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CRP Regional EcoPlan Themes - DETAILED

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Landscape Health

The Landscape Health theme centres on the conservation and protection of landscape-scale features which likewise support ecological processes at the landscape scale. This includes connectivity zones, escarpments and ridges, and large patches of natural vegetation.

Ecological connectivity zones

For any system to be effective, the key principle is connectivity. An ecosystem is no different; its health is dependent on the extent to which it can support the productive interplay of its parts. Connectivity measures the degree to which wildlife can move between patches of valuable habitat, the interconnectedness of surficial and subsurface water systems, availability of dispersion paths for plants and animals, and the evolutionary capacity of species and processes (especially in the face of a changing climate regime).

Unlike the wires of a computer or the mains of a water system, ecological connectivity tends to be less about narrow *corridors* and more about *zones*; wildlife and water tend to funnel through constricted channels only as a result of external (often human) forces. Protecting connective capacity can mean focusing on wide swaths as much as narrow passageways, the character depending heavily on what is being connected and what is impeding connection.

Escarpments and ridges

The CRP's ecological infrastructure report ("What We Know Now: Ecological Infrastructure in the Calgary Region," Tyler et al) identified ridges and escarpments in the Calgary region as particularly important landscape-level features. Ridge-top springs support growth of vegetation important for wildlife, and represent important water source points and water system connectivity. The result is a mix of humidity, water flow, soil, and vegetation that is important for wildlife movement and groundwater-surface water connectivity. The challenges of building structures on these features has thus far lead to limited development relative to other areas, creating an unintended conservation value effect (e.g., wildlife move through these areas because of the relative lack of development compared to other areas).

Large patches of natural vegetation

Underlying the concept of connectivity is “connection to what?” One part of that answer is unfragmented patches of habitat which provide the necessities of life for wildlife at individual, population and genetic scales. This might include connection to patches of seasonal habitat, new habitat for dispersing individuals (from seeds to fawns). Larger (unfragmented) patches are ecologically more functional, as fragmentation can decrease species richness, genetically isolate populations, impair processes like pollination, reduce connectivity, and reduce habitat availability below necessary thresholds for wide-ranging species.

These patches are best comprised of natural vegetation, ideally (but not necessarily) native. Natural vegetation provides water purification, habitat (forage, seeds, grazing, nectar, larval hosts, edge habitat), water storage, carbon capture, erosion control, temperature moderation, pollinator support, and soil enrichment. In the Calgary region, natural vegetation will in some places be based more on grassland species and in others on forest species.

The particular benefits of *native* vegetative species is they are better suited to the environment, more likely to persist, more resilient, less likely to be invasive (and outcompete existing species), better support native micro-organisms, more efficient nutrient cyclers, more supportive of diverse habitats (species diversity, genetic diversity), better adapted to supporting local wildlife (including insects, micro-organisms), and less likely to support less-well-adapted and disruptive organisms (i.e., pest species).

Watershed Health

The Watershed Health theme centres on the conservation and protection of the region’s natural water system (including its critical uplands, ecological infrastructure, and aquatic habitat), as well as our sustainable use of the system. This includes protecting wetland and riparian infrastructure, maintaining the water quality and quantity needs for all species, and protection of source water areas.

Wetlands

Wetlands (wet, low lying areas that collect enough water to support water-loving plants) are heavy lifters in terms of watershed health. These areas contribute to biodiversity and wildlife habitat, provide water storage in both wet and dry years (reducing the impacts of both floods and droughts), provide natural water filtration and purification services, and are vital for groundwater recharge.

Despite their importance, Alberta loses 6000 to 10,000 acres of wetlands each year (Ducks Unlimited). For these reasons, most municipalities in the Calgary region have policies regarding wetland use and conservation. Wetland conservation can have several facets including avoidance, mitigation, securement, restoration, and construction. Municipalities can have a critical role to play in wetland conservation both directly through planning, regulation and securement, and indirectly through partnerships, education, and coordination with provincial regulation.

Riparian areas

Riparian areas are the zones where water and land come together at the edge of water bodies such as streams, wetlands and lakes. The separation of water and land is clear in concept, but much more nuanced in reality, with the transition zone varying from site to site, and shifting over time. The 'constant' is that this dynamic nature creates a diversity of vegetation, wetness, and habitat. These riparian ribbons thrive in wet times and persist in dry times, often anchoring the sustainability of the local ecosystem, providing reliable nesting, forage, and movement opportunities. They help regulate the in-stream system, moderating temperatures, and filtering and regulating sediment, pollutants and nutrients entering the water. Healthy riparian areas regulate flood waters, stabilize banks, and limit erosion.

One species drawn in great numbers to these areas is humans, looking for access to water for recreation, drinking water, livestock watering, and various other types of residential, industrial and commercial activity. Conserving these area can mean regulating activity along riparian areas, directly protecting them, and/or incenting compatible activity.

Water quality

Water quality refers to the level of usability of water for humans or other local species. Those levels give guidance primarily as to whether the water is potable (safe for humans to drink), or presents risks to aquatic species. Other considerations include the effect pollutants might have on recreation, livestock, or other industrial uses that require a certain level of water quality.

Metrics for water quality focus largely on the presence of toxins (elements that are by some measure 'poisonous') or nutrients (elements that encourage growth rates that can 'choke' oxygen from the water). Other metrics include temperature and the presence of sediment, each seeking a viable range where potability and aquatic species health are ensured.. These parameters be measured in flowing water, accumulated water, or groundwater, each case presenting its own challenges.

Managing for water quality has two very different dynamics: cleaning dirty water and returning it into the water system, and reducing how much we dirty the water in the first place. Because of its conservation emphasis, the CRP Regional EcoPlan will focus on the latter, promoting best practices, and discouraging land and water use practices that are known to contribute to poor water quality.

It must also be recognized that one of the most significant challenges is connecting the management action to the water quality impact, due to pollution sources being distributed, and the infeasibility of monitoring every place in the system where potentially deleterious activity may be taking place (one notable exception being municipal waste water collectively piped to a treatment facility).

Water quantity

Water quantity refers to the amount of water available for use by humans or other species from accumulated water, flowing water, springs, or groundwater. Although water is a renewable resource, it is still finite, and conservation of water is becoming increasingly important In the Calgary region given the increasing population, closure of the Bow River Basin to further allocations, and the as-yet uncertain impacts of a changing climate regime.

Adapting to water quantity limitations (or water conservation) generally means one of three things: 1) using less water for the same activity; 2) using less as an

individual person or operation; or 3) using less collectively or system-wide. Most municipalities have water conservation policies in place already for various activities and a range of measures of their effectiveness.

Numerous measures of water use in the region exist at the municipal, regional and watershed scales, and also at the point of the tap, well, spring or intake pipe. However, two significant challenges exist. First, because water is a finite resource, using intensity-based metrics (such as per capita use) in the face of a growing population can be misleading; low intensity use can still lead to absolute increases. Second, despite being relied on by over 20% of Albertans for drinking water, a low emphasis has been placed developing usable metrics of availability and use of groundwater.

Compared with water quality, it is easier to connect individual water use activity with management actions aimed at conservation. This is because 'use' relates to active withdrawals that can more easily be measured, and changes in which can more easily be assigned to a specific management (or conservation) action. Because drinking water has preeminence in our water allocation system, and municipalities play the front-line role in its distribution, municipalities can have a great impact on water use and conservation.

Source water

Increasingly, municipalities are seeing local water conservation as a function of protecting the source, as much as limiting use. Communities tend to get their water from one of three sources: upstream headwaters, natural springs, or by directly accessing groundwater. Each of these feeds both flowing water (streams and rivers) and accumulated water (lakes and wetlands) from which communities draw their water directly. The sustainability of these source waters depends heavily on the land uses that surround them, and the effort to understand and protect them.

Source water protection necessitates a regional perspective as these sources are often outside of the municipal boundaries, and a given municipality is rarely the only accessing a given aquifer or river system. Strategies for conservation can include regulation of land and water use, incentives for improvement of practices, direct securement, and others.

Natural Spaces

Ecological conservation at a regional scale is a function of both individual, regional-scale actions *and* multiple small-scale actions; collectively, the latter may be just as or more important. The Natural Spaces theme centres on the conservation and protection of numerous, smaller patches of undeveloped spaces that perform valuable or critical ecological functions. This includes natural open space conservation, promotion of urban forests, retention of permeable surfaces, and protection of flood zones.

Natural open space

Open space refers to any land or water area that does not have built development on it, a concept that – in its broadest sense – may or may not have ‘ecological’ applicability. ‘Natural’ open space refers to the subset of open space that does have ecological value or potential. This can refer to smaller patches of native or natural vegetation, areas of important niche or stepping stone habitat, nature-based parks or ecological reserves, and nature-based recreation areas.

Urban forest

Urban forests includes trees (and in some cases their associated vegetation) that exist in urbanized parks, natural areas, private properties, roadways and other locations within an urban municipality. As well as an aesthetic and recreational value, municipalities’ urban forests reduce heat island effects, provide local habitat, absorb carbon and other pollutants, absorb stormwater, and lower the environmental costs of cooling and watering.

Permeable surfaces

Urban areas tend to accumulate land uses and land covers that prevent natural infiltration of precipitation. These impermeable surfaces increase run-off going directly to storm sewers and main stem waterways, reducing the ability of the ground to naturally purify water passing through, increases flood risks, and prevents effective recharge of groundwater aquifers. Maintenance of undeveloped

spaces with naturally permeable surfaces decreases these risks. Features such as wetlands and naturally-vegetated spaces best provide this service, but even non-natural spaces such as playing fields, school yards, and cemeteries can contribute to improved permeability, as can permeable paving techniques (such as paving stones, gravel, porous asphalt, etc.).

Natural flood zones

Flooding is generally – and appropriately – considered in terms of human safety and financial cost. However, flooding is an important natural process, providing roles such as creating stream-bed habitat, dispersing seeds, re-charging wetlands, enriching soils, flushing accumulated organic substances, and restoring the ecological health of stagnant areas. Maintaining areas within municipalities capable of accommodating seasonal flooding is ecologically important. At large scales, flooding can be ecologically destructive, too, thus maintenance of a diverse, meandering system of flood-capable water ways that can reduce flood severity is ecologically, as well as anthropogenically important.

Food Production

The Food Production theme centres on the conservation and protection of lands that are capable of producing food in an ecologically-compatible way. Conserving these functions and opportunities will vary significantly between more urbanized landscapes and more rural landscapes, including promoting low-impact agricultural operations and protecting the regional primary-production agricultural land base.

Regional agricultural land base

The agricultural land base around the Calgary region supports one of the most vital ecological functions of the regional landscape – the ability to produce the food humans need. Conserving this primary growth ability is dependent on several variables, one of the most fundamental being maintaining a land base capable of growing food. Although some approaches to food production can run contrary to other ecological conservation goals, an agricultural/ecological synergy exists in lands that produce food in an ecologically-compatible way.

As well as providing a sustainable source of food, agricultural lands can provide wildlife habitat, pollinator habitat, shelter belts, water features, soil formation, water filtration, and carbon sequestration. This conservation and protection theme does not include the agricultural lands that are used for secondary uses, such as food processing and animal finishing.

Urban agriculture

Although larger agricultural operations can encompass extensive ecologically-valuable landscapes, the smaller-scale operations which are occurring more frequently in proximity to urbanized areas can be an important contributor to ecological conservation from an efficiency perspective. Smaller-scale parcels/operations capable of growing food in a more concentrated way can have relatively low ecological costs per calorie of food as a result of reduced water, energy, chemical, space, and transportation requirements, and can also provide urban greenspace values.

The CRP EcoPlan will guide regional and local efforts to conserve such urban agriculture opportunities. Unlike the landscape focus of the regional agricultural land base, this sub-theme will focus more on the promotion of ecologically-efficient operating models.

Airshed Health

The regional airshed is the layer of ecological space we occupy that is above the ground; its health – and ours – is based on its capacity to absorb and cycle emissions in a way that ensures we have quality air to breathe and a healthy, sustainable level of greenhouse effect. The Airshed Health theme centres on the reduction of activities that overstretch the airshed’s capacity to absorb and cycle emissions, and promotion of activities that do not strain this capacity. This theme includes air quality and greenhouse gas (GHG) emissions.

Air quality

The Calgary Regional Airshed Zone or CRAZ (which covers the CRP region) describes air quality as being dependent on the rate at which pollutants are emitted into the atmosphere and the ability of the atmosphere to disperse these pollutants. The

importance of air quality is based on the impact to human health, quality of life, and the health of plant, water and wildlife systems. Current population and weather patterns may favour the region so far, but both are predicted to change.

CRAZ currently measures emissions of carbon monoxide, oxides of nitrogen, ozone, sulphur dioxide, methane, hydrogen sulphide, particulate matter (such as dust and smoke), total hydrocarbons and hydrogen sulphide. These are plotted against provincially-mandate thresholds, which if exceeded trigger requirements for increasing levels of mitigative action by regulatory agencies. Currently, there are only three measuring stations in the region (all in Calgary) and a mobile unit.

Air quality 'conservation' can mean limiting area pollution sources like car traffic, or point pollution sources like individual buildings or industrial operations through regulatory action, policy requirements, incentives, or a mixture.

GHG mitigation

Greenhouse gas (GHG) emissions refers to the gases emitted (primarily carbon dioxide and methane) from our individual and collective transportation, heating, agricultural, industrial and other activities – which thus come from our power plants, cars, houses, livestock, factories, and other sources. Although we need a certain amount of these gases and the resultant greenhouse effect to keep the earth's surface warm, it is recognized that we are beyond a safe point and need to take immediate action to reduce these emissions.

At the municipal level, action on greenhouse gas emissions and the resultant change in climate, tends to fall into three categories: 1) *mitigation*, where emission are lowered, 2) *sequestration*, where activities that absorb emissions are promoted, and 3) *adaptation*, where action is taken to respond to existing climate-induced changes affecting communities. The emphasis of the CRP Regional EcoPlan will be on *mitigation*.

Measurement of greenhouse gases at the municipal level is rarely a direct measure, but rather a 'proxy' measure where the amount of an emissions-producing activity is multiplied by a known emissions factor (one boiler emits X amounts of GHGs; two boilers emit 2X amounts of GHGs).

These measurements can have two dimensions at the municipal level: measuring emissions within the community, and measuring emissions from municipality's own

operations, both of which are important. These lead directly to two areas of management or mitigation actions: 1) changing corporate activities, and 2) requiring or incenting changes in community activities.