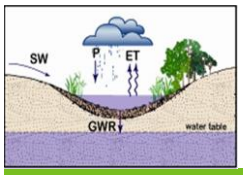



What is a Wetland?

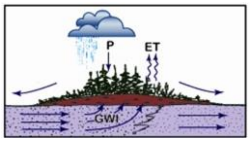
BOARD OF WATER AND SOIL RESOURCES

Minnesota Wetland Professional Certification Program

1

Topics

- 3 Parameters that define a wetland
- Wetland Values and Functions
- Overview of the Hydrogeomorphic Method



2

Pop Quiz

According to the 2019 Minnesota update of the National Wetland Inventory, how many acres of wetlands are in MN?

A) 6.3 million acres

B) 10.5 million acres

C) 12.2 million acres

D) 24.4 million acres

3

Pop Quiz

According to the 2019 Minnesota update of the National Wetland Inventory, how many acres of wetlands are in MN?

A) 6.3 million acres

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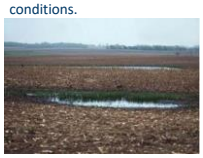
4

What is a Wetland?

Those areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions.



Hydrology + Vegetation + Soil = Wetland

5

3 Parameters of a Wetland

- 3 Parameters of a wetland
  - Hydrology- frequency and duration of movement of water through a landscape
  - Soil- organic and mineral surfaces which often exhibit characteristics that it has been in saturated conditions
  - Vegetation- plant community and prevalence of species that have made adaptations to live in saturated conditions

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Hydrology

…"inundated or saturated by surface or ground water at a frequency and duration"

- Technical standard of 14 or more consecutive days of flooding or ponding;
- Water table 12 in. or less below soil surface;



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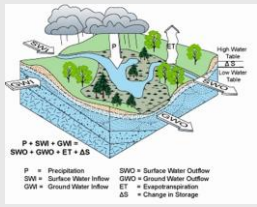
Hydrology



- Inputs
  - Precipitation
  - Surface water inflow
  - Groundwater inflow
- Outputs
  - Surface water outflow
  - Groundwater outflow
  - Evapotranspiration

8

Hydrology Indicators


Evidence that there is continuing hydrology and confirms that an episode of inundation/saturation occurred recently.

Wetland hydrology indicators are divided into two categories:
Primary – provide stand-alone evidence of a current or recent hydrologic event; and
Secondary – provide evidence of recent hydrology when supported by one or more other hydrology indicators.

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Soil

"…sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions"



10

Hydric Soil

- A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding **long enough** during the **growing season** to develop anaerobic conditions in the **upper part**.

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Hydric Soil Indicators

Based on key physical properties: color & texture

And the depth & thickness where they are found



12

Vegetation

"…sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions"

Wetland Indicator Status	Definition
Obligate Wetland (OBL)	Almost always occur in wetlands
Facultative Wetland (FACW)	Usually occur in wetlands, but may occur in non-wetlands
Facultative (FAC)	Occur in wetlands and non-wetlands
Facultative Upland (FACU)	Usually occur in non-wetlands, but may occur in wetlands
Obligate Upland (UPL)	Almost never occur in wetlands

National Wetland Plant List, 2016, V3.3
http://rsgisias.crrel.usace.army.mil/NWPL/

13

Hydrophytes

Adaptations to saturated environment:

- morphological (multiple trunks, floating leaves)
- physiological (metabolic pathways)
- reproductive (floating seedlings)

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Dominance Tests

Methods to determine dominance of hydrophytic vegetation:

- Rapid test
- Dominance test (50/20)
- Prevalence Index
- Morphologic adaptations

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Rapid Test Example

Hydrophytic Vegetation?

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Quiz

What are the three parameters that define a wetland?

17

Quiz

What are the three parameters that define a wetland?

Hydrology + Vegetation + Soil = Wetland

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Wetland Functions & Values

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Wetland Functions & Values

Wetland Functions: natural processes that can be scientifically assessed

Wetland Value: goods and services providing monetary or social welfare benefit.

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Wetland Values

- Recreation
  - hunting, fishing, bird watching, photography
- Food Production
  - Wild rice, cranberries
- Education
- Aesthetics

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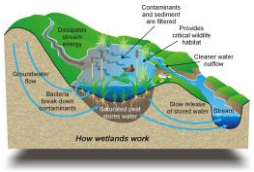
Wetland Functions

- Decreases fluid velocity during high flow events which decreases turbidity
- Stabilize base flow
  - Storm water retention (i.e. storage)
- Act as a natural "filter" to maintain water quality
- Facilitates infiltration recharging groundwater
- Provides habitat
- Shoreline protection



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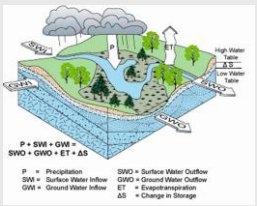
Hydrology



- Inputs
  - Precipitation
  - Surface water inflow
  - Groundwater inflow
- Outputs
  - Surface water outflow
  - Groundwater outflow
  - Evapotranspiration

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Functions

Habitat

- Many insects, reptiles and amphibians rely on wetlands to complete their life cycle.
- Some mammals are semi-aquatic: beavers, muskrat, mink, otters.
- Many birds feed and nest in wetlands.
- Fish rely on wetlands for breeding, feeding and shelter.

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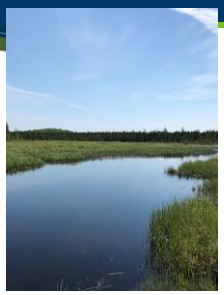
Functions

Floodwater Retention



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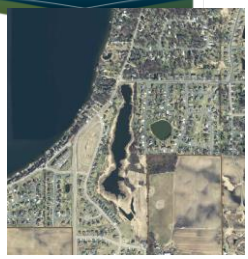
Functions

Sediment Trap



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Functions

Groundwater Recharge

27

Functions

Water Quality

28

Functions

Carbon Storage

Although wetlands only account for 5-8% of earths terrestrial landscape they may provide carbon sinks of about 300 to 700 billion tons of carbon. Peatland wetlands make up the majority of carbon sinks.

1. Mitsch et. al., Wetlands, carbon and climate. Landscape Ecology. Research Article. 2012
2. *Nature Reports Climate Change*
Published online: 26 November 2009 | doi:10.1038/climate.2009.125

29

Which one doesn't belong here?

Food Production | Carbon Storage | Groundwater recharge | Floodwater Retention

30

Which one doesn't belong here?

Food Production | Carbon Storage | Groundwater recharge | Floodwater Retention

31

Carbon Storage | Groundwater recharge | Floodwater Retention

What are these?

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Wetland Functions

Carbon Storage | Groundwater recharge | Floodwater Retention

What are these?

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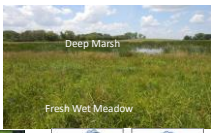
Wetland Classification Systems in MN

Circular 39
Cowardin
Eggers & Reed
Hydrogeomorphic Method



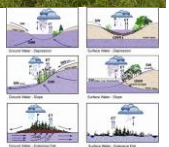


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Table of the Wetland Classification Systems used in Minnesota

Circular 39	Eggers and Reed	Cowardin	Typical HGM
1: Seasonally flooded basin or flat	Seasonally Flooded Basin, Floodplain Forest, Fresh Wet Meadow, Wet to Wet-Mesic Prairie	PEMA; PFOA	Depression, Riverine
2: Inland fresh meadow	Fresh Wet Meadow, Wet to Wet-Mesic Prairie, Sedge Meadow	PEMB	Depression, Sloped
3: Inland shallow fresh marsh	Shallow Marsh	PEMC and F; PSSH; PUBA and C	Depression, Lacustrine Fringe, Riverine
4: Inland deep marsh	Deep Marsh	PEMF; PEMG and H; PUBB and F; PABF and G; L2US; L2EMF and G; L2ABF	Depression, Lacustrine Fringe
5: Inland open fresh water	Shallow Open Water	L2ABG and H; L2EMA, B and H; L2RS; L2UB; PABH; PUBG and H	Depression, Lacustrine Fringe
6: Shrub swamp	Shrub-Carr, Alder Thicket	PSSA, C, F and G; PSS1, 5 and 6B	Mineral Flat, Sloped
7: Wooded swamp	Hardwood or Coniferous Swamp	PFO1, 5 and 6B; PFOC and F	Mineral Flat, Sloped
8: Bog	Open or Coniferous Bog	PFO2, 4 and 7B; PSS2, 3, 4 and 7B	Organic Flat, Lacustrine Fringe

35

Table of the Wetland Classification Systems used in Minnesota

Circular 39	Eggers and Reed	Cowardin	Typical HGM
1: Seasonally flooded basin or flat	Seasonally Flooded Basin, Floodplain Forest, Fresh Wet Meadow, Wet to Wet-Mesic Prairie	PEMA; PFOA	Depression, Riverine
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3: Inland shallow fresh marsh	Shallow Marsh	PEMC and F; PSSH; PUBA and C	Depression, Lacustrine Fringe, Riverine
4: Inland deep marsh	Deep Marsh	PEMF; PEMG and H; PUBB and F; PABF and G; L2US; L2EMF and G; L2ABF	Depression, Lacustrine Fringe
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8: Bog	Open or Coniferous Bog	PFO2, 4 and 7B; PSS2, 3, 4 and 7B	Organic Flat, Lacustrine Fringe

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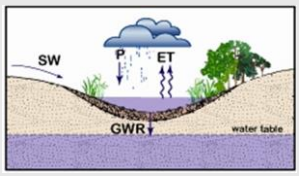
Hydrogeomorphic Method (HGM)

Established Classes based on geomorphology, hydrology, and hydraulic functions of palustrine wetlands



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HGM Classes

- RIVERINE
- DEPRESSIONAL
- SLOPED
- MINERAL SOIL FLATS
- ORGANIC SOIL FLATS
- ESTUARINE FRINGE
- LACUSTRINE FRINGE

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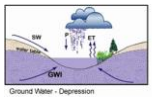
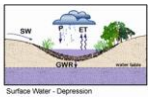
HGM Subclasses

Determined by:

- Hydrology Inputs
  - Surface vs ground water
- Hydrology Outputs
  - Surface vs groundwater



Ground Water - Depression



Surface Water - Depression

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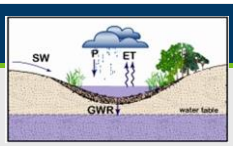
Depressional



- Landscape position- concave, foot slope/toe slope, closed contours
- Hydraulics- vertical
- Water source- surface flow or seasonal groundwater and precipitation
- Outputs- Evapotranspiration, groundwater recharge

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Mineral Soil Flats

Surface Water - Extensive Flat

- Landscape position- relic lake bottoms and floodplains, intergrades to multiple other classes (sloped, riverine, lacustrine)
- Hydraulics- vertical
- Water source- precipitation, no groundwater interaction
- Outputs- evapotranspiration, saturated "seepage" flow

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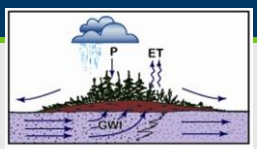
Organic Soil Flats



Ground Water - Extensive Flat

- Landscape position- summit (interfluves- broad "plateau" between drainage systems), depressions filled with organics, vertical accretion of organics
- Hydraulics- vertical
- Water source- precipitation, groundwater
- Outputs- saturated overland seepage, evapotranspiration

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Riverine

- Landscape position- floodplains and riparian corridors, often intergrade to sloped or depression
- Hydraulics- unidirectional, surface overbank flow, groundwater, interflow (both surface and ground) from adjacent uplands
- Water source- precipitation, groundwater
- Outputs- overland surface flow (perennial flow not required), evapotranspiration

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Lacustrine Fringe

- Landscape position- adjacent to lakes, toe slope, often intergrade to sloped or riverine
- Hydraulics- bidirectional (inflow from adjacent uplands and lake)
- Water source- precipitation, groundwater
- Outputs- return flow to lake, saturated surface seepage, evapotranspiration

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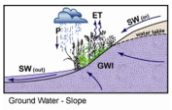
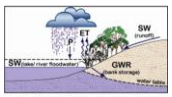
Sloped

- Landscape position- linear or concave, predominately found at foot and toe slope, can be found on back slope and shoulder slope, often intergrades to mineral flat, riverine, depression
- Hydraulics- unidirectional
- Water source- groundwater, surface runoff, precipitation
- Outputs- surface flow, groundwater recharge, evapotranspiration



Ground Water - Slope



Surface Water - Slope

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HGM Class (subclass)	Hydrology Inputs	Hydrology Outputs	Hydraulics
RIVERINE	surface flow precipitation groundwater	surface flow evapotranspiration	bidirectional (both surface and ground)
DEPRESSIONAL- surface	surface flow precipitation	groundwater recharge evapotranspiration	vertical
DEPRESSIONAL- ground	groundwater precipitation	intermittent surface flow evapotranspiration groundwater recharge	vertical
SLOPED- surface	surface flow precipitation	surface flow evapotranspiration groundwater recharge	unidirectional
SLOPED- ground	groundwater surface water precipitation	surface flow evapotranspiration	unidirectional
MINERAL SOIL FLATS	precipitation intermittent surface flow	evapotranspiration intermittent surface flow	vertical
ORGANIC SOIL FLATS	groundwater precipitation	intermittent surface flow Evapotranspiration	vertical
ESTUARINE FRINGE	surface flow tidal exchange precipitation	tidal exchange surface flow Evapotranspiration	bidirectional
LACUSTRINE FRINGE	surface flow groundwater precipitation	return flow to lake surface flow evapotranspiration	bidirectional

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HGM class?

47

HGM class?

48

HGM class?

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Questions?

bwsr.state.mn.us/minnesota-wetland-professional-certification-program

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