KEY TO LLWW (LANDSCAPE POSITION, LANDFORM, WATER FLOW PATH, AND WATERBODY TYPE) DESCRIPTORS

Montana Natural Heritage Program, October 2013 (*modified from Tiner 2011)*

Key A-1: Key to Wetland Landscape Position Descriptors

1. Wetland is completely surrounded by upland (non-hydric soils) ..... **Terrene**
Go to Key B-1 for Landform Classification

1. Wetland is connected to a waterbody or other wetland **2**

2. Wetland is located in or along a lake or reservoir (permanent waterbody where standing water is typically deeper than 6.6 feet *or* larger than 20 acres), including streamside wetlands in a lake basin ..... **Lentic**
..... Go to Landscape Position Modifier for Lentic Wetlands below
Go to Key B-1 for Landform Classification

> **Note:** Lentic wetlands consist of all wetlands in a lake basin (i.e., the depression containing the lake), including lakeside wetlands intersected by streams emptying into the lake. The upstream limit of lentic wetlands is defined by the upstream influence of the lake, which is usually approximated by the limits of the lake basin.

2. Wetland does not occur along a lake or reservoir **3**

3. Wetland is located in a river or stream (including in-stream ponds), within its banks, or on its floodplain **4**

3. Wetland is not located in a river or stream or on its floodplain OR wetland is located along a stream but is NOT subject to frequent overflows. Instead, the wetland is maintained by groundwater inputs ..... **Terrene**
Go to Key B-1 for Landform Classification

4. Wetland is the source of a river or stream, but there is ***no channelized flow*** through the wetland..... **Terrene**
Go to Key B-1 for Landform Classification

4. Wetland is located in a river or stream, within its banks, or on its floodplain ***and*** is periodically flooded by the river or stream ..... **Lotic**
..... Go to Gradient, Water Flow, and Other Special Modifiers below
Go to Key B-1 for Landform Classification

Landscape Position Modifier for Lentic Wetlands

a. Wetland is associated with a natural waterbody ..... **Natural Lake**

a. Wetland is associated with a waterbody that has undergone human-caused modifications .....
..... **b.**

b. Wetland is associated with a waterbody that has been excavated ..... **Excavated Lake**

b. Wetland is associated with a waterbody that has been dammed or impounded ..... **c.**

c. Wetland is associated with a waterbody created by a dammed river valley ....**Dammed River Valley**
c. Wetland is associated with a dammed natural lake ..... **Other Dammed Lake**

Gradient Modifiers

- Water flow is generally slow with extensive floodplain development (Cowardin's Lower Perennial Subsystem) ..... **Low Gradient**
- Water flow is moderate to fast with little to some floodplain development (Cowardin's Lower or Upper Perennial Subsystem) .....**Middle Gradient**
- Water flow is rapid due to steep gradient with little or no floodplain development (Cowardin's Upper Perennial Subsystem) .....**High Gradient**

Water Flow Modifier

Water flow is intermittent or ephemeral (as indicated on the high resolution National Hydrography Dataset) ..... **Intermittent**

Other Special Modifiers

- Wetland is modified by a beaver dam.....**Beaver**
- Wetland is modified by a ditch or has been partially drained..... **Partially Drained/Ditched**
- Wetland has been farmed.....**Farmed**
- Water flow or wetland modified by dam, dike, or impoundment..... .....**Dammed/Diked/Impounded**
- Wetland or waterbody has been modified by excavation .....**Excavated**

Key B-1: Key to Landform Descriptors

1. Wetland hydrology is influenced primarily by groundwater discharge to the surface (can occur on nearly flat landscapes) ***or*** wetland occurs on a slope of at least 2% ..... **Slope**
Go to Key C-1 for Water Flow Path
1. Wetland hydrology is influenced by a number of sources.....**2**

2. Wetland forms an island .....**Island**
Go to Key C-1 for Water Flow Path
2. Wetland does not form an island **3**

3. Wetland occurs ***within*** the banks of a river or stream or ***along the shores*** of a pond, lake, or island ***and*** is either (1) vegetated ***and*** at least saturated or semi-permanently flooded ***or*** (2) a non-vegetated bank or shore that is temporarily or seasonally flooded ..... **Fringe**
Go to Key C-1 for Water Flow Path
3. Wetland does not occur within the banks of a river or stream or along a shore.....**4**

4. Wetland occurs on an active floodplain.....**Floodplain**
Go to Key C-1 for Water Flow Path
4. Wetland does not occur on an active floodplain.....**5**

5. Wetland exists in a distinct depression in various landscape positions ..... **Basin**
Go to Key C-1 for Water Flow Path

5. Wetland receives water primarily via precipitation and loses water via evapotranspiration. Salt crusts may be visible on the surface ..... **Flat**
Go to Key C-1 for Water Flow Path

Key C-1: Key to Water Flow Path Descriptors

1. Water levels fluctuate due to variable lake or river water levels, but water does not flow through the wetland ..... **Bidirectional**

1. Wetland is not subject to the influences of lake or river levels **2**

2. Wetland receives surface water or groundwater from another watercourse, waterbody, ***or*** wetland at a higher elevation ***and*** surface or groundwater passes through it to another watercourse, waterbody, ***or*** wetland at a lower elevation ..... **Throughflow**

Note: Throughflow wetlands can be further divided into Throughflow-Intermittent if information is available from ancillary data layers.

2. Water does not pass through the wetland to other wetlands or waters **3**

3. Wetland does not receive surface water or groundwater inflows ***and*** no observable outflow of surface or groundwater occurs to other wetlands or waters ..... **Isolated**

3. Wetland is not hydrologically or geographically isolated ***or*** it is part of a group of isolated wetlands that are interconnected..... **4**

4. Wetland is part of a small group of isolated wetlands that are interconnected..... ..... **Isolated-Complex**

Note: Some isolated wetlands are part of a small group of interconnected wetlands. For these wetlands, the **Isolated** water flow path can be combined with other water flow paths to indicate the direction or type of flow connecting these wetlands within the complex: **Isolated-Throughflow, Isolated-Inflow,** and **Isolated-Outflow.**

4. Wetland is not hydrologically or geographically isolated **5**

5. Wetland receives surface water or groundwater via an intermittent or perennial stream or from a wetland at a higher elevation, but no observable outflow of surface water or groundwater exists ..... **Inflow**

5. Wetland receives ***no*** surface or groundwater inflow from a wetland or other permanent waterbody at a higher elevation ***and*** water is discharged from the wetland to a watercourse, waterbody, or other wetland at a lower elevation..... **Outflow**

Note: Outflow wetlands can be further divided into Outflow-Intermittent if information is available from ancillary data layers.

Key D-1: Key to Waterbody Types

1. Waterbody is standing water.....**2**
1. Waterbody is flowing water.....**3**

2. Waterbody is deep (> 6.6 feet) or greater than 20 acres in size.....**Lake**
.....Go to Lake/Pond Modifiers below
Go to Key C-1 Water Flow Paths
2. Waterbody is shallower than 6.6 feet deep or less than 20 acres in size .....**Pond**
.....Go to Lake/Pond Modifiers below
Go to Key C-1 Water Flow Paths

Lake/Pond Modifers
a. Waterbody is natural .....**Natural Lake**
a. Waterbody has undergone human-caused modifications or alterations..... **b.**

b. Waterbody has been excavated ..... **Excavated Lake**
b. Waterbody has been dammed or impounded .....**c.**

c. Waterbody is created by a dammed river valley .....
.....**Dammed River Valley**
c. Waterbody is a dammed natural lake ..... **Other Dammed Lake**

3. Waterbody is consistent with polygon (areal) stream/river features in the high resolution National Hydrography Dataset .....**River**
..... Go to Gradient, Water Flow, and Other Special Modifiers below
3. Waterbody is consistent with linear features (flowlines) in the high resolution National Hydrography Dataset .....**Stream**
..... Go to Gradient, Water Flow, and Other Special Modifiers below

Note: All River and Stream waterbody types will receive a **Throughflow** water flow path.

Gradient Modifiers
- Water flow is generally slow with extensive floodplain development (Cowardin's Lower Perennial Subsystem)..... **Low Gradient**
- Water flow is moderate to fast with little to some floodplain development (Cowardin's Lower or Upper Perennial Subsystem) .....**Middle Gradient**
- Water flow is rapid due to steep gradient with little or no floodplain development (Cowardin's Upper Perennial Subsystem).....**High Gradient**

Water Flow Modifier
Water flow is intermittent or ephemeral (as indicated on the high resolution National Hydrography Dataset) ..... **Intermittent**

Other Special Modifiers
Water flow is obstructed by an artificial impoundment .....**Dammed**

LANDSCAPE POSITION, LANDFORM, WATER FLOW PATH, AND WATERBODY (LLWW) CODING SYSTEM (Adapted from Tiner 2011)

Landscape Position	
Lentic	LE
Lotic	LO
Terrene	TE

Gradient Modifiers for Lotic Wetlands	
Low Gradient	1
Middle Gradient	2
High Gradient	3

Water Flow Modifier for Lotic Wetlands	
Intermittent	4

Lentic Type	
Natural lake	1
Dammed river valley	2
Other dammed lake	3
Excavated	4

Landform	
Basin	BA
Fringe	FR
Island	IL
Floodplain	FP
Slope	SL
Flat	FL

Water Flow Path	
Inflow	IN
Outflow	OU
Bidirectional	BI
Throughflow	TH
Isolated	IS
Isolated-Complex	IC
Isolated-Inflow	II
Isolated-Outflow	IO
Isolated-Throughflow	IT

Other Special Modifiers (apply to the end of the code as appropriate)

Beaver	b
Partially Drained/Ditched	d
Farmed	f
Dammed/Diked/Impounded	h
Excavated	x
Wetland associated with a pond	pd

Waterbody Type

Lake	LK
Pond	PD
River	RV
Stream	ST

River/Stream Gradient Modifiers

Low Gradient	1
Middle Gradient	2
High Gradient	3

Water Flow Modifier

Intermittent	4

Other Modifiers (apply to the end of the code as appropriate)

Beaver	b
Partially Drained/Ditched	d
Farmed	f
Dammed/Diked/Impounded	h
Excavated	x
Pond	pd

GLOSSARY OF TERMS

Basin – a landform occurring in a topographic depression that allows for the accumulation of water; water inlets and outlets are various or the wetland can lack inlets and outlets (*see Isolated)*

Bidirectional – a water flow path in which water moves horizontally as a result of changing water levels

Flat – a landform that receives water primarily through precipitation and has no groundwater inputs; examples of this landform typically have an impermeable soil layer

Floodplain – a landform occurring in an area influenced by fluvial or riverine processes; for the purposes of this classification, limited to the broad plain associated with large river systems subject to periodic flooding (once every 100 years) and typically having alluvial soils

Fringe – a landform occurring along a standing or flowing waterbody (lake, pond, river, or stream), including vegetated wetlands flooded for most or all of the growing season and nonvegetated wetlands along the banks or shores of these waterbodies

High Gradient – describes a fast-flowing river or stream that typically has no floodplain development; equivalent to the Upper Perennial Subsystem of the Riverine System of the Cowardin classification (Cowardin et al. 1979)

Inflow – a water flow path in which the wetland receives surface water or groundwater from a wetland or waterbody at a higher elevation but has no significant discharge to another wetland or waterbody

Intermittent – a stream that flows for only part of the year

Island – a landform completely surrounded by water

Isolated – a water flow path in which the wetland lacks an apparent surface water connection to other wetlands or waterbodies; for the purposes of this classification, this type is geographically isolated although it may be connected to other wetlands and waterbodies via groundwater; a complex of isolated wetlands may be connected via surface water or groundwater, but the group does not have a surface water outlet

Lake – a waterbody type that is at least 20 acres in size and typically greater than 6.6 feet in depth

Lentic – a landscape position associated with a large, deep standing waterbody (lakes and reservoirs); includes contiguous wetlands within the lake basin

Lotic – a landscape position associated with flowing waterbodies (rivers and streams); includes contiguous wetlands

Low Gradient – describes a slow-moving river or stream that typically has considerable floodplain development; equivalent to the Lower Perennial Subsystem of the Riverine System of the Cowardin classification (Cowardin et al. 1979)

Middle Gradient – describes a river or stream intermediate between high and low gradient; typically has limited floodplain development

Outflow – a water flow path in which water leaves the wetland, via natural or artificial means, to another wetland or waterbody at a lower elevation but has no significant input of water from a surface water source

Perennial – a stream that flows continuously all year, every year

Pond – a natural or human-made waterbody type that may be subject to periodic drawdowns

River – a waterbody type; for the purposes of this classification, this type is consistent with polygon (areal) features in the high resolution National Hydrography Dataset that are classified as Stream/River under the NHDArea layer

Slope – a landform in which the wetland is influenced primarily by groundwater discharge to the surface (can occur on nearly flat landscapes) or a wetland occurring on a slope of at least 2%

Stream – a waterbody type; for the purposes of this classification, this type is consistent with linear features (flowline) in the high resolution National Hydrography Dataset

Terrene – a landscape position in which the wetland is completely surrounded by uplands and lacking a channelized outlet; a stream may enter or exit this type but does not flow through it as a channel

Throughflow – a water flow path in which water enters and exits the wetland unidirectionally; this type receives surface water or groundwater from a wetland or waterbody that passes through the wetland and is discharged to a stream, wetland, or other waterbody at a lower elevation

Literature Cited:

Tiner, R.W. 2011. Dichotomous Keys and Mapping Codes for Wetland Landscape Position, Landform, Water Flow Path, and Waterbody Type Descriptors, version 2.0. U.S. Fish and Wildlife Service, National Wetlands Inventory Program, Northeast Region, Hadley, MA. 58 pp.