

Canadian Wetland Inventory
(Data Model)

Version 7.0

2016-03

Prepared by Canadian Wetland Inventory Technical Committee.

Committee members are as follows:

Canadian Space Agency

Ducks Unlimited Canada

Environment and Climate Change Canada

Natural Resources Canada

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Canadian Wetland Inventory

1. Overview

Water is the dominant factor determining the nature of soil development and the types of animals and plant communities living at the soil surface in a wetland environment. Wetlands exist in the continuum of environments where terrestrial and aquatic systems intergrade (Cowardin et al. 1979). Wetland refers to those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to promote aquatic processes as indicated by poorly drained soils that support a prevalence of vegetation adapted for growth in these saturated soil conditions (National Wetland Working Group, Canada, 1988). When undisturbed, wetlands are also areas where the soil is saturated with water long enough to inhibit the growth of plant species that depend on aerobic soil conditions (US Army Corps of Engineers, 1986). At their upslope margin, wetlands are distinguished from uplands by the latter's tendency to remain flooded or saturated for not more than 7 to 30 days in most years, a short enough period so that oxygen and other soil conditions do not limit terrestrial plant growth (Kadlec and Knight, 1996). Wetland classes include swamps, marshes, bogs, fens and shallow / open water.

2. Normative References

The following referenced documents are necessary for the application of this document.

ISO 19107:2003, Geographic Information – Spatial schema

3. Symbols, Notation and Abbreviated Terms

CWI	Canadian Wetland Inventory
CWIDM	Canadian Wetland Inventory Data Model
UML	Unified Modeling Language

4. Model

4.1 Application Schema

Note: This application schema complies with the international standard ISO 19109, Geographic information – Rules for application schema (ISO, 2015).

4.1.1 Description

Name: Canadian Wetland Inventory
 Stereotype: «ApplicationSchema»
 Version Number: 7.0
 Version Date: 2016-03

4.1.2 Diagrams

The CWI Data Model diagram (Figure 1) defines the concepts that are required for the definition of the Canadian Wetland Inventory data model in the Unified Modeling Language (UML) (Object Management Group, 2015; Rumbaugh et al. 2005). This diagram describes the data structure of the Canadian Wetland Inventory data layer.

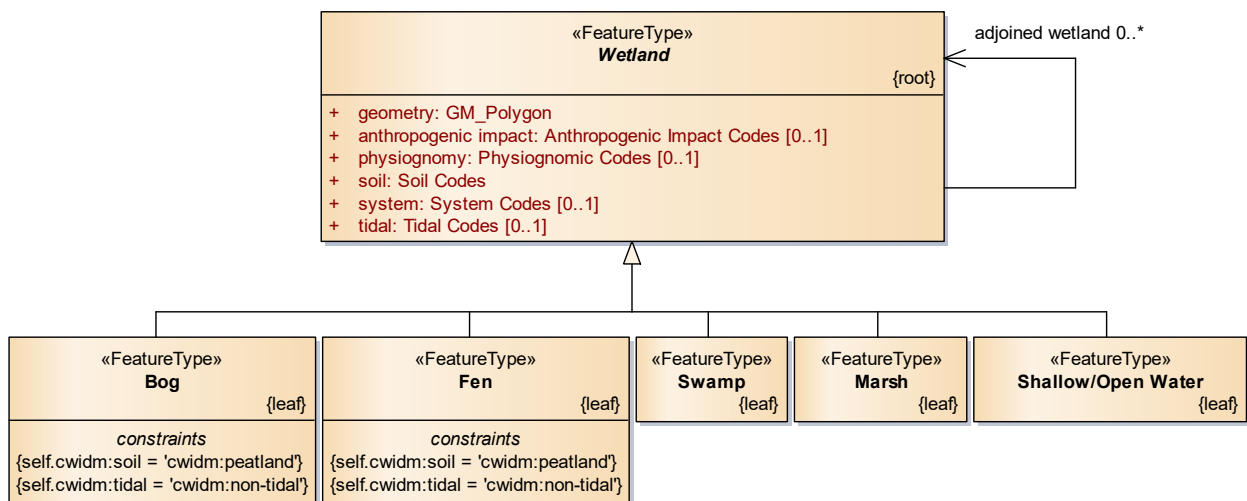


Figure 1: CWI Data Model

The CWI Code Lists diagram (Figure 2) defines the code lists in the Unified Modeling Language (UML) that are used for attributes of the Canadian Wetland Inventory data model.

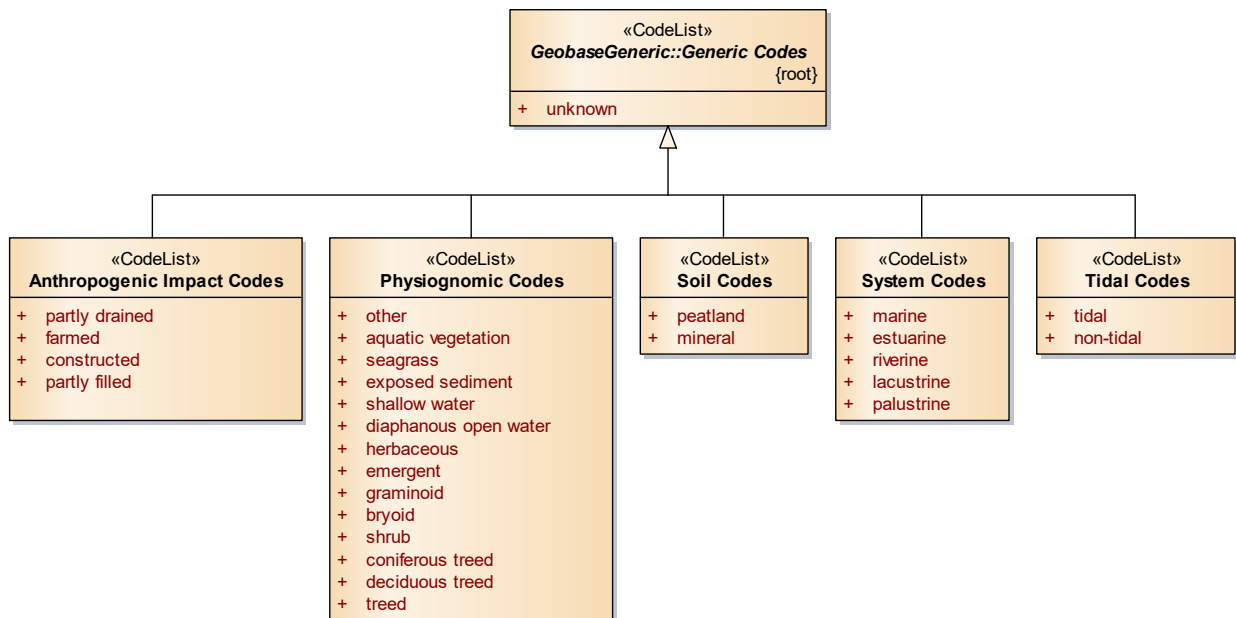


Figure 2: CWI Code Lists

5. Feature Catalogue

Note: This application schema complies with the international standard ISO 19110, Geographic information – Methodology for feature cataloguing (ISO, 2005) and its amendment 1 (ISO, 2011).

5.1 Description

Name:	Canadian Wetland Inventory Feature Catalogue
Scope:	Wetlands of Canada
Version Number:	7.0
Language:	English Canada (eng.CAN)
Producer:	Ducks Unlimited Canada

5.2 Feature Types and Code Lists

«FeatureType» Wetland

Abstract

Type Name: cwidm:Wetland

Definition: Area that is inundated or saturated by surface or ground water at a frequency and duration sufficient to promote aquatic processes as indicated by poorly drained soils that support a prevalence of vegetation adapted for growth in these saturated soil conditions (National Wetland Working Group, 1988).

Supertype: None

Properties:

Property: geometry	
Generic Name:	cwidm:geometry
Definition:	Continuous representation of a flat area depicted by a GM_Polygon type (ISO, 2003) that is comprised of one and only one outer linear ring, and zero to many inner linear rings delimiting exclusions.
Cardinality:	1..1
Type:	GM_Polygon
Default Value:	

Property: anthropogenic impact	
Generic Name:	cwidm:anthropogenicImpact
Definition:	Nature of human modifications influencing the character of the habitat.
Cardinality:	0..1
Type:	cwidm:AnthropogenicImpactCL
Default Value:	

Property: physiognomy	
Generic Name:	cwidm:physiognomy
Definition:	Dominant vegetation character based on the general physiognomy of the vegetation cover.
Cardinality:	0..1
Type:	cwidm:PhysiognomicCL
Default Value:	

Property: soil	
Generic Name:	cwidm:soil
Definition:	Soil characteristic.
Cardinality:	1..1
Type:	cwidm:SoilCL
Default Value:	

Property: system	
Generic Name:	cwidm:system
Definition:	Complex of wetlands and deepwater habitat characteristic.
Cardinality:	0..1
Type:	cwidm:SystemCL
Default Value:	

Property: tidal	
Generic Name:	cwidm:tidal
Definition:	Qualifier of tidal water presence.
Cardinality:	0..1
Type:	cwidm:TidalCL
Default Value:	

Relations:

Association: Adjoin		
Generic Name:	cwidm:Adjoin	
Definition:	A wetland may be isolated or adjoined to any other wetland type.	
Direction:	Source -> Destination	
Source Role	Name:	a wetland
	Generic Name:	cwidm:aWetland
	Definition:	A wetland feature.
	Type:	Wetland
	Cardinality:	1
Destination Role	Name:	adjoined wetland
	Generic Name:	cwidm:adjoinedWetland
	Definition:	An adjoined wetland feature.
	Type:	Wetland
	Cardinality:	0..*

«FeatureType» Bog

Type Name:	cwidm:Bog
Definition:	Bryoid (sphagnum moss, lichen) area dominated with more than 40 cm of accumulated peat with 25% to 60% canopy coverage comprised of trees (predominantly spruce trees more than 2 m to 10 m high) and/or shrubs (predominantly ericaceous shrubs less than 2 m high). Note: Water table is at or near the surface for all or most of the year.
Supertype:	cwidm:Wetland (generic name)

Properties:

Property: anthropogenic impact	
Member Name:	cwidm:anthropogenicImpact
Definition:	Nature of human modifications influencing the character of the habitat.
Cardinality:	0..1
Type:	cwidm:AnthropogenicImpactCL
Default Value:	

Property: geometry	
Member Name:	cwidm:geometry
Definition:	Continuous representation of a flat area depicted by a GM_Polygon type (ISO, 2003) that is comprised of one and only one outer linear ring, and zero to many inner linear rings delimiting exclusions.
Cardinality:	1..1
Type:	GM_Polygon
Default Value:	

Property: physiognomy

Member Name:	cwidm:physiognomy
Definition:	Dominant vegetation character based on the general physiognomy of the vegetation cover.
Cardinality:	0..1
Type:	cwidm:PhysiognomicCL
Default Value:	

Property: soil

Member Name:	cwidm:soil
Definition:	Soil characteristic.
Cardinality:	1..1
Type:	cwidm:SoilCL
Default Value:	

Property: system

Member Name:	cwidm:system
Definition:	Complex of wetlands and deepwater habitat characteristic.
Cardinality:	0..1
Type:	cwidm:SystemCL
Default Value:	

Property: tidal	
Member Name:	cwidm:tidal
Definition:	Qualifier of tidal water presence.
Cardinality:	0..1
Type:	cwidm:TidalCL
Default Value:	

Relations:

Inherited relations from Wetland.

Constraints:

- self.cwidm:soil = 'cwidm:peatland'
- self.cwidm:tidal = 'cwidm:non-tidal'

«FeatureType» Fen

Type Name:	cwidm:Fen
Definition:	<p>Area with more than 40 cm accumulated peat at surface dominated by low vigor graminoid and brown moss with 25% to 60% canopy coverage comprised of trees (e.g. tamarack trees more than 2 m to 10 m high) and/or shrubs (less than 2 m high) where the water table fluctuates and the vegetation is closely related to the depth of the water table.</p> <p>Note: Graminoid vegetation and some bryophytes dominate wetter fens where the water table is at or above the surface. Shrubs are prominent in drier fens where the water table is lower. Trees occur on the driest fen sites where microtopographic features are as much as 20 cm above the water table.</p>
Supertype:	cwidm:Wetland (generic name)

Properties:

Property: anthropogenic impact	
Member Name:	cwidm:anthropogenicImpact
Definition:	Nature of human modifications influencing the character of the habitat.
Cardinality:	0..1
Type:	cwidm:AnthropogenicImpactCL
Default Value:	

Property: geometry	
Member Name:	cwidm:geometry
Definition:	Continuous representation of a flat area depicted by a GM_Polygon type (ISO, 2003) that is comprised of one and only one outer linear ring, and zero to many inner linear rings delimiting exclusions.
Cardinality:	1..1
Type:	GM_Polygon
Default Value:	

Property: physiognomy	
Member Name:	cwidm:physiognomy
Definition:	Dominant vegetation character based on the general physiognomy of the vegetation cover.
Cardinality:	0..1
Type:	cwidm:PhysiognomicCL
Default Value:	

Property: soil	
Member Name:	cwidm:soil
Definition:	Soil characteristic.
Cardinality:	1..1
Type:	cwidm:SoilCL
Default Value:	

Property: system	
Member Name:	cwidm:system
Definition:	Complex of wetlands and deepwater habitat characteristic.
Cardinality:	0..1
Type:	cwidm:SystemCL
Default Value:	

Property: tidal	
Member Name:	cwidm:tidal
Definition:	Qualifier of tidal water presence.
Cardinality:	0..1
Type:	cwidm:TidalCL
Default Value:	

Relations:

Inherited relations from Wetland.

Constraints:

- self.cwidm:soil = 'cwidm:peatland'
- self.cwidm:tidal = 'cwidm:non-tidal'

«FeatureType» Swamp

Type Name: cwidm:Swamp

Definition: Wetland area with woody vegetation of more than 60% canopy coverage if trees are present or more than 25% if the canopy coverage is dominated by shrubs.

Note: Coniferous or deciduous trees are typically more than 10 m high; shrub cover is typically more than 2 m high. It includes coniferous, deciduous, mixed wood and shrub swamps. Periodic or persistent surface water may occur.

Supertype: cwidm:Wetland (generic name)

Properties:

Property: anthropogenic impact	
Member Name:	cwidm:anthropogenicImpact
Definition:	Nature of human modifications influencing the character of the habitat.
Cardinality:	0..1
Type:	cwidm:AnthropogenicImpactCL
Default Value:	

Property: geometry	
Member Name:	cwidm:geometry
Definition:	Continuous representation of a flat area depicted by a GM_Polygon type (ISO, 2003) that is comprised of one and only one outer linear ring, and zero to many inner linear rings delimiting exclusions.
Cardinality:	1..1
Type:	GM_Polygon
Default Value:	

Property: physiognomy

Member Name:	cwidm:physiognomy
Definition:	Dominant vegetation character based on the general physiognomy of the vegetation cover.
Cardinality:	0..1
Type:	cwidm:PhysiognomicCL
Default Value:	

Property: soil

Member Name:	cwidm:soil
Definition:	Soil characteristic.
Cardinality:	1..1
Type:	cwidm:SoilCL
Default Value:	

Property: system

Member Name:	cwidm:system
Definition:	Complex of wetlands and deepwater habitat characteristic.
Cardinality:	0..1
Type:	cwidm:SystemCL
Default Value:	

Property: tidal	
Member Name:	cwidm:tidal
Definition:	Qualifier of tidal water presence.
Cardinality:	0..1
Type:	cwidm:TidalCL
Default Value:	

Relations:

Inherited relations from Wetland.

«FeatureType» Marsh

Type Name: cwidm:Marsh

Definition: Wetland area dominated by high vigor herbaceous vegetation (emergents, graminoids, forbs) covering more than 25% of the surface area and where shrubs and trees cover less than 25% of the surface area of wetland.

Note: Vegetation can occur randomly across a marsh or can be arranged in distinct zones of parallel or concentric patterns in response to gradients of water depths, frequency of drawdowns, water chemistry or disturbance. Periodic or persistent surface water can occur.

Supertype: cwidm:Wetland (generic name)

Properties:

Property: anthropogenic impact	
Member Name:	cwidm:anthropogenicImpact
Definition:	Nature of human modifications influencing the character of the habitat.
Cardinality:	0..1
Type:	cwidm:AnthropogenicImpactCL
Default Value:	

Property: geometry	
Member Name:	cwidm:geometry
Definition:	Continuous representation of a flat area depicted by a GM_Polygon type (ISO, 2003) that is comprised of one and only one outer linear ring, and zero to many inner linear rings delimiting exclusions.
Cardinality:	1..1
Type:	GM_Polygon
Default Value:	

Property: physiognomy

Member Name:	cwidm:physiognomy
Definition:	Dominant vegetation character based on the general physiognomy of the vegetation cover.
Cardinality:	0..1
Type:	cwidm:PhysiognomicCL
Default Value:	

Property: soil

Member Name:	cwidm:soil
Definition:	Soil characteristic.
Cardinality:	1..1
Type:	cwidm:SoilCL
Default Value:	

Property: system

Member Name:	cwidm:system
Definition:	Complex of wetlands and deepwater habitat characteristic.
Cardinality:	0..1
Type:	cwidm:SystemCL
Default Value:	

Property: tidal

Member Name:	cwidm:tidal
Definition:	Qualifier of tidal water presence.
Cardinality:	0..1
Type:	cwidm:TidalCL
Default Value:	

Relations:

Inherited relations from Wetland.

«FeatureType» Shallow/Open Water

Type Name: cwidm:Shallow_OpenWater

Definition: Wetland areas, or portions of wetland areas and water bodies with standing or flowing water present for all or most of the year.

Note: Shallow/Open Water is not restricted to above or below a certain water depth. It should be utilized when water depth is determined to be less than 2 m during normal water conditions (usually mid-summer). Aquatic vegetation (floating or submerged plants) and seagrass may, or may not dominate shallow/open water. Sediments may be exposed during a tidal cycle or low water conditions. Above surface vegetation (tree, shrub and emergent vegetation) covers less than 25% of the surface area. A shallow/open water can be situated on deltas, floodplains, along rivers and streams, or along the margins and shores of lakes, oceans, and other open water bodies.

Supertype: cwidm:Wetland (generic name)

Properties:

Property: anthropogenic impact	
Member Name:	cwidm:anthropogenicImpact
Definition:	Nature of human modifications influencing the character of the habitat.
Cardinality:	0..1
Type:	cwidm:AnthropogenicImpactCL
Default Value:	

Property: geometry

Member Name:	cwidm:geometry
Definition:	Continuous representation of a flat area depicted by a GM_Polygon type (ISO, 2003) that is comprised of one and only one outer linear ring, and zero to many inner linear rings delimiting exclusions.
Cardinality:	1..1
Type:	GM_Polygon
Default Value:	

Property: physiognomy

Member Name:	cwidm:physiognomy
Definition:	Dominant vegetation character based on the general physiognomy of the vegetation cover.
Cardinality:	0..1
Type:	cwidm:PhysiognomicCL
Default Value:	

Property: soil

Member Name:	cwidm:soil
Definition:	Soil characteristic.
Cardinality:	1..1
Type:	cwidm:SoilCL
Default Value:	

Property: system	
Member Name:	cwidm:system
Definition:	Complex of wetlands and deepwater habitat characteristic.
Cardinality:	0..1
Type:	cwidm:SystemCL
Default Value:	

Property: tidal	
Member Name:	cwidm:tidal
Definition:	Qualifier of tidal water presence.
Cardinality:	0..1
Type:	cwidm:TidalCL
Default Value:	

Relations:

Inherited relations from Wetland.

«CodeList» Anthropogenic Impact Codes

Type Name: cwidm:AnthropogenicImpactCL

Definition: Many wetlands have been modified by man to a large degree. Since the nature of these modifications often greatly influences the character of such habitats, special modifying terms are included to emphasize their importance.

Supertype: GenericCodeList (generic name)

Listed Values:

Label Name	Generic Name	Definition	Numeric Code
unknown	gb:unknow	Not known or not well-known.	0 (or less than)
partly drained	cwidm:partlyDrained	Water level is artificially lowered, but the area is still classified as wetland because the soil moisture is sufficient to support hydrophytes. Note: Drained areas are not considered wetland since they can no longer support hydrophytes.	1
farmed	cwidm:farmed	Soil surface has been mechanically or physically altered for production of crops, but hydrophytes will become re-established if farming is discontinued.	2
constructed	cwidm:constructed	Soil surface has been mechanically or physically altered by excavation in order to create an impoundment for holding water. Note: Examples include sewage lagoons, golf course ponds, dugouts and wetland restoration sites.	3

Label Name	Generic Name	Definition	Numeric Code
partly filled	cwidm:partlyFilled	<p>Wetland basin has in part been filled so that that a portion is no longer capable of holding water long enough to promote wetland or aquatic processes</p> <p>Note: The filling procedure may split a single basin into two or more parts that still function as wetlands.</p>	4

«CodeList» Physiognomic Codes

Type Name: cwidm:PhysiognomicCL

Definition: Dominant vegetation characters based on the general physiognomy of the vegetation cover, rather than on species.

Supertype: GenericCodeList (generic name)

Listed Values:

Label Name	Generic Name	Definition	Numeric Code
unknown	gb:unknow	Not known or not well-known.	0 (or less than)
other	cwidm:other	Any other possible vegetation character value not explicitly mentioned in this codelist.	1
aquatic vegetation	cwidm:aquaticVegetation	Floating or submerged macrophyte - dominated area (25% of area or more).	2
seagrass	cwidm:seagrass	Marine angiosperms that live in seawater. Note: They grow in soft substrates like sandy soils and form large tidal and subtidal meadows in coastal regions.	3
exposed sediment	cwidm:exposedSediment	Temporarily exposed soil, sand, gravel or other substrate (less than 10% vegetated) within wetlands. Note: Exposed sediments are often the result of low water conditions (drought or seasonal fluctuations) or certain tidal conditions.	4
shallow water	cwidm:shallowWater	Open water up to 2 m deep.	5
diaphanous open water	cwidm:diaphanousOpenWater	Open water with no detectable aquatic or emergent vegetation present on the water surface, or in the water column.	6

Label Name	Generic Name	Definition	Numeric Code
herbaceous	cwidm:herbaceous	Area where herbs contribute a minimum of 20% ground cover, or herbs constitute more than 1/3 of the total vegetation cover. Note: Herbs are defined as vascular plants without a woody stem, including ferns, fern allies, grasses, and grass-like plants.	7
emergent	cwidm:emergent	Herbaceous area dominated (50% of cover or more) by tall rush communities such as bulrush (<i>Scirpus</i> spp.) and cattail (<i>Typha</i> spp.).	8
graminoid	cwidm:graminoid	Graminoid dominated herbaceous area (50% of cover or more). Note: Graminoids are grass-like plants with long, narrow leaves characterized by linear venation; including grasses, sedges, reeds, rushes, and other related species.	9
bryoid	cwidm:bryoid	Area where greater than 50% of the vegetation cover is in bryoids, and herb and shrub cover must each constitute less than 20%. Note: Bryoids are defined as bryophytes (mosses, liverworts, and hornworts) and lichens (foliose or fruticose; not crustose).	10
shrub	cwidm:shrub	Low woody plants (0.5 to 5.0 m high) dominated area (50% of cover or more).	11
coniferous treed	cwidm:coniferousTre ed	Coniferous trees more than 5 m high dominate the area (25% of cover or more) except bogs and fens where trees are more than 2 m high.	12
deciduous treed	cwidm:deciduousTre ed	Deciduous trees more than 5 m high dominate the area (25% of cover or more).	13

Label Name	Generic Name	Definition	Numeric Code
treed	cwidm:treed	Both coniferous and deciduous trees more than 5 m high dominate the area (25% of cover or more).	14

«CodeList» Soil Codes

Type Name: cwidm:SoilCL
 Definition: Broad categories of wetlands based on soil characteristics.
 Supertype: GenericCodeList (generic name)

Listed Values:

Label Name	Generic Name	Definition	Numeric Code
unknown	gb:unknow	Not known or not well-known.	0 (or less than)
peatland	cwidm:peatland	Area of peat, i.e. a heterogeneous mixture of more or less decomposed plant (humus) material that has accumulated in a water-saturated environment and in the absence of oxygen.	1
mineral	cwidm:mineral	Area of soil derived from minerals or rocks and containing little humus or organic matter.	2

«CodeList» System Codes

Type Name: cwidm:SystemCL

Definition: Complex of wetlands and deepwater habitats that share the influence of similar hydrologic, geomorphologic, chemical, or biological factors (Cowardin et al. 1979).

Supertype: GenericCodeList (generic name)

Listed Values:

Label Name	Generic Name	Definition	Numeric Code
unknown	gb:unknow	Not known or not well-known.	0 (or less than)
marine	cwidm:marine	Open ocean over the continental shelf and its associated high-energy coastline. Note: Marine habitats are exposed to the waves and currents of the open ocean and the water regimes are determined primarily by the ebb and flow of ocean tides.	1
estuarine	cwidm:estuarine	Deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land.	2
riverine	cwidm:riverine	Includes all wetlands and deepwater habitats contained within a channel, where water is usually flowing with two exceptions: (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens; and (2) habitats with water containing ocean-derived salts in excess of 0.5 ppm.	3

Label Name	Generic Name	Definition	Numeric Code
lacustrine	cwidm:lacustrine	<p>Includes all wetlands and deepwater habitats with these characteristics: (1) situated in topographic depression or dammed river channel; (2) lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30% aerial coverage; and (3) total area exceeds 8 ha.</p> <p>Note: Lacustrine waters may be tidal or nontidal, but ocean-derived salinity is always less than 0.5 ppm.</p>	4
palustrine	cwidm:palustrine	<p>Includes all nontidal wetlands dominated by trees, shrubs, emergents, graminoid, bryoids, and all wetlands lacking such vegetation, but with all of the following characteristics: (1) area less than 8 ha; (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of basin less than 2 m at low water; and (4) salinity due to ocean salts less than 0.5 ppm.</p>	5

«CodeList» Tidal Codes

Type Name: cwidm:TidalCL

Definition: Tidal water wetlands occur in the subtidal, intertidal, and supratidal zone of the seacoast and associated rivers. Tidal water wetlands can extend to 6 m below low tide on Canadian Hydrographic charts. Water levels fluctuate mainly daily.

Supertype: GenericCodeList (generic name)

Listed Values:

Label Name	Generic Name	Definition	Numeric Code
unknown	gb:unknow	Not known or not well-known.	0 (or less than)
tidal	cwidm:tidal	Influenced by tide.	1
non-tidal	cwidm:non-tidal	Not influenced by tide.	2

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