Glossary of Terms and Acronyms Used in Oil Sands Mining, Processing and Environmental Management December 2014 Update

Oil Sands Research and Information Network
School of Energy and the Environment
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Oil Sands Research and Information Network

The Oil Sands Research and Information Network (OSRIN) is a university-based, independent organization that compiles, interprets and analyses available knowledge about managing the environmental impacts to landscapes and water impacted by oil sands mining and gets that knowledge into the hands of those who can use it to drive breakthrough improvements in regulations and practices. OSRIN is a project of the University of Alberta's School of Energy and the Environment (SEE). OSRIN was launched with a start-up grant of $4.5 million from Alberta Environment and a $250,000 grant from the Canada School of Energy and Environment Ltd.

OSRIN provides:

- **Governments** with the independent, objective, and credible information and analysis required to put appropriate regulatory and policy frameworks in place
- **Media, opinion leaders and the general public** with the facts about oil sands development, its environmental and social impacts, and landscape/water reclamation activities – so that public dialogue and policy is informed by solid evidence
- **Industry** with ready access to an integrated view of research that will help them make and execute environmental management plans – a view that crosses disciplines and organizational boundaries

OSRIN recognizes that much research has been done in these areas by a variety of players over 40 years of oil sands development. OSRIN synthesizes this collective knowledge and presents it in a form that allows others to use it to solve pressing problems.

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REPORT SUMMARY

Glossaries help provide a common understanding of the language and acronyms used in various specialized fields such as oil sands mining, processing and environmental management. This broad subject area is comprised of many different technical fields, each of which has its own language. There are many Glossaries available in print or on the web, however these often relate only to one technical field or one stakeholder's interests. Therefore OSRIN felt it was valuable to prepare this Glossary as a single reference source.

The Glossary focuses primarily on environmental and environmental management terms, but also includes relevant mining, processing and tailings terms. Some general remediation terms are provided; for a more comprehensive listing of remediation and related risk-management terminology see Powter (2002). This will be a living document – updated as necessary to expand coverage in processing and environmental management and as new terms or acronyms come to light.

ACKNOWLEDGEMENTS

Definitions and acronyms in this Glossary were extracted from a variety of documents and websites that are listed in the References section. OSRIN is grateful to Alberta Environment and Sustainable Resource Development for allowing us to use the *Glossary of Reclamation and Remediation Terms Used in Alberta – 7th Edition* (Powter 2002) as the starting point for this Glossary.

OSRIN is grateful to Gord McKenna, BGC Engineering, for providing several source documents for the January 2013 update.

1 INTRODUCTION

This report is divided into two sections – the Glossary of Terms and the Acronyms.

2 GLOSSARY OF TERMS

The definitions are laid out as follows:

1. The term being defined **in bold**.
2. Similar or related terms cross-referenced in the glossary in *italics* at the right-hand margin.
3. The definition. In some cases, there are multiple parts to a definition; these are shown as 1, 2 etc. In other cases, there is more than one definition given – these are listed in separate paragraphs.

You can click on the letter below to go directly to that section of the Glossary; a Return to Index link is provided at the beginning of each new letter.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A

A Horizon *B Horizon/C Horizon*

A mineral horizon formed at or near the surface in the zone of removal of materials in solution and suspension, or maximum *in situ* accumulation of organic carbon, or both.

Abandonment *Shutdown/Suspension*

The permanent dismantlement of a facility so it is permanently incapable of its intended use. This includes the removal of associated equipment and structures, and any measures required to ensure that the facility is left in a permanently safe and secure condition.

Acid Soil *Alkaline Soil/pH*

Soil of pH less than 7.0.

Accumulator *Bioaccumulation*

A plant that absorbs high concentrations of an element or compound into tissue with no apparent detrimental effect.

Accuracy *Precision*

The closeness of a measured or computed value to its true value

The agreement between the measured value and the accepted or "true" value.

Acre-Foot

The volume of water that will cover 1 acre to a depth of 1 foot.

Acrotelm *Catotelm*

The uppermost layer of a peat deposit, with variable water content, high hydraulic conductivity, periodic aeration, and intense biological activity.

Acute *Chronic*

With reference to toxicity, having a sudden onset, lasting a short time (usually within hours or days). With reference to a stimulus, severe enough to rapidly induce a response.

Adaptive Management

A management approach that involves the monitoring and evaluation of a reclaimed area's performance followed by any necessary actions to achieve the intended performance objectives. Adaptive management also allows information to be fed back into the planning and design process so that future reclaimed areas will meet the intended objectives.

A tenet of ecological management, in which human resource users are flexible to change the way they interact with the environment, based upon need and the availability of new information

Adhesion *Cohesion*

Molecular attraction that holds the surfaces of two dissimilar substances in contact, such as water and soil particles.

Admixing

The dilution of topsoil with subsoil, spoil or waste material, with the result that topsoil quality is reduced. Admixing can result in adverse changes in topsoil texture, poor soil aggregation and structure, loss of organic matter, and decrease in friability.

Adsorption

The surface retention of solid, liquid, or gas molecules, atoms, or ions by a solid or liquid surface.

Aeration

Any process where a substance or substrate becomes permeated with air or another gas. The term generally applies to aqueous liquids being brought into intimate contact with air by spraying, bubbling or agitating the liquid.

Aeration (soil)

The process by which air in the soil is replaced by air from the atmosphere. In a well-aerated soil, the soil air is similar in composition to the atmosphere above the soil. Poorly aerated soils usually contain a much higher percentage of carbon dioxide and a correspondingly lower percentage of oxygen than the atmosphere. The rate of aeration depends largely on the volume and continuity of pores from the surface and within the soil.

Afforestation *Reforestation*

The artificial establishment of forest crops by planting or sowing on land that has not previously, or not recently, grown tree crops.

The process of establishing a forest by planting trees or their seeds on land that is not a forest, or has not been a forest for an extended period.

Aggradation

The process whereby a stream deposits its excess load to its channel.

Aggregate *Soil Structure*

A group of soil particles cohering so as to behave mechanically as a unit. The soil particles may be bound together by organic substances, iron oxides, carbonates, clays and/or silica. Aggregates may be spheres, blocks, plates, prisms, or columns.

Aggregate Stability

A measure of the vulnerability of aggregates to externally imposed disruptive processes. It is not measurable in absolute terms since it depends not only on the soil itself but also to a large degree upon the nature of the forces and the manner in which they are applied. Therefore, it is a relative and partly subjective concept.

Agronomic *Native Species*

A plant developed using agronomic methods (rather than a native plant).

Of or relating to the science of agronomy (the practice of field-crop production and soil management).

Air Porosity *Porosity*

The portion of the bulk volume of soil that is filled with air at any given time under a given condition such as a specified soil water potential. Usually, this portion is made up of large pores; that is those drained by a tension of less than about 100 cm of water.

Alien *Exotic Species/Invasive Plant/Native Species*

A plant that did not originally occur in an area where it is now established, but which arrived directly or indirectly by human activity.

Alkali Soil *Saline Soil/Sodic Soil*

1. A soil having a pH greater than 8.5 or an exchangeable sodium percentage greater than 15 or both.
2. A soil that contains enough alkali (sodium) to interfere with the growth of most crop plants.

Alkaline Soil *Acid Soil/pH*

A soil that has a pH greater than 7.0

Allelopathic

An action or substance produced by or in one plant that inhibits or restricts the growth of another plant species. These substances most commonly include toxic organic materials produced directly by the plant, or as a result of the decomposition of plant residues.

Alluvium (Alluvial Deposit) *Colluvium/Fluvial*

Material such as clay, silt, sand and gravel deposited by modern rivers and streams. Unless otherwise noted, alluvium is unconsolidated.

Amendment (soil)

1. An alteration of the properties of a soil, and thereby of the soil, by the addition of substances such as lime, gypsum, manure, and sawdust to make the soil more suitable for the growth of plants.
2. Any substance used for this purpose. Technically, a fertilizer is also an amendment but the term "amendment" is used most commonly for added materials other than fertilizer.

Amorphous Peat *Peat*

The structureless portion of an organic deposit in which the plant remains are decomposed beyond recognition.

Angle of Repose

Angle between the horizontal and the maximum inclination (slope) that a soil assumes through natural processes.

Anion *Cation*

An ion carrying a negative charge of electricity. The most common anion in soil is sulphate (chloride in salt water contaminated soils).

Anthropogenic *Biogenic*

Coming from or having been caused by man.

Approval Holder

The company that holds the *Environmental Protection and Enhancement Act* approval.

Aquatic

Growing, living in or frequenting water; occurring or situated in or on water.

Aquatic Biota

Organisms that live in or frequent water.

Aquatic Ecosystems

The biological community and the non-living environment functioning together as a system in water bodies.

Aquatic habitat for interrelated and interacting communities and populations of plants and animals.

Aquifer *Perched Aquifer/Unconfined Aquifer*

Stratum or zone below the surface of the earth capable of producing water as from a well.

Aquitard/Aquiclude

Stratum or zone below the surface of the earth that contains but cannot transmit water, e.g., clay.

A stratum or subsurface layer that has much lower permeability than adjacent units – it transmits very little water in comparison to an adjacent aquifer. Clays are usually aquitards.

Armouring *Rip Rap*

Channel erosion protection by covering with protection material (e.g., riprap, gabions, etc.).

Construction of landscape areas utilizing suitable materials to control erosion.

Artificial Wetland

A man-made wetland in an area where a natural wetland did not exist before.

As-Built (Drawings)

Engineering drawings portraying a site as constructed/reclaimed, including all changes from the original design that were implemented during construction and/or reclamation.

Aspect

Compass orientation of a slope as an inclined element of the ground surface.

Asset Retirement Obligation (ARO)

A legal obligation associated with the retirement of a tangible asset that a company is required to settle as a result of an existing or enacted law, statute, ordinance, or written or oral contract or by a legal construction of a contract under the doctrine of promissory estoppel. This definition is based on the principles and concepts presented in the CICA Handbook Section 3110 – Asset Retirement Obligations.

Atterberg Limits

The moisture conditions of "liquid limit", "plastic limit", "plasticity index", and "shrinkage limit".

Available Plant Nutrients *Nutrient*

That portion of any element or compound in the soil that can be readily absorbed and assimilated by growing plants.

Available Water *Water Content*

The portion of water in a soil that can be readily absorbed by plant roots.

B

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B Horizon *A Horizon/C Horizon*

A subsoil horizon characterized by one of:

1. an enrichment in clay, iron, aluminum, or humus (Bt or Bf).
2. a prismatic or columnar structure that exhibits pronounced coatings or stainings associated with significant amounts of exchangeable sodium (Bn or Bnt).
3. an alteration by hydrolysis, reduction, or oxidation to give a change in colour or structure from the horizons above or below, or both (Bm).

Backfill *Fill*

1. The operation of refilling an excavation.
2. The material placed in an excavation in the process of backfilling.

Background *Control*

An area not influenced by chemicals released from the site under evaluation or other impacts created by the activity on the site under evaluation.

Backwater

The rise in water surface elevation caused by some obstruction such as a culvert, narrow bridge opening, inefficient channel, dams, buildings or fill material that limits the area through which the water shall flow. Backwater reduces the capacity of a waterway or conduit.

Bank Cubic Metre

A cubic metre of material (e.g., spoil, overburden, topsoil) in place.

Barrel (bbl)

A measure of volume equivalent to 0.159 m^3 or 159 litres.

Basal Aquifer

The groundwater zone that lies beneath the oil sands.

A water-bearing strata located at the lowest portion of a stratigraphic unit.

Basal Area

The area occupied by a plant near the ground surface; measured across the stem of a tree 1.0 m to 1.5 m above the ground surface, or across a clump in the case of graminoids, usually 2 cm to 3 cm above the ground surface.

Base Flow

The fair-weather or sustained flow of streams; that part of stream discharge not attributable to direct runoff from precipitation, snowmelt, or a spring. Discharge entering streams channels as effluent from the groundwater reservoir.

Baseline

An initial set of observations or environmental data used for comparison or as a control against any future trends.

A surveyed condition that serves as a reference point on which later surveys are coordinated or correlated.

Base of Groundwater Protection

The elevation above which groundwater is deemed to be non-saline or useable without treatment.

Base of Highwall *Highwall*

The point of intersection between the highwall and the place formed at the base of the excavated material.

Base Saturation Percentage *Cation Exchange Capacity*

The extent of which the absorption complex of a soil is saturated with exchangeable cations other than hydrogen and aluminum. It is expressed as a percentage of the total cation exchange capacity.

Bathymetry

The measurement of the depth contours in bodies of water or the measurement of water depth at various places in a body of water.

Bearing Capacity

The average load per unit area that is required to rupture a supporting soil mass.

Bed and Shore (regulatory definition)

The land covered so long by water as to wrest it from vegetation or as to mark a distinct character on the vegetation where it extends into the water or on the soil itself.

Bedrock

The solid rock that underlies soil and the regolith or that is exposed at the surface.

Bedrock Spoil *Mine Dump/Spoil*

Bedrock material that has been mined and dumped. It may consist of hard fragments of varying size or may be soil-sized particles.

Benchmark

A marked point of known elevation from which other elevations may be established.

Benthic

Deriving from or occurring at the bottom of a body of water.

Benthic Invertebrates

Aquatic animals without backbones that dwell on or in the bottom sediments of a water body. Examples include mayflies, stoneflies, caddisflies, clams, worms.

Invertebrate organisms living at, in or in association with the bottom (benthic) substrate of lakes, ponds and streams.

Benthos

Organisms that inhabit the bottom substrates (sediments, debris, logs, macrophytes) of aquatic habitats for at least part of their life cycle. The term benthic is used as an adjective, as in benthic invertebrates.

Berm

A mound or wall of earth. Used to retain substances or to prevent substances from entering an area.

Best Attainable Condition *Reference Condition*

Equivalent to the expected ecological condition of least-disturbed sites if the best possible management practices were in use for some period of time. Sometimes considered to be a surrogate for the "reference condition."

Best Management Practice

Techniques and procedures that have been proven through research, testing, and use to be the most effective and appropriate for use in Alberta. Effectiveness and appropriateness are determined by a combination of: (1) the efficiency of resource use, (2) the availability and evaluation of practical alternatives, (3) the creation of social, economic, and environmental benefits, and (4) the reduction of social, economic, and environmental negative impacts.

Operating practice that enhances the sustainability of the resource to which the practice relates. Must be practical and economically achievable.

Bioaccumulation *Biomagnification*

A widespread term that describes a process by which chemical compounds are taken up by terrestrial and aquatic organisms from the medium directly and through the consumption of contaminated food.

Bioassay

The use of an organism or part of an organism as a method for measuring or assessing the presence or biological effects of one or more substances under defined conditions. A bioassay test is used to measure a degree of response (e.g., growth or death) produced by exposure to a physical, chemical or biological variable.

Bioavailability

The amount of chemical which is actually available to the target tissues following exposure.

Biodegradable

Able to be decomposed, as a result of the action of microorganisms such as bacteria. Materials are considered biodegradable if they decompose relatively quickly.

Biodegradation

The process of destruction or mineralization of either natural or synthetic materials by the microorganisms of soils, waters, or wastewater treatment systems.

Biodiversity

Totality of the richness of biological variation, ranging from within-species genetic variation, through subspecies and species, to communities, and the pattern and dynamics of these on the landscape.

Biogenic *Anthropogenic*

Coming from nature or the environment.

Biological Indicator

A biological parameter used to indicate the response of individuals, populations or ecosystems to environmental stress.

Biological Treatment

A wastewater treatment process that utilizes heavy growth of microorganisms for the purpose of oxidizing, absorbing, and adsorbing wastewater impurities, both organic and inorganic.

Biomagnification *Bioaccumulation*

Results from the process of bioaccumulation by which tissue concentrations of accumulated chemical compounds are passed up through two or more trophic levels so that tissue residue concentrations increase systematically as trophic level increases.

Biomass

The weight of all living material in a unit area or volume at a given instant in time. It can be expressed at different biological levels (e.g., population, community).

Biome

A major community of plants and animals such as the boreal forest or the tundra biome.

Biomonitoring (Biological Monitoring)

Systematic determination of the effects on organisms as a result of changes to an ecosystem. Often done to determine the effects of a pollutant release.

Biophysical Land Classification *Ecological Land Classification*

An approach to land classification that combines the physical and biological components of the environment. As the precursor to ecological land classification, the hierarchical classification system originally included four levels. Sometimes the physical components of classification are more heavily weighted than the biological components.

Bioremediation

The use of microorganisms to remediate contaminated soil or water.

Bitumen *Heavy Crude Oil*

A highly viscous, tarry, black hydrocarbon material having an API gravity of about 9 (specific gravity about 1.0). It is a complex mixture of organic compounds. Carbon accounts for 80% to 85% of the elemental composition of bitumen, hydrogen 10%, sulphur 5%, and nitrogen, oxygen and trace elements form the remainder.

The heavy viscous hydrocarbon associated with the Athabasca Oil Sands deposits. It contains some mineral and sulphur contamination. In its natural state, it is not recoverable at a commercial rate through a well because it is too thick to flow. Bitumen typically makes up about 10% by weight of oil sand, but saturation varies.

Bitumen Froth (Froth)

Air-entrained bitumen with a froth-like appearance that is the product of the primary extraction step in the hot water extraction process.

Bog *Fen/Marsh/Peatland*

A peat-covered area or peat-filled wetland, generally with a high water table. The water table is at or near the surface. The surface is often raised or level with the surrounding wetlands, and is virtually unaffected by the nutrient-rich groundwater from the surrounding mineral soils. Hence, the groundwater of the bog is generally acid and low in nutrients. The dominant peat materials are Sphagnum and forest peat underlain, at times, by fen peat. The associated soils are Fibrisols, Mesisols and Organic Cryosols. The bogs may be treed or treeless and they are usually covered with *Sphagnum* mosses, feathermosses, and ericaceous shrubs.

A peat-covered or peat-filled wetland, generally with a high water table having a low bearing strength. The water of a bog is generally acid and low in nutrients. Bogs usually support a black spruce forest but may also be treeless. They are usually covered with sphagnum and feathermosses and ericaceous shrubs.

Boreal Forest

The northern hemisphere, circumpolar, tundra forest type consisting primarily of black spruce and white spruce with balsam fir, birch and aspen.

Bottom Sediment

Those sediments that make up the bed of a body of running or still water.

Substrates that lie at the bottom of a body of water. For example, soft mud, silt, sand, gravel, rock and organic litter, that make up a river bottom.

Box Cut *Final Cut*

The initial cut driven in a property, where no open side exists; this results in a highwall on both sides of the cut.

Breach

An opening or a breakthrough of a dam (manmade or, for example, a beaver dam) resulting in a release of water.

> A **controlled breach** is the deliberate, controlled removal of embankment material to release water from the reservoir at a controlled rate.
>
> An **uncontrolled breach** is typically caused by rapid erosion of a section of earth embankment by water or other natural, uncontrolled forces.

Breakwaters

Artificial structures built on the margin of a waterbody to reduce the energy of wave impacts on shoreline erosion.

Broadcast Seeding *Direct Seeding/Drill Seeding*

Scattering seed on the surface of the soil. Contrast with drill seeding which places the seed in rows in the soil.

Brown Moss Peat *Forest Peat/Sedge Peat/Sedimentary Peat/Sphagnum Peat*

Peat composed of various proportions of mosses of Amblystegiaceae (*Scorpidium, Drepanocladus, Calliergon, Campylium*), *Hypnum*, and *Tomenthypnum*.

Brunisolic *Chernozemic/Gleysolic/Luvisolic/ Organic Soils/Podzolic/Regosolic/Solonetzic*

A soil order of sufficient development to exclude it from the Regosolic order, but without sufficient development to include it in any other order. These soils develop under various climates and vegetation, are frequently characterized by a reddish colour and have Bm or Btj horizons. The great groups Melanic Brunisol, Eutric Brunisol, Sombric Brunisol, and Dystric Brunisol belong to this order.

Brush Layering (watercourse reclamation) *Live Staking*

Spreading live cuttings taken from native shrubs (willow species) across an excavated pad, and covering them with soil. The cuttings root down into the soil, increasing bank stability and providing riparian habitat.

Buffer

An area designated to be undisturbed by an industrial activity. Buffers may preserve environmental features (e.g., river banks), provide safety (e.g., beside pipelines or buildings) or protect property (e.g., roads, property lines).

A transitional area between two different land uses that mitigates the effect of one land use on the other.

Buffering Capacity

Capacity of a soil to resist appreciable pH change in the soil solution.

Bulk Density (soil)

The mass of dry soil per unit of bulk volume. The mass is determined after drying to a constant weight at 105^{o}C. The bulk volume is that of the sample as taken in the field and includes the volume of the solids and of the pore space. Measures of bulk density (Db) are expressed in SI units (kg m^{-3}) and/or units derived from them. Mg m^{-3} is the preferred unit. Derived units, such as Mg m^{-3}, t m^{-3} or g cm^{-3} are numerically equivalent. Db values generally range from 0.90 to 1.80 Mg m^{-3} (900 to 1,800 kg m^{-3}). In commercial and engineering applications, Db is often expressed in lb ft^{-3} and has been called apparent density.

By-product

Something produced in addition to the principal product. For example, ash from coal-fired power plants or coke and sulphur from oil sands plants.

C

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C Horizon *A Horizon/B Horizon*

A mineral horizon comparatively unaffected by the pedogenic processes operative in the A and B horizons except for the process of gleying (Cg) or the accumulation of calcium carbonate (Cca) or other salts (Csa). A naturally calcareous C horizon is designated Ck.

Calcium Carbonate Equivalent

The total inorganic carbon content of soil material expressed in terms of percent calcium carbonate ($CaCO_3$).

Calibration

Comparison of a measurement standard or instrument with another standard or instrument in order to report or eliminate by adjustment any variation (deviation) in the accuracy of the item being compared.

Canopy

The tallest vegetation layer in an area.

Overhanging cover, shelter or shade.

Capability (land) *Equivalent Capability/Land Classification*

An evaluation of land performance that focuses on the degree and nature of limitation imposed by the physical characteristics of a land unit on a certain use, assuming a management system.

The suitability of land for use without permanent damage. It is an expression of the effect of physical land conditions, including climate, on the total suitability for use, without damage, for crops that require regular tillage, for grazing, for woodland and for wildlife. Land capability involves consideration of the risks of land damage from erosion and other causes and the difficulties in land evaluation owing to physical land characteristics, including climate.

Capability Class (soil)

A rating that indicates the capability of land for some use such as agriculture, forestry, recreation, or wildlife. In the Canadian system, it is a grouping of lands that have the same relative degree of limitation or hazard. The degree of limitation or hazard is nil in Class 1 and becomes progressively greater to Class 7.

Capability Subclass (soil)

A grouping of lands that have similar kinds of limitations and hazards. It provides information on the kind of conservation problem or limitation. The class and subclass together provide information about the degree and kind of limitation, for broad landuse planning and for the assessment of conservation needs.

Capillary Action

The rise or movement of fluid in the interstices of a soil due to capillary forces.

Capillary Conductivity

1. Physical property related to the readiness with which unsaturated soil transmits water.
2. Ratio of water velocity to driving force in unsaturated soil.

Capillary Fringe

A zone just above the water table that remains near saturation (zero gauge pressure). The extent and degree of definition of the capillary fringe depends upon the size distribution of pores.

A zone, in which the pressure is less than atmospheric, overlying the zone of saturation and containing capillary interstices some or all of which are filled with water that is continuous with the water in the zone of saturation but is held above the zone by capillarity acting against gravity.

Cap Water *End Pit Lake*

The water put over top of oil sands process-affected materials to fill an end pit lake to the surface.

Carrying Capacity

The maximum population size that can be supported by the available resources.

Catastrophic Outflow

A large, rapid outflow of contaminated fluid material from a containment structure resulting in an unacceptable impact on public safety and/or the environment.

Catchment Area *Drainage Basin/Watershed*

The area of land from which water finds its way into a particular watercourse, lake or reservoir.

Catena

A sequence of soils of about the same age, derived from similar parent materials, and occurring under similar climatic conditions, but of unlike characteristics due to variations in relief and drainage.

Cation *Anion*

An ion carrying a positive charge of electricity. The most common soil cations are calcium, magnesium, sodium, potassium, and hydrogen.

Cation Exchange

The interchange between a cation in solution and another cation on the surface of any surface-active material, such as clay colloid or organic colloid.

Cation Exchange Capacity (CEC)

A measure of the total amount of exchangeable cations that a soil can hold, expressed in terms of milliequivalents per 100 g of soil.

Catotelm *Acrotelm*

The lower portion of a peat deposit, with constant water content, low hydraulic conductivity, absence of aeration, and slight biological activity.

Centrate

Watery residue after centrifugation and production of paste from mature fine tailings or fluid fine tailings.

Channel

The bed of a stream or river.

A portion of a natural or artificial watercourse which periodically or continuously contains moving water, or which forms a connecting link between two bodies of water. It has a defined bed and banks that serve to confine the water.

Channel Stabilization *Rip Rap*

Protecting the sides and bed of a channel from erosion by controlling flow velocities and flow directions using jetties, drops, or other structures and/or by lining the channel with vegetation, riprap, concrete, or other suitable lining material.

Check Dam

Small dam constructed in a gully or other small watercourse to decrease the streamflow velocity, minimize channel scour, and promote deposition of sediment.

Chernozemic *Brunisolic/Gleysolic/Luvisolic/ Organic Soils/ Podzolic/Regosolic/Solonetzic*

An order of soils that have developed under xerophytic or mesophytic grasses and forbs, or under grassland-forest transition vegetation, in cool to cold, subarid to subhumid climates. The soils have a dark-coloured surface (Ah, Ahe, or Ap) horizon and a B or C horizon, or both, of high base saturation. The order consists of the Brown, Dark Brown, Black, and Dark Grey great groups.

Chiseling *Ripping/Subsoiling*

Breaking or loosening the soil, without inversion, with a chisel cultivator or chisel plow.

A method of tillage in which hard, compact layers, usually in the subsoil, are shattered or loosened to depths below normal plow depth.

Chronic *Acute*

Involving stimulus that is lingering or continues for a long time; often signifies periods from several weeks to years, depending on the reproductive life cycle of the species. Can be used to define either the exposure or the response to an exposure (effect). Chronic exposure typically induces a biological response of relatively slow progress and long continuance.

Clay *Particle Size/Sand/Silt*

1. As a rock term: a natural, earthy, fine grained material that develops plasticity with a small amount of water.
2. As a soil term: a textural class.
3. As a soil separate: a material usually consisting largely of clay minerals but commonly also of amorphous free oxides and primary minerals.
4. As a particle-size term: a size fraction less than 0.002 mm equivalent diameter.

Clean Fill

Uncontaminated subsoil or parent material used as fill for site development purposes or to replace excavated contaminated subsoil or parent material in remediation and reclamation.

Clear and Grub

Removing trees, brush and other woody debris from a site before soil salvage. Clear and grub operations may involve raking slash and non-merchantable timber into piles, which are later burned.

Clearwater Formation (Kc)

A Cretaceous clayshale overburden exhibiting a medium to high plasticity and low moisture content.

Climax Community *Disclimax/Seral Community*

The final, or most mature, plant community capable of self-perpetuation under the prevailing climatic and soil conditions.

Climax Species *Pioneer Species*

A climax plant species is defined as one that dominates a site under climax conditions.

Cline

A gradual change in a feature across the distributional range of a species or population.

Clod

A compact, coherent mass of soil, ranging in size from 5 to 10 mm to as much as 200 to 250 mm; produced artificially by the activity of plowing and digging when the soils, especially clays, are either too wet or too dry for normal tillage operations. Clods usually slake easily with repeated wetting and drying.

Clone

All asexually derived individuals produced from a single sexually produced individual.

Closure *Custodial Transfer/Reclamation Certification/Relinquishment*

The point after shutdown of operations when reclamation and remediation activities are satisfactorily completed, reclamation certification is received and the area is ready to be returned to the next custodian (Crown for public land or landowner for private land).

Closure Obligation

Corporate obligation to restore disturbed land to a condition equal to or better than that which existed before development occurred. The obligation is often interpreted to mean to a state acceptable to regulatory agencies and key stakeholders.

Closure Path

A set of reclamation activities undertaken to achieve satisfactory closure. All details may not be known at the start of a project and proposed activities may change as new knowledge suggests a more appropriate approach.

Closure Plan *Design for Closure*

The closure plan describes the technical measures and planning programs to be undertaken for the active decommissioning, rehabilitation and ultimate closure and release of a mine site.

Coagulant *Consolidated/Composite Tailings*

A reagent (typically a calcium salt) added to a dispersion of solids in a liquid to bind together active minerals to form a continuous mass. This is the process used for making Consolidated/Composite Tailings.

Coarse Filter Approach *Fine Filter Approach*

Conservation of land areas and representative habitats with the assumption that the needs of all associated species, communities, environments and ecological processes will be met.

Coarse Fragments

Rock or mineral particles greater than 2.0 mm in diameter. Rounded and sub-rounded rock fragments up to 7.5 cm in diameter are referred to as gravelly; 7.5 cm to 25 cm are cobbly; and over 25 cm are stony or bouldery.

Coarse-grained (soil) *Fine-grained*

With reference to soil, the texture exhibited by sands, loamy sands, and sandy loams but not including very fine sandy loam.

Coarse Texture (soil) *Fine Texture/Medium Texture*

The texture exhibited by sands, loamy sands, and sandy loams but not including very fine sandy loam. A soil containing large quantities of these textural classes.

Coarse Woody Material (Debris)

Sound and rotting logs and stumps that provide habitat for plants, animals and insects and a source of nutrients for soil development. The material is generally greater than 8 to 10 cm in diameter. Includes trees/branches that have died and remain standing or leaning.

Co-disposal

A placement of two or more tailings streams or tailings and overburden together.

Coefficient of Variation

A measure of precision that is calculated as the standard deviation of a set of values divided by the average and usually multiplied by 100 to be expressed as a percentage.

Cofferdam

A temporary structure enclosing all or part of a construction area so that construction can proceed in a dry area. A "diversion cofferdam" diverts a river into a pipe, channel, or tunnel.

Cogeneration

Technology that simultaneously produces power and thermal energy (heat and steam) from a single fuel source such as natural gas. An example is using steam generated for injection into reservoirs to also generate electricity.

Cohesion *Adhesion*

The attraction of a substance for itself; the mutual attraction among particles comprising a substance that allows it to cling together as a continuous mass.

Coke

Solid, black hydrocarbon which is left as a residue after the more valuable hydrocarbons have been removed from bitumen by heating the bitumen to high temperatures.

Coker

The processing unit in which carbon is removed from bitumen to produce lighter hydrocarbons.

Colloid

A substance in a state of fine subdivision, whose particles are 10^{-4} cm to 10^{-7} cm in diameter.

Mineral or organic particles smaller than 0.002 mm that have properties determined by surface forces.

Colluvial Slope *Talus*

Sloping land at the foot of steep hills or mountains made up of deposits of unconsolidated material that has been moved over short distances by gravity, water, or both and includes talus material and local alluvium.

Colluvium *Alluvium*

A heterogeneous mixture of material that has been deposited mainly by gravitational action.

Commercial Forest (regulatory definition) *Merchantable Forest/ Non-Productive (Non-Commercial) Forest*

Land characterized by all of the following: forest stands stocked with trees to meet the standards of a commercial forest as defined in the Alberta Pacific FMA Area Forest Management Plan, 2007 as amended; forest stands stocked with native tree species as defined by the *Timber Management Regulations* AR60-73 (144.2), 2010 as amended that may include White Spruce, Black Spruce, Jack Pine, Aspen Poplar, Balsam Poplar, White Birch and Larch; forest stands not limited by operating restrictions such as slopes steeper than 45%, with the exception of tailing sand structures with slopes over 20%, stream buffers, potential recreational lakes, stand size, arrangement or accessibility as identified in the *Northeast Alberta Operating Ground Rules*, 2010 as amended; and as otherwise authorized in writing by the Director.

Common Species *Rare Species*

A species widely distributed and easily found within a given area.

Community

Populations of plants or animals living and interacting with one another in a given area.

Compactibility

The maximum density to which a soil can be packed by a given amount of energy. The standard method for determining soil compactibility is the Proctor test.

Compaction *Compression/Consolidation*

The moving of soil particles closer together by external forces. In the compaction process, individual soil particles are packed closer together and soil aggregates are crushed, thus greatly reducing porosity. The major causes of soil compaction are: (1) natural consolidation during soil forming processes (e.g., the weight of glaciers during the ice ages); (2) trampling by animals and humans; (3) natural shrinkage of soil upon drying; (4) use of heavy equipment.

Increasing the density of a material by reducing the voids between the particles by mechanical effort.

The closing of the pore spaces among the particles of soil and rock, generally caused by running heavy equipment over the area, as in the process of leveling the overburden material of strip mine banks.

Companion Crop

A crop sown with another crop. Used particularly for small grains with which forage crops are sown. Preferred to the term nurse crop.

Compensation (fisheries) *Conservation Offset*

The replacement of natural habitat, increase in the productivity of existing habitat, or maintenance of fish production by artificial means, where other measures are not adequate to maintain habitats for fisheries resources.

Compensation Lake (No net loss lake)

A lake created to compensate for the loss of natural fish habitat.

Composite Tailings

See Consolidated/Composite Tailings.

Composite Sample

A sample comprised of two or more subsamples.

Compressibility

The property of a soil pertaining to its susceptibility to decrease in bulk volume when subjected to a load. The change of specific volume and density under hydrostatic pressure; reciprocal of bulk modulus (volume elasticity; incompressibility modulus). Under increasing force per unit area a body will decrease in size but increase in density. The ease with which soil decreases in

volume when subjected to a mechanical load. It is the slope of the straight line portion of void ratio, or bulk density vs. logarithm of stress.

Compressibility Index

The ratio of pressure to void ratio on the linear portion of the curve relating the two variables.

Compression *Compaction/Consolidation*

A system of forces or stresses that tends to decrease the volume or compact a substance, or the change in volume produced by such a system of forces. Compression of a saturated soil is consolidation and compression of an unsaturated soil is compaction.

Concentration

A measure of the amount of a substance present per unit volume or per unit weight of material.

Cone Index *Penetration Resistance*

The force per unit basal area required to push a cone penetrometer through a specified increment of soil.

Cone Penetration Test (CPT) *Penetrometer*

A standard test method for electronic friction cone and piezocone penetration testing of soils, as prescribed by ASTM D5778–07.

Conifer

A tree belonging to the order Coniferae with cones and evergreen leaves of needle shape or "scalelike." The tree is harvested to produce wood known commercially as "softwood."

Connectivity

The extent to which late successional ecosystems are linked to one another to form an interconnected network that allows movement of organisms form one place to another.

Conservation *Sustainability*

The planning, management and implementation of an activity with the objective of protecting the essential physical, chemical and biological characteristics of the environment against degradation (regulatory definition).

A policy which seeks to sustain future useable supplies of a natural resource by present actions.

The protection, improvement, and use of natural resources according to principles that will assure their highest economic or social benefits.

Conservation Offset *Compensation/Compensation Lake*

Conservation actions intended to compensate for the unavoidable residual harm to the environment, populations and/or biodiversity.

Conservation (soil)

1. Protection of the soil against physical loss by erosion or against chemical deterioration; that is, excessive loss of fertility by either natural or artificial means.
2. A combination of all methods of management and land use that safeguard the soil against depletion or deterioration by natural or man-induced factors.
3. The division of soil science dealing with soil conservation and (1) and (2).

Conservative Approach

Approach taken to incorporate protective assumptions to ensure risks will not be underestimated.

Consistence

1. The resistance of a material to deformation or rupture,
2. The degree of cohesion or adhesion of the soil mass.

Terms used in soil survey for describing consistence at various soil-water contents are:

Wet soil: non-sticky; slightly sticky; sticky; very sticky; non-plastic; slightly plastic; plastic and very plastic.

Moist soil: loose; very friable; friable; firm; very firm; compact; very compact; and extremely compact.

Dry soil: loose; soft; slightly hard; hard; very hard; and extremely hard.

Cementation: weakly cemented; strongly cemented, and indurated.

Consolidated Tailings/Composite Tailings *Mature Fine Tailings/Thickened Tailings*

Composite (Syncrude) or consolidated (Suncor) tailings are formed by injecting mature fine tailings from the tailings pond into the regular (whole) tailings sand stream, with a flocculant such as gypsum. This mixture is sent to disposal areas to form a non-segregating soil mixture which will result in a trafficable surface in the reclaimed landscape. The purpose of producing CT is to consume both mature fine tailings and thin fine tailings to create a land surface reclaimable to upland or wetland vegetation; CT has a sand-to-fines ratio (SFR) that is greater than about 3:1 to allow rapid consolidation but less than about 5:1 to permit useful levels of fines capture.

Consolidated Tailings Release Water

Water expelled from consolidated tailings mixtures during consolidation.

Consolidation

The gradual reduction in volume of a soil mass resulting from an increase in compressive stress. The adjustment of a saturated soil in response to increasing load involves the squeezing of water from pores and a decrease in the void ratio.

The densification of fine-grained material by the release of excess pore-water pressure over time, typically in response to change in applied stress. For oil sands tailings, this process often involves slow settlement over time in response to self-weight or vertical surcharge from a

capping layer. The expelled water is referred to as release water. Deposit strengths increase until full consolidation is reached. Many tailings materials remain soft even after full consolidation.

Constructed Wetland *Restored Wetland/Wetland*

A wetland built on an area where a wetland did not previously exist. Wetlands are often constructed for a specific purpose such as water treatment or habitat development.

Contaminant

A general term referring to any chemical compound added to a receiving environment in excess of natural conditions. The term includes chemicals or effects not generally regarded as "toxic", such as nutrients, salts and colour.

Contamination

The condition or state of soil, water, or air caused by a substance release or escape which results in an impairment of, or damage to, the environment, human health, safety, or property.

Continuous Improvement

The process of enhancing a system to achieve improvement in performance.

The ongoing improvement of performance in achieving environmental and resources outcomes, as well as improvements in the management systems used to achieve the outcomes (i.e., policies, delivery performance assessment, and information systems).

Contouring

The process of shaping the land surface to fit the form of the surrounding land.

Control

An area that is undisturbed or unaffected by an activity and therefore can serve as a comparison to assess the state of an area that has been disturbed or affected by an activity. Also known as a reference area. *Area control sites* are located further away than *local control sites*.

Control Samples

An environmental sample or simulated samples designed to help control the analytical process by checking the acceptability of some quality characteristic. These are often used synonymously with Quality Control check samples.

Control Section (soils)

The vertical section upon which soil classification is based. The control section usually extends to a depth of 100 cm in mineral materials and to 160 cm in organic materials.

Cool Season Plants *Warm Season Plants*

Plants mostly of temperate origins completing the major proportion of their growth during the spring and early summer months.

Core

The impervious or relatively impervious material forming the central part of a dam (e.g., a tailings dam) or embankment. Where a dam has a core, the outer zones are usually comprised of more pervious materials. Some dams are constructed entirely of a relatively homogeneous, impervious material with no distinct core.

Corridor *Movement Corridor*

In a landscape, a narrow strip of land that differs from the matrix on either side. Corridors may be isolated strips, but are usually attached to a patch of somewhat similar vegetation.

A travel route allowing animals to migrate from one faunal region to another.

Cover

The area of ground covered by all living (including stems and leaves) and dead (litter) plant material that is produced naturally on a site, expressed as a percentage of the total area. Bare soil is not cover. Also known as ground cover, canopy cover or aerial cover.

Cover Crop

A close-growing crop used primarily for the purpose of protecting and improving the soil between periods of regular crop production or before establishment of the final vegetation on a reclaimed site.

Cover Scale

A set of discrete classes defined by specific percentages that are used to estimate plant cover.

Coversoil *Regolith/Surface Soil/Topsoil*

Any peat-mineral mix, organic horizon or upland surface soil.

Unconsolidated materials including salvaged surface soil, salvaged Regolith, or selected bedrock spoil used to top-dress spoils to build a better quality minesoil.

Creep

Slow mass movement of soil and soil material down rather steep slopes primarily under the influence of gravity, but aided by saturation with water and by alternate freezing and thawing.

Crest Length

The length of the top of a dam.

Crimping

A soil stabilization technique that presses spread straw into the soil in a wave-like pattern. Crimping decreases surface erosion and creates a favourable microenvironment for plants.

Criteria *Guideline/Objective/Standard*

A basis for judging adequacy. Environmental criteria are usually compilations or digests of scientific data that are used for establishing environmental quality guidelines and objectives.

Generic numerical limits or narrative statements intended as a general guidance for the protection, maintenance, and improvement of specific uses of soil, water or land.

Cubic Feet per Second (cfs)

A measure of the volume of water passing a particular point each second. This volume of water is called the "rate of flow" or simply the "flow."

Cultivar *Ecovar*

A plant variety that has undergone genetic selection by plant breeders and has been registered by a certifying agency, and is propagated under specific guidelines to maintain its genetic integrity.

An assemblage of cultivated plants which is clearly distinguished by its characters (morphological, physiological, cytological, chemical, or others) and which when reproduced (sexually or asexually), retains those distinguishing characters. The terms cultivar and variety are exact equivalents.

Cumulative Effects

Changes in the environment due to the combined effects of past, present and foreseeable human activities.

Custodial Transfer *Closure*

The transfer of reclaimed land, with reclamation certification in place, to a subsequent land manager or user who takes full responsibility for ongoing sustainability of the landscape and its end land uses.

Cut-and-fill

Process of earth moving by excavating part of an area and using the excavated material for adjacent embankments or fill areas.

Cyclone Tailings

Hydrocyclones are used to classify (separate) oil sands slurry into a dense low-fines sandy underflow (Cyclone Underflow Tailings) and a low density, fines-rich cyclone overflow (Cyclone Overflow Tailings). The underflow may be beached or used as a feedstock for co-disposal with fines; the overflow is typically pumped to a settling basin.

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Dam *Tailings Pond*

The Canadian Dam Association (CDA) definition requires a dam to provide a fluid barrier that can impound 30,000 cubic metres or more and with a height of 2.5 metres or more. Fluid usually refers to water but may also refer to other liquids and potentially liquefiable materials (therefore tailings ponds berms are considered dams). To provide a maintenance free landscape, no structures that require monitoring and maintenance under CDA guidelines may be left behind.

Dam Safety Professional

A dam safety professional is an engineer or geologist with specific expertise in the design, operation, and construction of dams and appurtenant works. A dam safety professional must have specific knowledge with the aspects of the dam under consideration; for example, an engineer or geologist with geotechnical or geological experience would be required to evaluate a slope stability or soil concern. Or, an engineer with hydrologic and hydraulic experience would be required to determine spillway capacity. A dam safety professional is qualified if he/she has specific dam-related experience relevant to the issues or concerns that are present at any particular dam.

Sometimes referred to as the Engineer-of-Record for tailings dams.

Daylighting

Breaking, or taking, a working face (a bench) out onto the surface of a hillside. It usually means that an excavation that was not previously visible from a particular direction becomes visible because it has "daylighted".

The removal of a buffer between an extraction operation and a topographical low area (e.g., a river valley).

Decommissioning *Decontamination*

The permanent closure of all or part of an industrial facility followed by removal of process equipment, buildings and other structures, and the decontamination of the surface and subsurface.

Decomposers *Producers*

Organisms which derive their energy from breaking down organic matter from other deceased organisms (detritus).

Decomposition

The process of rotting and decay in dead plants and animals. Complex organic material is broken down into simple inorganic elements. These elements are then returned to the water or soil. Aerobic decomposition occurs at a faster rate than under anaerobic conditions.

Decontamination *Decommissioning/Remediation*

The removal, reduction, or neutralization of substances, wastes or hazardous material from a site so as to prevent or minimize any adverse effects on the environment now or in the future.

Dedicated Disposal Area (DDA)

An area dedicated solely to the deposition of captured fines using a technology or a suite of technologies. The material deposited each year must achieve a minimum undrained shear strength of 5 kPa within one year of deposition.

Degradation (soil)

The changing of a soil to a more highly leached and weathered state, usually accompanied by morphological changes such as the development of an eluviated, light coloured A horizon or a decline in soil quality. Processes include wind and water erosion, salinity, organic matter depletion, acidification and compaction.

Degraded *Reference Condition*

The environmental condition characteristic of environmental impacts in response to exposure to a stressor or stressors. Degradation includes subtle or gradual changes that reduce ecological integrity and health. An ecosystem in degraded condition is the complement of one in the "reference condition".

Demolition/Dismantling

Destruction of structures as part of the overall decommissioning process. Destruction may be undertaken by machines (dismantling) or explosives (demolition) – machines offer greater precision and are important when the structures, or parts of them, have salvage value. Dismantling may also be called *deconstruction*.

Dendritic Drainage Pattern

A drainage pattern characterized by irregular branching in all directions with the tributaries joining with the main stream at all angles. Dendritic drainage patterns are proposed to drain CT deposits.

Depression

An area that is lower than the general surrounding landscape, usually less well drained than the surrounding terrain.

Depressurization

The process of reducing the pressure in an aquifer, by withdrawing water from it.

Design Flood

The largest flood that a given project is designed to withstand safely.

Design for Closure *Closure Plan*

Applying integrated planning through all phases of a project to meet the requirements for successful closure. Project phases include initial planning, development, operations, ongoing and final reclamation. Considerations include an economical and environmentally responsible approach to mine layout, ore handling, waste management, water management, backfilling and reclamation.

Design Life

The period of time for which a facility is expected to perform its intended function.

Detection Limit

The lowest concentration at which individual measurement results for a specific analyte are statistically different from a blank (that may be zero) with a specified confidence level for a given method and representative matrix.

Detritus

Non-living particles of disintegrating biological material (inorganic and dead and decaying organic material) that can be suspended in the water column or deposited at the bottom of lakes, streams, oceans, etc.

Detritus Layer

The layer on the surface of soil or sediments that is composed of dead and decaying fragments of organic material.

Dewatering

Removal of groundwater from a geological formation using wells or drainage ditch systems.

Diameter at Breast Height (DBH)

The diameter of a tree at breast height. Diameter is measured at 1.3 m to 1.5 m above ground surface.

Diluent

A chemical agent used to reduce the thickness or viscosity of raw bitumen. Used to make raw bitumen flow through pipelines to processing plants.

Diluted Bitumen (Dil-bit or Dilbit)

Typically 50% bitumen diluted with 50% naphtha (the diluent), produced in connection with oil sand production.

Dimictic *Monomictic*

A description of a lake with two distinct mixing periods each year; covered by ice in winter and thermally stratified in summer.

Direct Placement

Transport of soil material from its original to its final resting place without intermediate storage or rehandling. This term is often specifically applied to the direct transport and placement of one layer of reclamation material (especially topsoil) onto overburden or tailings surfaces.

Direct Seeding *Broadcast Seeding/Drill Seeding*

Seeding with minimum disturbance and maximum surface residue retention.

Discharge

In a stream or river, the volume of water that flows past a given point in a unit of time (i.e., m^3/s).

In reference to groundwater, movement of water from an aquifer in the subsurface to the surface, as in mining activities to the surrounding environment.

In reference to industrial process-affected waters, the release of water off-site (usually to the natural environment) that meets appropriate regulatory quality requirements.

Disclimax (community) *Climax Community*

A type of climax community that is maintained by either continuous or intermittent disturbance to a severity that the natural climax vegetation is altered.

Disjunct Species

Populations separated from the main range of other species by 500 km or more.

Dispersal

The spreading of reproductive plant parts from one place or area to another.

Disperse

To cause aggregates to separate into individual soil particles. A disperse system is one in which at least one of the phases is subdivided into numerous small particles, which together exhibit a very large interfacial area per unit volume.

Dispersed Soil

Soil in which the clay readily forms a colloidal soil. Dispersed soils usually have low permeability. They tend to shrink, crack, and become hard on drying and to slake and become plastic on wetting.

Dissolved Oxygen (DO)

Oxygen that is present (dissolved) in water and is therefore available for fish and other aquatic organisms. Normally measured in mg/L (equivalent to ppm) and widely used as a criterion of water quality.

Disturbance Pattern

Spatial and temporal arrangement of disturbance.

Disturbed Land

Land on which excavation has occurred or upon which overburden has been deposited, or both.

Ditch Block

Barrier constructed across ditches to retard water flow, to redirect water from the ditch, or to form a small catch basin. Used to reduce erosion and siltation.

Diversity

The richness of species within a given area. Diversity includes two distinct concepts, richness of species and evenness in the abundance of the species.

Dominant

1. A plant with the greatest cover and/or biomass within a plant community.
2. The tallest trees within a forest stand, which extend above the general canopy.

Donor Site

The site from which soils, plant parts, or other reclamation materials are salvaged prior to anthropogenic disturbance.

Drainage

The removal of excess surface water or groundwater from land by natural runoff and percolation, or by means of surface or subsurface drains.

Drainage Basin *Catchment Area/Watershed*

Area tributary to or draining to a lake, stream, reservoir or other body of water

The total area of land that contributes water and materials to a lake, river, or other water body, either through streams or by localized overland runoff along shorelines.

Drainage (soil)

Soil drainage refers to the frequency and duration of periods when the soil is not saturated. Terms used are - excessively, well, moderately, imperfectly, and poorly drained soil.

Drawdown

The lowering of water surface level due to release of water from a reservoir.

Drift

All material moved by glaciers and by the action of meltwater streams and associated lakes.

Drill Seeding *Broadcast Seeding/Direct Seeding*

Planting seed with a drill in relatively narrow rows, generally less than 30 cm apart.

Droughty Soil

Sandy or very rapidly drained soil.

Due Diligence

Taking appropriate, responsible and defensible action. Usually used in the context of legal or enforcement actions.

Dry Landscape Reclamation *Wet Landscape Reclamation*

A reclamation approach that involved dewatering or incorporation of fine tailings into a solid deposit capable of being reclaimed as a land surface or a wetland.

Dyke

An embankment built to hold semi-solids or fluids.

Dysic *Euic*

A soil term referring to pH<<4.5 ($CaCl_2$) in all parts of the control section of an organic soil.

Dystrophy

The condition in water in which decay is hindered and recycling of nutrients is slowed; there is a high loading of allochthonous organic matter, but a low level of autochthonous input; dystrophic waters are heavily stained (brown water) and have a high content of humic substances.

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Ebullition

The process of overflowing a containment structure.

Ecological Descriptor

Variable making it possible to describe, compare or analyze ecological surveys. An ecological descriptor (e.g., altitude) does not have any direct physiological effect on living beings, but expresses the state of one or more ecological factors.

Ecological Integrity

Quality of a natural, unmanaged or managed ecosystem, in which the natural ecological processes are sustained, with genetic, species and ecosystem diversity assured for the future.

A critical range of variability in biodiversity, ecological processes and structures, regional and historical context, and sustainable cultural practices.

Ecological Management

1. Derivation of goods or services from or beneath ecosystems in ways that respect ecological integrity. It is a bio-centred approach to resource use, in which human needs are met if the ecosystem's ability to manage itself is not compromised, focusing on the management of human activities more strongly than other ecosystem components.
2. Derivation of goods or services from or beneath ecosystems in ways that consider, and (it is believed) do not seriously affect, ecological integrity. Ecosystem management is a human-centred approach to resource use, which aims at manipulation of ecosystem components and assumes sufficient knowledge of how ecosystems work.

Ecological Receptor

A non-human organism identified as potentially experiencing adverse effects from exposure to contaminated soil either directly through contact or indirectly through food chain transfer.

Ecological Restoration *Restoration/Reclamation*

The process of assisting recovery and management of ecological integrity.

Ecological Resilience

The capacity of an ecosystem to respond to a perturbation or disturbance by resisting damage and recovering quickly

Ecosite

Ecological unit that develops under similar environmental influences (climate, moisture, and nutrient regime). An ecosite is a group of one or more ecosite phases that occur within the same portion of the edatope (e.g., lichen ecosite). Ecosite, in this classification system, is a functional unit defined by moisture and nutrient regime. It is not tied to specific landforms or plant communities as in other systems, but is based on the combined interaction of biophysical factors that together dictate the availability of moisture and nutrients for plant growth. Thus, ecosites are different in their moisture regime and/or nutrient regime.

A subdivision of an ecosection that consists of an area of land with a particular parent material, having a homogeneous combination of soils and vegetation. A Canadian ecological land classification (ELC) system mapping unit, usually mapped at a scale of 1:50,000 to 1:10,000. Originally referred to as a "land type".

In Alberta, ecosite is defined as an area with a unique recurring combination of vegetation, soil, landform, and other environmental components.

Ecosite Phase

A subdivision of an ecosite based on the dominant tree species in the canopy. On some sites where a tree canopy is lacking, the tallest structural vegetation layer determines the ecosite phase.

Ecosystem

A complex of living organisms and their environment, linked by energy flows and material cycling.

An ecological community considered together with the nonliving factors of its environment as a unit.

Ecosystem Association *Ecosite*

An area having the potential of supporting plant communities with similar successional development and belonging to the same plant association, within the biogeoclimatic classification system.

Ecosystem Type *Ecosite*

An abstract classification unit defined as an area belonging to the same soil family with the potential of supporting vegetation belonging to the same plant association, within the biogeoclimatic classification system.

Ecotone

A transition zone of vegetation between two communities, which has characteristics of its own and of both types of adjacent vegetation.

Ecotype

A local ecological race adapted through natural selection to a particular habitat.

Ecovar *Cultivar*

The offspring of native species that have been selected for their ability to survive and reproduce in specific ecological regions. Selection is done without emphasis on improving agronomic characteristics. Ecovars have greater genetic diversity than cultivars.

Edaphic

1. Of or pertaining to the soil.
2. Resulting from, or influenced by, factors inherent in the soil or other substrate rather than by climatic factors.

Edge

Where plant communities meet (often an area of high biodiversity).

Where plants communities meet a disturbance.

Effective Precipitation

The portion of the total precipitation that becomes available for plant growth.

Effective Rooting Depth

The upper portion of the root zone where plants get most of their water. Effective rooting depth is estimated as one-half the maximum rooting depth.

Effluent

Stream of water discharging from a source.

Electrical Conductivity (EC)

The reciprocal of electrical resistivity. Expressed in deci-Siemens per metre (dS/m). EC provides a measure of water-soluble salt content.

Eluvial *Illuvial*

Soil material that has been transported via suspension or solution to another soil horizon via the downward movement of water.

Eluviation *Illuviation*

The removal of soil material in suspension or in solution from a layer or layers of the soil by the downward or lateral movement of water.

Emergent Vegetation

Plant species that have a part extending below the normal water level. Such plants are adapted to periodic flooding and include genera such as *Carex*, *Scirpus*, and *Typha*.

End Land Use *Equivalent Land Capability*

The allowable use/s of disturbed land following reclamation. May not be the same as the original land use. Municipal zoning/approval may be required for specific land uses.

End of Life

Generally this term refers to the date mining and/or production ceases on the site, but it could also mean the date the final reclamation certificate is issued.

End Pit Lake *Pit Lake*

An artificial, engineered water body within a mined out pit. In the oil sands region, some proposed pits will be filled with varying amounts of tailings and capped with fresh water; receives surface and groundwater from surrounding ecosystems and discharge water to downstream environments. Many such lakes will be designed as bioreactors – allowing natural biodegradation of organic acids in the tailings waters.

A water body greater than 2 metres deep which has been created as a result of mining/extraction activities.

Engineered Tailings *Consolidated/Composite Tailings/Thickened Tailings*

A term used to describe a mixture of mature fine tailings and coarse tailings.

Environmental Change

A change or disturbance of the environment by natural ecological processes.

Environmental Degradation *Land Degradation/Soil Degradation*

Any change or disturbance to the environment perceived to be deleterious or undesirable.

Environmental Management System (EMS)

An environmental management program/process or assessment procedure developed by an operator to assess and mitigate/address risks to the environment arising from an industrial activity. An EMS promotes ongoing improvement of operations. An EMS is comprised of elements such as policy development, standard operating procedures, training, auditing, reporting/document handling, monitoring and public involvement.

Environmental Outcome

The desired environmental end state defining the specific conditions or functions that one expects for the environment. An outcome is an event, occurrence, or condition that results from an activity or program that has an actual effect on resources, the environment, or Albertans.

Environmental Quality *Soil Quality/Water Quality*

A measure of the condition of an environment relative to the requirements of one or more species and/or to any human need or purpose.

Eolian Deposit *Fluvial*

Sand or silt, or both, deposited by wind, including both loess and dune sand.

Ephemeral

A phenomenon or feature that lasts only a short time (e.g., an ephemeral stream is only present for short periods during the year).

Epilimnion *Hypolimnion*

Surface layer of a stratified body of water.

Equivalent Land Capability (regulatory definition) *Capability (land)/End Land Use*

The ability of the land to support various land uses after reclamation is similar to the ability that existed prior to any activity being conducted on the land, but the ability to support individual land uses will not necessarily be equal after reclamation.

Ericaceous

Of or relating to the heath family (e.g., blueberry, bog cranberry).

Erodibility

A measure of the susceptibility of a soil to particle detachment and transport by rainfall and runoff.

Erosion

The wearing away of the land surface by running water, wind, ice, other geological agents, activities of man or animals, and including such processes as gravitational creep. Erosion may be either normal or accelerated; the latter being brought about by changes in the natural cover or ground conditions, including those due to human activity.

Essential Element (plant nutrition) *Nutrient*

A chemical element required for the normal growth of plants.

Euic *Dysic*

A soil term referring to pH >4.5 ($CaCl_2$) in all parts of the control section of an organic soil.

Eutrophic *Mesotrophic/Oligotrophic*

Term referring to peatlands that are relatively nutrient-rich; also refers to soils and waters with high nutrient content and high biological activity.

Evapotranspiration

1. The process of evaporation of water from a soil surface together with transpiration by plants.
2. Potential evapotranspiration is the maximum transpiration that can occur in a given weather situation with a low-growing crop that is not short of water and does not completely shade the ground.

Even-Aged Stands *Uneven-Aged Stands*

Stands where the ages of most trees are within 20 years of each other.

Excavation

Cutting or digging of the earth's surface which alters the original landscape by making a hole or hollow (pit).

Excess Soil Moisture

Condition in which soil is near, at or exceeding its moisture holding capacity. Excess soil moisture is a concern because serious site degradation can occur if sites are not properly managed. Operating heavy equipment on wet sites can cause serious rutting, compaction, and puddling damage and therefore should be avoided. Winter months are suitable for operating on wet sites as the ground is frozen and snow cover acts as a disturbance buffer.

Exchangeable Bases

Cations or bases adsorbed onto soil colloids.

Exotic Species *Alien/Native Species*

Plant species that are not native to the province and which are not native within the natural region.

Extensive Recreation *Intensive Recreation*

Refers to the recreational use of trails, natural lakes, rivers, streams and generally undeveloped or minimally developed areas. The term includes such activities as off-highway vehicle use, random camping, hiking, back packing, hunting, fishing, snowmobiling, horseback riding and cross-country skiing.

Extract (soil)

The solution separated from a soil suspension or from a soil by filtration, centrifugation, suction, or pressure.

Extraction

A process, unique to the oil sands industry, which separates the bitumen from the oil sand using hot water, steam, and caustic soda.

Extreme Events

Extreme cases of natural phenomena such as floods, severe earthquakes and heat waves which may occur at certain statistically determined time return intervals, and which tend to have a particularly detrimental effect on the environment (both natural and artificial).

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Factors of Safety

A concept used to describe the relative, calculated safety in engineering terms of physical structures to applied loads.

Failure Mode and Effects Analysis (FMEA)

A common form of engineering risk assessment, widely used in the mining and petrochemical industries and often applied to earthworks projects.

Fen *Bog/Marsh/Peatland*

A peat-covered or peat-filled wetland with a high water table that is usually at or above the surface. The waters are mainly nutrient-rich, minerotrophic waters from mineral soils. The dominant peat materials are shallow to deep, well to moderately decomposed fen peat. The associated soils are Mesisols, Humisols, and Organic Cryosols. The vegetation consists dominantly of sedges, grasses, reeds, and brown mosses, with some shrub cover and, at times, a scanty tree layer.

Fertility (soil)

The status of a soil in relation to the amount and availability to plants of elements necessary for growth.

Fetch

The distance the wind blows over water without an appreciable change in direction.

The length of open water on a waterbody over which wind can blow unobstructed to form waves.

Fibre (rubbed or unrubbed)

The organic material retained on a 100-mesh sieve (0.15 mm) either with or without rubbing, except for wood fragments that cannot be crushed in the hand and are larger than 2 mm in the smallest dimension. Rubbed fibre refers to materials rubbed between the fingers ten times or processed in a blender.

Fibric *Humic/Mesic*

Organic materials containing large amounts of weakly decomposed fibres whose botanical origins are readily identifiable; fibric material has 40% or more of rubbed fibre by volume (or weight of rubbed fibre retained on a 100 mesh sieve) and is classified in the von Post scale of decomposition as class 1 to class 4.

Field Capacity *Water Content*

The amount of water retained in the soil after the soil has been saturated and free drainage has practically ceased.

Fill *Backfill*

Depth of which material is to be placed (filled) to bring the surface to a predetermined grade. Also, the material itself.

Filterable Residue *Non-Filterable Residue*

Materials in water that pass through a standard-size filter (often 0.45 µm). This is a measure of the total dissolved solids (TDS), i.e., chemicals that are dissolved in the water or that are in a particulate form smaller than the filter size. These chemicals are usually salts, such as sodium ions and potassium ions.

Filtered Tailings

Tailings that are processed by a technology involving mechanically dewatering by filtration (typically under pressure or vacuum). The tailings become unsaturated and are either conveyed or trucked to a disposal area.

Filter Strip *Shade Strip*

An area adjacent to a water body that provides for infiltration of surface runoff and traps sediment and associated pollutants.

Final Cut (End Cut) *Box Cut*

Last cut or line of excavation made on a specific property or area.

Fine Filter Approach *Coarse Filter Approach*

Specific management for a single or a few species, rather than broad management for a habitat or ecosystem.

Fine-grained (soil) *Coarse-grained*

With reference to soil, the texture exhibited by silt and clay a soil containing large quantities of fine fractions.

Fines (tailings)

Mineral which includes fine sand, silt, and clay smaller than about 44 microns. The size split is somewhat arbitrary, related to standard screen mesh and/or analytical technique and the required interpretation (specifically those passing a #200 wet sieve, but also often measured using laser diffraction).

Fines Content *Sand Content*

The ratio of the mass of dry fines (<44 µm) to mass of dry solids, expressed as a percent.

Fine Tailings (Fine Tails, Sludge) *Consolidated Tailings/Tailings*

A term used in the oil sands industry to refer to the material accumulating at the bottom of oil sands tailings ponds. It is a matrix of dispersed clays, fine minerals, residual hydrocarbons, and various contaminants. Note that whole tailings (plant tailings) includes tailings sand which settles rapidly and is used to form tailings dykes.

A suspension of fine silts, clays, residual bitumen and water derived from extraction of bitumen from oil sands using the traditional hot water extraction process. The remainder from the extraction process is pumped to tailings facilities where coarse sand settles out. The overflow is directed to a settling pond where the fine grained portion slowly settles to yield a suspension of fine tailings. The fine tailings suspension is typically 85% water and 15% fine particles by volume. Further dewatering of fine tailings occurs very slowly. When first discharged, the very low density material is referred to as thin fine tailings (TFT). After a year or two, when the fine tailings have reached a solids content of about 30% (by mass), they are referred to as mature fine tailings (MFT). Settling occurs much more slowly after this point and remains fluid-like for decades or centuries.

Fine Texture (soil) *Coarse Texture/Medium Texture*

Consisting of or containing large quantities of the fine fractions, particularly silt and clay.

Fish Habitat

Spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes.

Floc

A loose-bound agglomeration of fine tailings particles typically around a polymer flocculant. These flocs, typically a few millimetres in diameter, settle quickly through water. Subsequent consolidation and densification typically breaks down the polymer and the floc.

Flocculant

A reagent added to a dispersion of solids in a liquid (e.g., tailings) to bring together the fine particles to form flocs.

A substance that promotes binding of particles together to form larger particles and thereby accelerate settling rates in water.

Flood Frequency

A statistical expression of the average time period between floods equaling or exceeding a given magnitude. For example, a 100-year flood has a magnitude expected to be equaled or exceeded on the average of once every hundred years; such a flood has a 1% chance of being equaled or exceeded in any given year. Often used interchangeably with "recurrence interval".

Floodplain

An area adjoining a body of water that has been or may be covered by flood water.

Flue Gas Desulphurization (FGD)

A process involving removal of a substantial portion of sulphur dioxide from the combustion gas (flue gas) formed from burning petroleum coke. Desulphurization is accomplished by contacting the combustion gases with a solution of limestone. Gypsum ($CaSO_4$) is formed as a byproduct of this process.

Fluid Tailings *Fine Tailings*

Any fluid discard from bitumen extraction facilities containing more than 1 mass per cent suspended solids and having an undrained shear strength of less than 5 kPa.

Flushing *Residence Time*

The rate at which water passes through a water body.

A mechanism that removes dissolved/suspended nutrients from an aquatic system.

Fluvial (deposits) *Alluvium/Colluvium/Eolian Deposit/Glaciofluvial*

Material that has been transported and deposited by streams and rivers.

Footprint

For the purposes of reclamation, the land or water area covered by a Project (i.e., all lands subject to direct disturbance from the project and associated infrastructure). There are other footprints of interest to other disciplines (e.g., air, noise, carbon, water).

Forage Area

The area used by an organism for hunting or gathering food.

Forb *Herb*

An herbaceous plant which is not a grass, sedge, or rush.

Forest Floor

Organic layer on soil surface consisting of one or more of L, F, and H horizons.

Forest Land *Afforestation/Reforestation*

Land bearing a stand of trees at any age or stature, including seedlings and of species attaining a minimum of 6 feet average height at maturity or land from which such a stand has been removed but on which no other use has been substituted. The term is commonly limited to land not in farms, forests on farms are commonly called woodland or farm forests.

Forest Management Agreement

A large, area-based agreement between the Province of Alberta and a company. It gives a company the right to establish, grow, harvest and remove timber from a particular area of land.

Forest Peat *Brown Moss Peat/Sedge Peat/Sedimentary Peat/Silvic/Sphagnum Peat*

Peat materials derived mainly from trees such as black spruce, and from ericaceous shrubs and feather mosses.

Fragmentation

The process of reducing the size and/or connectivity of an ecosystem or habitat type.

The breaking up of contiguous blocks of habitat into increasingly smaller blocks as a result of direct loss and/or sensory disturbance (i.e., habitat alienation).

Freeboard

Vertical distance between the maximum water surface elevation anticipated in design and the top of retaining banks or structures provided to prevent overtopping because of unforeseen conditions.

Free, Prior, and Informed Consent (FPIC)

Broadly refers to the rights of indigenous peoples to participate in decisions affecting their lands and resources, especially as related to natural resource development.

Free-to-Grow

A crop tree which has achieved the minimum height requirements and is free of competitor trees and shrubs as defined in the standards for the type of survey and tree species.

French Drain

A drainage trench backfilled with a coarse, water-transmitting material; may contain a perforated pipe.

Friable *Consistence*

A term pertaining to the ease of crumbling of soils.

Froth Treatment

The means to recover bitumen from the mixture of water, bitumen, and solids "froth" produced in hot water extraction.

Furbearers

Mammals that have traditionally been trapped or hunted for their fur.

Furrow

A channel worked into the surface of the soil by an implement such as a plough or hoe.

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Gabion

A mesh container used to confine rocks or stones and used to construct dams and groins or lining stream channels.

Gamma Probe *Neutron Probe*

An instrument for measuring soil moisture or density by relating the fraction of emitted radiation received by the detector to the soil wetness.

Geographic Information System (GIS)

A computer-based tool for mapping and analyzing things that exist and events that happen on the earth. GIS technology integrates common database operations such as query and statistical analysis with the unique visualization and geographic analysis benefits offered by maps. These abilities distinguish GIS from other information systems and make it valuable to a wide range of public and private enterprises for explaining events, predicting outcomes, and planning strategies.

Geotechnics / Geotechnique

The application of scientific methods and engineering principles to the acquisition, interpretation, and use of knowledge of materials of the Earth's crust for the solution of engineering problems; the applied science of making the Earth more habitable. It embraces the fields of soil mechanics and rock mechanics, and many of the engineering aspects of geology, geophysics, hydrology, and related sciences.

Geotextile Fabric

A woven or non-woven, water-permeable synthetic material used to trap sediment particles, prevent the clogging of aggregates with fine grained soil particles, or as a separator under road aggregate. It is also used as a filter.

Geotextile Liner

A synthetic, impermeable fabric used to seal surfaces against leaks.

Glaciofluvial *Fluvial*

Pertaining to the meltwater streams flowing from wasting glacier ice and especially to the deposits and landforms produced by streams; relating to the combined action of glaciers and streams.

Glaciomarine

Relating to process or deposits that involve the action of glaciers and the sea or the action of glaciers in the sear. Sediments of glacial origin laid down from suspension in a marine environment in close proximity to glacier ice.

Gleyed Soil

A soil affected by gleysation.

Gleysation

A soil-forming process under conditions of poor drainage resulting in reduction of iron and other elements and in grey colours and mottles.

Gleysolic *Brunisolic/Chernozemic/Luvisolic/ Organic Soils/Podzolic/Regosolic/Solenetzic*

An order of soils developed under wet conditions and permanent or periodic reduction. These soils have low chromas, or prominent mottling, or both, in some horizons. The great groups Gleysol, Humic Gleysol, and Luvic Gleysol are included in the order.

Grade

1. The slope of a road, a channel, or natural ground.
2. The finished surface of a canal bed, roadbed, top of embankment, or bottom of excavation; any surface prepared to a design elevation for the support of construction, such as paving or the laying of a conduit.
3. To finish the surface of a canal bed, roadbed, top of embankment, or bottom of excavation, or other land area to a smooth, even condition.

Gradient

1. A change of elevation, velocity, pressure, or other characteristics per unit length.
2. Slope.

Graminoid Wetlands

Wetlands dominated by grass or sedge species.

Grassed Waterway

A natural or constructed waterway, usually broad and shallow, covered with erosion-resistant grasses and used to safely conduct surface water from an area.

Great Group *Order*

A category in the Canadian system of soil classification. It is a taxonomic grouping of soils having certain morphological features in common and a similar pedogenic environment.

Green Area (regulatory definition) *White Area*

That part of Alberta shown outlined and coloured green on the map annexed to;

1. a Ministerial Order dated April 15, 1989 and made pursuant to Section 10 of the *Public Lands Act*, as that order is amended from time to time, or
2. any order made in substitution for that order, as amended from time to time.

Green Manure Crop

Any crop or plant grown and ploughed under while green or soon after maturity to improve the soil by addition of organic matter and the subsequent release of plant nutrients, especially nitrogen.

Ground Cover

Any living or dead vegetative material producing a protective mat on or just above the soil surface.

Groundtruthing

Conducting site visits to confirm accuracy of remotely sensed information.

Groundwater *Surface Water*

That water which at any particular time is either passing through or standing in the soil and underlying strata and is free to move under the influence of gravity.

Groundwater Recharge

Inflow of water to a ground water reservoir (zone of saturation) from the surface. Infiltration of precipitation and its movement to the water table is one form of natural recharge. Also, the volume of water added by this process.

Growing Season

Period with soil temperatures over 5°C at a depth of 50 cm.

Grubbing

The process of clearing stumps and roots from land.

Guideline *Criteria/Objective/Standard*

A basis for determining a course of action. An environmental guideline can be either:

- procedural, directing a course of action, or
- numerical, providing a numerical value that is generally recommended to support and maintain a specified use.

A numerical concentration or narrative statement recommended to support and maintain a designated use.

Guild

A set of co-existing species that share a common resource.

Gully

A channel caused by erosion and the concentrated but intermittent flow of water during or immediately after heavy rains or snow melt. It is deep enough to interfere with and not be removed by tillage operations.

Gully Erosion *Rill*

Erosion of soil or soft rock material by running water that forms distinct, narrow channels that are larger and deeper (30 cm to 30 m) than rills and that usually carry water only during and immediately after heavy rains or following the melting of ice or snow.

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Habitat

The natural environment or specific surroundings where a plant or animal grows or lives. The surroundings include physical factors such as temperature, moisture and light together with biological factors such as the presence of food or predators.

Habitat Effectiveness

The ability of a habitat to be used by wildlife. Includes the physical characteristics of a habitat.

Habitat Generalist

Wildlife species that can survive and reproduce in a variety of habitat types (e.g., red-backed vole).

Habitat Specialist

Wildlife species that is dependent on a few habitat types for survival and reproduction (e.g., Cape May warbler).

Habitat Suitability Index (HSI) *Resource Selection Function*

The value of habitat for wildlife species is estimated/modeled by relating a species' need for food and cover to structural and spatial attributes of vegetation types within a defined area. The HSI refers to the quality or suitability for a species or species group, and ranges from 1.0 (optimal value) to 0.0 (no value).

Habitat Type

The basic unit of vegetation classification in the system developed by Daubenmire and used in the northern United States, defined as an area capable of producing similar plant communities at climax. Vegetation stands included within a habitat type are not necessarily dominated by climax ecosystems.

Hardiness

The ability to withstand severe climates, especially frost during the growing season.

Hardpan *Pans*

A hardened soil layer in the lower A or in the B horizon caused by cementation of soil particles with organic matter or with materials such as silica, sesquioxides, or calcium carbonate. The hardness does not change appreciably with changes in the moisture content, and pieces of the hard layer do not slake in water.

Haul Road

Road from pit to loading dock, tipple, ramp, or preparation plant used for transporting mined material by truck.

Hazard *Risk*

The potential for a substance or situation to cause harm, usually human illness or injury.

Headwater

The source and upper reaches of a stream; also the upper reaches of a reservoir. The water upstream from a structure or point on a stream. The small streams that come together to form a river. Also may be thought of as any and all parts of a river basin except the mainstem river and main tributaries.

Heavy Crude Oil *Bitumen*

Oil having an API gravity less than 22.3°. Includes some oil that will flow, however slowly, but most heavy oil requires heat or dilution to flow to a well or through a pipeline.

Herb

Any flowering plant except those developing persistent woody bases and stems above ground.

Highwall

The unexcavated face of exposed overburden and mineral in a surface mine or the face or bank on the hill side of a contour strip mining excavation.

Historical Condition *Reference Condition*

The condition of sites at some point in their history (e.g., pre-settlement or predevelopment). Sometimes considered to be a surrogate for the "reference condition".

Holomictic

A condition in which a lake experiences an annual breakdown in stratification.

Hue

A colour or shade of colour in the Munsell Soil Color such as red, green, or blue.

Humic *Fibric/Mesic*

Organic material that is at an advanced stage of decomposition. It has the lowest amount of fibre, the highest bulk density, and the lowest saturated water-holding capacity of the organic materials. It is physically and chemically stable over time, unless it is drained. The rubbed fibre content is <10% by volume and the material usually is classified in the von Post scale of decomposition as class 7 or higher.

Humic Substances

A general category of naturally occurring, biogenic heterogeneous organic materials that can generally be characterized as being yellow to black in colour, of high molecular weight, and refractory.

Humification

The processes by which organic matter decomposes to form humus.

Hummock

A small knoll or mound of earth.

Humus

1. The fraction of the soil organic matter that remains after most of the added plant and animal residues have decomposed. It is usually dark coloured.
2. Used in the broader sense to refer to forest humus forms (mor, moder, mull).
3. All the dead organic material on and in the soil that undergoes continuous breakdown, change, and synthesis.

The more or less stable fraction from the decomposed soil organic material, generally amorphous colloidal, and dark coloured.

Hydraulic Conductivity *Permeameter/Relative Hydraulic Conductivity*
Saturated Hydraulic Conductivity

1. The ability of the soil to transmit water in liquid form through pores; includes properties of the fluid.
2. The factor of proportionality in Darcy's equation relating flow velocity to hydraulic gradient having units of length per unit of time.
3. A property of the porous medium and the water content of the medium.

Hydraulic conductivity is sometimes referred as the coefficient of permeability.

A coefficient, "k", that depends on the physical properties of formation and fluid. It describes the "ease" with which a fluid will flow through a porous material. "k" is the rate of flow per unit cross-sectional area under the influence of a unit gradient.

Hydraulic Gradient

A measure of the force of moving groundwater through soil or rock. It is measured as the rate of change in total head per unit distance of flow in a given direction. Hydraulic gradient is commonly shown as being dimensionless, since its units are m/m.

Hydraulic Head

The energy per unit weight of water made up of the sum of the pressure potential (head), velocity potential (head), and elevation potential (head). The velocity head is often negligible and taken as zero for subsurface flow.

The height of water above any plane of reference.

Hydraulic head is often referred to as water potential.

Hydrocracking ***Hydroprocessing/Hydrotreating***

A refining process for reducing heavy hydrocarbons to lighter fractions using hydrogen and a catalyst. It can also be used to upgrade bitumen.

Hydrocyclone

A device for separating out sand from extraction tailings slurry by imparting a rotating (cyclone) action to the slurry. Water, fine tailings and residual bitumen report to the overflow of the device. Sand flows out the bottom of the device in a dense slurry.

Hydromorphic

Developed under conditions of excess moisture; hydromorphic soils are found in areas of poor drainage.

Hydroperiod

The period of time that a wetland is covered with water. This is based only on the presence of surface water and not its depth.

Hydrophilic

Molecules and surfaces that have a strong affinity for water molecules. These molecules tend to be polar in chemical nature.

Hydrophobic

Molecules and surfaces that have little to no affinity for water, and typically have more affinity for other hydrophobic substances than for water. These molecules tend to be bi-polar or non-polar in chemical structure, such as lipids.

Hydrophobicity

The relative measure of the affinity of a molecule for water.

Hydrophyte *Mesophyte*

A plant that grows in water, or in wet or saturated soils; water-loving.

Hydroprocessing *Hydrocracking/Hydrotreating*

An upgrading/refining process that adds hydrogen to crude oil fractions using a catalyst system. Hydroprocessing includes both hydrotreating and hydrocracking.

Hydroseeding

Dissemination of seed hydraulically in a water medium. Mulch, fertilizer and other amendments can be incorporated into the sprayed mixture.

Hydrotransport

A method of transporting granular material, such as oil sands or extraction tailings, in a water-based slurry in a pipeline.

Hydrotreating *Hydrocracking/Hydroprocessing*

An upgrading/refining process used to remove sulphur and nitrogen and add hydrogen to molecules.

Hypolimnion *Epilimnion*

Lower layer of water in a stratified lake.

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Illuvial *Eluvial*

Soil material that has been moved from one soil horizon to another (usually a lower one) by precipitation from solution or deposition from suspension.

Illuviation *Eluviation*

The process of deposition of soil material removed from one horizon to another in the soil, usually from an upper to a lower horizon in the soil profile. Illuviated compounds include silicate clays, iron and aluminum hydrous oxides, and organic matter.

Impermeability *Permeability*

The condition of a rock, sediment, or soil that renders it incapable of transmitting fluids under pressure.

Impervious

Resistant to penetration by fluids or by roots.

Impoundment

Generally, an artificial water storage area, such as a reservoir, pit, dugout, sump, etc.

Indicator Species (sentinel species)

Any biological species that defines a trait or characteristic of the environment. For example, a species may delineate an ecoregion or indicate an environmental condition such as a disease outbreak, pollution, species competition or climate change.

Infiltration *Percolation/Runoff*

Downward water movement into the soil.

Infiltration Rate

A soil characteristic determining or describing the rate at which water can enter the soil under specified conditions, including the presence of excess water. It has the dimensions of velocity.

Infiltrometer

A device for measuring the rate of entry of fluid into a porous body, for example, water into soil.

Infrastructure

Basic facilities, such as transportation, communications, power supplies and buildings, which enable an organization, project or community to function.

Any works, buildings, structures, facilities, equipment, apparatus, mechanism, instrument or machinery belonging to or used in connection with a mine, oil production site, well, battery,

pipeline, quarry, pit, borrow excavation, peat operation, coal processing plant, plant or transmission line, and includes any storage site or facility, disposal site or facility, access road, haul road, railway or telecommunication line (Regulatory definition).

Inoculation

The artificial introduction of microorganisms into a habitat or their introduction into a culture medium.

Inorganic *Organic*

Not pertaining to or derived from plant or animal origins (organisms).

A chemical of mineral origin which does not contain (with few exceptions) carbon or carbon compounds.

In-stream Flow Needs (IFN)

The amount of water required in a river to sustain a healthy aquatic ecosystem, or to meet human needs such as recreation, navigation, waste assimilation or aesthetics.

The assessment of the volume of water needed in watercourses to maintain ecological integrity.

Intake

Any structure on the upstream face of a dam or within a reservoir created for directing water into a confined conduit, tunnel, canal, or pipeline.

Integrated Land Management (ILM)

A strategic, planned approach to manage and reduce human footprint on the landscape.

Integrated Resource Management (IRM)

A coordinated approach to land and resource management, which encourages multiple-use practices.

Intensive Recreation *Extensive Recreation*

Refers to high-density recreational use such as developed staging areas and camp and picnic grounds, and other sites or areas requiring continuous recreational management and services to maintain recreational opportunities.

Interflow

Water moving more or less laterally through the soil above the water table, sometimes produced by an impermeable layer that impedes infiltration; can be considered a type of groundwater flow.

Intermittent (Temporary) Water Body

Water bodies where the presence of water ceases for a time due to climatic conditions, including snow melt/spring runoff, seasonal storms and drought conditions. These changes are considered part of a natural cycle. These water bodies can remain dry for many years and may be fully restored after prolonged precipitation.

Invasive Plant *Alien*

A plant that has moved into a habitat and reproduced so aggressively that it has displaced the original structure of the vegetation community.

Invertebrate *Macro-invertebrate*

Animals without a backbone.

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Karst

Topography formed over limestone, dolomite, or gypsum and characterized by sinkholes, caves, and underground drainage.

Key Indicator Resource (KIRs) *Valued Ecosystem Component*

Environmental attributes or components identified as a result of a social scoping exercise as having legal, scientific, cultural, economic or aesthetic value.

Keystone Species

A species that is disproportionately important in the maintenance of community integrity, and without which significant changes to the community would occur.

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Lacustrine

Pertaining to lakes or lake shores; characteristic of lakes.

Material deposited in lake water and later exposed.

Lake Ecosystem

The complex of living organisms and their environment that occur within a lake, linked by energy flows and material cycling.

Land

The solid part of the earth's surface or any part thereof. A tract of land is defined geographically as a specific area of the earth's surface. Its characteristics embrace all reasonably stable, or predictably cyclic, attributes of the biosphere vertically above and below this area, including those of the atmosphere, the soil, and the underlying geology, the hydrology, and plant and animal populations, and the results of past and present human activity, to the extent that these attributes exert a significant influence on the present and future uses of land by man.

Land Capability (regulatory definition) *Capability*

The ability of the land to support a given land use, based on an evaluation of the physical, chemical and biological characteristics of the land, including topography, drainage, hydrology, soils and vegetation.

Land Classification *Capability*

Classification of specific bodies of land according to their characteristics or to their capabilities for use. A use capability classification may be defined as one based on both physical and economic considerations according to their capabilities for man's use, with sufficient (mapping) expression to indicate those differences significant to man.

Land Degradation *Environmental Degradation/Soil Degradation*

Any change or disturbance to the land perceived to be deleterious or undesirable.

A process that lowers the productivity of the land, assuming other factors such as technology, management, and weather are held constant.

The substantial decrease in either or both of an area's biological productivity or usefulness due to human interference.

Landfill

An engineered waste management facility at which waste is disposed by placing it on or in land in a manner that minimizes adverse human health and environmental effects.

Landform Grading

Constructing landforms to meet specific performance goals that could include: aesthetically pleasing, stable slope angles (not too steep), direct surface drainage to desired exit channels etc.

Landforms

The various shapes of the land surface resulting from a variety of actions such as deposition or sedimentation (eskers, lacustrine basins), erosion (gullies, canyons) and earth crust movements (mountains).

A distinctive topographic feature. It may be created by natural or artificial processes.

Landscape

All the natural features such as fields, hills, forests, water, etc., which distinguish one part of the earth's surface from another part. Usually that portion of land or territory which the eye can see in a single view, including all its natural characteristics.

Landscape Performance

Measured performance of the landscape against goals for erosion resistance and for supporting self-sustaining ecosystems.

Landscape Planning

The macro environment of land use and planning activity dealing with landscape features, processes, and systems.

Land Use Planning

The scientific, aesthetic, and orderly disposition of land, resources, facilities and services with a view to securing the physical, economic and social efficiency, health and well-being of urban and rural communities.

Leachate

Used to emphasize the chemical species in an aqueous medium. Leachate may have several chemical species in varying concentrations in an aqueous medium. Leachate may also be generated by organic solvents.

Leaching

The removal of soil material in solution by the downward or lateral percolation of water.

Lean Oil Sand *Oil Sand*

Oil bearing sands that do not have a high enough saturation of oil to make extraction of them economically feasible.

Legacy Tailings

Tailings previously deposited into tailings ponds or other disposal areas (as of a certain date).

Legume *Nitrogen Fixation/Rhizobia*

A member of the legume or pulse family, leguminosae. One of the most important and widely distributed plant families. Includes many valuable food and forage species, such as the peas, beans, peanuts, clovers, alfalfas, sweet clovers, lespedezas, vetches and kudzu. Practically all legumes are nitrogen-fixing plants.

Lentic *Lotic*

Referring to standing water, as in ponds and lakes.

Limnetic zone

Well-lit, open surface water of a lake where photosynthesis can occur.

Limnic

Peat formation occurring on or in deep water by free-floating or deeply rooted plants.

Liquid Limit *Atterberg Limits/Plastic Limit*

The moisture content at which a soil changes from plastic to liquid behaviour and often corresponds to a peak vane shear strength of about 2 kPa.

1. The water content corresponding to an arbitrary limit between the liquid and plastic states of consistence of a soil.
2. The water content at which a pat of soil, cut by a standard sized groove, will flow together for a distance of 12 mm under the impact of 25 blows in a standard liquid limit apparatus.

Lithic Layer

Bedrock under the control section of a soil.

Hard, consolidated bedrock.

A feature of a soil subgroup which indicates a bedrock contact within 50 cm of the soil surface.

Litter *Duff/Strippings*

The amount of previous year's plant growth left on the soil surface for nutrient recycling.

Litter, Fibric and Humic (LFH) *Fibric/Humic*

Organic layers developed primarily from leaves, twigs and wood materials with minor components of mosses. The forest floor that accumulates on the mineral soil surface under forest vegetation, and which includes dead vegetation and organic matter, including litter and unincorporated humus.

Littoral Zone

The productive shallow-water area at the edge of a lake that extends outward from the mean water level at the shore to the water depth where there is just enough light available (typically 1% of light intensity at the surface) for submerged rooted plants to grow; in the Athabasca region, this zone is thought to correspond to a sloping bed (typically with an overall slope of 0.2% to 1%) with water depths from 0 m (mean water level) to 3 m.

Productive shallow-water zone of lakes, rivers or seas with light penetration to the bottom – often occupied by rooted aquatic plants.

The biogeographic zone between the high- and low-water marks.

Live Crown Ratio

Ratio of crown length to tree height.

Live Staking (watercourse reclamation) *Brush Layering*

Individual native willow or poplar cuttings are carefully tamped into the soil and take root, providing bank stabilization.

Lotic *Lentic*

Of, relating to, or living in moving water.

Lower Subsoil *Upper Subsoil*

The soil material lying below the upper subsoil.

Luvisolic *Brunisolic/Chernozemic/Gleysolic/ Organic Soils/Podzolic/Regosolic/Solenetzic*

An order of soils that have eluvial (Ae) horizons, and illuvial (Bt) horizons in which silicate clay is the main accumulation product. The soils developed under forest of forest-grassland transition in a moderate to cool climate. The Grey Luvisol great group is the most common in western Canada.

Lysimeter

1. A device for measuring percolation and leaching losses of water and solutes from a column of soil under controlled conditions.
2. A device for measuring gains (precipitation and condensation) and losses (evapotranspiration) of water by a column of soil.

A device to measure the quantity or rate of water movement through or from a block of soil, usually undisturbed or *in situ*, or to collect such percolated water for quality analysis.

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Macro-invertebrate *Invertebrate*

Those invertebrate (without backbone) animals that are visible to the eye and retained by a sieve with 500 μm mesh openings for freshwater.

Macronutrient *Micronutrient/Nutrient*

A chemical element necessary in large amounts, usually greater than 1 ppm in the plant, for the growth of plants and usually applied artificially in fertilizer of liming materials. Macro refers to the quantity and not to the essentiality of the element to the plant.

Macrophyte

A large aquatic plant that may or may not be rooted. Examples are pondweed or cattails.

A member of the macroscopic plant life (larger than algae) especially of a body of water.

Maintenance-free

Reclaimed land that is as sustainable as the original landscape without human intervention. It is recognized that natural erosion processes continually affect natural and reclaimed landscapes.

Make-up Water

The water used to replace water lost to evaporation, splash-out, leaks and backwashing.

Map Unit

A combination of kinds of soil, terrain, or other feature that can be shown at a specified scale on a map, for the defined purpose and objectives of a particular survey.

Marsh *Bog/Fen/Peatland*

A class in the Canadian wetland classification system; a marsh is a mineral or a peat-filled wetland which is periodically inundated by standing or slowly moving water. Surface water levels may fluctuate seasonally, with declining levels exposing drawdown zones of matted vegetation or mud flats. The waters are nutrient-rich. The substratum usually consists dominantly of mineral material, although some marshes are associated with peat deposits. The associated soils are dominantly Gleysols with some Humisols and Mesisols. Marshes characteristically show a zonal or mosaic surface pattern of vegetation consisting of unconsolidated grass and sedge sods, frequently interspersed with channels or pools of open water. Marshes may be bordered by peripheral bands of trees and shrubs, but the predominant vegetation consists of a variety of emergent non-woody plants such as rushes, reeds, reed-grasses, and sedges. Where open water areas occur, a variety of submerged and floating aquatic plants flourish.

Mass Movement (Mass Wasting)

Movements of large portions of the land surface caused by either water saturation or water saturation and frost action. Mass movements include landslides, mud slides, creep, congeliturbation and solifluction.

Mature Fine Tailings (MFT) *Consolidated/Composite Tailings/Thickened Tailings*

Aged fine tailings that form in the deeper parts of the settling basins or tailings ponds. They contain less water (< 80% by volume) than fine tailings.

Tailings that have reached a solids content of about 30% (by mass) – approximately one or two years after being deposited as fluid fine tailings.

Mature Forest

A forest greater than rotation age with:

- moderate to high canopy closure;
- a multi-layered, multi-species canopy dominated by large overstory trees, some with broken tops and other decay;
- numerous large snags and accumulations of downed woody debris.

Mature Stand

A stand of trees for which the annual net rate of growth has peaked.

A stand that has reached rotation age or has a reduced growth rate. Such stands normally have large mature or over-mature trees, an abundance of large live trees with heart rot, numerous snags, stubs and high stumps, and an abundance of large downed woody debris.

Medium Texture (soil) *Coarse Texture/Fine Texture*

Intermediate between fine-textured and coarse-textured. It includes the following textural classes: very fine sandy loam, loam, silt loam, and silt.

Merchantable Forest *Commercial Forest*

A forest area with potential to be harvested for production of lumber/timber or wood pulp.

Forests with a timber productivity rating of moderate to good.

Meromixis *Monimolimnion/Stratification (water body)*

A process that maintains the stratification of a water body. Increased salinity or decreased temperature increases water density of the lower layer and prevents the mixing of upper lake layers with lower lake layers.

Mesic *Fibric/Humic*

Organic materials at a stage of decomposition between that of fibric and humic materials. Peat soil material with >10% and <40% rubbed fibres. Mesic material usually is classified in the von Post scale of decomposition as class 5 or 6.

Mesophyte *Hydrophyte*

A plant that grows under intermediate moisture conditions.

Mesotrophic *Eutrophic/Oligotrophic*

Containing a moderate amount of plant nutrients.

Methanogenesis

The generation of methane gas through microbial action; can occur in anaerobic lake sediments and tailings ponds.

Micro-climate

A local climatic condition near the ground resulting from modification of the general climate by local differences in elevation, exposure, or cover.

Microfauna

The part of the animal population consisting of individuals that are too small to be clearly distinguished without the use of a microscope. It includes protozoa and nematodes.

Microflora

Plants that are too small to be distinguishable without the aid of a microscope. Plants in this category include algae, bacteria, and fungi.

Micronutrient *Macronutrient/Nutrient/Trace Element*

A chemical element necessary in only extremely small amounts for plant growth.

Microrelief

Small-scale, local differences in relief, including mounds, swales, or hollows.

Mine (regulatory definition) *Pit/Quarry*

Any opening in, excavation in, or working of the surface or subsurface for the purpose of working, recovering, opening up, or proving coal, a coal bearing substance, oil sands or an oil sands bearing substance and includes any associated infrastructure.

Mine Dump *Spoil*

Area covered with overburden and other waste materials from ore and coal mines, quarries and smelters, and usually having little or no vegetative cover prior to reclamation.

Mineral

A homogeneous naturally occurring phase, sometimes restricted to inorganic, crystalline phases.

Mineralization

The ultimate degradation and recycling of an organic molecule into inorganic materials, such as carbon dioxide and water.

1. The conversion of an element from naturally occurring crystalline phases.
2. The conversion of an element from an organic form to an inorganic state as a result of microbial decomposition.

Mineral Soil *Organic Soil*

A soil consisting predominantly of, and having its properties determined predominantly by, mineral matter. It contains less than 17% organic carbon except for an organic surface layer that may be up to 40 cm thick if formed of mixed peat (bulk density 0.1 or more) or 60 cm if formed of fibric moss peat (bulk density less than 0.1).

Minerotrophic

A supply of water to vegetation originally derived from mineral soils or rocks but sometimes via lakes or rivers as intermediates; it may be eutrophic, mesotrophic, or oligotrophic.

Minesoil *Reconstructed Profile*

Soil produced by mining and reclamation activities that is capable of supporting plant growth.

Minimal Disturbance

Reducing the area of disturbance from the survey perimeter (maximum) to that deemed necessary to safely conduct the activity as well as ensuring the maintenance of equivalent soil capability.

Mire

1. an English word which is, in the general sense, a term embracing all kinds of peatlands and peatland vegetation (bog and fen);
2. a section of wet, swampy ground; bog; marsh; wet, slimy soil of some depth; deep mud, etc.

Mitigation

The process of rectifying an impact by repairing, rehabilitating or restoring the affected environment, or the process of compensating for the impact by replacing or providing substitute resources or environments.

Actions that lessen the severity and or duration of the effects on the environment.

Mixedwood Stands

Stands containing both deciduous and coniferous species.

Mixing Zone

A limited area around a release where an instream objective may be exceeded. In the case of the chronic protection of aquatic life guidelines, this area is half of the stream width wide and ten times the stream width for length.

Modal Site

A well-to moderately well-drained site without topographic or edaphic extremes that could reflect the influences of regional climate rather than local site conditions. Also used to describe typical site conditions for an ecosystem unit.

Moisture Content (soil) *Saturation Percentage*

Percentage of soil volume occupied by water (% volume/volume).

Moisture-Retention Curve

A graph showing the soil-moisture percentage (by weight or by volume) versus applied tension or pressure. Points on the graph are usually obtained by increasing or decreasing the applied tension or pressure over a specified range.

Monimolimnion *Meromixis*

The lowest, most dense layer of water in a meromictic lake; a layer that does not mix with the layers above it.

Monitoring

A scientifically designed system of long-term, standardized measurements and systematic observations to assist in timely decision making, ensure accountability and provide the basis for evaluation and learning.

> *Compliance monitoring* – The monitoring of variables required for regulatory compliance.
>
> *Early detection monitoring* – anticipatory monitoring with the intent of detecting stressors before severe ecological impairment (response) occurs. This provides a warning to initiate corrective measures rather than merely recording adverse environmental effects as they occur. Consequently, to carry out early detection monitoring, it is necessary to measure not just environmental response variables, but also stressors.

Effects-based monitoring – Monitoring activities undertaken to determine the status or trend of specific environmental attributes or indicators that reflect the current state of the environment. Usually, specific effects are anticipated based on the type of human activity or surrounding land use. It may also be a diagnostic form of monitoring where the objective is to attribute observed effects to particular causes or stressors.

Investigative monitoring – Short-term monitoring of selected variables for specific purposes (e.g., test a scientific hypothesis).

Monomictic *Dimictic*

A description of a lake with layers that mix only once a year.

Morphology (soil)

1. The physical constitution, particularly the structural properties, of a soil profile as exhibited by the kinds, thickness, and arrangement of the horizons in the profile, and by the texture, structure, consistence, and porosity of each horizon.
2. The structural characteristics of the soil or any of its parts.
3. The makeup of the soil, including the texture structure consistence, colour, and other physical mineralogical and biological properties of the various horizons of the soil profile.

Mottles

Spots or blotches of different colour or shades of colour found in imperfectly drained soils.

Mottling

Formation or presence of soil mottles.

Movement Corridor *Corridor*

Travel way used by wildlife for daily, seasonal, annual and/or dispersal movements from one area or habitat to another.

Muck

Fairly well decomposed organic soil material relatively high in mineral content, dark in colour, and accumulated under conditions of imperfect drainage.

Muck Soil

An organic soil consisting of highly decomposed material.

Mulch

Any material such as straw, sawdust, woodchips, leaves or loose soil that is spread on the soil surface to protect the soil and plant roots from the effects of raindrops, wind erosion, soil crusting, freezing and evaporation.

Multilayered Canopy

Forest stands with two or more distinct tree layers in the canopy. Also called multistoried canopy.

Muskeg *Peatland*

A North American term frequently employed for peatland. The word is of Algonquin Indian origin and is applied in ordinary speech to natural and undisturbed areas covered more or less with *Sphagnum* mosses, tussocky sedges, and an open growth of scrubby trees.

Mycorrhiza *Actinomycetes*

The association of fungi with the roots of seed plants.

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Naphthenic Acid(s) / Acid Extractable Organics *Process Affected Water*

Natural carboxylic acids with surfactant properties associated with petroleum. They are a complex mixture of alkyl-substituted acyclic and cycloaliphatic carboxylic acids, with the general chemical formula $C_nH_{2n+z}O_2$, where n indicates the carbon number and z specifies a homologous family. Oil sands process-affected water is toxic to aquatic organisms, and NAs are the primary group of compounds responsible for the toxicity.

Acids, chiefly monocarboxylic, derived from naphthenes. Naphthenes are primarily cycloalkanes especially cyclopentane, cyclohexane, and their alkyl derivatives.

Native Landscape

A landscape that contains assemblages of plants and plant communities that are indigenous to a particular region.

Native plant

A species, subspecies, or lower taxon, occurring:

- within its historic range; or:
- in an extension of that range bounded by the dispersal potential of the "taxon" and under the condition that the extension of that "taxon" is not known to be related to, and cannot be reasonably attributable to, human activities.

Native Species *Agronomic/Alien/Exotic Species*

A species that is a part of an area's original fauna or flora.

Natural Area

An area that is in a largely undisturbed condition, characterized by plant and animal species native to the area.

Natural Environment

An area that is relatively unchanged or undisturbed by human culture. Typically, a natural landscape or ecosystem is one that developed by natural processes and that is self-organizing and self-maintaining. Conversely, a non-natural environment is one that is relatively changed, modified, disturbed, or created intentionally or otherwise by our cultural activities. Humans as an organic species are natural, but the environmental effects of our unique, rapidly evolved, advanced, and artificial culture are not.

Naturalized Plant *Alien*

A plant introduced from other areas which has become established in and more or less adapted to a given region by long-continued growth there.

Natural Recovery/Natural Revegetation

Natural re-establishment of plants on disturbed land. Relies on revegetation from the topsoil (seedbank) or invasion from adjacent lands. May be combined with straw crimping or planting of annuals to provide erosion control.

Natural Region

A way of describing broad ecological variations in the landscape. Natural regions reflect differences in climate, geology, landforms, hydrology, vegetation, soils and wildlife. There are six natural regions in Alberta.

Natural Seeding (volunteer)

Natural distribution of seed over an area.

Natural Variability

The seasonal and long-term fluctuations of the presence, quantity, and quality of physical, hydrological, biological, or chemical attributes within a landscape or ecological unit that are not associated with human-related activities.

Also referred to as the natural range of variation or range of natural variability.

Neutralization

The process by which the acid or alkaline properties of a solution are reduced by addition of reagents to bring hydrogen and hydroxide concentrations to an equal value.

Neutron Probe *Gamma Probe*

A radioactive instrument for measuring soil water content indirectly through measurement of the slowing or thermalization of neutrons by hydrogen nuclei.

Nitrogen Fixation *Legume/Rhizobia*

The conversion of elemental nitrogen to forms that allow for ready uptake by plants.

Non-Filterable Residue *Filterable Residue/Total Suspended Solids*

Material in a water sample that does not pass through a standard size filter (often 0.45 µm). This is considered to represent Total Suspended Solids (TSS), i.e., particulate matter suspended in the water column.

Non-Polar *Hydrophobic/Lipophilic/Polar*

An uncharged molecule.

A compound that is lipophilic and hydrophobic.

Non-Productive (Non-Commercial) Forest *Commercial Forest*

Land revegetated for purposes other than commercial forestry including, but not limited to, forest ecosystems, shrublands, grasslands, wetlands, and water bodies.

Non-Saline Water *Saline Groundwater*

Water with less than 4,000 mg/L of total dissolved solids. Often referred to as fresh water.

Noxious Weed *Nuisance Weed/Restricted Weed*

A designation in Alberta for weeds that have the ability to spread rapidly and cause severe crop losses and economic hardship. These weeds must be controlled to prevent further establishment and spread.

Nuisance Weed *Noxious Weed/Restricted Weed*

A designation in Alberta for weeds that are common to the Province. In many cases they are native species. They can be found on nearly all land throughout the Province, and as such are very difficult to eradicate. They can cause significant economic losses, but are so biologically suited that they cannot effectively be eradicated. Every attempt should be made to prevent the spread of nuisance weeds.

Nutrient *Essential Element/Macronutrient/Micronutrient*

A chemical that is an essential raw material for the growth and development of organisms.

Nutrient Limiting

The limitation of an organism or population growth or productivity, due to a limited supply of an essential nutrient. Productivity does not increase until the limiting nutrient is supplied.

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Objective *Criteria/Guideline/Standard*

A purpose toward which an environmental control effort is directed. An environmental quality objective usually takes the form of a numerical value to support and maintain a specified use at a particular location, taking into account site-specific conditions.

A numerical limit or narrative statement that has been established to protect and maintain a specified use of soil, water or land at a particular site by taking account site-specific conditions.

Oil Sand *Lean Oil Sand*

Sand, clay or other minerals saturated with bitumen.

Defined in the *Mines and Minerals Act* as

(i) sands and other rock materials containing crude bitumen,

(ii) the crude bitumen contained in those sands and other rock materials, and

(iii) any other mineral substance (except natural gas) associated with the above-mentioned crude bitumen, sands or rock materials and includes a hydrocarbon substance declared to be oil sands under section 7(2) of the *Oil Sands Conservation Act*.

Oligotrophic *Eutrophic/Mesotrophic*

1. designation for peatlands that are poor to extremely poor in nutrients and with low biological activity;
2. containing a small amount of plant nutrients; refers to waters low in nutrient loading with low primary production of organic material by algae and/or macrophytes. Growth in oligotrophic water is often limited by low levels of phosphorus and nitrogen.

Ombrotrophic

A supply of nutrients exclusively from rain water (including snow and atmospheric fallout), therefore making nutrition extremely oligotrophic often in an unbalanced way.

Open Pit Mine *Mine Dump*

Refers to a procedure of mining that entails the complete removal of all material from over the product to be mined in a series of pits. Material from the pits may be cast into previous pits but is more often cast onto external spoil piles or dumps.

Operations

All activities at a site prior to closure, which include construction, extraction, and product processing.

Operability (forestry)

Classification of a forest site based on the potential to harvest timber on that site, as affected by physiographic characteristics, moisture regime and harvesting equipment/technology.

Order (soil) *Great Group*

A category in the Canadian System of Soil Classification. All the soils within an order have one or more characteristics in common.

Ore

A deposit which, under current conditions, contains economically recoverable product (e.g., bitumen or coal). Considerations – deposit geometry and continuity, grade, waste/ore ratio etc.

Orebody

A contiguous body of ore.

Ore Grade (oil sands)

The percentage of bitumen by weight in the oil sands.

Organic(s) *Inorganic*

Chemical compounds, naturally occurring or otherwise, which contain carbon, with the exception of carbon dioxide (CO_2) and carbonates (e.g., $CaCO_3$).

Organic Carbon (soil)

The percent by weight of carbon in organic forms in soil materials, determined by the difference between total carbon (determined by dry combustion) and inorganic carbon (determined by acid dissolution).

Organic Matter

The organic fraction of the soil; includes plant and animal residues at various stages of decomposition, cells and tissues of soil organisms, and substances synthesized by the soil population. It is usually determined on soils that have been sieved through a 2.0 mm sieve. It is estimated by multiplying the soil organic carbon content by 1.724.

Organic Soil *Brunisolic/Chernozemic/Gleysolic/Luvisolic Mineral Soil/Organic Soils/Podzolic//Regosolic*

An order of soils that have developed dominantly from organic deposits. The majority of Organic soils are saturated for most of the year, unless artificially drained, but some of them are not usually saturated for more than a few days.

Includes the Fibrisol, Mesisol, Humisol, and Folisol great groups. They contain 17% or more organic carbon, and:

(1) if the surface layer consists of fibric organic material and the bulk density is less than 0.1 Mg m^{-3} (with or without a mesic or humic Op less than 15 cm thick), the layer must extend to a depth of at least 60 cm; or

(2) if the surface layer consists of organic material with a bulk density of 0.1 Mg m^{-3} or more, the organic material must extend to a depth of at least 40 cm; or

(3) if a lithic contact occurs at a depth shallower than stated in (1) or (2) above, the organic material must extend to a depth of at least 10 cm.

Outlet

An opening through which water can be freely discharged from a reservoir, or the point of water disposal from a water body.

Outlet Channel

A waterway constructed or altered primarily to carry water from man-made structures, such as dam spillways, smaller channels, tile lines, and diversions.

Overburden *Spoil*

Materials of any nature, consolidated or unconsolidated, that overlie a deposit of useful materials.

Overstory Species *Understory Species*

A species that occurs within the tallest vegetation layer within a plant community. Most often trees.

Overstripping

The intentional stripping of the upper subsoil with the topsoil. This would only be done where incorporation of the upper subsoil would not significantly degrade the quality of the topsoil. This procedure may be suitable for areas with a shallow topsoil layer and good quality upper subsoil.

Overwintering Habitat

Habitat used during the winter as a refuge and for feeding.

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Pans *Hardpan*

Horizons or layers in soils that are strongly compacted, indurated or very high in clay content:

> *Caliche*: A layer near the surface, more or less cemented by secondary carbonates of calcium or magnesium precipitated from the soil solution. It may be a soft, thin soil horizon, a hard thick bed just beneath the solum, or a surface layer exposed by erosion. It is not a geological deposit.
>
> *Claypan*: A dense compact layer in the subsoil having a much higher clay content than the overlying material from which it is separated by a sharply defined boundary; usually hard when dry, and plastic and sticky when wet. It usually impedes the movement of water and air and the growth of plant roots. High clay content does not necessarily result in the formation of a claypan, as much depends on soil structure as well as texture.
>
> *Fragipan*: A natural subsurface layer having a higher bulk density than the solum above; seemingly cemented when dry but showing moderate to weak brittleness when moist. The layer is low in organic matter, mottled, and slowly or very slowly permeable to

water; it usually has some polygon-shaped bleached cracks. It is found in profiles of either cultivated or virgin soils but not in calcareous material.

Induced Pan: Also called pressure pan or traffic pan. A subsurface horizon or soil layer having a higher bulk density and a lower total porosity than the soil directly above or below it, as a result of pressure that has been applied by normal tillage operations or other artificial means. It is also referred to as plow pan, plow sole or traffic pan.

Parent Material

The unconsolidated and more or less chemically weathered mineral or organic matter from which the solum of a soil is developed by pedogenic processes.

Particle Size

The effective diameter of a particle measured by sedimentation, sieving, or micrometric methods.

Sand: a soil particle between 0.05 mm and 2.00 mm in diameter.

Silt: a soil separate consisting of particles between 0.05 mm and 0.002 mm in diameter.

Clay: a size fraction less than 0.002 mm in diameter.

Particle Size Distribution

The amount of the various soil separates in a soil sample, usually expressed as weight percentages.

Patch

Small ecological unit (patch) within a larger unit that is recognizably different from the larger unit but nevertheless interacts with it.

Peak Discharge

The maximum instantaneous flow from a given storm condition at a specific location.

Peat *Amorphous Peat/Brown Moss Peat/Forest Peat*

Material constituting peatlands, exclusive of the live plant cover, consisting largely of organic residues accumulated as a result of incomplete decomposition of dead plant constituents under conditions of excessive moisture (submergence in water and/or waterlogging).

Peatland *Bog/Muskeg*

A generic term including all types of peat-covered terrain.

Peat:Mineral Mix

A mixture of an organic horizon and the underlying mineral soil, or an organic horizon and mineral soil from another source, where the mineral soil in both cases is rated good, fair or poor according to Table 8, Page 27 of the *Soil Quality Criteria Relative to Disturbance and Reclamation, 1987*, as amended.

Coarsely mixed peat and mineral materials salvaged during the stripping process in which peat is over-stripped to a maximum depth of 3 m and includes 25% to 50% by volume of mineral materials.

Ped

A unit of soil structure such as a prism, block, or granule, formed by natural processes (in contrast to a clod, which is formed artificially).

Pedogenic

Pertaining to the mode of origin of the soil, especially the processes or soil-forming factors responsible for the development of the solum.

Pedon

A real unit of soil, the smallest homogenous, three-dimensional unit that can be considered a soil.

Penetrability

The ease with which a probe can be pushed into the soil. It may be expressed in units of distance, speed, force, or work, depending on the type of penetrometer used.

Penetration Resistance *Cone Index*

The resistance of a soil to penetration. Varies with shape and kind of instrument used.

Penetrometer *Cone Penetration Test*

A rod with specified size cone on its tip for measuring the resistance of a soil to penetration, giving an integrated index of soil compaction, moisture content, texture and type of clay mineral. The amount of penetration per unit force applied to a given soil will vary with the shape and kind of instrument used.

Perched Aquifer *Aquifer*

A localized unconfined aquifer formed above a relatively impermeable layer. May be seasonal due to recharge patterns and leakage through and flow around the restricting layer.

Perched Water Table

The water table of groundwater separated from an underlying body of groundwater by unsaturated rock or impermeable layer of compacted soil.

Percolation *Infiltration*

The downward flow of water in saturated or nearly saturated soil.

Movement of water under hydrostatic pressure or gravity through the interstices of rock, soil, or wastes. Typically a deep movement into subsurface aquifers.

Performance Assessment

Prediction of the future performance of a reclaimed landscape unit or lease to allow identification of potential adverse effects with respect to geotechnical, geomorphic and ecosystem sustainability.

Peripheral Species

Species found at the edge of their geographic range.

Periphyton

A complex mixture of algae, bacteria and other microbes covering submerged surfaces that can serve as food for higher trophic-level organisms such as aquatic insects; sometimes referred to as biofilm.

Permanent Reserve (forestry)

An area permanently excluded from harvesting.

Permeability (soil) *Impermeability*

The ease with which gases, liquids, or plant roots penetrate or pass through a bulk mass of soil or a layer of soil. Since different horizons of soil vary in permeability, the particular horizon under question should be designated.

Permeameter *Hydraulic Conductivity*

A device for confining a sample of soil or porous medium and subjecting it to fluid flow, in order to measure the hydraulic conductivity or intrinsic permeability of the soil or porous medium for the fluid.

pH (soil) *Acid Soil/Alkaline Soil*

The negative logarithm of the hydrogen-ion activity of a soil. The degree of acidity (or alkalinity) of a soil as determined by means of glass, quinhydrone, or other suitable electrode or indicator at a specific moisture content of soil-water ratio, and expressed in terms of the pH scale.

Phreatic Surface

The free surface of ground water at atmospheric pressure.

Physical Properties (soil)

The characteristics, processes, or reactions of a soil that are caused by physical forces, and are described by, or expressed in, physical terms or equations. Sometimes physical properties are confused with and hard to separate from chemical properties; hence, the terms "physical-chemical" or "physicochemical." Examples of physical properties are bulk density, waterholding capacity, hydraulic conductivity, porosity, and poresize distribution.

Phytoplankton

Photosynthesizing microscopic organisms found in water bodies that form the base of many lake food webs.

Phytoremediation

The use of plants and their associated micro-organisms for the in situ treatment of contaminated soils.

A process that uses plants to remove, transfer, stabilize, or destroy contaminants in soil, sediment and groundwater.

Piezometer

An instrument for measuring pressure head in a conduit, tank, soil, etc. It usually consists of a small pipe or tube tapped into the side of the container, connected with a manometer pressure gage, mercury or water column, or other device for indicating pressure head.

Piezometric Surface

Mapped and contoured water level elevations of an aquifer. Also known as a potentiometric surface.

Pioneer Species *Climax Species*

Plant species that initially invade a newly exposed surface.

Pit Lake *End Pit Lake*

A man-made lake used to fill a mine pit area into which tailings may be discharged. Pit lakes are typically filled with waters pumped from adjacent rivers, or from runoff waters from reclamation areas.

Plastic Limit *Atterberg Limits/Liquid Limit/Shrinkage Limit*

The plastic limit of soils is the moisture content at which the soil changes from a semisolid to a plastic state.

Plasticity Index *Shrinkage Index*

The numerical difference between the liquid limit and the plastic limit.

Podzolic *Brunisolic/Chernozemic/Gleysolic/Luvisolic/ Organic Soils/Regosolic/Solenetzic*

An order of soils having podzolic B horizons (Bh, Bhf, Bf) in which amorphous combinations of organic matter (dominantly fulvic acid) Al, and usually Fe are accumulated. The sola are acid and the B horizons have a high pH-dependent charge. The great groups in the order are Humic Podzol, Ferro-Humic Podzol, and Humo-Ferric Podzol.

Polar *Hydrophilic/Non-Polar*

A charged molecule.

A compound that is hydrophilic.

Polycyclic Aromatic Hydrocarbons (PAHs)

Hydrocarbons with two or more benzene rings formed by the incomplete combustion of organic materials such as wood, coal, and refuse. They are found in petroleum products and creosote and include such compounds as naphthalene, anthracene, and benzo-a-pyrene. When carried in water, they can pose a threat to human health and aquatic life.

Polishing Pond

Pond where final sedimentation or contaminant remediation takes place before discharge to the receiving environment.

Pore Space

Spaces between soil particles in a volume of soil.

Pore Water

Water between the grains of rock or soil.

Porosity *Air Porosity*

The volume percentage of the total bulk not occupied by solid particles.

The ratio of volume of voids in a soil mass to the total volume of the mass.

Potential Acid Input

A composite measure of acidification determined from the relative quantities of deposition from background and industrial emissions of sulphur, nitrogen and base cations.

Precautionary Principle

Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

Precision *Accuracy*

The closeness of repeated measurements of the same quantity.

Preplanning

Process of foreseeing reclamation problems and determining measures to minimize off-site damages.

Presence-absence *Abundance-Dominance*

Manner of completing a vegetation survey or analysis based on the presence or absence of a species instead of abundance-dominance.

Private Land *Public Land*

Land is privately owned by individuals, groups, companies or organizations that make decisions about how it is used or managed within existing legislation.

Probable Maximum Precipitation

The theoretically greatest depth of precipitation for a given duration that is physically possible over a particular drainage area at a certain time of the year.

Process-Affected Water (OSPW) *Naphthenic Acid(s)*

Water that has been altered in chemical composition by activities associated with oil sands mining and/or processing; includes raw tailings water, dyke seepage, process water, and water released from tailings.

Any water that has come in contact with oil sands, and may contain hydrocarbons, salts and other chemicals.

Producers *Decomposers*

Organisms which undergo photosynthesis to convert CO_2 and H_2O into sugars (autotrophs).

Productive Soil

A soil in which the chemical, physical and biological conditions are favourable for the production of crops suited to a particular area.

Productivity (land) *Capability (land)*

The physical yield expected from a land unit assuming specified management practices and input levels.

Productivity (soil) *Capability Class (soil)*

The capacity of a soil, in its normal environment, for producing a specified plant or sequence of plants under a specified system of management. The "specified" limitations are needed because no soil can produce all crops with equal success and a single system of management cannot produce the same effect on all soils. Productivity emphasizes the capacity of the soil to produce crops and is expressed in terms of yield.

Professional Judgement

The application of expert opinion in decision making. For example, the classification of a site's environmental or biological condition on the basis of an expert's qualitative assessment. There can be great agreement among experts assessing biological condition; however, best professional judgement lacks objectivity and assessments are dependent on the expertise of the decision makers and the quality and type of information available to them.

Profile (soil) *Control Section*

A vertical section of the soil through all its horizons and extending into the parent material.

Progressive Reclamation

Any interim or concurrent reclamation of land undertaken during, following or in connection with construction/development and ongoing operations.

Propagule

A part of a plant that implants a new individual.

Psychrometer

An instrument for determining atmospheric humidity by the reading of two thermometers, the bulb of one being kept moist and ventilated.

Public Land *Private Land*

Land owned by the provincial government, which makes decisions about how it is used and managed, including for agriculture, forestry, resource development, habitat conservation and protection of watersheds and biodiversity.

Pulverization

The degradation of topsoil structure through related mechanical action (e.g., vehicle traffic, tillage). Pulverization can lead to erosion, loss of organic matter and admixing.

Pure Live Seed (PLS)

PLS = %germination x %purity. Seeding rates based on Pure Live Seed (PLS) compensate for the purity and germination frequency of the seed.

Pycnocline

The sudden gradient change in chemistry (e.g., temperature, salinity), between two different layers in a stratified lake.

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Rare Species *Common Species*

A species not widely distributed or not easily found within a given area. Rare species include but are not necessarily limited to endangered, threatened or vulnerable species.

Reach

A comparatively short length of river, stream channel or shore. The length of the reach is defined by the purpose of the study.

Rearing Habitat

Habitat used by young for feeding and/or as refuge from predators.

Receptor *Critical Receptor*

The person or organism subjected to exposure to chemicals or physical agents.

Recharge

Process by which water is absorbed and added to the zone of saturation.

Reclamation *Rehabilitation/Restoration*

The process of reconverting disturbed land to its former or other productive uses.

All practicable and reasonable methods of designing and conducting an activity to ensure:

1. stable, non-hazardous, non erodible, favourably drained soil conditions, and
2. equivalent land capability.

Regulatory definition (*Environmental Protection and Enhancement Act*)

1. The removal of equipment or buildings or other structures and appurtenances,
2. The decontamination of buildings or other structures or other appurtenances, or land or water,
3. The stabilization, contouring, maintenance, conditioning or reconstruction of the surface of land,
4. Any other procedure, operation or requirement specified in the regulations.

Reclamation Certification *Custodial Transfer/Relinquishment*

The process of issuing a reclamation certificate, mandated by the *Environmental Protection and Enhancement Act*, to an operator. The reclamation certificate is issued following submissions of an application, review of the application for administrative and technical completeness and a field inquiry to determine if the reclamation meets expectations.

Reclamation Material Balance

The estimated volumes of the various types of reclamation materials required to achieve the reclamation objectives for the site calculated with consideration for short-term and long-term needs for soil salvage, storage, and placement.

Reclamation Water Release

Non-controllable, diffuse water releases from reclamation units, directed through streams, wetlands, and lakes to reach the regional river system, with quality controlled by the environmental sustainability of the source reclamation units and the watercourses through which the water passes.

Reconnaissance

A level of field analysis that involves relatively quick sampling for the purpose of obtaining general information about an area. In some cases, sampling quality may be high, but the intensity of sampling is very low relative to the size of the total area being studied.

Reconstructed Profile *Minesoil*

The result of selective placement of suitable overburden material on reshaped spoils.

Recovery Plan - Species at Risk

A recovery plan outlines known information about a species at risk and its habitat (and threats to them), as well as what data are needed to assist the species' recovery, both long-term and short-term goals for recovery, and the actions needed to achieve these goals.

Reference Condition *Best Attainable Condition/Degraded/Historic Condition*

The set of attributes or ecological characteristics that assist in identifying the location of a portion of the resource population along a continuum of anthropogenic disturbance. The reference condition extends from the point on the continuum representing complete absence of human influence to the point of minimally disturbed condition. Some authors operationally define the reference condition as areas minimally affected by human activity (Bailey et al. 2004, Host et al. 2005). In some classifications, it is considered the complement of "degraded condition." In terms of the Reference Condition Approach, the "reference condition" refers to the environmental characteristics that explain the variability of biota among reference sites. It is the standard or benchmark against which the current condition is compared.

Reforestation *Afforestation*

The natural or artificial restocking of an area with forest trees.

Refugia

A stand of undisturbed natural vegetation retained within a mine development area that serves as a source of native species for revegetation.

Regeneration

The renewal of a crop tree by natural or artificial means. It may also refer to the young crop itself.

Regional Plan

A provincial planning tool sanctioned under the *Alberta Land Stewardship Act*. There will be seven Regional Plans, plus separate plans for the Calgary and Edmonton regions. The Lower Athabasca Regional Plan (LARP) covers the mineable oil sands area.

Regolith

The unconsolidated mantle of weathered rock and soil material overlying solid rock.

Unconsolidated overburden that lies above bedrock. It includes glacial drift and colluvial and fluvial deposits that occur below the premine soil but does not include soft (paralithic) weathered-in-place bedrock.

Regosolic *Brunisolic/Chernozemic/Gleysolic/Luvisolic Organic Soils/Podzolic/Solenetzic*

An order of soils having no horizon development or development of the A and B horizons insufficient to meet the requirements of the other orders.

Rehabilitation *Reclamation/Restoration*

Implies that the land will be returned to a form and productivity in conformity with a prior land use plan, including a stable ecological state that does not contribute substantially to environmental deterioration and is consistent with surrounding aesthetic values.

Reject

Unwanted material separated from the desired product (e.g., the stone or dirt discarded from a coal preparation plant) and wasted.

Relative Abundance

The proportional representation of a species in a sample or a community.

Relative Hydraulic Conductivity *Hydraulic Conductivity*

The ratio of hydraulic conductivity of a given soil at a certain moisture content with the hydraulic conductivity of the same soil in saturated conditions.

Relief

The difference in elevation between the high and low points of a landscape.

Relinquishment *Custodial Transfer/Reclamation Certification*

Return of land to the owner (private or the Crown) following reclamation and certification. The last step in industrial development.

Remediation *Decontamination*

The removal, reduction, or neutralization of substances, wastes or hazardous material from a site so as to prevent or minimize any adverse effects on the environment now or in the future.

Remote Sensing

Measurement of some property of an object or surface by means other than direct contact. Usually refers to the gathering of scientific information about the earth's surface from great heights and over broad areas, using instruments mounted on aircraft or satellites.

Reproductive Success

The production of healthy offspring which live to reproduce themselves.

Reservoir

A man-made lake that collects and stores water for future use. During periods of low river flow, reservoirs can release additional flow if water is available.

Residence Time *Flushing*

Average time spent by a parcel of water in a basin (e.g., a wetland) before being discharged.

Residual Herbicide *Soil Sterilant*

A herbicide that can control weeds for long periods of time after it is applied.

Residual Effect

An effect that remains after mitigation (reclamation) has been applied.

Residual Material

Unconsolidated and partly weathered mineral materials accumulated by disintegration of consolidated rock in place.

Resource Selection Function (RSF) *Habitat Suitability Index*

A statistical analysis of the preference of a species for certain habitat types. A Resource Selection Function is created from an analysis of data and is directly related to the probability that a given resource will be used by an animal.

Restoration *Ecological Restoration/Reclamation/Rehabilitation*

The process of restoring site conditions as they were before the land disturbance.

Restored Wetland *Constructed Wetland/Wetland*

A wetland that is re-established on the site of a former wetland. The goal is to rehabilitate a degraded wetland or reestablish a wetland that has been destroyed by restoring hydrology and encouraging seed germination from an existing seed bank.

Restricted Weed *Noxious Weed/Nuisance Weed*

A designation in Alberta for weeds that pose a serious threat, and as such must be eradicated. Generally these weeds possess characteristics of rapid spread, and superior competition.

Revegetation

The establishment of vegetation that replaces original ground cover following land disturbance.

Rhizobia *Legume/Nitrogen Fixation*

Small heterotrophic bacteria of the genus *Rhizobium* that fix atmospheric nitrogen through the use of nodules on the roots of leguminous plants.

Rhizome

1. An elongated, usually underground, horizontal or ascending root-like stem.
2. A rootstock.

Rhizosphere *Root Zone*

The soil surrounding and directly influenced by plant roots.

The micro-environment of the roots.

Rhizosphere Effect

The direct effect of plant roots and their exudates on microorganisms, including the fact that microbial populations are usually larger within the rhizosphere than in the root-free soil.

Riffle (habitat) *Run (habitat)*

Shallow rapids where the water flows swiftly over completely or partially submerged materials to produce surface agitation.

Rill *Gully Erosion*

A narrow, very shallow, intermittent watercourse having steep sides. It presents no obstacle to tilling.

Riparian

Refers to terrain, vegetation or simply a position adjacent to or associated with a stream, flood plain, or standing water body.

Riparian Area

The area of water-loving vegetation beside a stream, river, lake, or pond. Riparian areas are critical in reducing the negative effects of various land-uses on adjacent waters.

Ripping *Chiseling/Subsoiling*

The act of breaking, with a tractor-drawn ripper or long angled steel tooth, compacted soils or rock into pieces small enough to be excavated or moved by other equipment as a scraper or dozer.

A tillage operation used to break up plough pans or other impermeable layers. Often a chisel is used to break up the soil to a depth of half a meter and at spacings of one metre. Ripping will also improve infiltration and percolation of water into the soil and thus improve vegetative growth.

Rip Rap (riprap)

Broken rock, cobbles, or boulders placed on earth surfaces, such as the face of a dam, bank of a stream or lining drainage channels, for protection against the action of water.

A layer of stone, pre-cast blocks, bags of concrete, or other suitable materials, generally placed on the upstream slopes of an embankment or along a watercourse as protection against wave action, erosion, or scour. Riprap is usually placed by dumping or other mechanical methods, but is occasionally hand placed.

Risk *Hazard*

The probability that a substance or situation will produce harm under specified conditions. Risk is a combination of two factors:

- The probability that an adverse event will occur (such as a specific disease or type of injury); and
- The consequences of the adverse event.

Risk Management

The selection and implementation of a strategy for control of a risk, followed by monitoring and evaluation of the effectiveness of that strategy. The decision to select a particular strategy may involve consideration of the information obtained during risk assessment. Implementation may involve a commitment of resources and communication with affected parties. Monitoring and evaluation may utilize such techniques as environmental sampling, post-market surveillance, prospective epidemiology, and analysis of new health risk information, as well as efforts to ensure compliance with the decision.

Robust Landscape

Landscape with either a capability to self-correct after extreme events or one with hazard triggers reducing with time.

Rollback

Strippings and debris returned to disturbed areas for reclamation purposes.

Root Zone (rootzone) *Rhizosphere*

The part of the soil that is penetrated or can be penetrated by plant roots.

Rough Mounding

Method where soil is pushed with a dozer to the place of final deposit and left as a rough, mounded surface. The next bladefull of soil is pushed up to but not over the last bladefull, again leaving it as a rough mound. The final surface has a rough mounded surface that provides microsite diversity, inherent erosion control, and minimized compaction.

Run (habitat) *Riffle (habitat)*

Areas of swiftly flowing water, without surface waves, that approximates uniform flow and in which the slope of water surface is roughly parallel to the overall gradient of the stream reach.

Runoff *Infiltration*

The portion of the total precipitation on an area that flows away through stream channels. Surface runoff does not enter the soil. Groundwater runoff or seepage flow from groundwater enters the soil before reaching the stream.

Run-on

Water that flows onto a property, or any piece of land. Includes only those waters that have not been in contact with industrial operations.

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Saline-Alkali Soil (Saline-Sodic Soil)

1. A soil containing enough exchangeable sodium to interfere with the growth of most crop plants, and containing appreciable quantities of soluble salts. The exchangeable-sodium percentage is greater than 15, the conductivity of the saturation extract is greater than 4 dS/m at 25^{o}C, and the pH is usually 8.5 or less in the saturated soil.
2. A saline-alkali soil has a combination of harmful quantities of salts and either a high alkalinity or high content of exchangeable sodium, or both, so distributed in the profile that the growth of most crop plants is reduced.

Saline Groundwater (regulatory definition) *Non-Saline Water*

Water that has total dissolved solids exceeding 4,000 mg/L (as defined in the *Water (Ministerial) Regulation*). Also referred to as brackish water.

Saline Soil

A non-alkali soil containing soluble salts in such quantities that they interfere with the growth of most crop plants. The conductivity of the saturation extract is greater than 4 dS/m, the exchangeable-sodium percentage is less than 15, and the pH is usually less than 8.5.

State in soil caused by the presence of soluble salt (ions such as Na, Ca, K, Mg, Cl, SO_4) yielding an electrical conductivity of at least 2 dS/m.

Salinization

The process of accumulation of salts in soils.

Salt-Affected Soil

Soil that has been adversely modified for the growth of most crop plants by the presence of certain types of exchangeable ions or of soluble salts. It includes soils having an excess of salts, or an excess of exchangeable sodium, or both.

Sand *Clay/Particle Size/Silt*

A soil particle between 0.05 mm and 2.0 mm in diameter.

Sand Content *Fines Content*

The ratio of the mass of sand (>44 μm) to mass of solids, expressed as a percentage.

Sand to Fines Ratio (SFR)

The mass of dry sand (>44 μm) to the mass of dry fines (<44 μm).

Saturated Hydraulic Conductivity *Hydraulic Conductivity/Relative Hydraulic Conductivity*

Hydraulic conductivity of a saturated soil with respect to water.

Saturation Percentage *Moisture Content*

Percent of the void volume in soil that is filled by water. Same as moisture content expressed in terms of percent.

Scarification (seed) *Stratification*

The artificial breakdown of the outer seed coat by mechanical or chemical means. These methods are used to improve germination frequency.

Scarification (soil)

Seedbed preparation to make a site more amenable to plant growth.

Loosening or stirring the surface soil without turning it over.

Sedge Peat *Brown Moss Peat/Forest Peat/Sedimentary Peat/Sphagnum Peat*

Peat composed mostly of the stalks, leaves, rhizomes, and roots of sedges (*Carex* spp.).

Sediment

Solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its surface of origin by air, water, gravity, or ice and has come to rest on the earth's surface either above or below sea level.

Sedimentary Peat *Brown Moss Peat/Forest Peat/Sedge Peat/Sphagnum Peat*

A material composed of plant debris and faecal pellets less than a few tenths of a millimetre in diameter and having brown or gray-brown colours when dry. It has slightly viscous water suspensions, is slightly plastic but not sticky, and shrinks upon drying to form clods that are difficult to rewet. It has few or no plant fragments recognizable to the naked eye.

Sedimentation

The process of subsidence and deposition of suspended matter carried by water, wastewater or other liquids, by gravity. It is usually accomplished by reducing the velocity of the liquid below the point at which it can transport the suspended material.

Sedimentation or hindered sedimentation (tailings)

A mode of densification when soil particles settle together en-masse through a water column. Unlike consolidation, during sedimentation there is no effective stress.

Sediment Basin

A reservoir for the confinement and retention of silt, gravel, rock, or other debris from a sediment-producing area.

Sediment Load

1. The soil particles transported through a channel by stream flow.
2. The total sediment, including bedload plus suspended sediment load, is the sediment being moved by flowing water in a stream at a specified cross-section.

Seedbed

The soil prepared by natural or artificial means to promote the germination of seed and the growth of seedlings.

Seepage

1. The slow flow of water into or from a soil. Seepage usually involves the lateral flow of water.
2. The emergence of water from the soil over an extensive area in contrast to a spring where it emerges from a local spot.

Segregation

Separation of fine and coarse fractions during or after deposition.

Self-Sustaining

A characteristic of a reclaimed area that will allow it to maintain its existence and/or recover from disasters without human intervention.

The ability to support various land uses after land conservation and reclamation is complete without requiring the use of fertilizers or any other special management (regulatory definition).

Sentinel Site

A sampling location that serves as a site-specific indicator of impairment. The site may be situated adjacent to human activities or is for some other reason considered at risk of impact. Alternatively, it may be remote and thought to be representative of the "reference condition." The site is monitored repeatedly over the long-term for any change in condition, providing a record of condition at that spatial point through a temporal range. However, because it is non-randomly selected, it cannot be assumed to be representative of the region from which it was drawn.

Sentinel Species

A monitoring species selected to be representative of the local receiving environment.

Seral Community *Climax Community*

One of a sequence of communities in the development stages towards a climax community.

Setback

A setback is the minimum distance that must be maintained between a development and an environmental feature (e.g., river valley, lake) or human feature (e.g., dwelling, rural housing development, urban centre, or public facility). Setbacks may vary according to the type of development and the sensitivity of the environmental or human feature.

Shade Strip *Filter Strip*

An area adjacent to a water body where sufficient timber or other vegetation is retained to provide shade that maintains water temperatures within the normal range.

Shallow Open Water *Bog, Fen, Marsh, Swamp*

Small bodies of standing water less than 2 m deep that act as transitional areas between lakes and marshes. Shallow open water does not contain emergent aquatic vegetation like cattails and reeds, but may support floating vegetation like lily pads.

Shear Strength

The maximum internal resistance of a soil to the movement of its particles; that is, resistance to slipping or sliding of soil over soil. The forces that resist shear are internal or inter-granular friction and cohesion.

Shore

The edge of a body of water and includes the land adjacent to a body of water that has been covered so long by water as to wrest it from vegetation or as to mark a distinct character on the vegetation where it extends into the water or on the soil itself.

Shrinkage Index *Plasticity Index*

The numerical difference between the plastic and the shrinkage limits.

Shrinkage Limit *Atterberg Limits/Liquid Limit/Plastic Limit*

The maximum water content at which a reduction in the water content will not cause a decrease in the volume of the soil mass; this defines the arbitrary limit between the solid and semi-solid states.

Shrub

A woody perennial plant differing from a tree by its low stature and by generally producing several basal shoots instead of a single trunk.

Shutdown *Abandonment/Suspension*

The temporary closure of an industrial facility, usually when economic conditions or operational requirements change. A shutdown may be:

1. short-term – the company has every intention of restarting operations. A short-term shutdown will likely last a maximum of one year; or,

2. long-term – the company believes it will restart operations if conditions improve. Some salvaging of equipment may occur. Operating licenses/leases may have to be changed.

Siemen *Electrical Conductivity*

A unit of electrical conductance, the reciprocal of ohm; the decisiemen (dS), one-hundredth of a Siemen, is the preferred term in soil sciences.

Silt *Clay/Particle Size/Sand*

A soil separate consisting of particles between 0.05 mm to 0.002 mm in equivalent diameter.

Silt Fence

A permeable fabric barrier installed on contour to filter surface water runoff. It is used to trap sediment from sheet or overland flow and prevent it from entering streams.

Silvic *Forest Peat*

Pertaining to organic soils developed in forest peat; used in describing organic soil families.

Silviculture

The art, science and practice of controlling the establishment, composition, health, quality and growth of forest stand vegetation.

Site Index

An expression of forest site quality based on the height of dominant and co-dominant trees at a specific age.

Slaking

The crumbling and disintegration of earth materials when exposed to air or moisture. More specifically, the breaking up of dried clay when saturated with water, due either to compression of entrapped air by inwardly migrating capillary water or the progressive swelling and sloughing off of the outer layers.

Slash

Debris left as a result of tree clearing. Includes materials such as logs, splinters, chips, branches and tops, uprooted stumps, and broken or uprooted trees and shrubs.

Slenderness Coefficient

The ratio of tree height to diameter at breast height.

Slope

The degree of deviation of a surface from horizontal, measured in a numerical ratio, percent, or degrees. Expressed as a ratio or percentage, the first number is the vertical distance (rise) and the second is the horizontal distance (run), as 2:1 or 200%. Expressed in degrees, it is the angle

of the slope from the horizontal plane with a 90^{o} slope being vertical (maximum) and 45^{o} being a 1:1 slope.

Snag

Any standing-dead, or partially-dead tree.

A dead, standing tree at least 6 m in height that may provide roosting or cavity nesting/denning opportunities for wildlife.

Sodic Bedrock

Unconsolidated sedimentary rock (bentonitic shales, clayey sandstones) also referred to as soft rock or residual materials, of marine origin containing sufficient exchangeable sodium to interfere with the growth of most crop plants and also containing appreciable quantities of soluble salts. The SAR is greater than 15. Sodic bedrock also has high saturation percent values and water supply problems and poor structural (aggregation) properties.

Sodicity

A measure of the amount of sodium on the exchange complex (often expressed as sodium adsorption ratio – SAR).

Sodic Soil

A soil containing sufficient exchangeable sodium to interfere with the growth of most crop plants. SAR of the saturation paste extract is greater than 15.

Soil

1. The unconsolidated material on the immediate surface of the earth that serves as a natural medium for the growth of land plants.
2. The naturally occurring unconsolidated material on the surface of the earth that has been influenced by parent material, climate (including the effects of moisture and temperature), macro- and micro-organisms, and relief, all acting over a period of time to produce soil that may differ from the material from which it was derived in many physical, chemical, mineralogical, biological, and morphological properties.
3. For the purpose of the Canadian taxonomic system, the earth's surface (the material that is to be classified) is divided into soil and nonsoil. Soil is the naturally occurring, unconsolidated, mineral or organic material at the earth's surface that is capable of supporting plant growth. It extends from the surface to 15 cm below the depth at which properties produced by soil-forming processes can be detected. These properties differ from those found in any underlying unconsolidated material. The soil-forming processes are defined as an interaction between climate, living organisms, and relief acting on soil and soil parent material. Unconsolidated material includes material cemented or compacted by soil-forming processes. Soil may have water covering its surface to a depth of 60 cm or less in the driest part of the year. Nonsoil is the collection of soil material or soil-like material that does not meet the preceding definition of soil. It includes soil displaced by un-natural processes and unconsolidated material unaffected by soil-forming processes, except

for the material that occurs within 15 cm below soil as defined. Nonsoil also includes unconsolidated mineral or organic material thinner than 10 cm overlying bedrock; organic material thinner than 40 cm overlying a hydric layer; and soil covered by more than 60 cm of water in the driest part of the year.

Soil Classification

The systematic arrangement of soils into categories and classes on the basis of their characteristics. Broad groupings are made on the basis of general characteristics and subdivisions on the basis of more detailed differences in specific properties.

Soil Complex

A mapping unit used in detailed and reconnaissance soil surveys where two or more defined soil units are so intimately intermixed geographically that is it impractical, because of the scale used, to separate them.

Soil Correlation Area

A mapping of soils within Alberta that places greater emphasis on local ecological, climatic, and topographical differences between areas.

Soil Degradation *Environmental Degradation/Land Degradation*

Any change or disturbance to the soil perceived to be deleterious or undesirable.

The decline in soil productivity through its use and/or misuse by humans.

The result of one or more processes which lessen the current and/or potential capability of soil to produce (qualitatively and/or quantitatively) goods and/or services.

Soil Horizon *A Horizon/B Horizon/C Horizon*

A layer of soil or soil material approximately parallel to the land surface distinguishable from adjacent layers by colour, structure, consistence, chemical, biological, and mineralogical composition.

Soil Improvement

Increasing a soil's capability to sustain plant growth by drainage and irrigation, or through the addition of various soil amendments such as fertilizers.

Soil Management

The sum total of all tillage operations, cropping practices, fertilizer, lime and other treatments conducted on or applied to a soil for the production of plants.

Soil Map

A map showing the distribution of soil types or other soil mapping units in relation to the prominent physical and cultural features of the earth's surface. There are five kinds of soil maps recognized: (1) detailed; (2) detailed reconnaissance; (3) generalized; (4) reconnaissance; and, (5) schematic.

Soil Map Delineation

A single soil area or polygon on a soil map which is differentiated from other areas on the basis of soil and landscape features.

Soil Map Unit

A defined and named repetitive grouping of soil bodies occurring together in an individual and natural characteristic pattern over the soil landscape. The attributes of a map unit vary within more or less narrow limits that are determined by the intensity of the survey. A map unit comprises all the map delineations that have the same name. A map unit is conceptual; a map delineation is real.

Soil Moisture Regime

The available moisture supply for plant growth on a relative scale ranging from very dry (xeric) to very wet (hydric) classes.

Soil Pores

The part of the bulk volume of soil not occupied by soil particles.

Soil Quality *Environmental Quality/Water Quality*

The capacity of soil to function within a specific kind of ecosystem in a manner that sustains plant and animal productivity, maintains or enhances water and air quality, and supports human health and habitation.

A measure of the condition of soil relative to the requirements of one or more species and/or any human need or purpose.

A basic, intrinsic characteristic of a soil that is a reflection of several soil properties and cannot be directly characterized in one measurement, ordinarily estimated from a number of measurements and/or observations.

Soil Regeneration

The reformation of degraded soil through biological, chemical, and/or physical agencies.

Soil Series

The basic unit of soil classification in the Canadian System of Soil Classification consists of soils that are essentially alike in all major profile characteristics except the texture of the surface.

Soil Solution

The aqueous liquid phase of the soil and its solutes consisting of ions dissociated from the surfaces of the soil particles and of other soluble materials.

Soil Structure

The combination or arrangement of primary soil particles into secondary particles, units, or peds. The secondary units are characterized and classified on the basis of size, shape, and degree of distinctness into classes, types and grades.

Structural units include:

Blocky: Cubelike blocks of soil up to 10 cm in size, sometimes angular with well-defined planar faces, sometimes with curved surfaces and corners (subangular blocky).

Columnar: Vertically oriented pillars, often six-sided, up to 15 cm in diameter with rounded tops. Such structures are common in the B horizon of clayey soils, particularly in semiarid regions.

Granular: Rounded aggregates, generally not much larger than 2 cm in diameter, often found in a loose condition in the A horizon. Where particularly porous, such units are called crumbs.

Platy: Horizontally layered, thin and flat aggregates resembling wafers. Such structures occur, for example, in recently deposited clay soils.

Prismatic: Vertically oriented pillars, often six-sided, up to 15 cm in diameter, with flat tops to the pillars; common in the B horizon of clayey soils in semiarid regions.

Soil Survey

A general term for the systematic examination of soils in the field and in the laboratory, their description and classification, the mapping of kinds of soil, and the interpretation of soils for many uses, including their suitabilities or limitations for growing various crops, grasses and trees, or for various engineering uses and predicting their behaviour under different management systems.

Soil Texture

The relative proportions of sand, silt or clay contained in a soil sample.

Soil Type

A unit in the natural system of soil classification; a subdivision of a soil series consisting of or describing soils that are alike in all characteristics including the texture of the A horizon.

Soil-Water Characteristic Curve

The relationship between soil water content and soil water pressure potential (matric suction or negative pore water pressure). This curve is also referred to as the soil moisture retention curve and is important to unsaturated flow.

Solids Content (tailings)

Ratio of the mass of dry solids to total mass of tailings, expressed as a percentage.

Solifluction

The flow of saturated soil downslope over rock or frozen ground, and the subsequent sorting of the debris on level ground, especially under conditions of alternate freezing and thawing.

Solifluction Lobe

Tongue-like mass of solifluction debris commonly with steep fronts and a relatively gentle upper surface.

Solonetzic *Brunisolic/Chernozemic/Gleysolic/Luvisolic/Organic Soils/Regosolic*

An order of soils developed mainly under grass or grass-forest vegetative cover in semiarid to subhumid climates. The soils have a stained brownish or blackish solonetzic B (Bn, Bnt) horizon and a saline C horizon. The order includes the Solonetz, Solodized Solonetz and Solod great groups.

Solum

The upper horizons of a soil in which the parent material has been modified and in which most plant roots are contained. It usually consists of the A- and B-horizons.

Sorption

The physicochemical processes by which an element, ion, or compound attaches to the surface of a particle.

Sorptivity

Sorptivity is the slope of the straight-line portion of the curve relating accumulated infiltration to the square root of time.

Spatial Resolution *Temporal Resolution*

Determined by the size of individual units of observation. It is synonymous with grain. In GIS it means the pixel size of imagery but it can also refer to the quadrat used by a plant ecologist or the wetland complex observed by the landscape ecologist.

Species

A taxonomic grouping of genetically and morphologically similar individuals.

A group of organisms that actually or potentially interbreed and are reproductively isolated from all other such groups.

Species Abundance

The number of individuals of a particular species within a biological community (e.g., habitat type).

Species Composition

The species found in the sampling area.

Species Distribution

Where the various species in an ecosystem are found at any given time. Species distribution varies with season.

Species Diversity

The number of different species and their abundance. Provides a measure of the variation in number of species in a region, depending on the variety of habitats and resources, and the degree of specialization of the species with respect to the habitats and resources.

Species Richness

The number of different species occupying a given area.

Sphagnic

Pertaining to Organic soils developed in peat derived mainly from Sphagnum spp.; used in describing organic soil families

Sphagnum Peat *Brown Peat/Forest Peat/Sedge Peat/Sedimentary Peat*

Peat consisting mainly of *Sphagnum* spp.; usually poorly decomposed and raw; may also contain *Eriophorum* spp., *Carex* spp., and ericaceous species.

Spoil *Mine Dump/Overburden*

1. The overburden or non-ore material removed in gaining access to the ore or mineral material in surface mining.
2. Debris or waste material from a mine.

Spoil Pile *Overburden*

A pile of spoiled overburden.

Sport/Game Fish

Large fish caught for food or sport (e.g., northern pike, trout, walleye, Arctic grayling).

Stability

The resistance of a structure, spoil heap, or a clay bank to sliding, overturning or collapsing. A structure is only as stable as its foundations and those in turn upon the soil or rock on which they are constructed. Soil stability, such as mountain slopes, spoil heaps, and embankments, depends on the shearing strength of the material and that is a function of internal strength and cohesion.

Stabilization

Chemical or mechanical treatment designed to increase or maintain the stability of a mass of soil or otherwise to improve its engineering properties.

Stakeholder

Individuals, groups and regulatory agencies with a substantive interest in development and closure of disturbed land as a land manager or land user.

Stand

A collection of plants having a relatively uniform composition and structure, and age in the case of forests.

Stand Age

The number of years since a stand experienced a disturbance event resulting in its replacement (e.g., fire, logging).

Standard *Criteria/Guideline/Objective*

A definite rule established by authority. Environmental standards often take the form of prescribed numerical values that must be met.

A legally enforceable numerical limit or narrative statement, such as in a regulation, statute, contract or other legally binding document, which has been adopted from a criterion or objective.

Standard Deviation

A measure of the dispersion of samples in a data set from the mean value. The standard deviation is equal to the square root of the sum of squares (sum of differences between individual values and the mean) divided by the degrees of freedom (sample size minus one). A small standard deviation indicates that the values are clustered close to the mean, while a large standard deviation indicates a wide range in values in the data set.

Stand Density

The number of plants in a given area.

The number and size of trees in a given forest area.

Standing Crop

The amount of biomass that occurs on a given site at a particular time without reference to rate of accumulation.

Statistical Significance

In hypothesis testing a sample is said to be significantly different from a hypothetical population if the observed test statistic differs from the associated critical value at a specified probability level (P * a; where a is a probability error of rejecting a true null hypothesis). Generally, a-levels > 0.05 are not considered to be statistically significant.

Steam to Oil Ratio (SOR)

The amount of steam (in barrels) needed to produce a barrel of oil. It is a key measure of efficiency for operations using SAGD technology.

Stilling Basin

A basin constructed to dissipate the energy of fast-flowing water to protect the streambed from erosion.

Stocking

A measure of the proportion of an area occupied by trees/seedlings, expressed in terms of a percentage of occupied fixed area sample plots.

Stratification (seeds) *Scarification (seed)*

The breaking of seed dormancy by exposing the seed to prolonged or repeated freezing under moist conditions. However, alternating warm and cold stratification methods are also frequently used. These methods are used to improve germination frequency.

Stratification (water body) *Meromixis*

The arrangement of a body of water into two or more horizontal layers of differing densities due to different layer characteristics of temperature, salinity, etc. Stratification is established when there is insufficient energy to mix the layers.

Stream

A body of water that flows across the Earth's surface via a current and is contained within a narrow channel and banks.

Stream order is a means of defining the size of perennial (a stream with water its bed continuously throughout the year) and recurring (a stream with water in its bed only part of the year) streams. When using stream order to classify a stream, the sizes range from a first order stream all the way to the largest, a 12th order stream. It takes a joining of two first order streams to form a second order stream. When two second order streams combine, they form a third order stream, and when two third order streams join, they form a fourth and so on.

Stream Flow

The movement of surface water in a stream channel, usually measured in cubic metres per second (m^3/s). It describes the flow at a specific location along the watercourse. Runoff contributed by the entire land area to the stream can be used to describe flow.

Strippings *Duff/Litter*

Layers of humus-bearing topsoil and fine woody material above mineral soil.

Strip Ratio

The ratio of waste (overburden material that covers mineable ore) to ore; used to define the quality of an oil sands ore body.

Stub (forestry)

A standing, dead tree that is generally less than 6 m tall.

Subsidence

A lowering of the soil surface due to a reduction in volume through settling or other means.

Subsoil *Topsoil*

Soil material identified (or described) as B and C in the Canadian System of Soil Classification.

The soil material found beneath the topsoil but above the bedrock.

Technically, the B horizon; broadly, the part of the profile below plough depth.

Substrate

The material that underlies the reclamation material cap.

Subsoiling *Chiseling/Ripping*

The breaking of compact subsoils, without inverting them, with a special knifelike instrument (chisel), which is pulled through the soil usually at depths of 30 cm to 60 cm and spacings of 60 cm to 150 cm.

The tillage of subsurface soil, without inversion, for the purpose of breaking up dense layers that restrict water movement and root penetration.

Succession

The natural sequence or evolution of plant communities, each stage dependent on the preceding one, and on environmental and management factors. *Primary succession* occurs on newly created surfaces, while *secondary succession* involves the development or replacement of one stable successional species by another on a site having a developed soil. Secondary succession occurs on a site after a disturbance (fire, cutting, etc.) in existing communities.

Suitability

A term used in land evaluation to indicate the appropriateness of a site to support a proposed activity or attribute; usually a relative scale is used to gage suitability such as high, moderate, low, or not suitable.

Surface Inflow *Total Net Inflow*

Calculated inflow to lake based on flow in near by streams and prorating the drainage area of the lake.

Surface Sealing

The orientation and packing of dispersed soil particles in the immediate surface layer of the soil to render the surface fairly impermeable to water.

Surface Soil *Coversoil/Topsoil*

The undisturbed soil profile, made up of any or all of the litter layer, and A, B, and BC horizons, or organic horizons (including deep peat deposits), that is salvaged for use in reclamation.

The uppermost part of the soil that is ordinarily moved in tillage, or its equivalent in uncultivated soils. It ranges in depth from 7.5 cm to 25 cm and is frequently designated as the "plow layer", the "Ap layer", or the "Ap horizon".

Surface Water *Groundwater*

Water bodies such as lakes, ponds, wetlands, rivers, and streams, as well as groundwater with a direct and immediate hydrological connection to surface water (for example, water in a well beside a river).

Survey Monument (Monument)

A post, stake, pin, mound of rock or other material, pit, trench or any other thing used to mark a triangulation point or the surveyed corner of a quarter section or a section, and includes a witness post indicating the position of such a corner.

Suspended Solids *Total Suspended Solids*

Organic or inorganic particles that are suspended in and carried by water. The term includes sand, silt and clay particles as well as solids in wastewater. Measured as the oven dry weight of the solids, in ppm, after filtration through a standard filter paper. Less than 25 ppm would be considered a clean water, while an extremely muddy river might have about 200 ppm of suspended solids.

Suspension *Abandonment/Shutdown*

The cessation of normal production or operation of a facility or site. The facility or site need not be rendered permanently incapable of its use, but is left in a safe and stable state during the suspension period.

Sustainability *Conservation*

The process of managing biological resources (e.g., timber, fish) to ensure replacement by regrowth or reproduction of the part harvested before another harvest occurs.

For non-renewable resources, sustainability involves the development of resources (e.g., oil sands, coal, oil and gas, minerals) for the benefit of Albertans in a responsible manner that protects the environment during the construction and operation phases and ultimately reclaims land disturbed by development. In this context, resource development is a temporary land use.

Sustainable Landscape

Landscape that can survive extreme events and natural cycles of change without being subjected to accelerated erosion or environmental impacts more severe than those of the natural environment.

Sustained Yield *Productivity*

A continual annual, or periodic, yield of plants or plant material from an area; implies management practices that maintain the productive capacity of the land.

Theoretical calculation of the yields of wood fibre possible on a continuing basis from a forest under a specified management regime.

Swale

A low-elevation or trough-like feature of a landscape designed to increase rates of water recharge into underground aquifers.

An elongated depression in the land surface that is at least seasonally wet, is usually heavily vegetated, and is normally without flowing water. Swales conduct stormwater into primary drainage channels and may provide some groundwater recharge.

Swamp

A peat-filled area or a mineral wetland with standing or gently flowing waters occurring in pools and channels. The water table is usually at or near the surface. There is strong water movement from margin or other sources, hence the waters are nutrient-rich. If peat is present, it is mainly well decomposed forest peat underlain at times by fen peat. The associated soils are Mesisols, Humisols, and Gleysols. The vegetation is characterized by a dense cover of coniferous or deciduous trees, tall shrubs, herbs, and some mosses.

Synthetic Crude Oil (SCO)

A mixture of hydrocarbons, similar to crude oil, derived by upgrading bitumen from oil sands.

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Tackifier

A glue-like material that is added to water and sprayed on the surface of disturbed or stockpiled topsoil to prevent soil loss by wind erosion.

Tailings *Fine Tailings*

Mineral waste from an oil sands processing plant usually deposited in a water medium.

Tailings Pond (Tailings Settling Basin) *Dam*

Man-made impoundment structures containing tailings. Tailings ponds are enclosed by dykes made with tailings and/or other mine waste materials to stringent geotechnical standards. Their function is to store solids and water and to act as a settling basin to clarify process water so it may be reused.

The primary purpose of the tailings pond is to serve as a process vessel allowing time for tailings water to clarify and silt and clay particles to settle, so the water can be reused in extraction. The pond also acts as a thickener, preparing mature fine tailings for final reclamation.

Tailings Sand

A byproduct of oil sands extraction comprised of sands, process water, and minor amounts of fine particles and residual bitumen; oil sands with the bitumen removed.

Talus *Colluvial Slope/Highwall*

A sloping heap of loose rock fragments lying at the foot of a cliff or steep slope.

Temporal Resolution *Spatial Resolution*

The frequency of sampling in the monitoring program or study. It is the size of the individual time steps represented by each observation.

Temporary Reclamation

Areas where cover soils may have been placed and vegetation has been seeded, planted or ingressed; however, further disturbance is expected at that location. This does not include cleared areas that have revegetated naturally.

Tensiometer

A device for measuring the negative pressure, or tension, of water in soil *in situ*; a porous, permeable ceramic cup connected through a tube to a manometer or vacuum gauge.

Terminal Lake

The ultimate collection point where water presents in a watershed; a lake that lies at the lowest elevation on a landscape.

Terrace

A nearly level, somewhat narrow plain, existing naturally along rivers, lakes or seas or created artificially to reduce erosion by overland runoff.

Terric

Unconsolidated mineral soil.

Terric Layer

An unconsolidated mineral substratum underlying organic soil material.

Texture Triangle

Diagram depicting texture class in relation to the percentage of sand, silt, and clay.

Thalweg

The (imaginary) line connecting the lowest points along a streambed or valley. Within rivers, the deep channel area.

Thermal Cover

Cover that is used by ungulates to help regulate their body temperatures during extreme ambient temperatures. These areas of forest, generally softwood, are more mature than those that make up the escape cover.

Thickened Tailings *Composite/Consolidated Tailings/ Mature Fine Tailings/Whole Tailings*

Tailings that have been significantly dewatered to a point where they will form a homogeneous non-segregated mass when deposited from the end of a pipe.

A developing tailings technology that produces tailings with a much lower water content (30% to 70%). This technology removes even more water from the tailings at a faster rate through the addition of chemicals and thickeners.

Thickening (tailings)

The process of adding a flocculant to a tailings stream to cause the active minerals to bind together and settle rapidly.

Threatened *Endangered/Extinct*

A species that is likely to become endangered if limiting factors are not reversed.

Threshold

A theoretical concept defining the point where the total load of accumulated stress on the ecosystem exceeds the system's ability to accommodate change and a fundamental shift occurs in the system.

Tile Drain

Pipe placed at suitable depths and spacings in the soil or subsoil to provide water outlets from the soil. The pipe may be concrete, ceramic, fibre, plastic, or any other suitable material.

Till

An unstratified, non-sorted deposit of gravel, boulders, sand and finer materials which has been transported by a glacier.

Tillage

Any mechanical manipulation of soil that changes its structure, strength or position in order to improve conditions for crop production. The four primary aims of tillage are generally: control of weeds, incorporation of organic matter into the soil, improvement of soil structure to improve soil-water and soil-air relations, and to provide a seedbed.

Tilth

The physical condition of a soil as related to its ease of tillage, fitness as a seedbed, and impedance to seedling emergence.

Topography

The shape of the ground surface, such as hills, mountains, or plains. Steep topography indicates steep slopes or hilly land; flat topography indicates flat land with minor undulations and gentle slopes.

Topsoil *Surface Soil/Subsoil*

Soil material identified (or described) as A, L, F, H and O in the Canadian System of Soil Classification.

1. The layer of soil moved in cultivation.
2. The A horizon.
3. The Ah horizon.
4. Presumably fertile soil material used to topdress roadbanks, gardens, and lawns.

The uppermost part of the soil, ordinarily moved in tillage, or its equivalent in uncultivated soils, and normally ranging in depth from 5 cm to 45 cm.

Topsoil Island

Topsoil placed in strategically located islands at substantial depths as opposed to laying a thin veneer of topsoil over the entire surface.

Total Dissolved Solids (TDS)

The amount of dissolved substances, such as salts or minerals, in water remaining after evaporating the water and weighing the residue.

Total Net Inflow *Surface Inflow*

Sum of direct precipitation, evaporation, surface runoff, and ground water.

Total Suspended Solids (TSS) *Non-Filterable Residue/Suspended Solids*

Solids in water that can be trapped by a filter. Total Suspended Solids can include a wide variety of organic and inorganic material, such as silt, decaying plant and animal matter, industrial wastes, and sewage. High concentrations can lower water quality by absorbing light, making the water warmer and reducing its ability to hold oxygen necessary for aquatic life. Because aquatic plants also receive less light, photosynthesis decreases and less oxygen is produced.

Toxic

A substance, dose or concentration that is harmful to a living organism.

Toxicity

The inherent potential or capacity of a material to cause adverse effects in a living organism.

Trace Element *Micronutrient*

Chemical element present in a minor amount in water or soil.

Traditional Ecological (or Environmental) Knowledge (TEK)

Knowledge and understanding of traditional resource and land use, harvesting and special places.

Traditional Land Use (TLU)

Activities involving the harvest of traditional resources such as hunting and trapping, fishing, gathering medicinal plants and travelling to engage in these activities. Land use maps document locations where the activities occur or are occurring.

How a culture used (and uses) the land and its resources.

Traditional Use Plants

Plants used by aboriginal people of a region as part of their traditional lifestyle for food, ceremonial, medicinal and other purposes.

Trafficability

The ability of the ground surface to support vehicular traffic.

Trafficable Deposit (ERCB regulatory definition)

A deposit typically created through a process involving self-weight consolidation, drying, enhanced drainage, and/or capping with minimum undrained shear strength of 5 kPa one year after deposition. The trafficable surface layer must have a minimum undrained shear strength of 10 kPa five years after active deposition.

Trajectory

The expected or actual performance of a site over time. A valuable tool to assess early performance for long-lived reclamation goals such as development of a productive forest, wildlife habitat or fen wetland.

Transect

A sampling system that involves the measurement or recording of data along a line. The line intercept method involves measurements of objects that occur beneath the line, while in other cases, small sampling plots are located along the line at specified distances. Individual measures from a line transect are combined to create a single set of data, e.g., average percent cover.

Transitional Soil

Mineral soils developed on mineral parent material under forest in locations with imperfect drainage or wetter, typically including an organic horizon over a mineral horizon.

Transmissivity (T)

The rate of water movement (m^2/s) within a specified thickness of an aquifer. T is equal to the product of the hydraulic conductivity and the height of the modeled aquifer boundary.

Transpiration

Process by which water from vegetation is transferred into the atmosphere in the form of vapour.

Transportation Corridor

A major highway and/or railway, including the associated land required for the right-of-way and buffer.

Trigger

A condition which, if exceeded, results in some action being taken.

Trophic Level

Position in the food chain determined by the number of energy transfer steps to that level.

Trophic Status *Eutrophic /Mesotrophic/* O*ligotrophic*

Nutrient status; availability of nutrients to plants.

Truck and Shovel Mining

Large electric or hydraulic shovels are used to remove the oil sand and load very large trucks. The trucks haul the oil sand to dump pockets where the oil sand is conveyed or pipelined to the extraction plant. Trucks and shovels are more economical to operate than the bucket wheel reclaimers and draglines they have replaced at oil sands mines.

Turbidity

The amount of solid particles suspended in water that scatters light. Turbidity makes the water cloudy or even opaque in extreme cases. High turbidity may reduce light transmission, and therefore reduce photosynthesis of aquatic plants.

Turnover, Fall

A physical phenomenon that may take place in a body of water during early autumn. The sequence of events leading to fall overturn include: (1) the cooling of surface waters; (2) a density change in surface waters producing convection currents from top to bottom; (3) the circulation of the total water volume by wind action; and (4) eventual vertical temperature equality. The overturn results in a uniformity of the physical and chemical properties of the entire water body. Also referred to as the fall overturn.

Turnover, Spring

A physical phenomenon that may take place in a lake or similar body of water during the early spring, most frequently in lakes located in temperate zones where the winter temperatures are low enough to result in freezing of the lake surface. The sequence of events leading to spring overturn include: (1) the melting of ice cover; (2) the warming of surface waters; (3) density changes in surface waters producing convection currents from top to bottom; (4) circulation of the total water volume by wind action; and (5) vertical temperature equality. The overturn results in a uniformity of the physical and chemical properties of the entire water mass. Also referred to as the spring overturn.

TZ Test

A test used to determine the germinating potential of seed. Tetrazolium chloride, a soluble salt, reacts with living tissue, staining it various colours.

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Uncertainty

The relative confidence in a scientific result owing to (1) variability in identified, contributing parameters and (2) ignorance regarding certain processes and phenomena. Uncertainty related to (1) can be reduced through data acquisition whereas uncertainty related to (2) cannot.

Imperfect knowledge concerning the present or future state of the system under consideration.

A component of risk resulting from imperfect knowledge of the degree of hazard or of its spatial or temporal distribution.

Unconfined Aquifer *Aquifer/Perched Aquifer*

A region of saturated ground material unbound by an impermeable or low-permeability layer such as clay. These systems allow for the draining of soil porewater and the subsequent movement of air (or water) to fill the spaces vacated by the moving water.

Understory Species *Overstory Species*

A species found in one of the lower vegetation layers within a plant community. Commonly shrub, grass or moss.

Uneven-Aged Stand *Even-Aged Stand*

Stand in which the trees differ markedly in age, usually with a span greater than 20 years.

Unsaturated Zone

The zone above the water table in an aquifer; the vadose zone.

Upgrader

An industrial plant where upgrading occurs. These are called *oil sands processing plants* under the *Environmental Protection and Enhancement Act* and *Activities Designation Regulation*.

Upgrading

The process of converting heavy oil or bitumen into synthetic crude either through the removal of carbon (coking) or the addition of hydrogen (hydroconversion).

Upland

Areas that have typical round slopes of 1% to 3% and are better drained.

Upland Ecosystem (regulatory definition) *Wetland Ecosystem*

Portions of reclaimed land characterized by: (a) terrestrial vegetation, including but not limited to trees, shrubs, grasses, and forbs, and (b) a rooting zone that is dry for the majority of the year.

Upland Soil

Mineral soils developed under forest in locations with imperfect drainage or drier, typically including LFH and A, B and C horizons.

Upper Subsoil *Lower Subsoil*

The soil material found immediately below the topsoil.

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Valued Ecosystem Component (VEC) *Key Indicator Resource*

The environmental element of an ecosystem that is identified as having scientific, social, cultural, economic, historic, archaeological or aesthetic importance. The value of an ecosystem component may be determined on the basis of cultural ideals or scientific concern. Valued ecosystem components that have the potential to interact with Project components should be included in the assessment of environmental effects.

Vegetation Management

The selective removal and/or control of vegetative growth (e.g., trees, shrubs, grass, herbs and weeds) for one or more of the following purposes: fire control and wildfire protection, noxious weed control, safety, access, aesthetics, range improvement, ensuring the integrity of the native plant communities, and maintaining functionality of industrial/commercial facilities.

Veneer

A mantle of unconsolidated materials too thin to mask the minor irregularities of the underlying unit surface. A veneer will generally be less than 1 m in thickness.

Visual Aesthetics

The study of the psychological responses to appearances. Most often used in the context of how visual impact of land disturbance or reclamation can be minimized.

Void Ratio (e)

The ratio of the volume of voids to the total volume of solids, typically expressed as a decimal.

Volatile Organic Carbon (VOC)

An organic compound with a low boiling point. Converts readily from the liquid phase to the gaseous phase at ambient conditions.

Volatilization

Transfer of a chemical into the atmosphere as a gas or vapour.

von Post Humification Scale *Peat*

Scale describing peat moss in varying stages of decomposition ranging from H1, which is completely unconverted, to H10, which is completely converted.

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Warm Season Plants *Cool Season Plants*

Plants, mostly of tropical origins, completing the major portion of their growth during the mid- to late-summer months. Their physiology demands full sunlight and warmer temperatures.

Waste Treatment

Any method, technique, or process, including, without limitation, neutralization and stabilization, that is designed to change the physical, chemical and/or biological character or composition of a substance.

Water Balance

A complete accounting of all inputs and outputs of water to a system.

Water Content (Soil Moisture Tension)

The amount of water held in a soil, expressed on a weight or volume basis. Generally, gravimetric water contents are expressed relative to the oven-dry weight of soil.

> *Available Water*: Generally that portion of soil water that can be readily absorbed by plant roots; as a specific soil moisture value, the mathematical difference in the amounts of water a soil holds at the field capacity and the permanent wilting point.
>
> *Field Capacity*: The amount of water remaining in a soil after it has been saturated and then allowed to drain freely for one or two days. Usually expressed as a percentage in terms of weight or volume. Often estimated at -1/3 bar water potential.
>
> *Gravitational Water*: Water that moves into, through, or out of the soil under the influence of gravity. The water between field capacity and saturation.
>
> *Hygroscopic Water*: Water so tightly held by the attraction of soil particles that it cannot be removed except as a vapour, by raising the temperature above the boiling point of water. It is unavailable to plants and lies between permanent wilting point and oven dry.
>
> *Permanent Wilting Point*: The water content of a soil at which plants wilt and fail to recover their turgidity when placed in a dark, humid atmosphere. The percentage of water at the wilting point approximates the minimum water content in soils under plants in the field at depths below the effects of surface evaporation. It is approximated by the soil water content at 15 bar tension.

Water-Holding Capacity

The ability of soil to hold water. The water-holding capacity of sandy soils is usually considered to be low while that of clayey soils is high.

Waterlogged

Saturated with water.

Water Quality *Environmental Quality/Soil Quality*

A measure of the condition of water relative to the requirements of one or more species and/or any human need or purpose.

Water Retention

The relationship between matric potential and soil water content is represented graphically as the soil moisture characteristic curve or the soil water retention curve.

Watershed *Catchment Area/Drainage Basin*

All lands enclosed by a continuous hydrologic-surface drainage divide and lying upslope from a specified point on a stream.

Watertable

Elevation at which the pressure in the water is zero with respect to the atmospheric pressure.

The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water Treatment

The process used to make process-affected water acceptable for reuse as recycled water within the extraction plant or for discharge to the environment. Active water treatment typically involves pumping and amending or physically manipulating water within a vessel or pipeline. In some cases, water may be treated in holding ponds or even end pit lakes through active addition of amendments. Passive water treatment occurs without the addition of amendments.

Weathering (contaminants)

The change in composition and bioavailability with time as related to natural processes including wind, sun, rain, volatilization, differential mobility, biodegradation and stabilization.

Weathering (soil)

The physical and chemical disintegration, alteration, and decomposition of rocks and minerals at or near the earth's surface by atmospheric agents.

Weir

An overflow structure frequently used for measuring discharge.

1. In dam terminology, the crest of a spillway controlling the upstream surface level.
2. A structure in a water body over which water flows, and whose prime purpose is to raise the water level, usually to divert water into a watercourse.

Wetland *Constructed Wetland/Restored Wetland*

Land having the water table at, near, or above the land surface or which is saturated for long enough periods to promote wetland or aquatic processes as indicated by hydric soils, hydrophytic vegetation, and various kinds of biological activity that are adapted to the wet environment. Wetlands include peatlands and areas that are influenced by excess water but which, for climatic, edaphic or biotic reasons, produce little or no peat. Shallow open water, generally less than 2 m deep, is also included in wetlands.

Wetland Complex

A mixture of wetland classes in close proximity to one another. The classes can include open water ponds, emergent zones, marsh meadow zones, various subclasses of bogs, fens and swamps.

Wetland Ecosystem (regulatory definition) *Upland*

Land revegetated for purposes other than commercial forestry including, but not limited to, forest ecosystems, shrublands, grasslands, wetlands, and water bodies.

Wetland Functionality

The individual and collective physical, hydrological, chemical, and biological processes performed by a wetland that relate directly to the characteristics of the ecosystem and its capacity to interact with the adjacent landscape. These include:

- the way the wetland looks;
- the way water enters, moves through, and leaves the wetland;
- the natural substances that occur in the wetland and the changes they undergo;
- the animals and plants that live in and use the wetland; and
- the way the wetland interacts with the surrounding land.

Functionality includes the effects that each of these elements have on the wetland, both by themselves and when working together with other elements.

Wetland Value

The measure of the relative social, ecological, or economic importance of a wetland function being performed by the wetland to individuals or groups of human beings. These can include:

- the direct benefits the wetland provides to individuals and communities;
- the ways that the wetland affects the environment in which people live;

- the plants, animals, and other things taken from the wetland to be used by individuals and communities;
- the social or cultural events that occur in the wetland; and
- the spiritual importance of the wetland to individuals and communities.

Wet Landscape Reclamation *Dry Landscape Reclamation*

A reclamation approach that involves a lake system, whereby contained fluid tailings are capped with a layer of water of sufficient depth to isolate the fine tailings from direct contact with the surrounding environment.

Whole Tailings *Mature Fine Tailings/Tailings/Thickened Tailings*

Unaltered tailings that come directly from an extraction plant. Whole tailings is sometimes referred to as coarse tailings.

Wild Harvest

Collection of viable native seed from undisturbed native plants.

Winter Hiding Cover

Generally, vegetation that conceals 90% of a standing animal (broadside) at a distance of 60 m.

Winter Thermal Cover

Generally, an area of at least 10 ha having a conifer canopy at least 10 m high, with at least 70% crown closure and a minimum width of 200 m that is used by animals to assist with their temperature regulation during the winter.

Woody Debris

Sound and rotting logs and stumps that provide habitat for plants, animals and insects and a source of nutrients for soil development. The material is generally greater than 8 to 10 cm in diameter. Includes trees/branches that have died and remain standing or leaning.

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Zooplankton

Animal life, usually microscopic, found floating or drifting in the water column of oceans or bodies of fresh water; forming the bulk of the primary consumer link in the aquatic food chain. Zooplankton form the link between primary producers (phytoplankton) and the higher trophic levels (e.g., fish, humans).

3 ACRONYMS

This list of common acronyms is divided into six sections:

- Technical Terms
- Tailings Terms
- Mining and Processing Terms
- Administrative and Financial Terms
- Organizations and Committees
- Legislation

3.1 *Technical Terms*

AAC	Annual Allowable Cut
ALCES	Alberta Landscape Cumulative Effects Simulator (a model)
ALI	Alberta Land Inventory (see CLI)
ASTM	American Society for Testing Materials
AVI	Alberta Vegetation Inventory
AWI	Alberta Wetland Inventory
BMF	Biodiversity Management Framework (Lower Athabasca Regional Plan)
BMP	Best Management Practice(s)
BOD	Biological Oxygen Demand
C&R	Closure and Reclamation
C&R	Conservation and Reclamation
CEA	Cumulative Effects Assessment
CEC	Cation Exchange Capacity
cfs	Cubic Feet per Second
CLI	Canada Land Inventory
COD	Chemical Oxygen Demand
COPC	Contaminant(s) of Potential Concern
CPP	Caribou Protection Plan
CPT	Cone Penetration Test
CWQG	Canadian Water Quality Guidelines
CWS	Canada-Wide Standards
DART	Disturbance and Reclamation Trajectory (research program)
DBH	Diameter at Breast Height (trees)
DEM	Digital Elevation Model
DFMP	Detailed Forest Management Plan

DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
EC	Electrical Conductivity
EEM	Environmental Effects Monitoring
EIA	Environmental Impact Assessment
EMS	Environmental Management System
EPL	End Pit Lake
EPP	Environmental Protection Plan
ESP	Exchangeable Sodium Percentage
ELU	End Land Use
FGD	Flue Gas Desulphurization
FPIC	Free, Prior and Informed Consent
GIS	Geographic Information System
GYPSY	Growth and Yield Projection System
HADD	Harmful Alteration, Disruption or Destruction (of fish habitat, under the federal *Fisheries Act*)
HHRA	Human Health Risk Assessment
HRU	Hydrologic Response Unit
HSI	Habitat Suitability Index
IFN	In-stream Flow Needs
ILCR	Incremental Lifetime Cancer Risk
Kc	Cretaceous Clearwater Formation Clays
KIR	Key Indicator Resources (used in EIAs; see also VEC)
kPa	Kilopascals
LAI	Leaf Area Index
LCCS	Land Capability Classification System
LEAP	Landscape Ecological Assessment and Planning (COSIA project)
LFH	Litter-Fibric-Humic (surface soil horizon components)
LiDAR	Light Detection and Ranging
masl	Metres Above Sea Level
mbgs	Metres Below Ground Surface (groundwater)
NNL	No Net Loss (fisheries)
NNLL	No Net Loss Lake

NNLP	No Net Loss Plan
NORMs	Naturally Occurring Radioactive Materials
OM	Organic Matter (usually %OM)
PAH	Polycyclic Aromatic Hydrocarbon
PAI	Potential Acid Input
PLS	Pure Live Seed
PMF	Probable Maximum Flood
PMM	Peat Mineral Mix
ppb	part per billion
ppm	parts per million
QA/QC	Quality Assurance/Quality Control
RSA	Regional Strategic Assessment (Lower Athabasca Regional Plan)
RSF	Resource Selection Function
SAR	Sodium Adsorption Ratio
SIL	Survey Intensity Level (soils)
SMR	Soil Moisture Regime
SNR	Soil Nutrient Regime
SQC	Soil Quality Criteria
SQI	Soil Quality Index
SSCC	Soil Shrinkage Characteristic Curve
SWAT	Soil and Water Assessment Tool (model)
SWCC	Soil Water Characteristic Curve
TDS	Total Dissolved Solids
TEK	Traditional Ecological Knowledge
TLU	Traditional Land Use
TOC	Total Organic Hydrocarbon
TPR	Timber Productivity Rating
TSS	Total Suspended Solids
VEC	Valued Ecosystem Components (used in EIAs; see also KIR)
VOC	Volatile Organic Carbon
WCO	Water Conservation Objective
WTDC	Water Technology Development Centre
ZLD	Zero Liquid Discharge

3.2 *Tailings and Tailings Measurement Terms*

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AFD	Atmospheric Fines Drying (Shell)
BAW	Beach Above Water
BBW	Beach Below Water
BML	Base Mine Lake (Syncrude Mildred Lake site)
CFF	Cross Flow Filtration
COT	Cyclone Overflow Tailings
CPT	Cone Penetration Test
CST	Coarse Sand Tailings
CST	Cycloned Sand Tailings
CT	Consolidated or Composite Tailings
CUT	Cyclone Underflow Tailings
D074	(ERCB) Directive 074
DDA	Dedicated Disposal Area (tailings)
ETA	External Tailings Area
ETDA	External Tailings Disposal Area
ETF	External Tailings Facility
FFT	Fluid Fine Tailings (Fine Fluid Tailings)
FTT	Froth Treatment Tailings
ILFTLD	In-Line Flocculation and Thin Lift Dewatering
ILTT	In-Line Thickened Tailings
MBI	Methylene Blue Index (clays)
MFT	Mature Fine Tailings
MLSB	Mildred Lake Settling Basin (Syncrude)
NA	Naphthenic Acid(s)
NST	Non-Segregating Tailings
OSPW	Oil Sands Process- affected Water
OSTWAEO	Oil Sands Tailings Water Acid-Extractable Organics
PAM	Polyacrylamide
PAW	Process-Affected Water
PSD	Particle Size Distribution

SFR	Sand to Fines Ratio
ST	Spiked Tailings
STP	South Tailings Pond (Suncor Millennium)
SWSS	South West Sand Disposal (Syncrude)
TDR	Time Domain Reflectometry
TFT	Thin Fine Tailings
TLD	Thin-Lift Drying
TMF	Tailings Management Framework (Alberta Environment and Sustainable Resource Development)
TMS	Tailings Management System
TRO	Tailings Reduction Operation (Suncor)
TT	Thickened Tailings
TUT	Thickener Underflow Tailings
USR	Undrained Strength Ratio
USS	Undrained Shear Strength

3.3 *Mining and Processing Terms*

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ATP	Alberta Taciuk Process
BCM	Bank Cubic Metre
ChOPS	Cold-heavy Oil Production with Sand
CHWE	Clark Hot Water Extraction Process
CSS	Cyclic Steam Simulation
DBM	Design Basis Memorandum
DRU	Diluent Recovery Unit
FEED	Front-End Engineering and Deign
LEE	Low Energy Extraction
LOS	Lean Oil Sand
MRM	Muskeg River Mine (Shell Albian)
NRU	Naphtha Recovery Unit
OCWE	OSLO Cold Water Extraction
PSV	Primary Separation Vessel
RMS	Reclamation Material Stockpile

SCO	Synthetic Crude Oil

3.4 *Administrative and Financial Terms*

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AOA	Area Operating Agreement (Green Area)
ASFD	Asset Safety Factor Deposit (in MFSP)
ARO	Asset Retirement Obligation
BSD	Base Security Deposit (in MFSP)
CICA	Canadian Institute of Chartered Accountants
EZE	Easement (under the *Public Lands Act*)
EPSF	Environmental Protection Security Fund (under the *Environmental Protection and Enhancement Act*)
FMA	Forest Management Agreement
FMU	Forest Management Unit
FPIC	Free, Prior Informed Consent
FRP	Forest Resource Plan
GAAP	Generally Accepted Accounting Principles
IFRS	International Financial Reporting Standards
ILM	Integrated Land Management
IRM	Integrated Resource Management
IRMS	Integrated Resource Management System (Lower Athabasca Regional Plan)
IRP	Integrated Resource Plan
LARP	Lower Athabasca Regional Plan
LOC	Licence of Occupation (under the *Public Lands Act*)
LSAS	Land Status Automated System (ASRD)
LUF	Land Use Framework
MFSP	Mine Financial Security Program
MLL	Miscellaneous Lease (under the *Public Lands Act*)
MSL	Mineral Surface Lease (under the *Public Lands Act*)
NPV	Net Present Value
OLD	Operating Life Deposit (in MFSP)
ORD	Outstanding Reclamation Deposit (in MFSP)
PIL	Pipeline Installation Lease (under the *Public Lands Act*)

PLA	Pipeline Agreement (under the *Public Lands Act*)
PSP	Permanent Sample Plot
SMC	Surface Materials Licence (under the *Public Lands Act*)
SML	Surface Materials Lease (under the *Public Lands Act*)
TFA	Temporary Field Authority (public lands)

3.5 *Organizations, Committees, Programs, Places, etc.*

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ABMI	Alberta Biodiversity Monitoring Institute
ACC	Alberta Caribou Committee
ACFN	Athabasca Chipewyan First Nation
ACO	Aboriginal Consultation Office (provincial)
AEMERA	Alberta Environmental Monitoring, Evaluation and Reporting Agency
AER	Alberta Energy Regulator (replaces ERCB and parts of AESRD)
AESRD	Alberta Environment and Sustainable Resource Development
AIEES	Alberta Innovates – Energy and Environment Solutions
AITF	Alberta Innovates – Technology Futures
ANHIC	Alberta Natural Heritage Information Centre
AOSP	Athabasca Oil Sands Project (Shell Albian)
AOSR	Athabasca Oil Sands Region
API	American Petroleum Institute
ASTM	American Society for Testing and Materials
ATC	Athabasca Tribal Council
AWC	Alberta Water Council
BCC	Boreal Caribou Committee
CANMET	Canada Centre for Mineral and Energy Technology
CAPP	Canadian Association of Petroleum Producers
CCME	Canadian Council of Ministers of the Environment
CDA	Canadian Dam Association
CEAA	Canadian Environmental Assessment Agency
CEATAG	CONRAD Environmental Aquatic Technical Advisory Group
CEMA	Cumulative Environmental Management Association
CETC	CANMET Energy Technology Centre

CFS	Canadian Forestry Service
CLRA	Canadian Land Reclamation Association
CONRAD	Canadian Oil Sands Network for Research and Development (merged into COSIA)
COSIA	Canada's Oil Sands Innovation Alliance
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPDFN	Chipewyan Prairie Dene First Nation
CRI	Conservation and Reclamation Inspector
CSA	Canadian Standards Association
DFO	Department of Fisheries and Oceans (federal)
EIPA	Energy Information Platform of Alberta (Alberta Innovates)
EMCLA	Ecological Monitoring Committee for Lower Athabasca
EPA	Environmental Priority Area (under COSIA)
EPLSG	End Pit Lake Sub-Group (under CEMA)
ESAA	Environmental Services Association of Alberta
ERRG	CONRAD Environmental and Reclamation Research Group
FMFN	Fort McKay First Nation
FMFN	Fort McMurray First Nation
FML1935	Fort McMurray Local 1935
FML2020	Fort McMurray Local 2020
GoA	Government of Alberta
HEAD	Hydrology, Ecology and Disturbance (research program)
IOSA	In-Situ Oil Sands Alliance
IRC	Industry Relations Corporation
JOSM/JOSEM	Joint Oil Sands Monitoring / Joint Oil Sands Environmental Monitoring
LUKN	Alberta Land-use Knowledge Network
LUS	Land Use Secretariat
MCFN	Mikisew Cree First Nation
NAOS	Northern Athabasca Oil Sands (region)
NARCOSS	NAIT Applied Research Center for Oil Sands Sustainability
NRCan	Natural Resources Canada
NRCB	Natural Resources Conservation Board
NSMWG	$NOxSO_2$ Management Working Group (under CEMA)

OSCA	Oil Sands Community Alliance (formerly OSDG)
OSEC	Oil Sands Environmental Coalition
OSLI	Oil Sands Leadership Initiative (merged into COSIA)
OSRIN	Oil Sands Research and Information Network
OSTRF	Oil Sands Tailings Research Facility
PADEMP	Peace-Athabasca Delta Environmental Monitoring Program
PTAC	Petroleum Technology Alliance of Canada
RAMP	Regional Aquatic Monitoring Program (oil sands)
RIWG	Regional Issues Working Group
RMWB	Regional Municipality of Wood Buffalo
RSDS	Regional Sustainable Development Strategy
RWG	Reclamation Working Group (under CEMA)
SAOS	Southern Athabasca Oil Sands (region)
SEWG	Sustainable Ecosystems Working Group (under CEMA)
SVWG	Soil and Vegetation Working Group (under RWG)
SWWG	Surface Water Working Group (under CEMA)
TEEM	Terrestrial Environmental Effects Monitoring (under WBEA)
TWG	CONRAD Tailings Working Group
WBEA	Wood Buffalo Environmental Association
WBNP	Wood Buffalo National Park
WPAC	Watershed Planning Advisory Council
WSG	Watershed Stewardship Group

3.5.1 Historical Organizations, Committees, etc.

Readers may find reference to these organizations in older documents.

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AEC(V)	Alberta Environmental Centre – Vegreville (now part of AITF)
AENV	Alberta Environment (now Alberta Environment and Sustainable Resource Development)
AEP	Alberta Environmental Protection (now Alberta Environment and Sustainable Resource Development)
AERI	Alberta Energy Research Institute
AOSERP	Alberta Oil Sands Environmental Research Program
AOSIEA	Alberta Oil Sands Industry Environmental Association

AOSTRA	Alberta Oil Sands Technology and Research Authority
ARC	Alberta Research Council (now AITF)
ASRD	Alberta Sustainable Resource Development (now Alberta Environment and Sustainable Resource Development)
ENR	Energy and Natural Resources (now Energy and AESRD)
ERCB	Energy Resources Conservation Board (replaced by Alberta Energy Regulator)
EUB	Alberta Energy and Utilities Board (former combination of the ERCB and the Public Utilities Board)
FLW	Forestry, Lands and Wildlife (now AESRD)
FTFC	Fine Tailings Fundamentals Consortium
LCRC	Land Conservation and Reclamation Council (the name no longer applies)
LFS	Land and Forest Service (part of AESRD)
OSDG	Oil Sands Developers Group (now OSCA)
OSESG	Oil Sands Environmental Study Group
OSLO	Other Six Lease Operators
OSTC	Oil Sands Tailings Consortium (now part of COSIA Tailings EPA)
PERD	Panel for Energy Research and Development (NRCan)
RRTAC	Reclamation Research Technical Advisory Committee

3.6 *Legislation*

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ADR	*Activities Designation Regulation*
ALSA	*Alberta Land Stewardship Act*
ARPR	*Approvals and Registrations Procedures Regulation*
CEAA	*Canadian Environmental Assessment Act* (federal)
CEPA	*Canadian Environmental Protection Act* (federal)
CRR	*Conservation and Reclamation Regulation*
EPEA	*Environmental Protection and Enhancement Act*
MBCA	*Migratory Birds Convention Act* (federal)
MMA	*Mines and Minerals Act*
NWPA	*Navigable Waters Protection Act* (federal)
OSCA	*Oil Sands Conservation Act*
PLA	*Public Lands Act*

RCR	*Remediation Certificate Regulation*
REDA	*Responsible Energy Development Act*
SARA	*Species at Risk Act* (federal)
WA	*Water Act*

3.6.1 Historical Legislation

Readers may find reference to these pieces of legislation in older documents.

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LSCRA	*Land Surface Conservation and Reclamation Act* (replaced by EPEA)
SRA	*Surface Reclamation Act* (replaced by LSCRA)

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