Kenai Peninsula Wetland Assessment – Homer SWCD Technical Report

Background

The Homer Soil and Water Conservation District (HSWCD) conducted wetland functional assessments on the lowlands of the Western Kenai Peninsula and in the Seward area. This collaborative project, funded by the EPA's Wetland Program Development Grant, will give landowners and land managers information to make better land use decisions. The wetlands have already been mapped, and assessing their functions was the next logical step in wetland management for this rapidly developing area of Alaska. This document was created for professionals and users already familiar with the wetland mapping and assessments and intends to provide a brief summary of each functional assessment. Users new to this project or unfamiliar with the wetland mapping and assessments are encouraged to consult Kenai Peninsula Wetlands – A Guide for Everyone for additional background information. Management strategies can be found in Managing Peninsula Wetlands to Maintain Their Functions and Values. A shapefile of the assessment results is available; please contact info@homerswcd.org. Additional publications from this project, including functional assessment maps, are available at www.homerswcd.org.

Methodology

The functional assessments concentrate on 3 major components; hydrology, biology, and community/culture. The assessment methodology is based on the Ontario Wetland Assessment System (OWES), and modifications made by the cities of Anchorage and Homer, as part of their wetland assessment projects. These methodologies allow comparisons between different wetlands based on how they are functioning, instead of rating them on a disturbance gradient as many wetland assessments do. These methodologies provide the foundation of the Western Kenai Peninsula assessment for the biology and community/culture components; however innovative departures were necessary, as this landscape scale assessment primarily used Geographic Information Systems (GIS), and site visits weren't deemed practical.

The hydrology component departed from the methodologies mentioned above, and assessments were based on updated methods used in the Matanuska-Susitna Borough. The Matanuska-Susitna methodology was developed using the same mapping and classification used on the Kenai Peninsula and did not require site visits to assess the functions.

Experts from a wide variety of agencies and organizations provided essential guidance in the development of the assessments, and HSWCD is grateful for their expertise and insight.

Limitations

The functional assessments, and the Wetland Mapping and Classification of the Kenai Lowland, Alaska they were based on, were both done at a scale of 1:24,000. This is a landscape scale assessment, and site visits and field assessments are encouraged for specific projects. Results were not ground-truthed and interpretations should be made carefully.

Scoring

This assessment uses unit-less scores that intend to give relative value to how much a particular wetland polygon performs a function. The top score for each functional assessment is 40. For some assessments it was reasonable to have several scores, for others it was "all or nothing". These decisions were made based on data availability, confidence in the data, and professional knowledge about wetland functions in the project area. If a wetland polygon meets more than one criterion for a function, it is given the highest score for which it qualifies; the scores within a function are not cumulative (with the exception of the multiple variables used to assess the Habitat Diversity Function.

The 16 Functional Assessments

Moose winter habitat

On the Kenai Peninsula, moose utilize the lowlands in the winter, as well as additional locations where their main winter food source, willows, is abundant and accessible. The lowlands likely have fewer predators, less snowpack, trails for ease of movement, and more accessible food than other areas of the peninsula in the winter.

- Wetlands below 600 feet in elevation are typically utilized by moose in the winter more than wetlands at higher elevations.
- Riverine zones with willows, even those above 600 feet in elevation, are utilized by moose in winter.
- Discharge slopes (S) with willows are often located on footslopes or toeslopes, just uphill from stream corridors and wetlands used by moose in the winter.
- The Anchor River/Fritz Creek Critical Habitat Area was created to protect habitat important for moose overwintering. The Homer Airport Critical Habitat Area, which was also created to protect moose habitat; is below 600 feet in elevation and was therefore covered under the elevation criteria described above.

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The assessment resulted in 74% of the wetland area receiving a positive score for moose winter habitat.

> Moose winter habitat
> (40) ___ Late winter habitat (lowlands < 600 ft elevation, or riverine zones w/willows, or discharge slopes w/willows or wetland w/in the AnchorRiver/FritzCreek CHA) (74% wetland area)
> (0) ___ None of the above (26% wetland area)

Salmon habitat support

The Kenai Peninsula supports five species of Pacific salmon. Salmon utilize rivers, streams, and even open water wetlands during the freshwater portion of their life cycles. Wetlands adjacent to salmon streams maintain water quality by storing and filtering water. Coho salmon (silvers) utilize the greatest extent of wetland and stream habitat on the Kenai Peninsula, and their support needs were used for this assessment. This methodology is an updated version of an assessment done by Mike Gracz of Kenai Watershed Forum http://www.kenaiwetlands.net/Habitat.htm. An updated version of the Anadromous Waters Catalog, published by the Alaska Department of Fish & Game was used, and the original assessment area was expanded to include the Seward area. The Seward area has some different stream types than the Western Kenai Peninsula; these braided streams were addressed separately, using the same concepts as used in the rest of the survey area.

- Wetlands with cataloged anadromous streams running through them are critical for salmon habitat support.
- Streams flowing directly into anadromous streams are likely to support coho salmon and are labelled “likely coho streams”
- Wetlands with open water adjacent to anadromous streams or likely coho streams may be utilized by coho salmon as well, and are labelled “coho wetland habitat”. Extending the network further, streams flowing into these open water wetlands are labelled “possible coho streams”.
- Wetlands that are adjacent to any of the above categories will filter water and maintain water quality for salmon, and are labelled “coho support habitat”.
- Braided streams in Seward are a challenge to map as the channels move frequently. In these systems, anadromous stream channels, side channels, and floodplain mapunits were given the highest score, and stream terrace mapunits were given a coho support habitat score.

The assessment resulted in 57% of the wetland area receiving a positive score for supporting salmon habitat.

Salmon habitat support

For Seward area braided stream systems (RD components):

(40) ___ Wetland has cataloged anadromous stream through it (RD4C, RD3C, or RD4SC) or wetland is a floodplain unit (RD4F*) adjacent to an anadromous stream

(20) ___ Wetland is a terrace unit (RD4T*) adjacent to an anadromous stream

(0) ___None of the above

For all other Kenai Peninsula stream systems:

(40) ___ Wetland has cataloged anadromous stream through it. (11% wetland area scored 40, including Seward streams)

(30) ___ Likely coho streams (Streams flowing directly into an anadromous stream) (5% wetland area)

(25) ___ Likely coho wetland habitat (w/ open water, adjacent to 2 categories listed above) or Possible coho streams (4% wetland area)

(20) ___ Coho support habitat (wetland adjacent to any of the above categories) (38% wetland area scored 20, including Seward streams)

(0) ___ None of the above (43% wetland area scored 0)

Rare wetland plants

The Alaska Natural Heritage Program (AKNHP) tracks rare plants that are of conservation concern in Alaska and assigns them a state conservation rank. There are six freshwater wetland plant species documented on the Kenai Peninsula that received a rank indicating they are rare or imperiled within the state (rank of S1 – S3).

1. *Carex heleonastes* (Hudson Bay sedge) S2S3
2. *Catabrosa aquatica* (water whorlgrass) S1
3. *Ceratophyllum demersum* (coon's tail) S1
4. *Eriophorum viridicarinatum* (thinleaf cottonsedge) S2
5. *Pedicularis groenlandica* (elephanthead lousewort) S1S2
6. *Pedicularis macrodonta* (muskeg lousewort) S3

For this assessment, the habitat of each of the rare plant species was considered, and is indicated in the table as being a "wetland of appropriate type". *Ceratophyllum demersum* (coon's tail) is an aquatic plant, and its habitat is one that includes open water (hydrologic code =1, or Riverine wetland). None of the rare plants on the list are likely to be found on a forested mineral soil, so forested discharge slope wetlands were excluded from "wetland of appropriate type".

- Wetlands of an appropriate type within 0.5 mile of a rare wetland plant location may support additional populations of the rare plant, and provide potential habitat for that plant species.
- Wetlands of an appropriate type within between 0.5 and 1.25 miles of a rare wetland plant location may also support additional populations of the rare plant, and potential habitat for that rare plant species.
- Wetlands of any type within a 1.25 mile buffer provide habitat support for those wetlands that contain rare plants. Disturbance of these support wetlands may impact the characteristics of the wetlands where the rare plants occur.

The assessment resulted in 7% of the wetland area receiving a positive score for supporting rare plants. Note that buffer distances were determined by the AKNHP Program Botanist, Dr. Matt Carlson.

Rare wetland plants

(40) ___ Wetland of appropriate type within 0.5 mile of rare wetland plant location (2% wetland area)

(20) ___ Wetland of appropriate type within between 0.5 and 1.25 miles of rare wetland plant location (4% wetland area)

(10) ___ Habitat support – wetland type unlikely to contain rare plant, but within the 1.25 mile buffer (1% wetland area)

(0) ___ Wetland not within 1.25 mile buffer of rare wetland plant (93% wetland area)

Animal Species of Concern

The Alaska Natural Heritage Program (AKNHP) tracks animal species of conservation concern and assigns them a state conservation rank. There are 5 birds, 2 fish, and 1 invertebrate on the Kenai Peninsula that received a rank indicating they are vulnerable or imperiled within the state (rank of S1 – S3, the qualifiers are B – breeding and N – nonbreeding). Two birds, McKay's Bunting and Kittlitz's Murrelet, were excluded from the assessment as they are unlikely to utilize freshwater wetlands on the Kenai Peninsula. The animal species that were assessed are listed below, along with their rankings.

1. Aleutian Tern (*Oncychoprion aleuticas*) S3B
2. Rusty Blackbird (*Euphagus carolinus*) S4B, S3N

3. Pribilof Rock Sandpiper (*Calidris ptilocnemis ptilocnemis*) S2N, S3B
4. Alaskan Brook Lamprey (*Lampetra alaskensis*) S3
5. Yukon Floater (a freshwater mussel) (*Anodonta beringiana*) S3, S4

In addition, caribou summer and calving habitat and potential sandhill crane nesting habitat were included in the assessment as additional species of concern to Kenai Peninsula residents. Mike Gracz of the Kenai Watershed Forum previously assessed the caribou calving/summer habitat and potential sandhill crane nesting habitat in Kenai Peninsula wetlands, and this project used his analysis, found at: http://www.kenaiwetlands.net/Habitat.htm.

- Wetlands that overlap AKNHP's animal species of conservation concern occurrence polygons and/or range maps were scored for this function. The more animal species of concern mapped in an area, the higher the score for wetlands supporting animal species of concern in that area.

The assessment resulted in 22% of the wetland area receiving a positive score for supporting animal species of concern.

Animal Species of Concern
(40) ___ Wetland supports 4 species of concern (1% wetland area)
(30) ___ Wetland supports 3 species of concern (2% wetland area)
(20) ___ Wetland supports 2 species of concern (11% wetland area)
(10) ___ Wetland supports 1 species of concern (9% wetland area)
(0) ___ Wetland supports 0 species of concern (78% wetland area)

Scarcity

The spatial distribution of wetland types is not consistent across the Kenai Peninsula. Wetlands of different types function differently, and a wetland type that is relatively scarce within a watershed should be recognized as it contributes to the biodiversity of the watershed.

- Wetland types were based on the Geomorphic Component of the wetland, i.e. Kettle, Riverine, Depression, Relict Glacial Drainageway, Relict Glacial Lakebed, Abandoned Meander Terrace, Discharge Slope, and Wetland/Upland Complex. The sixth level hydrologic units created by the U. S. Geological Survey were used as the watershed units. These sixth level units range from 10,000 - 40,000 acres in size. The scarcity of the wetland type was assessed using the percentage of each geomorphic component by area, compared to the total wetland area within the watershed.

The assessment resulted in 81% of the wetland area receiving a positive score for scarcity.

Scarcity
(40)___Area of that Geomorphic Component accounts for <5% of total wetland area (4%wetland area)
(30)___Area of that Geomorphic Component accounts for 5 -10% of total wetland area (8% wetland area)
(20)___Area of that Geomorphic Component accounts for 10-30% of total wetland area (38% wetland area)
(10)___Area of that Geomorphic Component accounts for 30-50% of total wetland area (31% wetland area)
(0) ___Area of that Geomorphic Component accounts for >50% of total wetland area (19% wetland area)

Habitat Diversity

Wetlands provide habitats for many plant and animal species. Instead of focusing on one select species or a small group of species, this assessment looks at the diversity of habitats a wetland potentially provides, or the structural heterogeneity. More structurally complex and heterogeneous wetlands have greater diversity of habitats available. The habitat diversity assessment considers vegetation, open water, and productivity.

- Number of wetland plant communities. The number of common plant communities for each wetland type was based on the number of mapunit components in the wetland polygon.
- Vegetation structure. This variable looks at the vegetation layers for each plant community type in the subject wetland. Layers include trees, low and high shrubs, herbaceous vegetation, and moss.

- Surface water persistence. This variable assesses the probability of surface water being present during the period of April to July, which is important for waterbird nesting and rearing.
- Open water types (see Figure C at the end of this document). The pattern of open water and vegetation is an indicator of waterbird habitat.
- Wetland contiguity with stream, lake, or pond. Wetlands contiguous with open water are considered to have higher habitat value than wetlands that aren't adjacent to open water.
- Soil type in the upper foot from NRCS soil survey. Mineral soils are more productive than organic soils.
- Type of wetland. This variable looks at the location of the wetland on the landscape and relates to wildlife diversity, habitat potential, and biological productivity.

Scores were assigned for each of the variables, based on the scoring system developed in the Anchorage assessment. These scores were then added and grouped into categories based on natural breaks in the score distribution for a final score that is of similar scale of the other assessments. The assessment resulted in 100% of wetland polygons receiving a positive score for habitat diversity.
This assessment only addresses attributes of each wetland polygon, and not those of the surrounding area. Wetland polygons that include a greater number of hydrologic codes score higher than a similar wetland complex where each polygon includes a fewer number of hydrologic codes. As with all the assessments, the setting of the wetland polygon being assessed should be considered by users. In the future, this assessment should be improved by addressing attributes of the surrounding area, not simply the attributes of the individual wetland polygons.

Total Habitat Diversity Score (Sum of scores of all habitat variables)
(40)___ Total sum of habitat variables is 36-51 (13% wetland area)
(30)___ Total sum of habitat variables is 26-35 (14% wetland area)
(20)___ Total sum of habitat variables is 17-25 (56% wetland area)
(10)___ Total sum of habitat variables is 4-16 (18% wetland area)

Habitat Variables used in Total Habitat Diversity Score

Vegetation community structure. Identify forms (vegetation layers) for each community type in subject wetland. Forms include trees, low and high shrubs, herbaceous vegetation, and moss. Particular form must cover at least 10% of site. The number of forms was obtained using the Kenai Lowlands Wetland Mapping and Classification. To establish the number of forms in each map component, the number of forms in the most common plant communities found there was averaged. After the map components were added, the number of forms was rounded to the nearest whole number.

Example: Subject wetland has two map components. Within each map component, identify each (and all) forms and add the number of forms for each map component, e.g. DW5 has 2 forms, DW5A has 5 forms, so DW55A has 7 forms (2+5):
(13) ___ Wetland polygon has 13 vegetation layers (3% wetland area)
(12) ___ Wetland polygon has 12 vegetation layers (0.2% wetland area)
(11) ___ Wetland polygon has 11 vegetation layers (0.2% wetland area)
(10) ___ Wetland polygon has 10 vegetation layers (0.6% wetland area)
(9) ___ Wetland polygon has 9 vegetation layers (2% wetland area)
(8) ___ Wetland polygon has 8 vegetation layers (1% wetland area)
(7) ___ Wetland polygon has 7 vegetation layers (11% wetland area)
(6) ___ Wetland polygon has 6 vegetation layers (11% wetland area)
(5) ___ Wetland polygon has 5 vegetation layers (12% wetland area)
(4) ___ Wetland polygon has 4 vegetation layers (26% wetland area)
(3) ___ Wetland polygon has 3 vegetation layers (20% wetland area)
(2) ___ Wetland polygon has 2 vegetation layers (11% wetland area)
(1) ___ Wetland polygon has 1 vegetation layers (1% wetland area)
(0) ___ Wetland polygon is mapped as DISTURB, Rt, RD4C, RD3C (1% wetland area)

Number of wetland plant communities
(6) ___ Wetland polygon has 6 mapunit components, e.g. LB1-6, DW1-5A (0.03% wetland area)
(5) ___ Wetland polygon has 5 mapunit components, e.g. DW1-5, LB2-6 (3% wetland area)
(4) ___ Wetland polygon has 4 mapunit components, e.g. K1-4, LB3-6 (2% wetland area)
(3) ___ Wetland polygon has 3 mapunit components, e.g. K1-3, D2-4, RC, Reb (9% wetland area)
(2) ___ Wetland polygon has 2 mapunit components, e.g. K12, LB34, DW32, SSL, RB, Rel, Rea, Res (47% wetland area)
(1) ___ Wetland polygon has a single mapunit component, e.g. K1, LB4, DW5, SS, RDA, Rib, RD4SC (38% wetland area)
(0) ___ Wetland polygon is mapped as DISTURB (0.03% wetland area)
Open water types (see Figure C).
(12) ___ Type 5 (LBSF or Riverine RC, RDA) (5% wetland area)
(9) ___ Type 4 (Wetlands w/ 3 hydro components, including hydro = 1or Riverine Reb, RD4C, RD3C, RD4SC) K1-3, D1-3, H1-3, LB1-3, DW1-3, DWR, RD4F1-3 (5% wetland area)
(7) ___ Type 3 (Riverine Res) OR Type between 4/6 (Wetlands w/ 2 hydro components, including hydro = 1) e.g. K12, K31, RD4F12 (4% wetland area)
(5) ___ Type 2 (Wetlands w/ 4 hydro components, including hydro = 1 or Riverine Rea, Rel) K1-4, D1-4, H1-4, LB1-4, DW1-4, RD4F1-4 (5 % wetland area)
(4) ___ Type 6 (RB) OR Type 1 (Wetlands w/ 5+ hydro components, including hydro = 1) DW1-5, DW1-5A, LB1-5 (5% wetland area)
(3) ___ Type 8 (Wetlands w/ hydro = 1or Riverine RA,RAA,Rt) D1, D1c, K1, K1c, DW1, H1, LB1, RD4F1, RD4F1c (2% wetland area)
(0) ___ No open water (74% wetland area)
Soils type
(5) ___ Mineral soil (Discharge Slope (S), Late Snow Plateau (LSP), Riverine (R) Wetlands and Wetland/Upland complexes (WU)) (46% wetland area)
(2) ___ Organic soil (All other geomorphic components; D, K, H, LB, DW, FI, AMT, Spring) (54% wetland area)
Type of wetland
(5) ___ Riverine (at mouth) (R or AMT polygons that intersect with coast) (2% wetland area)
(4) ___ Lacustrine (next to lake) or Riverine (all other R wetland polygons) (16% wetland area)
(3) ___ Palustrine (with outflow) (All other K,LB,DW, H, AMT,S,LSP, WU polygons) (79% wetland area)
(2) ___ Palustrine (isolated) Depression (D) (3% wetland area)
(0) ___ DISTURB (0.3% wetland area)
Surface water persistence (% probability of surface water present during the period April to July)
(10) ___ 100% of April-July (Wetlands containing a hydro component = 1, Or Riverine (R) wetlands except Rib, RD4T1, RD4T2, RD4SC) (26% wetland area)
(6) ___ 50 to <100% of April-July (Wetlands containing a hydro component = 2, Or RD4SC, RD4F2, RD4F23, RD4F2-4 (13% wetland area)
(2) ___ 0 to 50% of April-July (Wetlands with hydro components >2) (61% wetland area)
Wetland contiguity with stream, lake, or pond
(5) ___ Stream/lake/pond lies within wetland (All R wetlands, and all polygons with a score of 10 in Surface water persistence) (27% wetland area)
(3) ___ Wetland adjacent to stream/lake/pond (70% wetland area)
(0) ___ Wetland isolated from stream/lake/pond (3% wetland area)

Groundwater Recharge

Groundwater recharge occurs in areas of the landscape where water moves from surface water to groundwater below. Groundwater recharge occurs primarily in uplands, but also in a few wetland types. In this assessment, wetlands meeting one of the following 4 conditions were given scores for recharging groundwater.

- Bogs (LB3, LB36, LB63) are wetlands that, by definition, hold precipitation in the peat and slowly recharge water into the substrate below.
- Depressions (D) are isolated basins that collect and store precipitation and snowmelt, which slowly recharge the underlying substrate.
- Late Snow Plateaus (LSP) and Headwater Fens (H) are wetland types located at higher elevations. Wetlands in the higher reaches of a watershed are likely to contribute some recharge to wetlands located further down in the watershed.
- Wetland / Upland Complexes (WU) are wetland types that include a significant upland component in the map unit. Uplands recharge groundwater.

The assessment resulted in 12% of the wetland area being given a positive score for recharging groundwater.

Groundwater Recharge
(40) ___ Bog (LB3, LB63, LB36), Depression (D), Late Snow Plateau (LSP), Headwater Fen (H), or Wetland/Upland Complex (WU) (12% wetland area)
(0) ___ None of the above (88% wetland area)

Water Storage

Natural water storage occurs where inflows from precipitation, surface flow, or subsurface flow are absorbed or held before they flow out. This storage includes both surface and subsurface storage (in the soil). In this assessment, wetlands meeting any of the following 4 conditions were given positive scores for water storage.

- Depressions (D) are basin shaped wetlands that aren't connected to other wetlands at the surface; therefore the water they hold is generally stored instead of being discharged to other wetlands or water bodies.
- Wetlands with a highly fluctuating water table, identified by the hydrologic code of the mapunit (hydrologic code >3), or Wetland / Upland Complex (WU), have the opportunity to store additional water in the peat or the mineral soil of the Wetland / Upland Complex.
- Wetland types located at higher elevations, Late Snow Plateaus (LSP) or Headwater Fens (H), are likely to store water in the form of snow longer than other landscape features.
- Wetlands with a moderately fluctuating water table, i.e. a water table that is more consistently near the surface (hydrologic code 2-3, or AMT, DWR, or LBSF), have the opportunity to store additional water in the peat, but have less storage capacity available than a wetland with a highly fluctuating water table.

The assessment resulted in 58% of the wetland area receiving a positive score for water storage.

Water Storage
(40)___Depression (D) (3% wetland area)
(30)___Hydrologic component >3, or Headwater Fen (H), Late Snow Plateau (LSP), Wetland/Upland Complex (WU) (33% wetland area)
(20)___Hydrologic component 2-3 or LBSF or DWR or Abandoned Meander Terrace (AMT) (22% wetland area)
(0) ___None of the above (42% wetland area)

Transmitting Discharge

Wetlands that transmit discharge are those with water essentially passing through the wetland. Water leaving the wetland through outflow comes from the inflows of precipitation, surface flow, and subsurface flow. Wetlands with consistent open water at their surface tend to transmit discharge. A second type of discharge function, contributing discharge, occurs where the outflows are from storage within the wetland, as well as the inflows of precipitation, surface and subsurface flow. In this assessment, wetlands meeting one of 3 general conditions were given a positive score for transmitting discharge.

- Riverine (R) wetlands generally store water for only short periods of time and the water moving through the riverine wetlands is typically from the inflow upstream.
- Open water wetlands (hydrologic component = 1) that are not isolated (D) receive their water from groundwater. In these wetlands, outflows are likely from the inflows of precipitation, surface flow, and subsurface; not from storage. Drainageways (DW) also receive their water from groundwater. Floating Islands (FI) are a small unique wetland type found on open water wetlands, and are included here with the open water wetlands.
- Non isolated wetlands that have high stable water tables at or near the surface (hydrologic component 1-2, LBSF) transmit discharge, but to a lesser degree than open water wetlands, as there is some capacity for

storage and contributing discharge. Discharge slopes (S) also tend to have a stable water table near the surface.

Indicator of non-function = Isolated wetlands (Depressions). Depressions (D) are not connected to other wetlands or streams and do not transmit discharge. They are omitted from the transmitting recharge function based on this isolation.

The assessment resulted in 61% of the wetland area receiving a positive score for transmitting discharge.

Transmitting Discharge
(40) ___ Riverine (R) wetland or Floating Island (FI) OR wetland has a Hydrologic component =1 AND polygon is NOT a Depression (D) (16% wetland area)
(30) ___ All other Drainageway (DW) wetlands, or LBSF, or Discharge Slope (S), or Hydrologic component 1-2 AND polygon is NOT a Depression (D), (45% wetland area)
(0) ___ None of the above (39% wetland area)

Contributing Discharge

Wetlands that contribute discharge receive inflows from precipitation, surface water and subsurface water, yet the outflow exceeds these inflows, and comes from storage within the wetland. Wetlands that contribute discharge have a more variable water table than those that are simply transmitting discharge. In this assessment, wetlands meeting any of the following 4 conditions were given a positive score for contributing discharge.

- Bogs (LB3, LB63, LB36) receive their water from precipitation only, and therefore any discharge that occurs must come from storage.
- Wetland types located higher in the watershed, Late Snow Plateaus (LSP) and Headwater Fens (H), receive minimal input from groundwater and surface flows. Outflow from these types is likely from storage.
- Wetlands with highly fluctuating water tables (hydrologic code >3) that aren't Depressions (D) probably don't have steady groundwater input, indicating their outflow is from storage.
- Non-isolated wetlands with a moderately fluctuating water table, (hydrologic code 2-3, AMT, or LBSF) perform similarly to those with highly fluctuating water tables, but to a lesser extent.

The assessment resulted in 47% of the wetland area receiving a positive score for contributing discharge.

Indicator of non-function = Isolated wetlands (Depressions). Depressions (D) are not connected to other wetlands or streams and do not transmit discharge. They are omitted from the contributing recharge function based on this isolation.

Contributing Discharge
(40) ___ Bog (LB3, LB63, LB36), Late Snow Plateau (LSP), Abandoned Meander Terrace (AMT), LBSF, Headwater Fen (H), or Hydrologic component >3 AND polygon is NOT a Depression (29% wetland area)
(20) ___ Hydrologic component 2-3 AND polygon is NOT a Depression (18% wetland area)
(0) ___ None of the above (53% wetland area)

Maintaining natural stream flow regime

Wetlands located near streams slow the release of water from rain and snow events, thus helping to maintain the natural stream flow regime. This natural stream flow regime includes the speed and volume of flow, amount and size of sediment transport, and channel characteristics. Wetlands meeting any of the following 4 conditions were given a positive score for maintaining natural stream flow regime.

- Riverine wetlands (R) include the floodplains or braidplains of rivers and streams, as well as the valley bottoms. These wetlands determine the shape of the stream.
- Wetlands adjacent to a Riverine wetland (R) are positioned on the landscape where immediate effects on the stream can occur.
- Wetlands in the upper portion of the watershed, Late Snow Plateaus (LSP) and Headwater Fens (H), can have a significant effect on maintaining base flow in a stream system.
- Wetlands within 50 meters of a Riverine wetland (R) are included to account for wetlands near a river or stream that are separated by upland or by a narrow wetland of another type. Their location on the landscape can have significant effects on buffering stream flow.

The assessment resulted in 64% of the wetland area receiving a positive score for maintaining the natural stream flow regime.

Maintaining Natural Stream Flow Regime
(40) ___ Riverine (R) wetland polygon (16% wetland area)
(30) ___ Late Snow Plateau (LSP) or Headwater Fen (H) or any wetland polygon adjacent to a Riverine (R) wetland polygon (45% wetland area)
(20) ___ Any wetland polygon within 50m of a Riverine (R) wetland polygon (3% wetland area)
(0) ___ None of the above (36% wetland area)

Water Quality

Wetlands maintain water quality by detaining and filtering water. Vegetation slows water flow and organic soils detain and store water. The water quality function includes wetlands that maintain and/or improve water quality, as well as those that are located where they have an increased opportunity to do so. Wetlands that have the opportunity to filter out pollutants and sediments are valuable for improving water quality. In this assessment, wetlands meeting one of 4 general conditions were given a positive score for water quality.

- Riverine (R) wetland polygons and those wetland polygons adjacent to (R) wetland polygons have the potential to maintain water quality in the neighboring stream or river.
- Peatlands have organic soils, which have the potential to detain large volumes of water and release it slowly. Peatlands in the area also tend to be relatively flat, which helps slow runoff.
- Wetlands impacted by human disturbance are located where they have an increased opportunity for their water quality functions to reduce further human-caused water quality impacts. In the wetland mapping, disturbed wetlands are classified in a couple of different ways. Wetlands that are highly disturbed, so much that the original characteristics of the wetland are no longer discernible, are mapped as DISTURB. These wetlands are not given positive scores in the water quality assessment, as they may have lost their ability to maintain water quality. Wetlands that are moderately disturbed (minimum of 10% of the polygon), designated by a (d) after the mapunit, still possess the majority of their natural characteristics, and have the potential to filter out pollutants and sediments in areas with human disturbance.
- Wetland polygons located near roads and trails can improve water quality that may otherwise be impacted by the existing roads or trails.

This assessment resulted in 96% of the wetland area receiving a positive score for maintaining water quality.

Water Quality
(40) ___ Riverine (R) wetland polygon OR adjacent to (R) wetland polygon OR wetland polygon is a peatland (94% wetland area) (NOT Discharge Slope (S) or Late Snow Plateau (LSP), or Wetland/Upland Complex (WU) or DISTURB)
(30) ___ Wetland polygon is disturbed (d) (0.05% wetland area)
(20) ___ Wetland polygon is within 50 feet of a road or trail (2% wetland area)
(0) ___ None of the above (4% wetland area) (mineral soil (S, LSP, WU) wetland polygons that aren't near a road or trail OR DISTURB wetland polygons)

Streambank and Shoreline Stabilization

Wetlands adjacent to streams, lakes, and ponds help stabilize the streambanks and shorelines and protect them from erosion. Vegetation on shorelines holds soil in place, filters sediments and pollutants, and provides wildlife habitat. In this assessment, wetland polygons meeting one of 3 general conditions were given positive scores for streambank and shoreline stabilization.

- Riverine (R) wetland polygons include the stream channel and associated valley bottom. The vegetation in these wetlands protects the streambank from erosion.
- Wetland polygons adjacent to lakes and ponds are important for stabilizing shorelines of those water bodies. Forest- or shrub-dominated wetland polygons, with their extensive root systems, are more effective at shoreline stabilization than those dominated by herbaceous vegetation and were given higher scores.
- Wetland polygons that consist of a combination of open water and vegetated wetland shore perform the function of shoreline stabilization and erosion control to a lesser degree than those polygons that have a higher ratio of vegetated shoreline to open water. This is because part of the wetland polygon is the pond itself, which does not provide erosion control. These wetland polygons were scored accordingly, and are described below as having two or more hydro components, one of which is open water (hydro = 1).

The assessment resulted in 67% of the wetland area receiving a positive score for streambank and shoreline stabilization.

Streambank and Shoreline Stabilization
(40) ___ Riverine (R) wetland polygon OR forest- or shrub- dominated wetland polygon adjacent to open water (57% wetland area)
(30) ___ Wetland polygon with 2 hydro components with the dominant hydro component =1 (e.g. LB12, K13) OR Herbaceous dominated wetland polygon adjacent to open water (Riverine wetland or Lake or D1, D1c, DW1, H1, LB1, K1, K1c) (8% wetland area)
(20) ___ Wetland polygon with > 2 hydro components, one of which is the hydro component =1 (e.g. LB1-3, DW1-5) (2% wetland area)
(0) ___None of the above (33% wetland area)

Recreation

Wetlands that provide public access can be enjoyed for recreation. Recreation includes a wide variety of activities including hiking, photography, fishing, and hunting. Wetlands meeting any one of the following criteria were given positive scores for recreation.

- Wetlands located on public lands designated as recreation, park, habitat, or conservation area are valued for recreation as these land categories maintain natural conditions as well as providing public access.
- Wetlands owned by conservation entities often offer public access and maintain natural conditions.
- Wetlands that are publicly owned in other land classifications offer public access, but may not be naturally maintained or conserved in the near future.

Wetlands do not follow parcel boundaries, and this assessment gave wetland polygons a positive score for recreation even if only part of the wetland is on public land. This does not mean that any wetland with a recreation score can be accessed by the public; portions of the wetland may be on private land. Please check land ownership. This assessment resulted in 58% of the wetland area receiving a positive score for recreation.

Recreation
(40) ___ Wetland is on state land classified as Habitat, Recreation, State Park, or Kenai River Special Management Area
(40) ___ Wetland is classified by KPB as campground, fairground, park, or recreation
(40) ___ Wetland is city-owned with designation of Conservation, Recreation, Park, or Bridge Creek Watershed
(40) ___ Wetland is owned by a conservation entity (42% wetland area scored 40 pts)
(30) ___ Wetland is on state land classified as Disposable Interest, General, Miscellaneous (17% wetland area)
(0) ___ None of the above (42% wetland area)

Education

Wetlands that provide public access near education facilities provide valuable opportunities for learning. Education facilities include schools, visitor centers, libraries, and museums. Opportunities for both formal and informal education about wetlands in these places allow students to experience wetlands in a hands-on environment, and to understand the role of wetlands in the landscape. Wetlands meeting any of the following criteria were given positive scores for education.

- Wetlands that are located on a parcel with an existing education facility have the greatest opportunity to be utilized for education.
- Within 0.2 miles of an existing education facility, wetlands on publicly owned lands designated as recreation, park, habitat, or conservation area are likely to be utilized for education.
- Within 0.2 miles of an existing education facility, wetlands on publicly owned lands designated with land classifications other than those listed above can also be used for education, but may not be naturally maintained or conserved in the near future.

Wetlands do not follow parcel boundaries, and this assessment gave wetland polygons a positive score for education even if only part of the wetland is on public land. This does not mean that any wetland with an education score can be accessed by the public; portions of the wetland may be on private land. Please check land ownership. The assessment resulted in 4% of the wetland area receiving a positive score for education.

Education
(40) ___ Wetland is on parcel of existing education facility (4% wetland area scored 40 points)
(40) ___ Wetland received score of 40 for recreation AND is within 0.2 mile of an existing education facility
(30) ___ Wetland received score of 30 for recreation AND is within 0.2 mile of an existing education facility (0.1% wetland area)
(0) ___ None of the above (96% wetland area)

Dena'ina Culture

The Dena'ina Athabascans are the dominant indigenous culture in the assessment area. They have utilized natural resources in the area, including plants and animals within wetlands, for hundreds of years, and continue to do so. Wetlands meeting any one of the following criteria were given positive scores for Dena'ina culture.

- Wetlands located within 10 miles of a known Dena'ina village site or occupation site would have been considered readily accessible to community members. Dena'ina regularly traveled 10 miles out and back from a settlement in a day.
- Wetlands located within 10 miles of a potential Dena'ina occupation site would have been used the same, but as these sites are only potential sites instead of known sites, these areas were given a lower score.

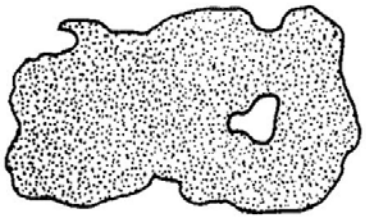
The assessment resulted in 82% of the wetland area receiving a positive score for Dena'ina culture.

Dena'ina Culture
(40) ___Wetland is within 10 miles of a known Dena'ina village site or occupation site (65% wetland area)
(30) ___Wetland is within 10 miles of a potential Dena'ina occupation site (17% wetland area)
(0) ___ None of the above (18% wetland area)

AWAM Figure C
Open Water Types

White areas indicate open water (including floating and submerged plants). Stippled areas indicate emergents, shrubs and trees.

Type 1



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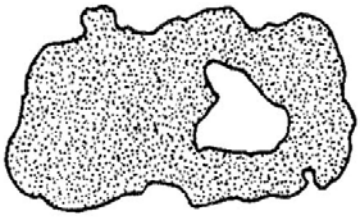

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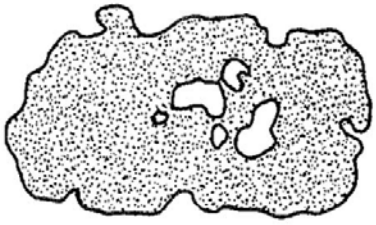

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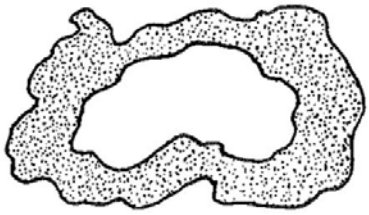

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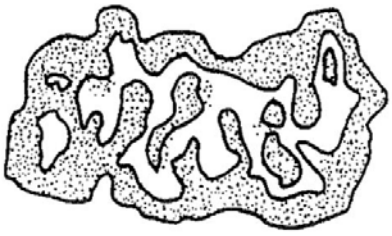
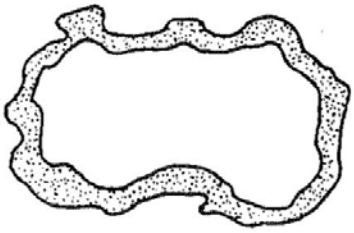


Type 6



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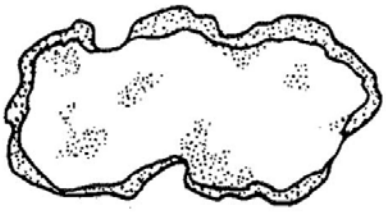
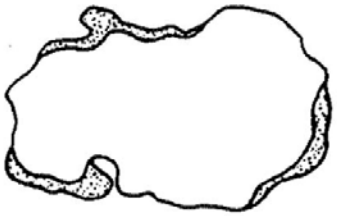


Type 8



Source: Adapted from Golet, 1976

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