river called a meander. After a period, the river takes on a twisted appearance, which is evident in maps or views from a height.

2.4 Groundwater and Springs

Groundwater now flows along these old buried river sediments but cannot pass into the underlying impermeable bedrock. Where the old river channel is exposed along the banks of the modern River Valley, water in the ground reaches the surface in the form of springs. Although the water discharges are minimal, they are marked by striking red, white, and black mineral deposits. The red deposits are formed from iron oxide minerals, while the white is made up of calcium carbonate. The black material is composed of manganese oxide minerals. These minerals form at the surface because the spring is fed by groundwater which is soaked down through mineral-rich rocks and sediments. When the cold water comes into contact with the air, the rise in temperature and the activity of micro-organisms causes the minerals in the spring water to precipitate and form a solid deposit.[3]

2.5 Whitemud Creek

Whitemud Creek is a tributary of the North Saskatchewan River, joining it within the City of Edmonton. The name of Whitemud Creek was noted in 1858, by Dr. James Hector of the Palliser Expedition. The white-coloured mud found along the creek's banks and in the immediate vicinity, was used to whitewash the Hudson's Bay Company buildings.[5]

In terms of its geology, the site is underlain by glacio-lacustrine (Lake Edmonton) deposits consisting of silt and clay, with minor sand occurrences (Kathol and McPherson, 1975; Andriashek, 1988). Near the Whitemud Creek valley, it is reported that these deposits rest on a horizon of glacial till which generally thins toward the west. Below the till is bedrock of the Horseshoe Canyon formation, which is composed of sandstone and clay shale with numerous coal seams.

Adjacent to the Larch site, the height of the bank ranges from about 36 to 28 m at the south and north ends, respectively. The valley slopes are generally steeper adjacent to the outside bends of the creek, and shallower on the inside bends, as a result of the erosion/sedimentation cycle.

Several active slopes and old scarps can be observed along the top of the bank and along the trails. These are indicative of ongoing slope flattening that is occurring over a relatively long time frame, due to the effects of weathering, groundwater discharge and surface runoff. This is generally a slow process and is an ongoing occurrence along the Whitemud Creek valley.

Just north of the Larch development, Whitemud Creek is joined by Blackmud Creek, drains the area to the southeast. Whitemud Creek eventually drains into the North Saskatchewan River.

2.6 Formation of the Oxbow

As the loops get bigger and more and more sediment deposits, the resistance to flow increases. Other impediments to flow may occur, such as beaver dams. It takes more and more energy to push the water around the loop. Eventually, the water finds another, less resistant course to follow, and over many years a new channel is formed which bypasses the old loop. The old loop becomes isolated, and receives little or no flow. This old loop is then often referred to as an oxbow (because of its resemblance to the C-shaped structure of the wooden yoke used to harness oxen).

The Whitemud Creek possesses numerous such oxbows, one of which lies below us here. The nearest (western) body of water to us is the oxbow, which has an old beaver dam at the north end and a wall of accreted sediments on the south end. The course of the Creek is now the channel to the east. We can see how the outer edge of this eastern channel is busy eroding the steep banks of its east shore.

In between the oxbow and the main channel of Whitemud Creek, is an “island”, which also has a walking trail originating at the north end of the oxbow and linking to the North Valley trail at its north end.

The inactive (west) channel is thought to be fed partly by groundwater and seepage from the west side of the ravine, as well as surface runoff from the west slope of the ravine.

3.0 HUMAN HISTORY IN THE RIVER VALLEY SYSTEM

3.1 Early History

It is likely that some 500 generations of people have camped or hunted or fished in the North Saskatchewan River Valley near the “bend in the river” that is the location of Edmonton. Before contact with the Europeans, Aboriginal people of the Saskatchewan River country hunted and traded in an economy of great natural abundance. They followed the bison herds, dried the meat and fish, prepared clothing and shelter from the skins, and moved along the rivers in assemblies of hundreds of tipis. While the people’s basic needs were met from the buffalo hunt, they traded beaver pelts to the Europeans in exchange for items such as tobacco, decorative beads, rum, blankets, metal cooking pots, knives, axes and firearms. Besides trading, they served as guides, interpreters, canoeists and porters for the European fur trading companies. But they could also trade through a network of Aboriginal tribes that spanned the continent, so that in some ways the Europeans needed the Aboriginal people more than the Aboriginal people needed the Europeans.[4]

Because the valley was carved out from top to bottom, the earliest archaeological sites will be found on the highest river terraces. Occupations dating after 8,000 years ago can be found on the lowest terrace, but also on the highest terraces as well.[1]

To the west of here, a land rises to a knoll called Rabbit Hill, a relic of the last ice age when sand and sediment was deposited by meltwater. It is one of the highest points in the Edmonton area. From here, Aboriginal hunters would have watched for the movement of bison and deer at drinking spots near the watercourses below. [4] At Rabbit Hill, archaeologists have found tools used by people who lived thousands of years apart. Early families sharpened tools made of quartzite, chert, petrified wood and mudstone. Aboriginal people probably camped on this hill, at intervals, perhaps for as long as 12,000 years. The earliest visitors would have valued a high, protective lookout for this excellent view of the lands below.[1]

Archaeological evidence suggests that human beings first began visiting the Edmonton region about 13,000 years ago. Archaeologists have discovered stone tools showing that temporary encampments were established along the newly formed North Saskatchewan River Valley terraces by 9,000 to 10,000 years ago. River valleys contain much of the food and tool-making resources that would be of critical importance to early humans, both in the form of abundant and diverse plants and animal food and in the form of rocks, cobbles and pebbles from which early forms of tools could be fashioned. The layers of the River Valley banks contained abundant quartzite cobbles and chert pebbles. Early humans recognized that a variety of useful and durable cutting tools could be made from these materials. A quartzite cobble, for example, could be used to hammer smaller pebbles into yet smaller pieces, using the principle that chert and quartzite break in a predictable fashion. This allowed them to fashion stone pebbles into sharp-edged projectile points, scrapers, knives and other useful tools (M. Wright, in [2]).

Both ancient and relatively recent sites of human habitation are found along the valley margins and on the terraces of the River, indicating that the River flats and terraces have always attracted humans. We can learn something of the types of tools they used by observing the kinds of remains preserved at archaeological sites. These include bone fragments, ancient fireplaces and evidence of temporary shelters. But the most common remains are the “garbage” of the former campers, the myriads of small stone chips left from tool-making, and the fewer fragments of manufactured stone tools themselves.

3.2 Recent History

In the late 18th century, Edmonton became a permanent settlement, with the establishment of fur trading posts along the North Saskatchewan River. The Hudson’s Bay Company, the Northwest Company and the X.Y. Company all established posts along the river. However, it was the Hudson’s Bay Fort Edmonton posts which were prominent. Fort Edmonton soon became the hub for a trading network that routed furs and other goods down the river from the surrounding territories.

After some time, seasonal settlement by Aboriginal peoples grew on the river flats around the fur trading nucleus; and these eventually became permanent settlements on higher ground. The fur trade fundamentally changed the way of life for the Aboriginal people. The use of the River Valley by the fur trade set the stage for the later development of the River Valley resources including brickmaking, coal mining and dredging the river for gold. Many of the historic trails that were established during the fur trade became the cart tracks and ultimately the roadways of the 20th century (M. Wright, in [2]).

4.0 THE FOREST ECOSYSTEM

4.1 Introduction

The Larch natural area lies within the Central Parkland Sub region of Alberta as described in Natural Regions and Sub regions of Alberta http://www.cd.gov.ab.ca/preserving/parks/anhic/docs/nsr2005_final_letter.pdf

The key features or characteristics are that:

i. The region is mostly cultivated with mosaics of aspen and prairie vegetation on remnant native parkland;

ii. Temperature, precipitation and growing season characteristics are intermediate between the dry, warm grasslands to the south and the cooler, moister boreal forests to the west and north;

iii. Elevations range from 500 m near the Alberta Saskatchewan border to 1250 m near Calgary;

iv. Dominant landforms include undulating till plains and hummocky uplands; and

Northern and western parts of the region are mostly aspen forests with interspersed grasslands.

In the ravine area of Whitemud Creek Ravine, you will see a variety of forest communities: deciduous, coniferous and mixed-wood. The forest is an “ecosystem”, and at the same time serves human interests such as forest products like paper and timber. A most important aspect of the forest, however, is that it not only serves as home to many plants and wildlife, it also serves to provide a cultural and spiritual resource to people. These functions are particularly important in urban areas, providing solace from our busy and stressful modern way of life.

The rest of this module talks about the functions of the forest, how it acts as an ecosystem, and the many plants and animals which reside within it.

4.2 Forests serve many functions

Forests provide many benefits to society. In terms of the economy, forests provide timber products and related jobs, as well as commercial or sustenance activities such as hunting and trapping.

However, forests provide critical ecological functions throughout Alberta, and throughout most of Canada. Forests offer homes (i.e., habitats) in both wilderness and urban settings for countless birds, mammals, insects and other forms of life. They serve as a natural filter and cleansing system which provides high quality water in rivers, streams and lakes. Forests provide protection from natural phenomena such as avalanches, wind, cold air drainage and erosion. Forests serve as a “sink” for greenhouse gases, such as carbon dioxide, that are believed to be responsible for global climate change.

In addition to economic or ecological functions, forests offer an important social function. They provide various recreational opportunities like hiking and watching and learning about plants and wildlife. More than this though, forests have great importance as a cultural and spiritual resource to people. These functions are particularly important in urban areas, providing solace from our busy and stressful modern way of life. Forests offer rich visual landscapes.

4.3 The forest is an interconnected web

Forests are a type of *ecosystem* An ecosystem is defined as *a community of interdependent plants and animals together with the abiotic environment which they inhabit and with which they interact*. A forest is also a *community* of living things – plants, animals and tiny micro-organisms.

This web is composed of:

- large live trees
- standing dead trees ("snags")
- understorey, consisting of small trees, shrubs, bushes and herbs;
- forest floor
- litter
- downed logs
- soil
- air
- water in the soil (groundwater)
- surface water (creeks, streams, ponds)

Forests may be comprised of a deciduous community of trees and associated plants, a coniferous community, or a mixed-wood (both deciduous and coniferous) community.

In a deciduous community in this region, the trees are mainly trembling aspen or balsam poplar. A coniferous community is dominated by white spruce. A mixed-wood forest community is comprised of aspen, poplar and spruce. Each of these different types of forest community has an assemblage of understorey and ground vegetation species that are adapted to living in the particular community.

4.4 The forest provides a variety of habitats

The forest provides a wide variety of habitats for plants and animals. *Habitat* is the place where an animal or plant normally lives. More specifically, a habitat is characterized by various factors, including:

- Climate

- Slope
- Elevation
- Aspect (e.g., south facing) and the amount of sunlight penetrating the upper canopy;
- Type and depth of soil
- Moisture
- Availability of food and nutrients

Each species of plant and animal has a unique habitat, and is adapted to successfully occupying that niche. Habitat may also be formed by different conditions of vegetation, e.g., living trees, dead trees, fallen trees, herb and shrub vegetation, and litter on the ground. Each of these different types of habitat would contain a different assemblage of species living in or on it.

For example, standing dead trees (snags) form an important component of habitat for species such as the Pileated Woodpecker. A dead tree contains many, species of insects on which these birds forage . The following are a few of the birds that either breed in the coniferous and mixed-wood parts of the Whitemud Creek valley, or are seasonal migrants. Their preferred diet is indicated, along with the expected times that they would be observed here.

Northern Flicker:

Nests are in deciduous, mixed wood, coniferous forest areas, edges, shelterbelts; make cavity in dead deciduous trees, poles, fenceposts or nest box. Forage on the ground and trees for ants, insect larvae, beetles, some worms and berries. Late March to late September, but may also over-winter.

Blue Jay:

Nests in mixed and deciduous forest, and semi-open landscapes; usually nest in conifers. Omnivorous diet, fruits, insects, grains, and eggs/nestlings of other songbirds. Resident, adults remain on breeding territory while young disperse several hundred kms; may be partially migratory.

Red-breasted Nuthatch:

Prefer coniferous and mixedwood areas, and nest in cavities in dead/decaying trees, stumps, 2 –12 m above ground. Feed largely on coniferous seeds, as well as spiders and insects. April to September; many are resident.

Chipping Sparrow:

Open deciduous, mixed and coniferous forests, openings, edges, farms and residential areas. Nest in shrubs and small trees. Feed on insects and some types of seeds. Migratory; Mid-April to mid-August.

Dark-eyed Junco:

Nest in coniferous and mixed-wood openings, clearings and edges, on the ground under tree roots, stumps or logs. Forage on the ground, scratch for seeds, insects and berries. Mid-March to mid-October.

Common Redpoll:

Breeds in the Arctic and sub-Arctic, although there are records of nesting in Central Alberta in deciduous trees and shrubs. Feed on seeds of coniferous and deciduous trees and shrubs. Winter visitor, October to April.

Pine Siskin:

Coniferous and mixed-wood forests. or shade trees in residential areas. Often hang upside down to feed on seeds of conifers, birch, alder, weed seeds, thistle, dandelion, insects. Irruptive migrant, late-April to early November with some over-wintering.

For a more complete bird list of birds observed on the Larch Lands see Table A2 in the Appendix.

4.5 The forest contains a diverse community of plants and animals

The forest is a “community” of many plants and animals. These living things fall into three groups (“guilds”) that carry out critical roles in the functioning of the forest ecosystem:

- producers
- consumers
- decomposers

The *producers* are plants such as trees, shrubs, herbs, ferns and mosses that use carbon dioxide, minerals and sunlight to produce biomass. As such, they form the base of the food chain, providing food for the animals in the forest. For each ton of wood formed, a tree absorbs 1.5 tons of carbon dioxide, an important greenhouse gas.

The *consumers* are insects, birds, mammals, frogs and other animals that get their energy either directly or indirectly from the producers. Some animals are herbivores and eat plants. Other animals eat animal prey, and they are called secondary consumers. A deer, for example, feeds on leaves and other parts of trees or bushes and is therefore a primary consumer. By contrast, a fox feeds on other, smaller animals like mice, and is therefore a secondary consumer.

Decomposers are bacteria, fungi and other organisms that consume the bodies of dead producers and consumers. They play a critical role in the entire metabolism of the forest ecosystem, by breaking down complex organic material in plants and animals, which is then available as nutrients for both producers and consumers. This is the forest’s way of recycling energy and nutrients.

Each particular type (species) of living thing in the forest has a particular role or function to carry out. Here are some examples:

- trees produce leaves and wood, using water, minerals, carbon dioxide and sunlight;
- beetle larvae feed on plant leaves, shredding them into smaller pieces;
- fungi digest the cellulose of wood, which is not digestible to most living things;
- bacteria digest the bodies of dead animals as well as their wastes (“scats”);
- some beetles eat other insects;
- many bird species feed on beetles or other insects.

4.6 Energy flow in the forest ecosystem

Plants in the forest (trees, shrubs, herbs, grasses) absorb energy from the sun’s rays to power a process known as photosynthesis. In photosynthesis, carbon dioxide from the atmosphere and water from the soil is converted into sugar. Organic minerals from the soil are taken up by the plant’s roots and used in other metabolic processes in the plant.

By the action of enzymes, the plant uses the sugar for general metabolism and to produce new roots, new leaves and branches, to protect against disease and pests, to produce flowers, fruits, seeds, and to produce larger stems (wood)

The amount of sunlight energy that is captured by the leaves determines how productive the forest is going to be. The individual growth of forest vegetation depends on the plant species, the age of plant, and the amount of moisture and nutrients available in the forest soil. Growth rates change during the growth of a forest overall. The upper canopy shades out the bushes and herbs below it as the forest grows. At some point, the older trees die and fall, and light filters into the lower canopy and ground vegetation. This allows the younger trees and bushes to grow faster, and some of them will form the upper canopy in the years to come.

The forest has two phases that go on all the time:

- Building phase (nutrients built into trees, plants, animals)
- Decay phase (nutrients returned to soil).

Both phases are essential; and both are driven by living plants and animals.

Carbon cycling is the process through which the carbon of dead trees, plants and animals is released back into the soil. After being processed in the soil by insects, worms and micro-organisms, it is released to the air in the form of carbon dioxide and can be used by plants in photosynthesis. Similarly, important nutrients such as nitrogen, phosphorus and trace elements are released from dead vegetation and then re-absorbed by the roots of growing plants. Another source of nutrients is from the weathering of rocks over time, which is dissolved in the soil water. Carbon, energy, nutrients and trace minerals are all cycled in this respect.

Some plants are capable of absorbing nitrogen from the atmosphere, rather than getting it from the soil. These are called nitrogen-fixing plants. Examples are alder and most legumes. In these plants, special micro-organisms live on the plant roots, which are able to capture nitrogen from the air within the soil. These plants are often “pioneer” species, as they are able to grow in an environment where nutrients are sparse.

4.7 Forest productivity

The productivity of a forest is the amount of plant biomass that is produced over a given time. Forest productivity depends a lot on the efficiency of the cycling processes. Large pieces of rotting wood "regulate" the speed of energy, carbon and nutrient cycling. The average temperature and moisture are also important factors that determine forest productivity.

In tropical forests, there is rapid decomposition and fast recycling. They tend to be large forests based on a thin layer of soil, with nutrients being stored mostly in the trees. Our cooler northern forests generally have a slower rate of decomposition, and hence a slower cycling rate. They tend to be smaller forests on a thick layer of soil, with nutrients being stored mostly in the soil.

4.8 Water in the Forest Ecosystem

Water is the connector in the forest ecosystem, permeating the air, the soils, the vegetation and the animals. Living things are made up of more than 70% water.

When it rains or the snow melts, water seeps into the forest soil. Here it picks up nutrients from the soil and is taken up into plants via the root system. Animals get water from creeks, ponds, wetlands and plants. While some of the water in the soil slowly seeps back into creeks or wetlands, some also evaporates from the soil and from plants, and returns to the atmosphere.

The forest acts like a sponge and also like a filter. By slowly releasing clean water into creeks, lakes and wetlands, it maintains order and balance in the watershed. While seeping through the soil, the water is cleansed through the filtering action of the soil and by the metabolic processes of micro-organisms. So, when a forest is degraded by human activities such as poor forest harvesting practices, the water in surrounding areas is also degraded.

4.9 The importance of dead trees

When they die, small plants or animals return to forest floor to decay, or provide a meal for forest wildlife.

Because the wood of trees consists of cellulose and lignins that most animals can't digest, the wood of trees decays more slowly. About the only living things that can digest wood are termites and different types of fungus. But even termites can't digest wood by themselves. They have special micro-organisms (protozoa) in their gut, which break down the cellulose for them.

There are two kinds of dead wood:

- *coarse woody debris* -- large pieces of dead trees that have already fallen down
- *snags* -- dead trees that are still standing

As mentioned above, dead wood has a lot of energy and nutrients stored inside it. When trees die, the dead wood releases the nutrients and energy that it built up during life; but this process is slow. Dead wood is broken down mostly by leaching by rainwater, and biological breakdown (insects, worms, fungi, etc.)

In terms of forest productivity, dead wood:

- improves the soil by adding organic matter
- retains moisture for the soil during dry periods
- provides a seed bed for regenerating trees
- provides a site for nitrogen-fixing bacteria (add nitrogen to soil)

But dead trees, whether standing or fallen, have another important function, that of providing habitat for an astonishingly wide variety of plants and animals. Dead wood in the forest:

- provides a place for nesting, denning of small mammals;
- provides a home for many herbs, mosses, ferns;
- provides a home for spiders, insects, etc., which are the base of the food chain;
- provides a foraging site for many insectivorous birds such as woodpeckers;
- provides food, protection, shelter, cover, and suitable climate for thousands of organisms; and
- can provide escape for small animals from clear-cutting activities, or fire.

Dead wood also maintains soil and water stability.

- fallen trees provide some protection from erosion on sloping ground
- dead fallen trees collect material on upslope side (litter, soil, etc.)
- this creates a place for plants to grow or animals to burrow
- biodiversity is increased, since dead wood is home to many insect and other species

Even dead wood that falls into a stream continues to perform an ecological role. It provides habitat and a source of food for aquatic animals and plants; and it controls current velocities, preventing scouring of the streambed. It stabilizes stream banks, and provides waterfalls and pools that are important for fish feeding and spawning.

In an ecological sense, it is detrimental to remove coarse woody debris and snags from the forest, as this interrupts the energy and nutrient cycles. Ultimately, the growth and productivity of the forest would start to decline as a result. Dead trees would of course need to be removed if they presented a hazard to people walking along the trails, or to people and homes near the edge of the forest.

4.10 The aging forest and natural succession

Ecological succession is a natural process that involves an ongoing series of important changes in the forest. One community of trees and shrubs is gradually replaced by another, and then another, over the course of time. Each plant community affects the soil, the amount light and shading, and other factors, allowing conditions for a new community to take over.

In this natural sub-region, trembling aspen and balsam poplar trees along with white birch are typically considered “pioneer” deciduous species, because they can establish and grow where there are not already many other trees. White spruce, on the other hand, are “shade tolerant”, and can survive and grow under a canopy of aspen/poplar. Eventually the spruce exceed the aspen and poplar trees in height and they become dominant in the upper canopy. This tends to reduce the amount of light entering the lower areas of the forest, and it has an effect on the biodiversity of understorey and ground plants.

Eventually, however, the spruce age and die. When they fall, they leave an open space in the forest canopy, so that light can shine in. At that point, the “shade intolerant” trees like aspen and poplar can establish again. In this way, the forest undergoes a cyclical pattern over and over. Although succession takes place naturally, it can be triggered by disturbances, such as fire, disease and insect infestations, strong winds or landslides, and of course clearcut logging. The rate of succession will be a function of the intensity and frequency of the disturbance.

If not exposed to these disturbances, the forest community eventually progresses to a *climax* stage, which in this natural region consists of trembling aspen and white spruce – a mixed-wood forest. The type of forest community reached in the climax stage depends on the climate and soils, and is different for different parts of the country. In the boreal forest, generally, the climax forest is dominated by white spruce, whereas in coastal British Columbia, for example, it is dominated by redwood.

The rate of succession depends on whether there was a disturbance, what kind of disturbance it was, and how severe it was. It also depends on how large an area is disturbed, the climate and the soil. Most of Canada's forests are composed of even-aged stands that have regenerated following major disturbances, such as fires, insect outbreaks or harvesting. In North America, disturbances have become more common due to forest fires and forest harvesting. True climax forests are becoming increasingly limited to parks and forest reserves.

The current forest on the Whitemud Creek ravine represents conditions where the impacts of such disturbances including fire and flooding have been limited for some time, and therefore some quite old spruce trees are found here.

Some degree of disturbance is not only natural but desirable. Over the course of time, nutrients in northern forests are locked up in a relatively slowly decomposing soil layer. However, to allow younger trees to flourish, it is important that nutrients be released back into the soil. Northern boreal forests evolved with cycles of fire, disease, and pests.

4.11 Biodiversity in the forest

Biodiversity is an expression of the variety of species of living things that inhabit a given area. High biodiversity is associated with a large assemblage of different species of plants and animals. A high level of biodiversity is a good thing not only because it offers an interesting variety of wildlife and plants that can be observed or studied, but because it is associated with ecosystem stability. A greater number of species in an ecosystem tends to add more stability and resilient to disturbances and increases the capture of energy because of the greater number of interactions in the system.

Generally speaking, the more structurally complex an ecosystem is, the higher the biodiversity. This is because in a complex system, there are more ecological *niches* that are suitable to different organisms. A forest with an upper canopy, an understory and ample ground vegetation, for example, is likely to have a relatively high biodiversity. The existence of a creek, lake, wetland or other waterbody adjacent to the forest enhances its biodiversity even more, because there are additional ecological niches for aquatic plants, mammals, shoreline birds, waterfowl, amphibians and aquatic insects. The Larch Lands forest along the Whitemud Creek is structured this way, and hence the area has quite a high biodiversity of plants, mammals, birds, amphibians, insects and other living creatures.

Most of the trees of the Larch area are trembling aspen, balsam poplar, white spruce and in some areas white birch. Some of the trees and shrubs along the North Valley trail include: beaked hazelnut, high bush cranberry, low-bush cranberry, various species of willows, saskatoon, pin cherry, choke-cherry, red-osier dogwood and prickly wild rose.

A list of the tree, shrub and herb species that have been observed in the Larch Lands area is given in Table A1, showing both common and scientific names.

A list of the breeding birds observed or expected to frequent the Larch Lands area is given in Table A2. Information provided in Table A3 includes nesting habitats, feeding behaviour, and some ways that birds can be encouraged to nest or feed in human-made structures.

Visitors are encouraged to tell us if they observe any additional plants or wildlife species in the area, via the "contact us" page of this website.

A summary of the Dominant Ecological Communities is given in Table 1 below.

Table 1: *Dominant Vegetation Communities on the Property*

Dominant Vegetation Community	Approximate Area	Description
Old coniferous forest	Creek banks (both sides)	Mature white spruce in nearly pure stands, in places.
Old mixedwood forest	Creek banks (both sides)	White spruce, trembling aspen and balsam poplar, with associated understory bushes and herbs.
Deciduous forest	Valley and ravine slopes	Open stands of primarily trembling aspen, with associated understory bushes and herbs.
Riparian / aquatic emergent and submergent	Oxbow area	Shoreline, emergent and submergent plants around the edges of the oxbow and Whitemud Creek.
Regeneration forest (white birch)	Valley	A stand of almost pure white birch, with associated ground vegetation.
Meadow	Valley, in loop of creek	Grassy area with regenerating deciduous and coniferous trees.

4.12 Forest sustainability

The "ecological health" of the forest can be viewed by several measuring sticks:

- biodiversity (how many species of animals and plants inhabit or use the forest?)

- stability (will the forest tolerate insects, fires, disease, etc?)
- sustainability (will the forest last in its present form, undergoing natural succession?)

Some of the tools that can be used in land management strategies include establishing riparian buffer areas, including connectivity corridors, and setting aside forest reserves.

There are a number of threats to forest sustainability. Perhaps the most important is population growth, the spread of urban development (and agriculture in the past), the expansion of natural resource industries, and the resulting need for more land.

The burning of fossil fuels and emission of greenhouse gases such as carbon dioxide since the industrial revolution is thought to be leading to major changes in the earth's climate. A warmer climate in the northern latitudes could have many effects on forests, including increased frequencies of wildfires, insect outbreaks, tree diseases, water levels and streamflow, and changes in tree species.

Damage to forest soils can result from over-intensive foresting harvesting, poor road construction and maintenance, soil compaction from operating forest harvesting machinery, and the removal of organic matter (e.g., dead wood, over-harvesting).

If forest harvesting leaves too few seed trees, the genetic base of the tree community may be narrowed down, resulting in the loss of genetic diversity. Genetic diversity is nature's "insurance policy": the more genetic variation there is in a population of trees allows ability to survive stresses such as pests, disease and severe weather or drought.

Human management of the forests has in many cases changed the frequency of natural occurrences such as fire, insects, disease and wind. Our forests have evolved with certain levels and fluctuations of these natural occurrences, and are therefore adapted to them. Using strategies that "simplify" the forest community (i.e., resulting in forests having single species and an even age distribution) make the forests more vulnerable to these natural phemonena.

Poor forest resources management can lead to over-harvesting (e.g., short rotation time or too intensive), inadequate regeneration, and poor treatment of soils.

4.13 Old-Growth Forest

Old-growth forest is characterized as having very old, large trees, a multi-layered forest structure with several canopies, and a thick layer of woody debris (rotting logs, snags).

Often the question arises as to why we need "old-growth" forest. There are a number of ecological and human values associated with old-growth forest. They include:

- the human aesthetic value of old-growth forest, with its clean air, often compared with a cathedral;
- the traditional value of old-growth forest to Aboriginal people and others, including cultural activities, resources and a link with ancestors;
- functioning as a sort of ecological "benchmark", so that we can see the way a forest behaves in its natural, undisturbed state;

- serving as a source of genetic diversity, which enhances resistance to disturbances and stresses;
- habitat to which many species are adapted – many of them rare species;
- serving as migration corridors for certain wildlife species.

5.0 The Oxbow and the Riparian Area

As mentioned above, the oxbow block contains an “island” of land to the east of which is the actively flowing channel of Whitemud Creek, and to the west of which is a channel or pond that previously flowed but has over a period become blocked by sedimentation and accretion of organic and inorganic matter, as well as the activities of beaver. The inactive (west) channel/pond is thought to be fed partly by groundwater and seepage from the west side of the ravine, as well as surface runoff from the west slope of the ravine.

The *riparian zone* is an important part of forest ecology. The word “riparian” comes from a Latin word meaning “river”. Riparian areas, therefore, are wet vegetated areas that border streams, rivers, lakes and wetlands. The riparian area normally includes the floodplain, streamside vegetation, and the lower slopes of the forest that are influenced by moisture from the wetland. In Alberta, approximately 80% of all wildlife utilize riparian areas for all or part of their life cycle requirements. Riparian areas are essential wildlife corridors, travel routes, connectors between different habitats and stop-overs on migration.

Natural landscapes are interconnected by riparian zones. Riparian areas are important to the ecological functioning of the forest ecosystem. They provide water, and dense vegetation for many of the life history requirements of the diversity of species inhabiting them. Furthermore, riparian areas provide movement routes for large and small animals including deer, moose and associated predatorsThe dispersal of many types of plants also tends to follow riparian corridors. The native streamside vegetation of the riparian area protects the floodplain, which has been formed by the deposition of sediments over time. Native plants have a complex root system that has the ability to stablize the streambanks. If the riparian vegetation is removed or degraded, this may result in serious erosion and soil instability.

Riparian areas carry out a number of other important ecological functions in the forest. They improve water quality by reducing sedimentation caused by bank erosion, and regulate water flows in the watershed. Riparian vegetation provides habitat for many species, thus increasing biodiversity, as well as forming connectivity corridors for animals and plants. The riparian zone improves fish habitat in the stream by supplying dead wood, which forms small pools and regulates stream flow. Fish habitat is also improved by the overhanging vegetation of the riparian zone, which shades the water and regulates temperature. If the riparian vegetation is cleared during forest harvesting, trampling by cattle or other human activities, the stream temperature may rise and have an effect on the number and species of fish inhabiting the creek.

Riparian zones can be protected by establishing a buffer strip along the watercourse which eliminates forestry practices, grazing and other detrimental uses.

The riparian area around the oxbow pond is clearly visible from its north end. Semi-aquatic mammals including beaver, muskrat and possibly mink, as well as amphibians such as chorus frogs, wood frogs and salamanders frequent the area. Emergent riparian plants may also be observed here, including cattails, bulrushes, duckweed, marsh marigold, water sedges, marsh reed grass, horsetails, manna grass, slough grass, spike rushes, wild mint, and water crowfoot.

Waterfowl, grebes, and other waterbirds use the oxbow pond as feeding, breeding and brood-rearing habitat. In addition, Spotted and Solitary Sandpipers may be observed along the creek and the oxbow. In addition, song birds that feed mainly on flying insects, such as swallows, flycatchers, waxwings,, would utilize the oxbow area. Bats commonly forage over water areas such as the oxbow and the surrounding forest provides daytime roosting sites.

A list of organisms observed in the oxbow pond appears below.

List of fauna observed in the Oxbow pond in July, 2007.

Common Name	Scientific Name – Order (Family/Genus)
Caddis-fly larvae	*Trichoptera* larvae: wood cases.
Backswimmers	*Hemiptera (Notonecta)*
Damselfly (aquatic stage)	*Odonata (Aeschnidae)* naiads
Damselfly (winged stage)	*Odonata (Aeschnidae)* adults
Water striders	*Hemiptera (Gerridae)* adults
Diving beetles	*Coleoptera (Dytiscidae)* adults
Whirligig beetles	*Coleoptera (Gyrinidae)*
Leeches	*Oligochaeta (Hirudineae)*
Snails	*Gastropods*
Tadpoles (larval frogs) - boreal chorus frog - wood frog	 *Pseudacris maculata* *Rana sylvatica*
Two beaver lodges are located along the shoreline.	

6.0 Wildlife and Biodiversity

Field investigations of the Larch Lands site indicated that the ravine portion which comprises the east part of the property supports a mixed-wood forest of mainly balsam poplar, trembling aspen and white spruce. In many locations, concentrations of mature white spruce border the creek. Other vegetation includes white birch, beaked hazelnut, Saskatoon, red osier-dogwood, wild cranberry, honeysuckle, wild rose, and choke cherry. The forested area throughout the ravine portion of the property is in good health, and provides valuable habitat for plants and animals, such as moose, white-tailed deer, fox, coyote, hare, frogs, and a wide variety of songbirds and waterfowl. The banks of the creek are very steep and high in many places, and deep gullies are formed where the creek winds to the east or west. This heterogeneity of habitat types leads to a large number of niche opportunities for avian, mammalian, herptile and other fauna, as well as plants.

A total of 42 avian species were recorded and suspected to be breeding in the study area; however, more birds (over 90 species) probably frequent or breed in the area, as shown in Table A2 of Appendix A. Most common species observed on the study area were Black-capped Chickadees, American Robins, House Wrens, and Red-eyed Vireos followed by Yellow Warblers, Mallards, American Crows and Chipping Sparrows; White-throated Sparrows, Brown-headed Cowbirds, Yellow-rumped Warblers and Cedar Waxwings were next with more than a single observation. Two raptor species including Swainson’s and Red-tailed Hawks were observed but a nest site was not located for either species, although the Red-tails did exhibit some territorial behaviour. As predicted from the habitat observations a good number of species observed were cavity nesters, taking advantage of the holes created by the diversity of woodpecker species.

Two species of owls were detected in a survey in the oxbow area: Northern Saw-whet and Long-eared . Another report noted an observation of a pair of Barred Owls in the area and a pair of Great Horned Owls nesting.

The diversity of habitats in the study provide for breeding waterfowl both in the flowing and still water areas. Common Mergansers, Common Goldeneye, Bufflehead and even Mallard, Gadwall, and Teal are able to utilize these major habitat types for breeding and brood-rearing. This was demonstrated by the presence of breeding pairs and broods observed during the June and July surveys. A pair of Mallards, and a lone Mallard drake indicate that this species was still nesting or maybe re-nesting if the initial nest was lost at the time of the June survey. A Mallard hen with a brood of six downy ducklings was an indication that successful breeding was occurring. In addition, two Goldeneye broods were observed, one with seven ducklings and another with two (incomplete count). During the latter survey a pair of Gadwall was recorded, along with a brood of three Mallards, nearly fully feathered, and a brood of 12 Common Mergansers (mostly feathered). All the broods with the exception of the mergansers were observed on the oxbow area indicating a preference for this habitat type.

Tracks of white-tailed deer were most common along with those of snowshoe hares and small mammals (likely voles), and numerous white-tailed deer were seen throughout the surveys.. Hare browsing and barking, and signs of deer browsing (mainly on red osier-dogwood) were also observed. Several sets of moose tracks, and moose scats, were observed along Whitemud Creek, as well as the tracks of a black bear. Apparently, wild boars were introduced accidentally into the area through the efforts of a local game farmer, but none have been reported for some time.

Evidence of deer cratering near the edge of the ravine along the west side was observed during a winter survey. Coyote tracks were also seen along the top of the valley. Signs of red squirrel were evident both by tracks and remains of spruce cones and were always near clumps of mature spruce trees. Several beaver dams and beaver cuttings indicated presence of these species. Beaver dams provide lentic (still or slow moving water) habitat for bird and amphibian species that may not use the lotic (flowing water) portions of Whitemud Creek. Mammals recorded incidentally on the site included: beaver, porcupine, coyote, red squirrel, least chipmunk, snowshoe hare, white-tailed deer, moose, northern pocket gopher, white-footed deer mouse (abundant) and meadow vole (abundant).

Amphibian surveys conducted around the oxbow during the late spring and summer of 2003 (Eaton, 2003) found wood frogs and boreal chorus frogs. It is possible that Canadian toads and tiger salamanders exist here, too. Overwintering habitat for toads and salamanders may be limited, however, due to the surficial material in the area (soft soil required for burrowing).

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APPENDIX A PLANTS AND BIRDS OF THE LARCH LANDS VALLEY FOREST AREA

Table A1 gives a list of the vascular plant species that have been observed in the forested slopes of the Larch Lands area. Both the common and scientific names are given.

Table A2 shows some characteristics of bird species that are expected to use the Larch Lands habitat, for nesting or feeding. The approximate seasonal arrival/departure times of the birds is shown in parentheses. "Resident" indicates presence year–round, and an "irruptive migrant" is a species that is forced to leave the normal range, e.g., due to lack of food, and move elsewhere in search of it. Also shown in the table for each bird species, are the nesting habits, feeding preferences, and suggestions for ideal types of plantings, nest structures and feeding items.

Table A3 shows a list of the birds observed/expected to breed on Larch Lands along Whitemud Creek.

Table A1: List of Plants observed, Larch lands.

Common Name	Scientific Name
A. Trees and Shrubs:	
Manitoba maple	*Acer negundo*
Alder	*Alnus rugosa*
Saskatoon	*Amelanchier alnifolia*
Spreading Dogbane	*Apocynum androsaemifolium*
White birch	*Betula papyrifera*
Caragana	*Caragana arborescens*
Red-osier dogwood	*Cornus stolonifera*
Beaked Hazelnut	*Corylus cornuta*
Wolf-Willow	*Elaeagnus commutata*
White Spruce	*Picea glauca*
Balsam poplar	*Populus balsamifera*
Trembling aspen	*Populus tremuloides*
Pin cherry	*Prunus pensylvanicus*
Chokecherry	*Prunus virginiana*
Shrubby willow	*Salix arbusculoides*
Beaked Willow	*Salix bebbiana*
Pussy Willow	*Salix discolor*
Sandbar Willow	*Salix exigua*
(Western) Shining Willow	*Salix lucida / lasiandra*
Yellow Willow	*Salix lutea*
Basket willow	*Salix petiolaris*
Scouler's willow	*Salix scouleriana*
Western Mountain Ash	*Sorbus scopulina*
Low bush cranberry	*Viburnum edule*
High bush cranberry	*Viburnum opulus*
Buffaloberry	*Shepherdia canadensis*
B. Forbs, Herbs and Other Vascular Plants:	
Baneberry	*Actaea rubra*
Quack grass	*Agropyron repens*
Slender wheat grass	*Agropyron trachycaulum*
Short-awned foxtail	*Alopecurus aequalis*
Canada anemone	*Anemone canadensis*
Cut-leaved / Long-fruited Anemone	*Anemone multifida (or cylindrica)*
Columbine	*Aquilegia sp.*

Wild sarsaparilla	*Aralia nudicaulis*
Blunt-leaved sandwort	*Arenaria lateriflora*
Fringed aster	*Aster ciliolatus**
Slough grass	*Beckmannia syzigachne*
Fringed brome	*Bromus ciliatus*
Brome grass	*Bromus inermis.*
Marsh Reed Grass	*Calamagrostis canadensis*
Vernal water-starwort	*Callitriche verna*
Marsh marigold	*Caltha palustris*
Awned Sedge	*Carex atherodes*
Water Sedge	*Carex aquatilis*
Two-Seeded Sedge	*Carex disperma*
Beaked Sedge	*Carex utriculata*
Wood reedgrass	*Cinna latifolia*
Canada thistle	*Cirsium arvense*
Bunchberry	*Cornus canadensis*
Spotted Coralroot	*Corrallorhiza maculata*
Yellow Lady’s Slipper	*Cypripedium calceolus*
Fairy bells	*Disporum trachycarpum*
Creeping Spike-rush	*Eleocharis palustris*
Fireweed	*Epilobium angustifolium*
Horsetail (common)	*Equisetum arvense*
Horsetail (swamp)	*Equisetum fluviatile*
Horsetail (meadow)	*Equisetum pratense*
Fescue	*Festuca sp.*
Woodland strawberry	*Fragaria vesca*
Wild strawberry	*Fragaria virginiana*
Hemp-nettle	*Galeopsis tetrahit*
Northern bedstraw	*Galium boreale*
Small bedstraw	*Galium trifidum*
Sweetscented bedstraw	*Galium triflorum*
Yellow/purple avens	*Geum sp.*
Tall manna grass	*Glyceria grandis*
Fowl manna grass	*Glyceria striata*
Bracted Bog-Orchid	*Habenaria viridus*
Alpine Sweet-vetch	*Hedysarum alpinum*
Cow-parsnip	*Heracleum lanatum*

Narrow-leaved Hawkweed	*Hieracium umbellatum*	Forest floor moss	*Polytrichium sp.*
Foxtail barley	*Hordeum jubatum*	Silverweed	*Potentilla anserina*
Creamy Peavine	*Lathyrus ochroleucus*	Wintergreen, Pink	*Pyrola asarifolia*
Duckweed	*Lemna minor*	One-sided wintergreen	*Pyrola secunda*
Twinflower	*Linnaea borealis*	Tall Buttercup	*Ranunculus acris*
Twining honeysuckle	*Lonicera dioica*	Yellow Water-crowfoot	*Ranunculus gmelinii*
Bracted honeysuckle	*Lonicera involucrata*	Bristly Buttercup	*Ranunculus pensylvanicus*
Wild lily-of-the-valley	*Maianthemum canadense*	Celery-leaved Buttercup	*Ranunculus sceleratus*
Yellow sweet-clover	*Melilotus officinalis*	Skunk currant	*Ribes glandulosum*
Wild Mint	*Mentha arvense*	Wild black currant	*Ribes americanum*
Tall Lungwort	*Mertensia paniculata*	Northern black currant	*Ribes hudsonianum*
Rough-leaved rice grass	*Oryzopsis asperifolia*	Northern gooseberry	*Ribes oxacanthoides*
Northern rice grass	*Oryzopsis pungens*	Currant (Red)	*Ribes triste*
Coltsfoot, Palmate	*Petasites palmatus*	Prickly rose	*Rosa acicularis*
Coltsfoot, Arrow Leaved	*Petasites sagittatus*	Wild rose	*Rosa woodsii*
Reed canary grass	*Phalaris arundinacea*	Wild raspberry	*Rubus idaeus*
Timothy	*Phleum pratense*	Trailing raspberry	*Rubus pubescens*
Common Plantain	*Plantago major*	Western dock	*Rumex occidentalis*
Fowl bluegrass	*Poa palustris*	Snakeroot	*Sanicula marilandica*

Purple Oat Grass	*Schizachne purpurascens*
Great Bulrush	*Scirpus lacustris*
Marsh skullcap	*Scutellaria galericulata*
Marsh Ragwort	*Senecio congestus*
Star-flowered False Solomon's Seal	*Smilacina stellata*
Goldenrod	*Solidago canadensis*
Marsh Hedge Nettle	*Stachys palustris*
Northern Stitchwort	*Stellaria calycantha*
Snowberry	*Symphoricarpos albus*
Buckbrush	*Symphoricarpos occidentalis*
Dandelion	*Taraxacum officinale*
Veiny meadow rue	*Thalictrum venulosum*
Stinkweed	*Thlaspi arvense*
Alsike clover	*Trifolium hybridum*
White clover	*Trifolium repens*
Cattail	*Typha latifolia*
Stinging nettle	*Urtica dioica*
Wild vetch	*Vicia americana*
Early blue violet	*Viola adunca*
Western violet	*Viola canadensis*
Kidney leaved violet	*Viola renifolia*

Table A2: *Common and scientific names of birds observed/expected to breed on Larch Lands habitats along Whitemud Creek.*

*Canada Goose	*Branta canadensis*	*Black-capped Chickadee	*Parus atricapillus*
Gadwall	*Anas strepera*	*Boreal Chickadee	*Poecile hudsonica*
American Widgeon	*Anas americana*	*Red-breasted Nuthatch	*Sitta canadensis*
*Mallard	*Anas platyrhychos*	*White-breasted Nuthatch	*Sitta carolinensis*
Blue-winged Teal	*Anas discors*	Brown Creeper	*Certhia americana*
Northern Shoveler	*Anas clypeata*	House Wren	*Troglodytes aedon*
Green-winged Teal	*Anas crecca*	Winter Wren	*Troglodytes troglodytes*
Bufflehead	*Bucephala albeola*	*Ruby-crowned Kinglet	*Regulus calendula*
*Common Goldeneye	*Bucephala clangula*	Mountain Bluebird	*Sialia currucoides*
Gray Partridge	*Perdix perdix*	*Veery	*Catharus fuscesens*
Ring-necked Pheasant	*Phasianus colchicus*	*Swainson's Thrush	*Catharus ustulatus*
*Great Blue Heron	*Ardea herodias*	Hermit Thrush	*Catharus guttatus*
Sharp-shinned Hawk	*Accipiter striatus*	*American Robin	*Turdus migratorius*
*Cooper's Hawk	*Accipiter cooperii*	*Gray Catbird	*Dumetella carolinensis*
Northern Goshawk	*Accipiter gentiles*	*Bohemian Waxwing	*Bombycilla garrulus*
Swainson's Hawk	*Buteo swainsoni*	*Cedar Waxwing	*Bombycilla cedrorum*
*Red-tailed Hawk	*Buteo jamaicensis*	European Starling	*Sturnus vulgaris*
American Kestrel	*Falco sparverius*	*Tennessee Warbler	*Vermivora peregrina*
*Great Horned Owl	*Bubo virginianus*	Orange-crowned Warbler	*Vermivora celata*
*Long-eared Owl	*Asio otus*	*Yellow Warbler	*Dendroica petechia*
*Northern Saw-whet	*Aegolius acadicus*	*Yellow-rumped Warbler	*Dendroica coronata*
Ruby-throated Hummingbird	*Archilochus colubris*	American Redstart	*Setophaga ruticilla*
*Belted Kingfisher	*Ceryle alcyon*	Ovenbird	*Seiurus aurocapillus*
*Yellow-bellied Sapsucker	*Sphyrapicus varius*	Common Yellow-throat	*Geothlypis trichas*
*Downy Woodpecker	*Picoides pubescens*	*Western Tanager	*Piranga ludoviciana*
Hairy Woodpecker	*Picoides villosus*	American Tree sparrow	*Spizella arborea*
Northern Flicker	*Colaptes auratus*	*Chipping Sparrow	*Spizella passerine*
*Pileated Woodpecker	*Dryocopus pileatus*	*Clay-coloured Sparrow	*Spizella pallida*
Olive-sided Flycatcher	*Contopus cooperi*	Savannah Sparrow	*Passerculus sandwichensis*
Western Wood-Pewee	*Contopus sordidulus*	*Song Sparrow	*Melospiza melodia*
Alder Flycatcher	*Epidonax alnorum*	Lincoln's Sparrow	*Melospiza lincolnii*
*Least Flycatcher	*Epidonax minimus*	*White-throated Sparrow	*Zonotrichia albicollis*
*Eastern Phoebe	*Sayornis phoebe*	*Dark-eyed Junco	*Junco hyemalis*
*Eastern Kingbird	*Tyrannus tyrannus*	Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Northern Shrike	*Lanius excubitor*	Red-winged Blackbird	*Agelaius phoeniceus*
*Warbling Vireo	*Vireo gilvus*	Common Grackle	*Quiscalus quiscula*
Philadelphia Vireo	*Vireo philadelphicus*	*Brown-headed Cowbird	*Molothrus ater*
*Red-eyed Vireo	*Vireo olivaceus*	Baltimore Oriole	*Icterus galbula*
*Blue Jay	*Cyanocitta cristata*	Pine Grosbeak	*Pinicola enucleator*
*Black-billed Magpie	*Pica pica*	Purple Finch	*Carpodacus purpureus*
*American Crow	*Corvus brachyrhynchos*	White-winged Crossbill	*Loxia leucoptera*
*Common Raven	*Corvus corax*	Common Redpoll	*Carduelis flammea*
*Tree Swallow	*Tachycineta bicolor*	*Pine Siskin	*Carduelis pinus*
*Bank Swallow	*Riparia riparia*	*American Goldfinch	*Carduelis tristis*
Cliff Swallow	*Petrochelidon pyrrhonota*	Evening Grosbeak	*Coccothraustes vespertinus*
Barn Swallow	*Hirundo rustica*	House Sparrow	*Passer domesticus*

** observed during field surveys, 2007, and other studies.*

Expected derived from The Atlas of Breeding Birds of Alberta

Table A3: *Some characteristics of bird species expected to use the Larch Lands property and adjacent ravine area, for nesting or feeding.*

Species (Arrival/departure)	Nesting Habits	Feeding Behavior	Management Recommendations		
			Plantings	Nest Structures	Feeding
American Kestrel (Apr. to Sep.)	Tree cavities, crevices, cliffs, building recesses, nest boxes	Hunts from a perch; insects, grasshoppers, crickets, frogs, mice		Nest box: 3" hole size, 10-30 feet high	
Northern Saw-whet Owl (unknown migration)	Nests in tree cavities, woodpecker holes, occasionally nest boxes	Small mammals, small birds, insects, frogs		Nest box	
Ruby-throated Hummingbird (mid-May to late Aug.)	Wooded deciduous edges, gardens, nests on limbs with overhead canopy. 3-7m high	Flower nectar, small insects, spiders, tree sap	Tubular flowers, honeysuckle, bee balm, hollyhocks, salvia, verbena, petunia, dahlia,		Feeders: syrup start with 1 sugar: 4 water, then reduce to 1:6 or 1:9
Downy Woodpecker (resident)	Deciduous/mixed wood forest, shelterbelts, parks golf courses. Excavate cavities in dead trees	Wood-boring larva, beetles, some fruits and seed, sap		Leave some dead trees/snags standing	Hanging feeders: suet or peanut butter; sunflower seed
Hairy Woodpecker (resident)	Deciduous/mixed wood, Often around openings and edges	Ants, caterpillars, beetles, sap		As above for Downy	As above for Downy
Northern Flicker (late-March to late-Sep.)	Deciduous, mixed wood, coniferous, open areas, edges, shelterbelts, make cavity in dead deciduous, poles, fencepost; nest box	Forage on the ground & trees; ants insect larvae, beetles, some worms and berries		Nest box: 2.5" hole, southeast facing, 6-30 ft. high, fill w/wood chips/shavings	May come to feeder: suet, peanut butter, corn
Pileated Woodpecker (resident)	Prefer mature mixed and deciduous, large dead or dying trees (40-50 cm) for nesting, also in urban areas. Excavate cavities	Feed on live, dead or downed trees. Wood boring insects, larva, carpenter ants, fruit and nuts.			Occasionally come to feeder: suet; best to fix to tree; non-hanging

Species (Arrival/departure)	Nesting Habits	Feeding Behavior	Management Recommendations		
			Plantings	Nest Structures	Feeding
Eastern Phoebe (mid-Apr. to early Sep.)	Open wooded areas, near edges and water, around humans, cottages, farms, culverts, ledges, eaves	Hawk insects from a perch; also seeds and wild berries (winter)		Open nest boxes with canopy, ledges/shelves under eaves	
Purple Martin (early-May to mid-Sep.)	Under natural conditions prefer mature woodlands, burns, cliff crevices, woodpecker holes; now mostly use nest boxes	Forage on the wing for Mayflies, flying ants, dragonflies, butterflies and moths		Colonial nest boxes: painted white,10-15 ft. high, away from buildings/trees, 2.125” round hole	
Tree Swallow (mid-Apr. to late-Aug.)	Natural cavities, woodpecker holes in mature woodlands, often near ponds, lakes, or wet areas	Forage on the wing on mostly flying insects; will eat berries in inclement weather		Single or colonial nest boxes: 5-15 ft. high, 1.375” hole, round, east facing	
Blue Jay (resident-may be partially migratory)	Mixed and deciduous forest, semi-open, ornamentals and urban landscapes; usually nest in conifers	Omnivorous diet, fruits, insects, grains, and eggs/nestlings of other songbirds	Conifers for nesting		Frequent feeders - sunflower seeds & peanuts
Black-capped Chickadee (Resident)	Prefer deciduous and mixed-wood; nest in cavities of dead trees, snags, or broken tops	Feed mainly on insects on trees, insect eggs , seeds and berries		Nest boxes: hole size 1.125”, 5-15 ft. high, away from prevailing wind; place shavings/ wood chips in box; they like to excavate	Frequent feeders - sunflower seeds, peanuts, suet, peanut butter
Red-breasted Nuthatch (resident- some may migrate)	Prefer coniferous and mixedwood, urban areas, nest in dead/decaying trees, stump, post 2-12m above ground	Feed largely on coniferous seeds, also spiders and insects		Nest box: 1.25” hole, away from prevailing wind, 5-15 ft. high, shavings in bottom, they like to excavate	Frequent feeders – sunflower seeds, suet and peanut butter

Species (Arrival/departure)	Nesting Habits	Feeding Behavior	Management Recommendations		
			Plantings	Nest Structures	Feeding
White-breasted Nuthatch (resident)	Mature deciduous, mixed wood, and coniferous forests, use other cavities or excavate their own	Glean insects from bark and limbs, berries, sunflower seeds		Nest box: 1.375” hole, 5-20 ft high; like to excavate as above	Make use of feeders; sunflower seeds, suet, peanut butter
House Wren (mid-May to mid-Sep)	Open woodland, thickets, coulees, backyards, shelterbelts, nest in cavities and nest boxes	Feed entirely on insects	Planting dense shrubbery near fences and corners	Nest box: 1.25” hole, 5-10 ft high,	
Mountain Bluebird (mid-Mar. to early Sep)	Open woodlands, edges scattered trees, burns and farmland, cavity nesters, woodpecker holes or nest boxes.	Hover while foraging for insects, mainly crickets, grasshoppers, beetles, some worms and wild fruit		Nest box: 1.56” hole, 3-6 ft high, preferably east facing	
American Robin (early-Mar. to early-Oct)	Woodlands, open areas, edges, urban, ornamental and shade trees; nest in trees, shrubs, ledges, eaves.	Feed on worms, insects, berries, fruit, earthworms in urban areas	Food shrubs and fruits	Ledges and platforms under eaves	Feeder: corn, suet or peanut butter
Gray Catbird (mid-May to early-Sep)	Dense shrubby areas, edges, along streams and roadsides; nest less than 3m from ground	Feed on insects, spiders, berries and cultivated fruit	Plant shrubs for nesting and food		
Bohemian Waxwing (winter to mid-Apr.)	Nest in boreal forest to the north	Prefer mountain ash and juniper berries; also saskatoons, choke cherries, rose hips, raspberries, strawberries, cedar	Plant food trees and shrubs		Feeder: wheat
Cedar Waxwing (late May/Aug./Sep)	Deciduous woodland, edges, but will use ornamental trees and shrubs near human habitation, 2-16m high	Insects gleaned from leaves or ‘hawked’ from perches. Fruits, berries fall and winter	Ornamental trees and shrubs; fruit and berry plants		

Species (Arrival/departure)	Nesting Habits	Feeding Behavior	Management Recommendations		
			Plantings	Nest Structures	Feeding
Chipping Sparrow (mid-Apr to Aug./Sep.)	Open deciduous, mixed and coniferous forests, openings, edges, farms and residential, nest in shrubs and trees	Feeds on lawns, hedgerows, meadows for insects mainly; some seeds	Shrubs, gardens		
Song Sparrow (mid-Apr to late-Sep)	Shrubby growth along woodland edges, gardens and farmland thickets, hedgerows, shrubbery @ buildings	Scratches for insects and seeds in leaf litter	Plant tall shrubs		May come to sunflower seeds, canola, safflower,
Dark-eyed Junco (mid-Mar. to mid-Oct.)	Coniferous and mixed-wood openings, clearings edges, burns, cutover areas, occasionally parks, cottages, residential, gardens; nest on the ground under tree roots, stumps, logs	Forage on the ground, scratch for seeds, insects and berries		Downed brushpiles for nesting and foraging	Pick up seeds from feeders, Niger seed, corn, safflower, hemp, millet
Common Redpoll (winter visitor, Oct. to Apr.)	Breeds in the Arctic and sub-Arctic, although there are records of nesting in Central AB.	Feed on seeds of coniferous and deciduous trees and shrubs, weed seeds, spilled grain			Frequent feeders: millet, corn, thistle, canola, hemp, sunflower seed
Pine Siskin (irruptive migrant, late-May to early Nov., some over-wintering)	Coniferous and mixed-wood; at times ornamentals or shade trees in residential areas	Often hang upside down to feed on seeds of conifers, birch, alder, weed seeds, thistle, dandelion, insects.			Frequent feeders: Niger, millet, thistle, canola,
American Goldfinch (early-June to mid-Sep)	Overgrown fields, pastures, fencerows, roadsides, residential gardens, farmyards, nest in shrubs/trees < 6m high	Seed eaters, prefer dandelion and thistle seed	Shrubs for nesting and dandelions for feeding		May come to millet, thistle or sunflower

Species (Arrival/departure)	Nesting Habits	Feeding Behavior	Management Recommendations		
			Plantings	Nest Structures	Feeding
Evening Grosbeak (irruptive migrant)	Secretive nester in coniferous and mixed-wood, nest may be 18m above ground.	Mainly seed eaters, particularly Manitoba maple, also eat buds, cones and fruit	Plant Manitoba maple		Frequent feeders: corn, sunflower seed safflower
House Sparrow (resident)	Always associated with humans, nest in crevices, cavities, nest boxes	Seed eaters, cultivated crop seeds, grass seeds, insects, household scraps		Use nest boxes, are aggressive to other nesters, proper hole will deter their use	Use feeders: millet, wheat, safflower and sunflower

Sources:

Semenchuk, G. P. 1992. *The Atlas of Breeding Birds of Alberta*. Federation of Alberta Naturalists, Edmonton, Alberta 391 pp.

Butler, E. 1991. Attracting Birds. Lone Pine Publishing, Edmonton, AB. 63 pp.