Assessing Wetland Functions & Services

Alaska **F**ood Security Act **W**etland **A**nalysis (AFWA)

NRCS Natural Resources Conservation Service

Michelle Schuman
State Resource Ecologist

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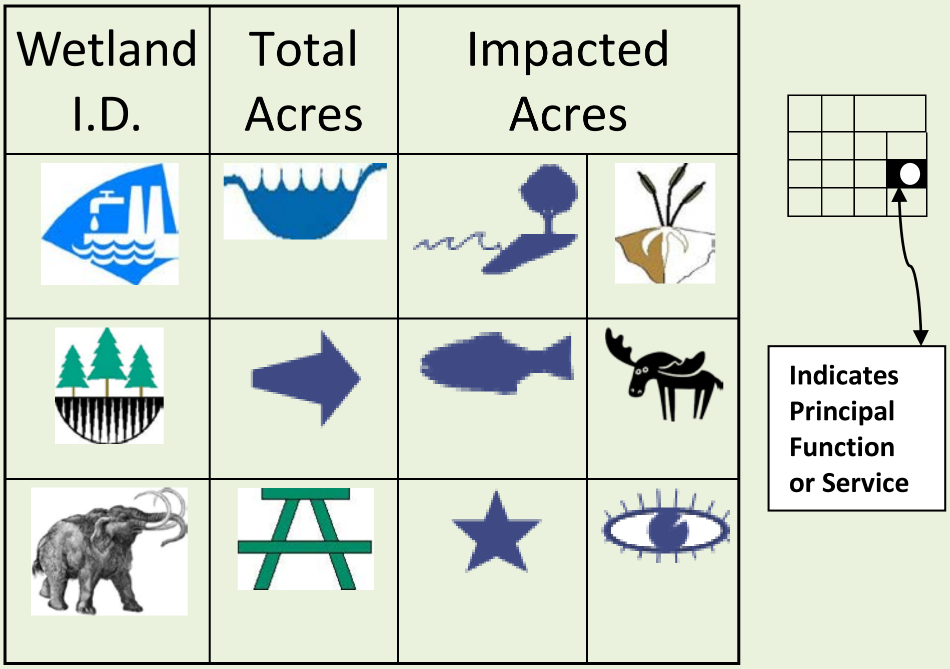
Steve Campbell, Soil Scientist, USDA - Natural Resources Conservation Service, West National Technology Support Center, Portland, Oregon

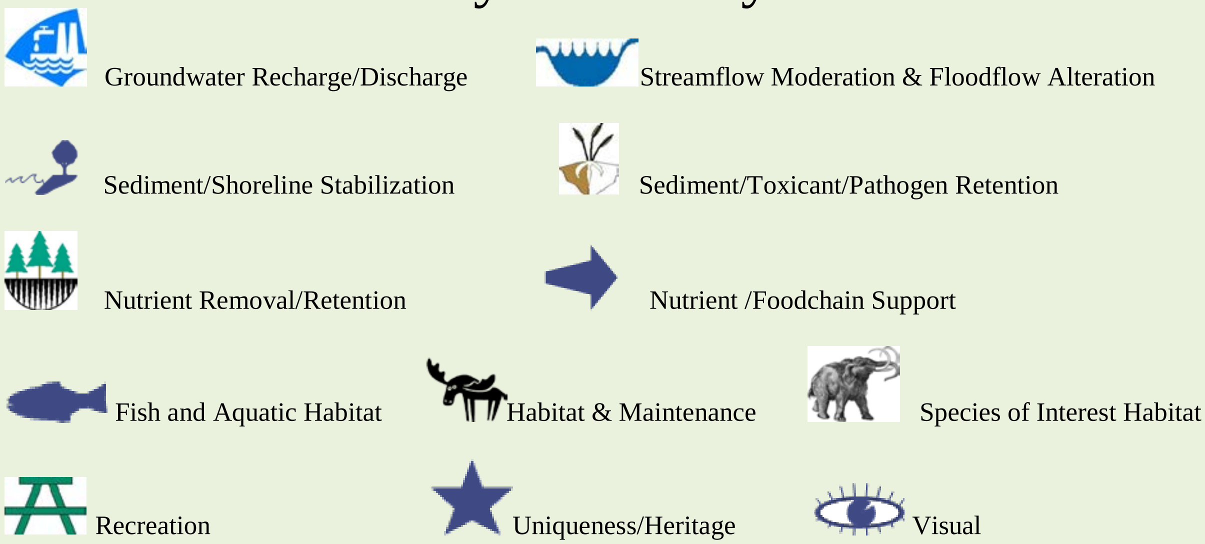
Mike Gracz. PhD Student, Wetland Scientist, Kenai Watershed Forum, Alaska

Richard Weber, Design Engineer, USDA - Natural Resources Conservation Service, Central National Technology Support Center, Fort Worth, Texas

Graphical Representation of Wetland Functions and Services



Symbols Key



This graphical summary of wetland characteristics was developed as a tool to help construct an annotated map of functions and services for project analysis. Based on the findings reported on a data collection form, an icon box is prepared for each wetland being investigated in the project area and adjacent areas.

Contents

.Forested wetland on the Kenai Peninsula

Low scrub shrub tundra wetland in the North

Preface

NRCS has been delegated authority to grant farm bill participants an exemption when the participant converts a wetland through any action that has a minimal effect on either the individual or cumulative wetland functions in an area (See 16 U.S.C.§3822). In addition, NRCS has identified the categorical minimal effect (CME) exemptions on a regional basis [7 CFR 12.31 (d) (e)] and minimal effect exemption (MW) on a local basis. CME’s and MW’s are those actions, identified on a regional or local basis, which are routinely determined to have a minimal effect on wetland functions. A farm bill participant is not exempted from the Clean Water Act (CWA) Section 404 permit requirements or related laws and regulations on the basis of being granted a CME or MW. Therefore, all persons granted a minimal effect exemption will also be provided with the appropriate contact information for the COE representative in order to see evaluation of any proposed activity under CWA Section 404.

In response to this mandate, NRCS in Alaska developed procedures in 1994 for conducting minimal effects and mitigation determinations using the Hydrogeomorphic (HGM) Models. The Alaska Food Security Act Wetland Analysis (AFWA) booklet provides guidance for an alternative assessment to HGM for NRCS. AFWA incorporates the concept of HGM classes to categorize wetlands by their important attributes or characteristics as well as incorporating a "descriptive approach" which can be used for any project where the characterization of wetland resources is necessary for a FSA minimal effect or mitigation requirement. AFWA also uses a “scoring” system to differentiate between wetlands based on their sensitivity to disturbance, their significance, their rarity, the ability to replace them, and the functions they provide.

AFWA adapts portions of already developed assessment procedures (i.e. The Supplement to the Highway Methodology Workbook, New England District, Corps of Engineers Regulatory Branch in 1993, a scoring system similar to the Washington State Wetland Rating System, 2006, the Matanuska Susitna Borough Wetlands Functional Assessment Team in 2011, and HGM, 1994).

Definition of a wetland...

Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Introduction

The Food Security Act (FSA) of 1985 contained a Minimal Effect Exemption (MW) provision whereby an agricultural operator could request a determination that a proposed conversion of a wetland would have a minimal effect on the hydrological and biological functions and services of the wetland. The 1996 Farm Bill reemphasized the use of the minimal effects exemption and provided additional opportunities for farm bill participants to convert low service wetlands where the activity would have a minimal effect or they can mitigate wetland losses through restoration, enhancement or creation. The purpose of these provisions, as stated by Congress, was to increase USDA's ability to meet the objectives of the wetland conservation provisions in a more flexible manner.

In response to this mandate, NRCS in Alaska developed procedures for conducting Minimal Effects and Mitigation determinations for wetland conversions in relation to USDA program eligibility. In accordance with the Interim Final Rule (7CFR Part 12) NRCS decisions concerning these provisions would be based upon the results of a wetland functional assessment using approved Hydrogeomorphic (HGM) Wetland Assessment Models or alternative assessment models until the HGM Models were available. In 1997, through a collaborative effort three HGM models were developed: 1) Slope/Flat Wetland Complexes in the Cook Inlet Basin, 2) Precipitation-Driven Wetlands on Discontinuous Permafrost in Interior Alaska, and 3) Riverine and Slope River wetlands in Coastal Southeast & Southcentral Alaska. In addition a generic method was developed for HGM subclasses where an HGM model was not available. However, as the need for farm bill participation increased the usability of HGM for predicting the functions and services for FSA wetlands statewide decreased. For this reason, NRCS in Alaska has developed a methodology that utilizes the fundamentals of HGM (class, subclass and scores) but also includes a qualitative description of the physical characteristics of the wetlands, and incorporates a visual, geospatial representation of functions and services (i.e., ecological services).

Visualizing geographical relationships between all resources is crucial to making decisions that are sensitive to natural and human resources including, but not limited to, the protection of wetlands. In utilizing the best of both methods NRCS can efficiently assess wetland functions and services for the purpose of FSA throughout Alaska; utilize and incorporate GIS layers that are part of the conservation planning process; and provide the farm bill program *participant* with a product that is understandable. Educating our landowners on how and why they need to protect wetlands while promoting agricultural sustainability is the mission of NRCS: *helping people help the land.*

What are wetland functions and services?

Ecological functions of healthy wetland ecosystems which serve all living organisms through purification of water, maintenance of biodiversity, decomposition of wastes, soil and vegetation renewal, and groundwater recharge form a very important part of any management decision. Functions are self-sustaining properties of a wetland ecosystem that exist in the absence of society. Functions result from both living and non-living components of a specific wetland. These include all processes necessary for the self-maintenance of the wetland ecosystem such as primary production and nutrient cycling. Therefore, functions relate to the ecological significance of wetland properties without regard to subjective human services. To measure the effects of agricultural activities, functional assessments are conducted for a proposed alteration of the wetland before it occurs and then estimated based on assumed effects of the projected activity after the alteration. The difference between these two levels of performance is the loss in functioning due to the impact. Alternatively, if a degraded wetland is to be restored, functional assessment allows an estimate of increases in functioning by comparing the change in functional performance before and after the restoration activity.

For example, a wetland that has slowly moving water performs the function of retaining sediments and toxicants. That is, the physical characteristic of a wetland that causes surface water to move slowly serves to let suspended particulates settle out of that water. This function traps sediments carried to it in runoff from uplands or upstream areas and clarifies the water. Identification of that function helps evaluate (1) whether the impacts of a project may impair that function and (2) whether such impacts are permissible under the FSA or the CWA.

Moose foraging

Services or *values* are benefits derived from either one or more functions or the physical characteristics associated with a wetland. Most wetlands have corresponding societal service. The service of a particular wetland function, or combination thereof, is based on human judgment of the worth, merit, quality, or importance attributed to those functions. For example, a particular wetland might be considered valuable because it is known to store flood waters up gradient or adjacent to a developed area. That function is valuable to society because it lessens the destructive severity of flood events. Another wetland might be important because its combination of diverse wildlife habitat and picturesque setting offers various recreational and educational opportunities.

Understanding wetlands and the importance they provide for wildlife and the food chain can be achieved through education

It is NRCS's intent to describe a process that results in continued protection of wetland functions that have direct societal services or related resources that society recognizes as significant. The National Food Security Act Manuals (NFSAM) describes a process to identify thresholds of wetland functional ratings to determine minimal effect or mitigation. The concept is that, if wetland functions are already impaired, additional impacts or impairments may only be minimal. This logic applies to two basic scenarios; where the functions are currently operating well, and the planned activity would have only a slight or minimal effect on those functions; or where the functions have already been degraded to such a low level that it would have a minimal effect on wetland services if the wetlands were totally converted to nonwetlands.

To assure that the procedure is applied properly, some initial questions need to be considered: 1) Does the site have soils suitable for agriculture? 2) Is wetness the only limitation? 3) Is it physically and economically feasible to convert this site to agricultural use? It is only after these questions are addressed that the Food Security Act (FSA) Minimal Effects/Mitigation procedure will be used to identify wetland functions; services of those functions; and the relative importance of having those services present on the landscape. Most wetland conversion in Alaska will result in negative responses. Only those sites where a landowner can answer yes to the initial questions should this procedure be used by the planner to arrive at the answers relative to wetland services.

The proximity of development may alter wetland functions and services. Therefore, evaluation of the resource must consider not only the wetland, but also adjacent land use and associated interrelationships.

How to assess functions and services?

The functions that a wetland performs are characterized by answering a series of questions or criteria that address the presence or absence of certain indicators. Indicators are observed characteristics that are assigned a quantitative or qualitative observation of a function (Hruby et al. 2000). Most indicators are fixed characteristics that describe the structure of the ecosystem or its physical, chemical, and geologic properties (Brinson 1995). They reflect the capacity and opportunity that a wetland has to perform a particular function(s). First, the criteria are grouped by the hydrogeomorphic class of the wetland that is being “scored” and second, by the three major functions that a wetland performs (hydrologic, biogeochemical or water quality, and wildlife habitat). The three groups of functions are given *approximately equal importance in setting the category* for a wetland.

The indicators only represent structural characteristics of a wetland and its landscape. They do not measure “rates” at which a function is performed. For example, we do not measure the amount a wetland can trap sediments, toxicants, or pathogens (that would require monitoring for several years at different times). However, we can score the structural characteristics of a wetland through the use of “indicators” as to the “**potential**” for a wetland to perform a function. The type of questions asked “Does the wetland have the necessary characteristics present to perform the function?” “Does the wetland have the vegetation present to trap sediments and is the soil capable to bind or remove toxicants?” (Refer to Appendix A).

A "descriptive approach" to describe wetland functions and services (i.e., values) incorporates both wetland science and human judgment. Intermixing science with value judgments in this way, while difficult, has proven to be both effective (only because we have nothing else to compare it to) and acceptable. The evaluator first determines if a wetland is suitable for particular functions and services and why, followed by a determination of what functions and services are principal and why. Functions and services can be principal if they are an important physical component of a wetland ecosystem (function only) and/or are considered of special service to society from a local, regional, and/or national perspective. However, the starting point for understanding the functions of a particular wetland depends on the type or classification of the wetland, the condition of that wetland, and where the wetland occurs relative to other ecosystems in the landscape.

The three groups of functions; biogeochemical, hydrologic, and wildlife habitat, are given *approximately* equal importance (one functional group is not weighted differently than another functional group) when assigning scores for the function. The biogechemical functions (i.e., improving water quality through nutrient and sediment removal and retention and providing nutrient support and carbon export) and the hydrologic functions (i.e., addressing water quantity through groundwater recharge and discharge, stream flow moderation and flood flow alteration, and shoreline stabilization) each have a maximum score of 20 points. The habitat functions (i.e., providing fish and/or wildlife habitat) has a maximum score of 24 points. The combined score for the three groups of *functions* is 64 points (20 + 20+24). Wetland *services* are each given 2 points and are added to the functions score. The maximum points for services are 8 points. A total score of *functions and services* is 72 points.

Wetland Categories

Wetland types in Alaska differ widely in functions and services. Some wetland types such as Palustrine Shrub Scrub are common in the interior while others such as estuarine intertidal are limited. All wetlands provide some functions that are of value, whether ecological, economic, recreational or aesthetic. One of the most time and cost-effective methods to assess functions and services of wetlands is to categorize wetlands by their important attributes or characteristics. Scores can then be assigned to wetland types based on their sensitivity to disturbance, their significance, their rarity, "our" ability to replace them, and the functions they provide.

CATEGORY I

Category I wetlands are those that 1) represent a unique or rare wetland type; or 2) are more sensitive to disturbance than most wetlands. We cannot afford the risk of any degradation to these wetlands because their functions and values are too difficult to replace. Category I wetlands include wetlands that are listed under Special Characteristics (Appendix B). These include "*Red Flag*" wetlands that were designated in 1994 by the State Technical Committee. Category I wetlands do not qualify for a minimal effects decision.

Estuarine Wetlands – Non-disturbed Estuarine wetlands are Category I wetlands because they are relatively rare and/or limited and provide unique natural resources that are considered to be valuable to society. These wetlands need a high level of protection to maintain their functions and the values society derives from them. Furthermore, the questions used to characterize how well a freshwater wetland functions cannot be used for estuarine wetlands. Estuaries, the areas where freshwater and salt water mix, are among the most highly productive and complex ecosystems where tremendous quantities of sediments, nutrients and organic matter are exchanged between terrestrial, freshwater and marine communities. This availability of resources benefits an enormous variety of plants and animals. Fish, shellfish, birds and plants are the most visible. However, there is also a huge variety of other life forms in an estuarine wetland: for example, many kinds of diatoms, algae and invertebrates are found there. Estuarine systems have substantial economic value as well as environmental value. They have a high fish and wildlife density and species richness, important breeding habitat, important fish and wildlife seasonal ranges and movement corridors, limited availability, and high vulnerability to alteration of their habitat. Alaska estuaries have historically been impacted by development but are one of the most important ecosystems for subsistence lifestyles.

Bogs - Bogs are Category I wetlands because they are sensitive to disturbance and impossible to re-create through compensatory mitigation. Bogs are generally found on flat areas where precipitation is the dominant source of water, and therefore are classified as FLATS, Organic under the HGM classification. Soils are nutrient poor, acidic, and are organic. The chemistry of bogs is such that changes to the water regime or water quality of the wetland can easily alter its ecosystem. The plants and animals that grow in bogs are specifically adapted to such conditions and do not tolerate changes well. Immediate changes in the composition of the plant community often occur after the water regime changes. Sphagnum species become prevalent in bog systems associated with an increasing deficiency of nutrients reflective of a precipitation driven rather than a ground water driven system. Minor changes in the water regime or nutrient levels in these systems can have major adverse impacts on the plant and animal communities (e.g. Grigal and Brooks, 1997). In addition to being sensitive to disturbance, bogs are not easy to re-create through compensatory mitigation. Researchers in northern Europe and Canada have found that restoring bogs is difficult, specifically in regard to plant communities (Bolscher 1995, Grosvermier et al. 1995, Schouwenaars 1995, Schrautzer et al. 1996), water regime (Grootjans and van Diggelen 1995, Schouwenaars 1995) and/or water chemistry (Wind-Mulder and Vitt 2000). In fact, restoration may be impossible because of changes to the biotic and abiotic properties preclude the re-establishment of bogs (Shouwenaars 1995, Schrautzer et al. 1996). Nutrient poor wetlands, such as bogs, have a higher species richness and diversity of species than nutrient rich fens (review in Adamus and Brandt 1990). They are, therefore, more important than would be accounted for using a simple assessment of wetland functions (Moore et al. 1989).

Fens – Fens are Category I wetlands because they are important for filtering sediments and moderating streamflow and other substances. Fens are portals into the same groundwater from which many household wells obtain their supply. They are very important for groundwater recharge and discharge. Fens are typically classified as SLOPE wetlands under HGM. or the purpose of this document, fens are nutrient rich "**open systems**" but with time can become nutrient poor as peat accumulates, transitioning to closed nutrient poor "bogs". Like bogs, they are difficult to re-create and restore.

Unique & Natural Heritage Wetlands – Wetlands that support Federal and State listed threatened or endangered plants are Category I wetlands. The presence of rare plants in a wetland indicates unique habitats that might otherwise not be identified through a wetland determination process. Rare plant populations are also sensitive to disturbance, particularly activities that result in the spread of invasive species. These also include wetlands with state or federal listed historical or archeological sites or potential sites; wetlands adjacent to (within ¼ mile) and hydrologically connected to surface waters known to contain aquatic species of local/state concerns; wetlands within a local or state protection area; wetlands protected under American Indian Religious Freedom Act; wetlands under the Wild and Scenic Rivers Act; and special aquatic sites.

Wetlands That Perform Many Functions Very Well - Wetlands scoring 58 points or more (out of 72) (functioning at 80% to 100%) on the questions related to functions are Category I wetlands. Not all wetlands function equally well, especially across the suite of functions performed. The questions and criteria were developed to provide a method by which wetlands can be categorized based on their relative performance of different functions. Wetlands scoring 58 points or more were judged to have the highest levels of function. Wetlands that provide high levels of all three types of functions (improving water quality, hydrologic functions, and habitat) are considered relatively rare.

CATEGORY II

Category II wetlands are difficult, though not impossible, to replace, and provide high levels of some functions. These wetlands occur more commonly than Category I wetlands, but still need a relatively high level of protection. Category II wetlands include wetlands that are listed under "special characteristics". These include *"Yellow Flag"* wetlands that were designated in 1994 by the State Technical Committee. These wetlands do not meet a minimal effects threshold but are candidates for mitigation.

Estuarine Wetlands - Any estuarine wetland that are disturbed are category II wetlands. Although disturbed, these wetlands still provide unique natural resources that are considered to be valuable to society. Furthermore, the questions used to characterize how well a wetland functions cannot be used for estuarine wetlands.

Interdunal Wetlands - Interdunal wetlands that are greater than or equal to 1 acre are Category II because they provide critical habitat in this ecosystem (Wiedemann 1984). This resource is important but constitutes only a small part of the total dune system (Wiedemann 1984). Interdunal wetlands form in the deflation plains and swales that are geomorphic features in areas of coastal dunes. These dunes form as a result of the interaction between sand, wind, water and plants. The dune system immediately behind the ocean beach (the primary dune system) is very dynamic and can change from storm to storm (Wiedemann 1984).

Wetlands That Perform Functions Well - Wetlands scoring between 36 - 57 points (out of 72) (functioning 50% to 79%) on the questions related to the functions present are Category II wetlands. Wetlands scoring 36-57 points were judged to perform most functions relatively well, or performed one group of functions very well and the other two moderately well.

CATEGORY III

Category III wetlands are 1) wetlands with a moderate level of function (scores between 15 - 35 points) (functioning at less than 50%) and 2) interdunal wetlands between 0.1 and less than 1 acre in size. Wetlands scoring between 15 - 36 points generally have been disturbed in some ways, and are often less diverse or more isolated from other natural resources in the landscape than Category II wetlands. These wetlands would meet the minimal effects threshold. They may be candidates for mitigation and in some cases, may need to be protected due to their uniqueness in the area of question.

CATEGORY IV

Category IV wetlands have the lowest levels of functions (scores less than 15 points) and are often heavily disturbed. These are wetlands that could be replaced, and in some cases, a function may be improved. These wetlands may provide some important functions, and depending on their uniqueness “in the area of question” may also need to be protected. These wetlands would meet the minimal effects threshold.

Classifying Wetland Vegetation

There are several questions on the data sheet that ask you to classify the vegetation found within the wetland into different types. This should not be confused with the classifying the wetland itself (e.g., HGM classification). The classification of vegetation used for the scoring system is mostly (with some exceptions noted in the field form) based on the Cowardin classification (used in NWI). Cowardin vegetation types are distinguished by the uppermost layer of vegetation (forest, shrub, etc.) that provides more than 30% surface cover within the area of its distribution. If the total cover of vegetation is less than 30% the area does not have a vegetation type. It should be identified as open water or sand/mud flat.

A **forested area** is one where the canopy woody vegetation over 20 ft. (6 m) tall (such as cottonwood, aspen, cedar, etc.) covers at least 30% of the ground. Trees need to be partially rooted in the wetland in order to be counted towards the estimates of cover. Some small wetlands may have a canopy but the trees are not rooted within the wetland. In this case the wetland does not have a forested class.

A **shrubby area** (scrub/shrub) in a wetland is one where woody vegetation less than 20 ft. (6 m) tall is the top layer of vegetation. To qualify, the shrub vegetation must provide at least 30% cover and be the uppermost layer. Examples of common shrubs in Alaskan wetlands include sweetgale, alder, willows, bog birch, dwarf birch, bog rosemary and Labrador tea.

An area of **emergent plants** (herbaceous) in a wetland is one covered by erect, rooted herbaceous plants excluding mosses and lichens. These plants have stalks that will support the plant vertically in the absence of surface water during the growing season. This vegetation is present for most of the growing season in most years. To count, the emergent vegetation must provide at least 30% cover of the ground and be the upper-most layer. Herbaceous plants are defined as seed-producing species that do not develop persistent woody tissue (stems and branches). Most species die back at the end of the growing season. Bulrushes and sedges are good examples of plants in the "emergent" plant type.

NOTE: *It should be noted that the vegetation "strata" are classified differently in the Alaska Regional Supplement (p. 10) for the tree and shrub strata. To maintain consistency between information collected during the wetland determination, a forested area will consist of woody plants 3 inches or more in FBH regardless of height. The sapling/shrub stratum will consist of woody plants less than 3 inches in FBH, regardless of height. The idea is to maintain consistency for purposes of vegetation classification*.

An area of aquatic bed plants is any area where rooted aquatic plants such as lily pads, pondweed, etc. cover more than 30% of the pond bottom. These plants grow principally on or below the surface of the water for most of the growing season in most years. This is in contrast to the emergent plants described above that have stems and leaves that extend above the water most of the time. Aquatic bed plants are found only in areas where there is seasonal or permanent ponding or inundation. *Lemna sp.* (duckweed) is not considered an aquatic bed species because it is not rooted. Aquatic bed vegetation does not always reach the surface and care must be taken to look into the water. Sometimes it is difficult to determine if a plant found in the water is aquatic bed or emergent. A simple criterion to separate emergent and aquatic bed plants most of the time is--If the stalk will support the plant vertically in the absence of water, it is emergent. If, however, the stalk is not strong enough to support the plant when water is removed, it is aquatic bed. Examples of how different areas might be classified are given below.

1. *An area (polygon) of trees within the wetland boundary having a 50% cover of trees and with an understory of shrubs that have a 60% cover would be classified as a forest. The trees are the highest layer of vegetation and meet the minimum requirement of 30% cover.*
2. *An area with 20% cover of trees overlying a shrub layer with 60% cover would be classified as a shrub. The trees do not meet the requirement for minimum cover.*
3. *An area where trees or shrubs each cover less than 30%, but together have a cover greater than 30% is classified as shrub.*
4. *When trees and shrubs together cover less than 30% of an area, the zone is assigned to the dominant plant type below the shrub (e.g. emergent, aquatic bed, mosses and lichens) if these have greater than 30% cover.*

In evaluating vegetation types, you are asked to characterize the vegetation types in terms of how much area within the wetland is covered by a type. The thresholds for scoring differ among the questions so use caution in filling out the rating form. Vegetation is also characterized by "strata" (i.e., horizontal layers of vegetation) and "structure" (i.e., vegetation life form). For the purposes of AFWA, these two terms will refer to the following:

1. Aquatic Bed: *plants that grow on or below the surface of the water*
2. Moss-Lichen: *mosses or lichens*
3. Emergent: *herbaceous angiosperms*
4. Scrub-Shrub: *shrubs or small trees*
5. Forested: *large trees*

In addition, the scrub-shrub strata can also be grouped based on height:

a. prostrate: less than or equal to 8 inches
b. low-medium: greater than 8 to 10 feet
c. tall: greater than 10 feet

For more information check out the Alaska Vegetation Classification reference at the following link on the Ecological Sciences Share Point Site:

..\References\The Alaska Vegetation Classification.pdf

Hydrogeomorphic “HGM” Classification

Hydrogeomorphic classification of a wetland is based upon its position in the landscape or geomorphic setting, dominant source of water, and hydrodynamics of the water. The purpose behind HGM is to compare similar wetlands and ecological processes within those wetlands. A wetland on a slope will function differently than a wetland in a depression. This becomes important when managers and planners start to address “wetland loss” and “mitigation for wetland loss”. Functions and services of a particular wetland class are more similar to each other than functions and services of wetlands within a different wetland class. For more information on HGM refer to the operation draft guidebooks for Alaska (Brinson, M. 1995. The HGM approach explained. National Wetlands Newsletter 17(6): 7-13.; Brinson, M. 1996. Assessing Wetland Functions Using HGM. National Wetlands Newsletter 18(1): 10-16.) (NRCS Reference List: Slope/Flat Wetland Complexes, Lower Kenai January 2002; Precipitation-Driven Wetlands on Discontinuous Permafrost, Interior Alaska 1999; Riverine and Slope River Wetlands, Coastal Southeast, 2007).

Not *all* HGM classes will provide *all* functions. For example, the hydrological function, “sediment and shoreline stabilization” generally, is not considered a principle function for the “Slope HGM class”. There may be exceptions to this, especially if a slope wetland is adjacent to a low sinuosity stream channel (Rosgen, D., and Silvey, H.L. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs). This function is a principle function for the “Riverine, Estuarine- and Lake-fringe” HGM class. However, not all wetlands, even within the same HGM class, will function exactly the same. This could be the result of different disturbance regimes, succession, adjacent land use impacts, localized weather or a variety of abiotic and biotic influences. For this reason, the evaluator may need to assess functions or services not listed. In those cases, they are encouraged to describe the function and adjust the scoring accordingly. AFWA is considered to be a dynamic document.

There is also an “ecotonal” or gradation from one HGM class to another. For example, the HGM class “Estuarine Tidal Fringe” wetlands occur along coasts and estuaries and are under the influence of sea level. They intergrade landward with riverine wetlands where tidal current diminishes and river flow becomes the dominant water source. Additional water sources may be groundwater discharge and precipitation. The interface between the estuarine tidal fringe and riverine freshwater tidal fringe classes is **where bidirectional flows from tides dominate over unidirectional flow controlled by floodplain slope of riverine wetlands.** Because tidal fringe wetlands frequently flood and water table elevations are controlled mainly by sea surface elevation, tidal fringe wetlands seldom dry for significant periods. Estuarine tidal fringe wetlands lose water by tidal exchange, by overland flow on impervious areas (e.g., urban areas) or interflow (shallow unconfined groundwater)to tidal creek channels, and by evapotranspiration. Organic matter normally accumulates in higher elevation marsh areas where flooding is less frequent and the wetlands are isolated from shoreline wave erosion by intervening areas of low marsh. *Triglochin maritimum* salt marshes are a common example of estuarine tidal fringe wetlands. For the purpose of this document, indicators of an estuarine fringe wetland includes wetlands that are less than 2 meters deep (not considered a deep water wetland), are vegetated and dominated by salt loving vegetation (i.e., halophytic plants such as *Lyngbyai* sedge, *Distichlis* species, *Plantago maritime*), salinity is “generally” greater than 5 ppt, are mapped on NWI as “Estuarine”, are low energy systems, and the dominant flow is by tides. Riverine (freshwater tidal) wetlands have a salinity less than 5 ppt (i.e., freshwater) but could be difficult to distinguish from the Estuarine Tidal Fringe class.

The “slope” and “flat” HGM classes are many times difficult to tease apart. They occur on the same landforms and have similar soils and vegetation. The major difference between the two classes is the source or input of water. Slope wetlands predominantly receive water from groundwater. Flat wetlands predominantly receive water from precipitation. However, there is also a hydrodynamic grade between these classes that is dependent on disturbance, natural succession, climate and weather, and where the wetland is located on the landscape (adjacency).

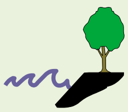
A key to the HGM classes is available on the Alaska Share Point site and in Appendix C. It is also important to note that sometimes it is hard to determine if the wetland meets the criteria for a specific class. There may be characteristics of several different hydrogeomorphic classes within one wetland boundary. For example, seeps at the base of a slope often grade into a riverine or a small stream within a depressional wetland with a zone of flooding along its sides that could be classified as a riverine wetland. For the purposes of AFWA, the “depression” HGM class is not identified as a stand along class. Depressions can occur on any landform and at any scale (i.e., size). If there is a wetland with characteristics of several HGM classes present within the wetland boundaries the general guidance is to use the HGM that reflects the dominant hydrological component in the sampling unit. A brief description of the seven HGM classes of wetlands can be found in the table below and also in the National Engineering Handbook, Chapter 13, “Wetland Construction and Restoration”. The handbook is located in the Restoration List on the Alaska Ecological Sciences Share Point Site at the following link:

Ecological Sciences > Wetlands & HEL > Restoration

CLASSIFICATION	DEFINITION
Riverine (& Freshwater Tidal Fringe)	Riverine waters/wetlands occur in floodplains and riparian corridors in association with stream channels. Dominant water sources are overbank flow from the channel or subsurface hydraulic connections between the stream channel and waters/wetlands. Additional water sources may include groundwater discharge from surficial aquifers, overland flow from adjacent uplands and tributaries and precipitation. Riverine waters/wetlands lose surface water by flow returning to the channel after flooding and saturation flow to the channel during precipitation events. They lose subsurface water by discharge to the channel, movement to deeper groundwater, and evapotranspiration.
Depressional	Depressional waters/wetlands occur in topographic depressions on a variety of geomorphic surfaces. Dominant water sources are precipitation, groundwater discharge, and surface flow and interflow from adjacent uplands. The direction of flow is normally from surrounding non-wetland areas toward the center of the depression. Elevation contours are closed, allowing for the accumulation of surface water. Depressional waters/wetlands may have any combination of inlets and outlets or lack them completely. Dominant hydrodynamics are vertical fluctuations, primarily seasonal. Depressional waters/wetlands lose water through intermittent or perennial drainage from an outlet, evapotranspiration, or contribution to groundwater.
Slope	Slope waters/wetlands normally occur where there is a discharge of groundwater to the land surface. They usually exist on sloping land surfaces; from steep hillslopes to nearly level terrain. Slope waters/wetlands are usually incapable of depressional storage. Principal water sources are groundwater return flow and interflow from surrounding non-waters/wetlands as well as precipitation. Hydrodynamics are dominated by downslope unidirectional flow. Slope waters/wetlands can occur in nearly level landscapes if groundwater discharge is a dominant source to the waters/wetland surface. Slope waters/wetlands lose water by saturation subsurface and surface flows and by evapotranspiration. Channels may develop but serve only to convey water away from the waters/wetland.
Mineral Soil Flats	Mineral soil flats are most common on interfluves, extensive relic lake bottoms, or large floodplain terraces where the main source of water is precipitation. They receive virtually no groundwater discharge, which distinguishes them from depressions and slopes. Dominant hydrodynamics are vertical fluctuations. They lose water by evapotranspiration, saturation overland flow, and seepage to underlying groundwater. They are distinguished from flat upland areas by their poor vertical drainage and low lateral drainage.
Organic Soil Flats	Organic soil flats, or extensive peatlands, differ from mineral soil flats, in part, because their elevation and topography are controlled by vertical accretion of organic matter. They occur commonly on flat interfluves, but may also be located where depressions have become filled with peat to form a relatively large flat surface. Organic flats often expand beyond the areas where they started to form (usually depressions) to adjacent areas that were non-wetland or mineral soil flats. Water source is dominated by precipitation, while water loss is by saturation overland flow and seepage to underlying ground water. Raised bogs share many of these characteristics, but may be considered a separate class because of their convex upward form and distinct edaphic conditions for plants.
Estuarine Fringe (Tidal Fringe)	Tidal fringe waters/wetlands occur along coasts and estuaries and are under the influence of sea level. They usually intergrade landward with riverine or slope waters/wetlands where tidal currents diminish and other sources of water (e.g. river flow; groundwater discharge) dominate. Tidal fringe waters/wetlands seldom dry for significant periods. They lose water by tidal exchange, by saturation overland flow to tidal creek channels, and by evapotranspiration. Organic matter normally accumulates in higher elevation marsh areas where flooding is less frequent and are isolated from shoreline wave erosion by intervening areas of low marsh.
Lacustrine Fringe (Lake Fringe)	Lacustrine fringe waters/wetlands occur adjacent to lakes where the water elevation of the lake maintains the water table in the water/wetland. In some cases, they consist of a floating mat attached to land. Additional sources of water are precipitation and groundwater discharge. Surface flow in bi-directional, usually controlled by water level fluctuations such as seiches in the adjoining lake. Lacustrine fringe waters/wetlands are indistinguishable from depressional waters/wetlands where the size of the lake becomes so small relative to fringe waters/wetlands that the lake is incapable of stabilizing water tables. Lacustrine waters/wetlands lose water by flow returning to the lake after flooding, by saturation surface flow, and by evapotranspiration. Organic matter normally accumulates in areas sufficiently protected from shoreline wave erosion.

What wetland functions and services are considered by NRCS in the FSA process?

In Alaska, eight wetland functions and four wetland services that are *potentially* associated with agricultural development are listed below. Services are grouped together at the end of the list. These are not necessarily the only wetland functions and services possible, nor are they so precisely defined as to be unalterable. However, they do represent the best working "palette" of descriptors which can be used to paint an objective representation of the wetland resources associated with a proposed project.



SEDIMENT/SHORELINE STABILIZATION — **Hydrology** function relates to the effectiveness of a wetland to stabilize stream banks and shorelines against erosion; energy dissipation.

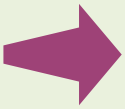
GROUNDWATER RECHARGE/DISCHARGE — **Hydrology** function considers the potential for a wetland to serve as a groundwater recharge and/or discharge area. Recharge should relate to the potential for the wetland to contribute water to an aquifer. Discharge should relate to the potential for the wetland to serve as an area where groundwater can be discharged to the surface.

STREAMFLOW MODERATION/FLOODFLOW ALTERATION— **Hydrology** function considers the effectiveness of the wetland in reducing flood damage by attenuation of floodwaters for prolonged periods following precipitation events. Floodflow Alteration plays a key role in regulating the flow of water in a watershed. Floodwater storage is important in developed areas with a large portion of the watershed impacted with impervious structures.

SEDIMENT/TOXICANT/RETENTION — **Biogeochemical** function reduces or prevents degradation of water quality. It relates to the effectiveness of the wetland as a trap for sediments, toxicants, or pathogens.

NUTRIENT REMOVAL/RETENTION/TRANSFORMATION — **Biogeochemical** function relates to the effectiveness of the wetland to prevent adverse effects of excess nutrients entering aquifers or surface waters such as ponds, lakes, streams, rivers, or estuaries; soil health and integrity; nutrient cycling.

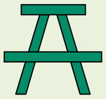
NUTRIENT/FOOD CHAIN SUPPORT — **Biogeochemical** function relates to the effectiveness of the wetland to produce food or usable products for humans or other living organisms; organic carbon export.



FISH AND AQUATIC — **Habitat** function considers the effectiveness of seasonal or permanent water bodies associated with the wetland in question for fish and shellfish habitat.

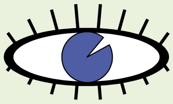
WILDLIFE HABITAT — **Habitat** function considers the effectiveness of the wetland to provide habitat for various types and populations of animals typically associated with wetlands and the wetland edge. Both resident and/or migrating species must be considered. Species lists of observed and potential animals should be included in the wetland assessment report.

RECREATION (Consumptive and Non-Consumptive) — **Service** considers the effectiveness of the wetland and associated water- courses to provide recreational opportunities such as canoeing, boating, fishing, hunting, and other active or passive recreational activities. Consumptive activities consume or diminish the plants, animals, or other resources that are intrinsic to the wetland, whereas non-consumptive activities do not.



UNIQUENESS/HERITAGE/SUBSISTENCE — **Service** relates to the effectiveness of the wetland or its associated water bodies to produce certain special services. Special services may include such things as archaeological sites, unusual aesthetic quality, historical events, or unique plants, animals, or geologic features. Permafrost wetlands may be included in their capacity to act as carbon sinks. Climate change in the northern latitudes is resulting in the potential loss of permafrost causing an increase in carbon dioxide and greenhouse gases.

VISUAL QUALITY/AESTHETICS — **Service** relates to the visual and aesthetic qualities of the wetland.



SENSITIVE SPECIES HABITAT — **Service** relates to the effectiveness of the wetland or associated water bodies to support threatened or endangered species.

How are wetlands assessed under the FSA Program?

An assessment of wetland functions and services are used by the NRCS to:

- Determine pre and post wetland functions and services and impact of conversion activities on those functions and services
- Avoid and minimize project impacts
- Determine significance of impacts for MED
- Weigh environmental impacts against project benefits and
- Design and monitor mitigation

Additional NRCS program requirements:

- The Minimal Effect and Mitigation decision will consider whether cumulative and secondary impacts are minimal
- All MEDs (minimal effect decisions) must be done on-site
- Approval of mitigation plans may also include a monitoring plan
- Resulting minimal effects decision or mitigation decisions relate only to FSA
- Coordinate minimal effect and mitigation decisions with the Clean Water Act Section 404 permits
- A MED will be implemented by generating a new NRCS-CPA-026e to the client and Farm Services Agency; if required, a plan must be applied within one year
- Minimal effect worksheets should evaluate functions and services of the wetland under considerations as well as the effects on other wetlands in the area
- The procedures must be understandable by clients and defensible to the landuser
- Allow a quick and easy process that is understandable
- The services of wetlands in the State are identified by the State conservationist in consultation with the State Technical Committee
- Wetlands that are flagged as Category I or "red" will not qualify for MED or mitigation options
- Wetlands that are flagged as Category II or "yellow" will not qualify for MED but may qualify for mitigation options with caution.
- All lands proposed for the Wetland Reserve Program will be evaluated using AFWA prior to a WRP contract

Steps for Making a Minimal Effect/Mitigation Decision

The minimal effect and mitigation approval process requires the planner to answer two questions: 1) what functions do these wetlands perform or would they perform if unaltered? And 2) what is the importance of those functions? To obtain the answer to the first question requires collecting information about the wetland that can be documented and evaluated consistently. The answer to the second question is to evaluate if there are ecological services that are of importance locally or regionally. This two step process helps assure that wetland conversion decisions are made only after a thorough understanding of the wetland and the associated ecological systems.

Functional assessment of wetlands is used to measure the level of performance of hydrological, chemical, and biological properties and processes that occur in wetland ecosystems. The ecological factors that define wetlands (vegetation, soils, hydrology) are the basis for indicators or the assessment questions. The scoring system is designed as a rapid screening tool to categorize in protecting and managing wetlands. It should be used only on vegetated wetlands as defined using the delineation procedures. The rating system does not try to establish the economic values present in a wetland; it only helps to identify its sensitivity, rarity, and functions (refer to Appendix E).

Wetland resources are first evaluated in the office; the evaluator must define the area of wetland to be included in the assessment. In many cases this is a simple matter of assessing the entire wetland for relatively small wetlands; the "scoring boundary" will generally coincide with the jurisdictional boundary (project boundary). For large wetlands or a project area (i.e., a trail that crosses a wetland) that only affects a "portion of a larger wetland", the decision of what to include in the assessment area must be determined. Many wetlands are connected across types into huge complexes (>2000 acres). In these situations, determining the assessment area can be problematic. Normally, the assessment area will coincide with the wetland type and in many cases; a functional assessment can be done at the same time as the wetland determination.

Next, the evaluator should review data sources that can help determine wetland types and classifications, and associated ecosystems that can assist in determining wetland functions and services. It is recommended to search the local borough and other resources in addition to those used for wetland determinations. All information should be documented and included with the wetland evaluation report. Example web sites and other types of information are:

- MSB Wetland Mapping Project: http://wetlands.matsugov.us/
- Kenai Wetland Mapping Project: http://cookinletwetlands.info/Downloads/GoogleEarthDownloads.html
- NWI Mapping: http://www.fws.gov/wetlands/Data/Mapper.html

- Google Earth Mapping: http://www.google.com/earth/index.html
- Alaska Department of Fish and Game Anadromous Fish Distribution Maps: http://gis.sf.adfg.state.ak.us/AWC_IMS/viewer.htm
- USFWS Bald Eagle Nest Atlas: http://alaska.fws.gov/mbsp/mbm/lanFBirds/alaskabaldeagles/default.htm
- Comprehensive Plans
- Lake Management Plans
- Trail Plans
- Coastal Management Plan

Two functional assessments are performed for each wetland type; one representing the existing condition and one for the planned condition (i.e., what will happen to the function if an activity or practice is installed?) (refer to Appendix E for detailed instructions). Wetland functions are grouped into three general areas or categories: hydrology, biogeochemical and habitat, and then by wetland class (i.e., HGM class and subclass and/or NWI). Standards, questions and criteria for each function (MSB Functional Assessment Team, 2007; HGM A-Teams, 1999-2003) are recorded for the same wetland type under the two scenarios; *existing* wetland and what would happen to the existing wetland after the *planned* or "proposed activity". For each wetland class, the principle function for each of the three functional categories are rated and scored using the Wetland Class & Function Score Sheets (Appendix D). The scores are based on the ability of the wetland to be fully functional and whether or not the wetland can recover. The difference between the scores represents the functions lost or gained. It is also important for the evaluator to understand the general condition of the existing wetland in comparison to a reference wetland of the same type. A reference wetland is one that can maintain the chemical, physical and biological processes (full ecological integrity) over time without human alterations. *Condition can be defined as the relative ability of a wetland to support and maintain its complexity and capacity for self-organization with respect to species composition, physio-chemical characteristics and functional processes as compared to wetlands of a similar class without human alterations. Ultimately, condition results from the integration of the chemical, physical and biological processes that maintain the system overtime.* Methods best suited to measure condition reflect this by providing a quantitative measure describing where a wetland lies on the continuum ranging from full ecological integrity (or the least impacted condition) to highly impaired (poor condition).

In some cases, the wetland within the wetland assessment or project area may be impacted or disturbed to the degree that a surrogate or "reference wetland site" must be located. This allows the evaluator to observe a "fully functional" wetland of the same HGM class to make a "rating" of the wetland in the assessment area or sampling unit.

The criteria, questions, and scoring should be answered in the field but the timing and seasonality may influence how the criteria and questions are answered in the field. Further, some questions may not be answered at certain times and notes on the evaluation form should state this. A high degree of subjective judgment is used to note the occurrence of a function or service based on or all of the listed criteria. Unless the rationale is documented, it is difficult to determine whether a function or service is primary to a wetland. It is the responsibility of the evaluator to properly document justification for answers.

The results are recorded on the Wetland Function-Service Evaluation form (Appendix A and Sharepoint Site). The top portion of the form allows a space for general description of the wetland with respect to the surrounding landscape and hydrologic systems. Information regarding potential impacts is also documented here (see below).

Wetland Function-Service Evaluation Form

Wetland ID:	Location(gps/lat_long):			Evaluator:	Tract & Farm #:	
Proposed Wetland Impact (type/acres):		Circle if applies: AEW Other:				
Adjacent land use:		Distance to nearest roadway or other development (show on map):				
Dominant Wetland Class (HGM):		Cowardin Class:			Viereck AK Class (if known):	
Is the wetland a separate hydraulic system?		If not, where does the wetland lie in the drainage basin?				
How many tributaries contribute to the wetland?		Wildlife Sign:			(attach list for wildlife, plants, etc.)	
FUNCTION & SERVICES	**SYMBOL**	**Function**		**Rationale**	**Scores**	
HYDROLOGICAL Total Score: 20		**Principle**	**Other**	**(criteria #)**	**Exisiting**	**Planned**
Groundwater Recharge/Discharge						
Streamflow Mod/Floodflow Alteration						
Sediment/Shoreline Stabilization						
BIOGEOCHEMICAL Total Score: 20						
Sediment/Toxicant Retention						
Nutrient Removal/Retention						
Nutrient/Foodchain Support						
HABITAT Total Score: 24						
Fish/Aquatic						
Wildlife Habitat						
SERVICES Total Score: 8						
Recreation						
Sensitive Species/Habitat						
Uniqueness/Heritage						
Visual Quality						
Other:						
Notes:						

Each wetland that is potentially impacted by a project activity needs to be visited. Each is evaluated considering the *presence or absence* of the 12 wetland functions and services defined earlier. Functions are checked as either principle or other and the criteria supporting the presence or absence of a function and/or service are recorded. A standard, but flexible, list of criteria for each function and service, numbered for easy reference, will facilitate this documentation. Criteria for each function and service can be found in Appendix A. Additional criteria can be developed and recorded. This could be particularly important for a wetland class, within a field office service area, MLRA, or vegetation type.

Since wetlands are apt to contain most functions and services to some degree, it is helpful to identify those *few that are most important.* Focusing on the principal functions and services helps the reviewer more easily assimilate information for large projects with multiple wetlands. A single numeric score is the result. This score is not meant to measure absolute service or have intrinsic meaning, but allow comparisons between wetlands to be made.

The scores from the Wetland Function-Service Evaluation Form are recorded on the Summary of Scores sheet. The change in condition between the existing and planned score represents either the loss (minus) or the gain (positive) of a function after the activity or impact has been applied. The decision on whether or not the activity meets a minimal effect is then applied. The Decision Rule is based on:

- Category I (red flag): if the planned score is less than 58 points then the effect is **not** considered a "minimal effect".
- Category II (yellow flag): if the planned score is less than 36 points then the effect is not considered a "minimal effect" but mitigation may be allowed.
- Category III and Category IV: if the planned score is less than 15 points then the effect is considered **minimal** and a MED is made.

Note: For wetland creation, restoration, and enhancement,(i.e., WRP) the scores for the planned activity should reflect higher than the scores of the existing wetland.

If the proposed action will result in more than just a minimal effect, the client must be informed of mitigation options. The "loss" of wetland function(s) that exceed the acceptable threshold must be replaced through wetland restoration, creation, or enhancement at an acceptable mitigation site (NFSAM, 5th Edition, 515.10) or in lieu fee or the use of a mitigation bank. Upon completion of a Minimal Effects/Mitigation determination, the landowner/operator will be given one of the following determinations (refer to Minimal Effects flowchart on the Share Point Site) (Ecological Sciences > Wetlands & HEL > Minimal Effects)

- ***Minimal Effect*** *is approved with no special conditions; decision is a result of an on-site functional assessment; notification letter to the owner/operator is required*
- ***Minimal Effect with conditions*** *is approved; implementation requires a Minimal Effect Agreement that stipulates the terms and conditions such as permit restrictions, location, maintenance, and operation (NFSAM, 5th edition, 515.10).*
- ***Not Minimal Effect*** *and cannot be Mitigated (Cat. I or red flag); requires an explanation of the decision making process and an explanation of the owners/operator appeal rights*
- ***Categorical Minimal Effect*** *does not require an on-site functional assessment; written notification to the owner/operator is required.*

The planner should complete the Minimal Effect / Mitigation Determination, notify landowner/operator of decision by certified letter and provide mitigation option and appeal rights as appropriate. Prepare the Minimal Effect Agreement (refer to Share Point

Site link) and a new NRCS-CPA-026e if needed. If the wetland unit does not meet a minimal effects decision but mitigation is allowed, the field office will develop mitigation and monitoring plan(s).

The Summary of Scores sheet (Appendix A) is used to tally the principle functions and services from the Wetland Class and Function Score Sheets, assign thresholds, and record a decision whether or not the wetland unit meets a minimal effect decision (MED).

SUMMARY OF SCORES

		Existing	Planned	
HYDROLOGICAL	**Max 20 Points**			
Total Score from Principle Function (16)				
**Total Score from Other Function(s)(4)				
	TOTAL			
BIOGEOCHEMICAL	**Max 20 Points**			
Total Score from Principle Function (16)				
**Total Score from Other Function(s)(4)				
	TOTAL			
HABITAT	**Max 24 Points**			
Total Score from Principle Function (22)				
**Total Score from Other Function(s)(2)				
	TOTAL			
***SERVICES**	**Max 8 Points**			
*Give 2 points for each service	**TOTAL**			
				MED CONSIDERED Yes or No
TOTAL FUNCTION & SERVICE SCORE				

**Give 2 points for each additional function

*Give 2 points for each service the wetland provides

	Total Points		
	Existing	**Planned**	**THRESHOLDS**
Cat I	58-72	< 58	NOT CONSIDERED A MED
Cat II	36 - 57	< 36	NOT CONSIDERED A MED BUT MITIGATION ALLOWED
Cat III	15 - 35	< 15	CONSIDERED A MED
Cat IV	<15	<15	CONSIDERED A MED

NOTES:

A Wetland Function Assessment Report should include at a minimum a sketch of the wetland in relation to the impact area and surrounding resources, the wetland determination forms which provide an inventory of vegetation, soils and hydrology data; observed and indirect observation of potential wildlife species, and a photo of the wetland. This additional information facilitates understanding functions and the subjective analysis of "service assessment".

PHOTO, MAP AND LOCATION AND ADDITIONAL INFORMATION

Additional Plant Species List			
Common Name	**Scientific Name**	**Cover %**	**Strata**
Black spruce	Picea mariana	10	Tree
ClouFBerry	Rubus chamaemorous	25	Forb
Starflower	Trientalis europeaea	20	Forb
Woody Debris	1 to 2 inch	35	Ground cover

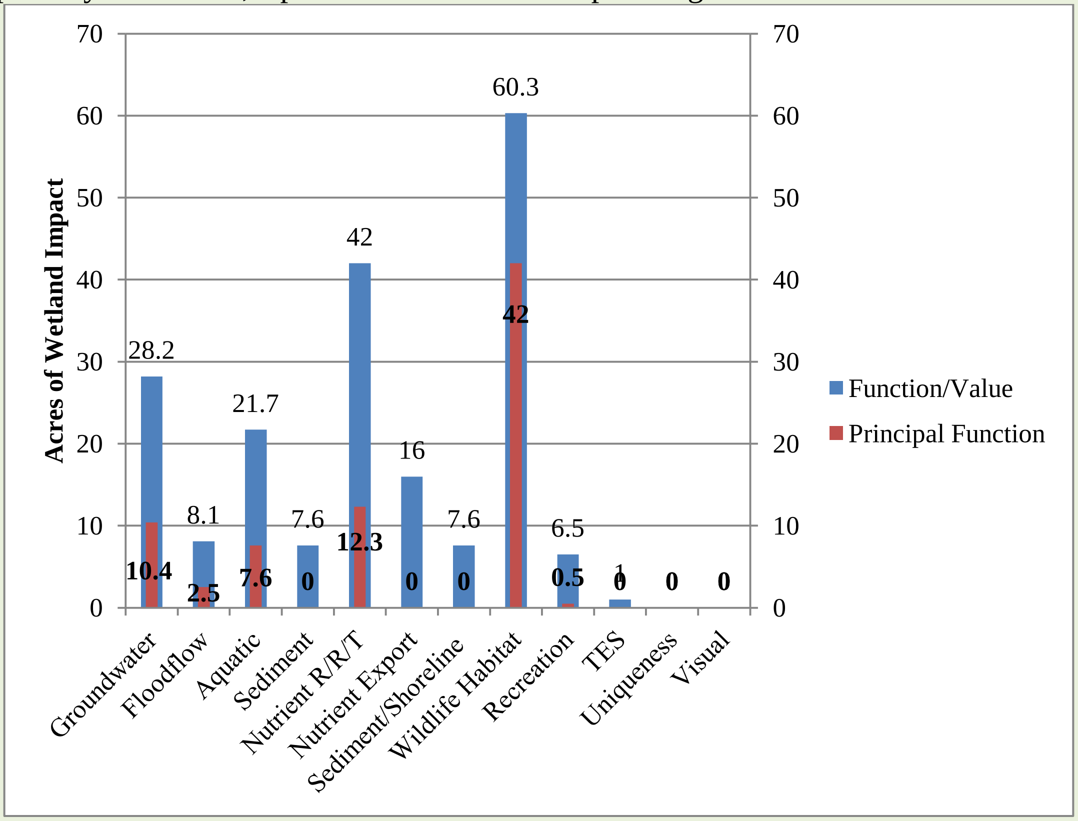
Additional Wildlife	
Moose	*Visual observation scat and browsing and trail*
Great Horned Owl	*Visual observation*
Red Salmon	*Visual observation of 4 adult salmon*

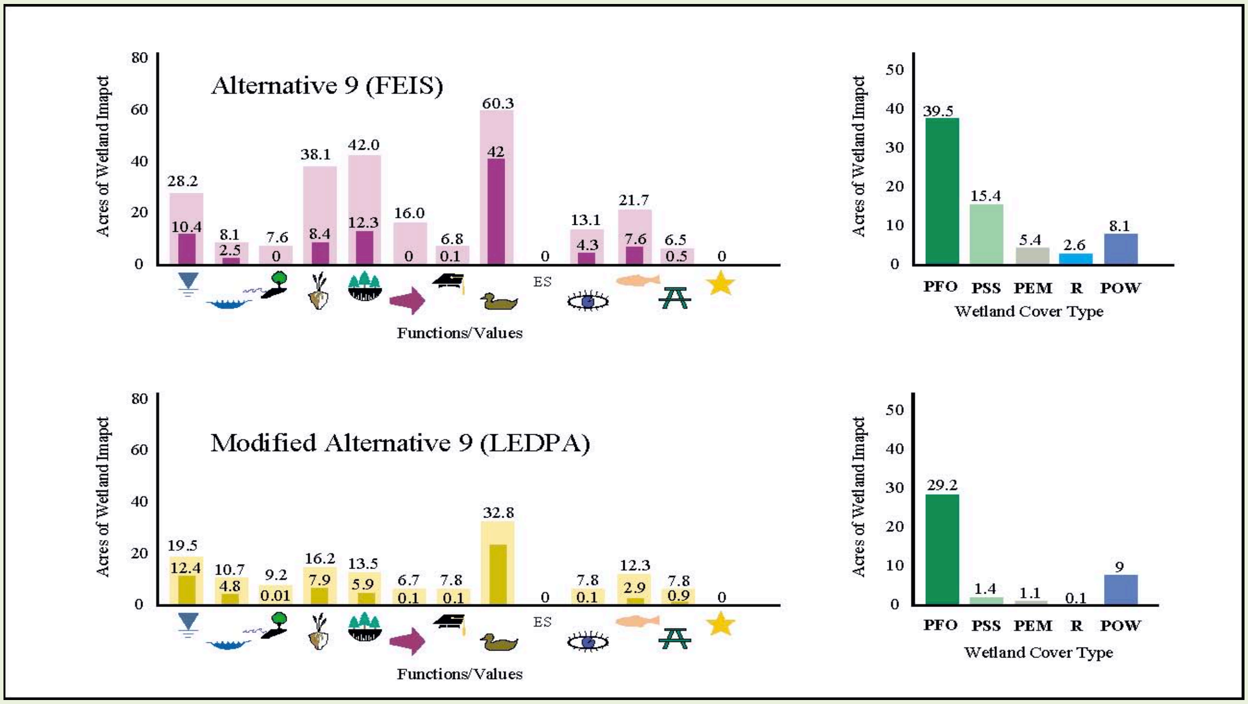
Graphical Approach for a Wetland Evaluation

The objective is to graphically display wetland information in a format that can easily be understood, is supported with factual data, and is displayed at an appropriate scale of detail. Most of the information is already collected during the NRCS planning process. The wetland evaluation process can include the completed wetland evaluation form with corresponding backup information, the project area, and the wetland assessment area (if larger than the actual project area) that includes information on the functions and services for all wetlands evaluated.

A complete wetland function/service package can easily be converted into descriptive text for environmental documents or graphical display. Impacts on other resources of concern, upland wildlife habitat and socio-economic constraints can be analyzed. It may be important that other resources be displayed along with the wetland functions and services in order to give the evaluator a complete picture especially for larger projects. The goal of the GIS effort would be the creation of a visual map of wetland functions and services within a field office service area, watershed or HUC, or MLRA.

Wetland functions and services can be displayed visually over a project area or cumulatively over a watershed. Graphical representation can be used to show alternatives to address either a wetland mitigation site or restoration site. Alternatives might include practices or a combination of practices. By using a variety of GIS layers such as National Wetland Inventory (NWI) wetland cover types, the affected impact area as well as cumulative impacts can be geographically referenced, a powerful visual tool for planning.





The graphical representation above displays NWI wetland vegetation types, functions and services, and principal functions and services by acreage of direct impacts under the footprint of the disturbance activity. This type of graphical display is especially useful for large projects showing the least environmentally damaging practicable alternative (LEDPA).

The figure below displays the project area and illustrates GIS layers from National Wetland Inventory, hydric soils and the principal functions and services. From this graphic, a reviewer can analyze such things as wetland position in the landscape, configuration, cover type, and corresponding functions and services. Potential impacts to each system can be implied by the relative location of other structures such as roads, subdivisions, etc., with respect to each wetland. To make a complete, informed decision regarding other project impacts (i.e., if several practices or projects are within the same wetland type) can also be shown and evaluated.