ADOT&PF
Alaska Wetland Assessment Method

Version 1.0

Adapted with permission from:
Montana Department of Transportation
Montana Wetland Assessment Method

By:
Alaska Department of Transportation and Public Facilities
Research and Technology Transfer Division
and
Statewide Environmental Office
Fairbanks and Juneau, Alaska

With assistance from:
U.S. Army Corps of Engineers, Regulatory Branch, Fairbanks Field Office
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and

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Anchorage, Alaska

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James Sweeney of ADOT&PF provided contracting assistance for adaptation of MWAM to become AKWAM. Ben White of ADOT&PF Statewide Environmental Office and Christy Everett, Melissa Riordan, and Greg Mazer of the U.S. Army Corps of Engineers, Regulatory Branch, Fairbanks Field Office, served as the core members of the Technical Advisory Group that guided this first version of AKWAM to completion. Mary Lee Plumb-Mentjes, Andy Mitzel, and Katherine McCafferty (all of the Corps of Engineers, Regulatory Branch) and Jerry Tande (U.S. Fish and Wildlife Service, National Wetlands Inventory) provided valuable assistance at project startup. Robert McLean (Alaska Department of Fish and Game) gave helpful input on the fish habitat section.

ADOT&PF adapted the categorization of waterbodies from a system developed for use in the Anchorage area by representatives of the U.S. Army Corps of Engineers, Environmental Protection Agency, U.S. Fish and Wildlife Service, and the Municipality of Anchorage.

The AKWAM team also acknowledges that developers of each wetland assessment method adopt and build upon concepts originated and re-worked by other practitioners, making it impossible to ever give credit to whom it is due.

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SOLICITATION OF COMMENTS

ADOT&PF wants your comments on specific problems or issues with this method and your suggested improvements to make this method as useful and relevant as possible. Subsequent versions of AKWAM will incorporate your suggestions as appropriate. Please send your feedback on the AKWAM method to:

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QUESTIONNAIRE

Applying AKWAM

- To what kind of project did you apply AKWAM?
- What was the approximate acreage of the project area?
- Was the project area more linear or square?
- How many AKWAM forms did you use to evaluate the project?
- How long did it take you to apply this to each wetland or waterbody?

Understanding the Instructions and Data Form

- Did delineation of AAs seem straightforward? If not, in what situations was it difficult to define the AA?
- In what situations was the method difficult to implement?
- What parts of the instructions are difficult to understand?

Interpreting the Results

- What parts of the forms produced little value relative to the work required to complete them?
- What ratings did not seem appropriate?
- Did the method adequately differentiate among wetland types?
- Did the method give results that were intuitively better or worse than other methods you have used?

Your name and contact information (optional):

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I. INTRODUCTION

In 2005, the Alaska Department of Transportation and Public Facilities (ADOT&PF) identified the need to choose a single rapid wetland assessment method for use on the routine projects it conducted throughout Alaska. Several methods had been developed and applied in limited geographic areas (Anchorage, Juneau, Southeast Alaska). Guidebooks and reference data sets had also been developed for three wetland hydrogeomorphic (HGM) classes found in limited parts of the state. A multitude of other established methods had been employed on ADOT&PF projects. Best professional judgment was often the method of choice. Adopting one method for use on most of its projects would save time and money for ADOT&PF and the regulatory agencies, and would result in more consistent evaluations that would be acceptable to all concerned parties. ADOT&PF therefore hired a consultant in 2005 to identify a method for use in Alaska and to chart the course for the method's implementation on routine projects throughout the state. A Technical Advisory Group provided guidance on the desirable characteristics of the Alaska method. That effort led to a recommendation that ADOT&PF adopt and modify the Montana Department of Transportation's (MDT) Montana Wetland Assessment Method (MWAM).

Most of the concepts, text, and graphics of this Alaska Wetland Assessment Method are copied verbatim from the Montana Wetland Assessment Method.

In 2009, after gaining the approval of the MDT, ADOT&PF adopted the MWAM and began the process to modify it for use in Alaska, resulting in this version 1.0 of the Alaska Wetland Assessment Method (AKWAM). Please note that most of the concepts, text, and graphics of AKWAM are copied nearly verbatim from MWAM, with MDT's permission. AKWAM is intended to be used for all routine projects conducted by ADOT&PF. Nothing precludes the use of AKWAM for other types of projects undertaken in Alaska.

The Alaska Wetland Assessment Method is intended to be used for all routine ADOT&PF projects; that is, projects without significant impacts, that can typically be addressed via an Environmental Assessment or Categorical Exclusion checklist.

The U.S. Army Corps of Engineers (COE) Regulatory Branch must consider impacts to wetland functions and services (also called "values") when evaluating Section 404 permit applications. Functions are the physical, chemical, and biological processes that occur in ecosystems (COE 2008). Shoreline stabilization is an example of a wetland function. Services are the benefits that human populations receive from functions that occur in ecosystems (COE 2008), such as wetlands' use for recreation or flood control.

Most typically, AKWAM will be used to characterize wetlands that may be affected by a proposed project. In addition, it may be used to define the baseline condition of a proposed compensatory mitigation site and to describe the change resulting from the wetland-improving activity. It is important to note that this method is used to *evaluate* wetland functions and services, and is distinct from the need to *delineate* wetland boundaries. Before they are evaluated, a site's wetlands should be delineated using the 1987 Corps of Engineers wetland delineation manual (Environmental Laboratory 1987) and the most recent Regional Supplement for use in Alaska (currently, COE 2007).

AKWAM assessments result in a relative rating for up to 10 wetland functions and services. This rating provides no information on the **magnitude** at which a function (such as flood attenuation, sediment retention and removal, production export, or groundwater recharge) is performed. The actual magnitude at which a measurable function is performed is dependent on site-specific conditions, requires specialized equipment and repeated measurements, and is beyond the scope of this methodology.

At the request of the COE, ADOT&PF has added a component to evaluate **waterbodies**, in addition to wetlands. The COE has authority over "waters of the United States"; wetlands are a subset of those. Simply put, "wetlands" refers to vegetated wet areas, not to open waterbodies such as streams or lakes or ocean. Throughout this document, the term "waterbody" will be used in the strict sense to mean non-wetland waters. The term "wetlands" will sometimes be used in the strict sense to reference just areas that meet the strict regulatory definition (essentially, vegetated wet areas), and sometimes will be used more generically to encompass both wetlands and waterbodies. Whether "wetlands" is being used in its strict or broad sense should be clear from the context or is immaterial in the context in which it is used.

Because resources for developing AKWAM are limited, rather than evaluate each potential waterbody function and service, AKWAM will use an abbreviated approach to place each waterbody into one of four management categories. These categories are the same as those defined for wetlands. ADOT&PF has adopted a categorization system that has been applied in the Anchorage area for approximately ten years.

The objectives of the AKWAM are to provide a rapid, economical, repeatable, and easy-to-understand wetland and waterbody evaluation method applicable throughout Alaska that:

- incorporates current and relevant information on wetland functions;
- meets the needs of ADOT&PF, the Corps of Engineers, and other concerned agencies for rating the functions and services of wetlands and categorizing wetlands and waterbodies potentially affected by ADOT&PF's routine projects;
- minimizes subjectivity and variability among evaluators;
- allows for the comparison of different wetland types and different waterbody types;
- rates wetlands and waterbodies in a way that helps prioritize impact avoidance and minimization measures; and
- categorizes wetlands and waterbodies in a way that promotes consistent and predictable application of compensatory mitigation requirements.

It should be recognized that the functional performance of any given wetland may not represent the overall importance of wetlands to the surrounding watershed or ecoregion. The low or moderate functional capacity of some wetland types may be compensated by their widespread distribution and abundance. That is, although some common wetland types may have generally low to moderate performance capacity, the type's widespread distribution and abundance may give it a high cumulative importance.

AKWAM is designed to be applied by resource professionals familiar with wetland science and

its terminology. Typical assessment staff qualifications include a Bachelor's degree in a natural resources field and at least two years of experience in wetland-related work. A glossary is included at the end of the user's manual to help evaluators and to promote consistent understanding and use of this method.

This first version of AKWAM does not represent a comprehensive, fully Alaska-adapted, and final assessment method. Rather, it is the first approximation. ADOT&PF expects that, as AKWAM is used, its users will suggest improvements to ADOT&PF and the method will be revised. Please provide your feedback!

II. METHOD DEVELOPMENT

The MDT developed MWAM over the course of a decade and several versions. MDT reviewed relevant literature on wetland functions and assessment and adapted suitable elements for use in Montana. MDT reviewed fifteen other wetland and stream assessment methods (listed in the bibliography) and incorporated pertinent information into this methodology. The ADOT&PF has incorporated concepts from additional methods.

To adapt the Montana method for use in Alaska, ADOT&PF:

- eliminated references to resources that do not exist in Alaska (e.g., warm-water fish);
- replaced Montana species with Alaska-appropriate threatened, endangered, and candidate species; other species of conservation concern; and noxious and invasive species;
- incorporated the use of hydrologic unit subregions (AGDC 2002);
- modified language to reflect types of disturbance and land uses prevalent in Alaska;
- increased the consideration of watershed context;
- modified indicators as appropriate for Alaska's colder climate;
- combined some functions;
- reviewed the wetland categories wetlands and adjusted them to align with commonly held Alaska values; and
- added a waterbody categorization and rating component.

ADOT&PF also reviewed the wetland categorization relative to information presented in COE Regulatory Guidance Letter 09-01 which relates to how compensatory mitigation will be implemented in Alaska.

III. INSTRUCTIONS

Most of this manual pertains to evaluation of **wetlands**. Wetlands have saturated or inundated substrates that lead to development of characteristic *vegetation* and *soils*. **Waterbodies** are open water areas that do not support an abundance of vegetation that extends above the water surface; they may be flowing or standing, and permanent, seasonal, intermittent, or ephemeral. Assessment of **waterbodies** is addressed in section III.E Categorizing Waterbodies. However, note that the wetland assessment method considers wetlands in the context of any adjacent waterbodies. Sections III.A through III.D of this user's manual provide instructions for completing each of the fields on the **wetland** data form provided in Appendix A. The wetland evaluator should use this manual while completing the data form; many of the indicators used to assign ratings and scores require reference to this manual.

A. Overview of the ADOT&PF Alaska Wetland Assessment Method

Depending on the wetland being assessed, up to 10 functions or services may be evaluated through the use of AKWAM, including:

- Habitat for species of concern
- General wildlife support
- General fish support
- Water storage
- Sediment/nutrient/toxicant retention and removal
- Sediment/shoreline stabilization
- Production export/terrestrial and aquatic food chain support
- Groundwater discharge/recharge
- Uniqueness
- Recreation/education potential

Please reference this user's manual during every assessment. This will reduce errors caused by misinterpretation of the indicator categories and will maximize consistency among users.

A critical step in a project's wetland evaluation is defining the assessment areas (AAs). This process is described in section III.B. The evaluator sketches each AA on a map, then works through the data form, with the user's manual in hand, for each AA. The evaluator answers several questions to characterize the AA, then assesses and assigns applicable function and service ratings of low, moderate, or high (or, in some cases, exceptional) to the AA. Most functions and services are also assigned functional points on a scale of 0.1 (lowest) to 1.0 (highest).

Several attributes on the form are rated by working through matrices. Variables used within these matrices are addressed in a dichotomous, top-to-bottom fashion, resulting in an assignment of functional points and a rating for each evaluated function. An example based on the matrix used to evaluate general fish support is provided below. In this example, the investigators estimated that the duration of surface water in the AA was seasonal; the aquatic cover was optimal; and they knew the site supports anadromous salmon species. This resulted in a score of 0.9 and a rating of "high" for this function.

Duration of surface water in AA	Permanent / Perennial			Seasonal / Intermittent			Temporary / Ephemeral		
Aquatic hiding / resting / escape cover	**Optimal**	**Adequate**	**Poor**	**Optimal**	**Adequate**	**Poor**	**Optimal**	**Adequate**	**Poor**
Anadromous salmon species	1E	.8H	.6M	.9H	.7M	.5M	.7M	.5M	.3L
Resident and non-salmon sport and subsistence species	.9H	.7M	.5M	.8H	.6M	.4M	.6M	.4M	.2L
Other resident species	.8H	.6M	.5M	.7M	.5M	.4M	.5M	.3L	.2L

When completing sections 14A through 14J (the functions and services assessment portion of the form), if the evaluator's best professional opinion suggests a particular function is inadequately represented on the form due to specific site conditions, it is appropriate to override the calculated value and note the justification in the comment space. It is important to note, however, that this should occur only in exceptional situations.

In exceptional situations, the evaluator may override the calculated value and note the justification in the comment space.

After evaluating each of the functions and services in section 14 of the form, the evaluator transcribes the ratings and functional points onto the Summary and Overall Rating page of the data form. For many projects, it will be appropriate to consider the ratings for the individual functions and services, as well as the rating produced by summing the individual function scores. The evaluator can calculate the percentage of the total possible functional points that the assessment area received for the functions and services.

Finally, this method applies an Overall Rating to the assessment area. This is based on the percentage of total possible functional points that an assessment area receives, and on whether the assessment area performs certain highly valued functions. The result of the Overall Rating is assignment of the assessment area into one of four categories. Category 1 is the highest ranking a wetland can receive, followed by Category 2, Category 3, and Category 4. The categories, in general, reflect how the wetlands in the assessment area will be managed or considered during project evaluation and permitting.

Whether or not all of the wetlands in a given project area will be evaluated is a project-specific decision and is dependent on many factors such as the assessment's purpose, agreements among project sponsors and agency staff, wetland accessibility, and the investigator's contract. If only a subset of potentially affected wetlands will be evaluated in the field, the investigator should be careful to select the subset to adequately represent the range of wetland types (particularly HGM classes) and degrees and types of past and ongoing disturbance.

B. Defining the Assessment Area for a Wetland Evaluation

Before evaluating wetland functions, the evaluator must identify the AA using the guidance below and summarized in Chart 1. Several example AAs relevant to highway projects are shown in Figure 1, and these may serve as reference for other types of projects as well.

Establish a working map or set of maps on which you will sketch the "project area," the various features used to define the AAs, and each AA's boundaries and identification number.

Defining the project area. Start by defining the "project area." For the purposes of the wetland assessment, the "project area" should generally be considered the area that is within the proposed project construction footprint plus the area that would be indirectly affected by the project. How the "project area" is defined will be project-specific, and will depend on such factors as the stage of the project (preliminary or final) and the degree of change that may occur from preliminary to final project design (e.g., the final alignment might shift from preliminary alignment). Note that the "project area" definition for the wetland assessment may not match the "project area" used in other project documents. As a general rule, assess any wetland that lies at least partially within the project right-of-way or within 100 feet of the proposed construction limits.

While the wetland assessment area may include all or part of one or more waterbodies, sizable waterbodies should also be evaluated using the waterbody rating form. The waterbody part of a wetland AA will, in the end, be assigned to the category determined via the waterbody rating form.

Considering wetlands in relation to their adjacent waterbodies. Next, note that wetland AAs in this assessment method often encompass waterbodies or parts of waterbodies. The wetland evaluation is focused on the **wetland's** functions, but those must be considered in relation to adjacent waterbodies. That is why the waterbody may be included in the wetland AA. The evaluator may ALSO assess the waterbody separately, as described in section III.E of this User's Manual, if it is within the project area. In the final scoring of the wetlands and waterbodies in the project area, the scores, ratings, and categories determined on the wetland data forms will be applied to the **wetland** parts of each AA, and the waterbody categories assigned via the waterbody rating forms will be assigned to the **waterbodies**.

Distance limits of the AA. The next step defines the distance the AA extends from the project area. The wetland AA includes the portion of a wetland that is:

A. the "project area" ***plus*** the contiguous wetland/waterbody to a distance determined by B or C below, whichever distance is *closer* to the project area
B. contiguous up- and downstream from the proposed project area to physical points of significant hydrologic change (these may include wetland/upland boundaries, points where wetlands are no longer adjacent to a waterbody, natural or man-made constrictions or expansions, points where the gradient changes abruptly, points of significant inflow [e.g., tributaries], or places where other factors limit hydrologic interaction) ***OR***
C. contiguous up- and downstream to a maximum distance of 1,000 feet from the proposed project footprint if no points of significant hydrologic change (including the wetland/upland boundary) occur within this distance.

Wetlands that were once contiguous but are now bisected by a road (or other manmade feature) should be considered as a single AA if they remain hydrologically connected, such as by a functioning culvert, so that their water levels are about equal.

Including the adjacent waterbody in the wetland AA. The following steps help the evaluator determine whether an adjacent open-water area should be included in the wetland AA and the

extent of the open water area to include. Open water is defined as *any area of standing or flowing water without (that is, with <10% total cover of) emergent, scrub-shrub, or forested vegetation.*

Where wetlands are contiguous with **standing** non-wetland waterbodies (lakes, ponds):

> If wetlands are contiguous with <20 acres of open water, include all open water in the AA to a distance from the project determined by A, B, and C above (see Figure 1, Panel #6).
>
> If wetlands are contiguous with ≥20 acres of open water, include open water in the AA to the estimated deep water line (>6.6 feet deep) or to a point that is double the width of the wetland shoreline fringe, whichever is greater (see Figure 1, Panel #7).

For wetlands contiguous with **flowing** non-wetland waterbodies (rivers, streams), it is necessary to first define "bankfull," "fringe," and "non-fringe" wetlands:

- "Bankfull," for the purposes of this method, is the elevation on the bank where flooding begins. That is, where the stream just fills the channel to an elevation at which the water begins to overflow onto a floodplain (paraphrased from Leopold et al. 1964).

- "Fringe" wetlands have a width that is less than the bankfull channel width. The wetland's width is its vegetated width from the edge of the open water (likely at a lower elevation than the "bankfull" location) to its upland boundary.

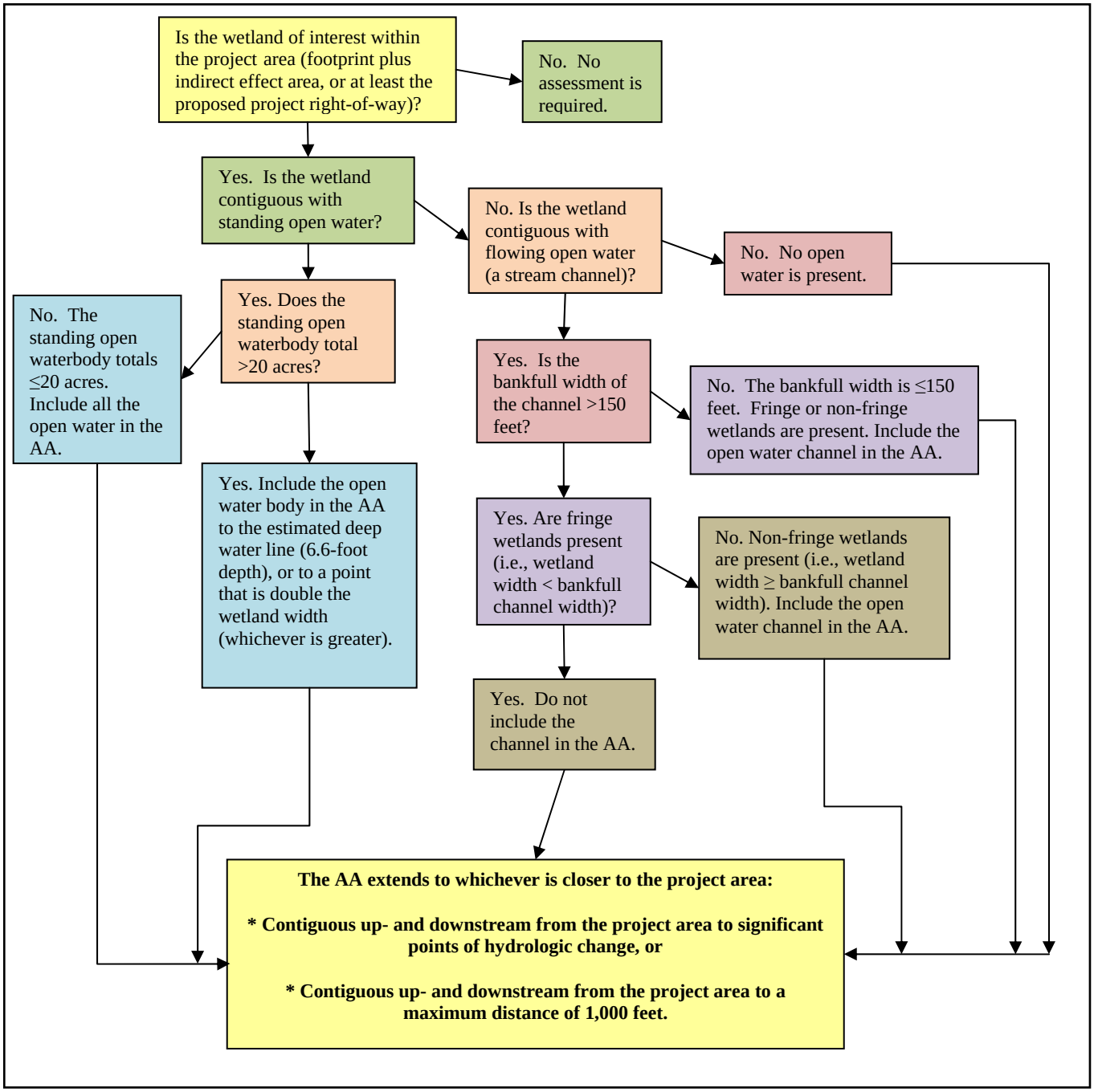
- "Non-fringe" wetlands have a wetland width (see above) that is greater than or equal to the bankfull channel width.

For all wetlands adjacent to a channel with a bankfull width <150 feet and for all non-fringe wetlands adjacent to a channel of any width, include the entire channel in the AA to a distance from the project determined by A, B, and C above (see Figure 1, Panel #s 10, 11, 13, 14, 15, 17, and 18).

For fringe wetlands adjacent to a channel with a bankfull width ≥ 150 feet, only include the *actual wetlands* (not the main channel) in the AA to a distance from the project determined by A, B, and C above (see Figure 1, Panel #s 9, 12, 16, and 18).

NOTE: In some cases, wetlands technically contiguous with a stream are at some point of such horizontal or vertical distance from the channel that, in the evaluator's professional opinion, they no longer substantively influence, or are influenced by, channel attributes and processes such as fish habitat or flooding. In this situation, it is appropriate to break out separate AAs that do not include the channel, and note that in the comments.

Chart 1: Flowchart to Define a Wetland Assessment Area



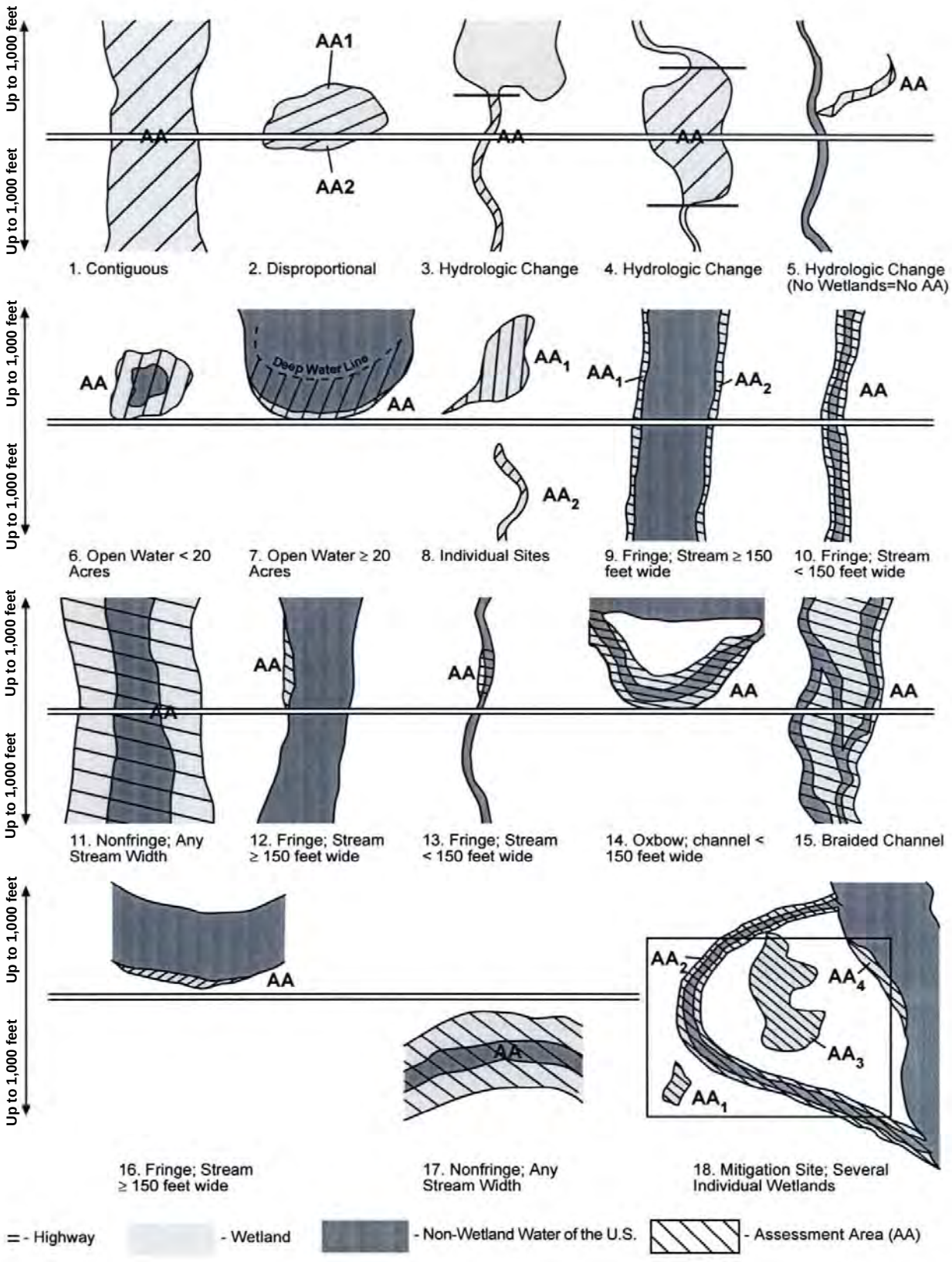


Figure 1: Example Assessment Areas

Wetland complexes. Assess multiple wetlands abutting a stream or pond as a single AA if they are separated -- one from the next -- by less than 100 feet of upland shoreline **AND** if they are of the same HGM class.

If patches of two or more <1-acre wetlands are separated from each other by uplands or patches of open water, consider all of the wetland patches to be one AA if the wetland patches occupy more than 50% of total area (comprised of the wetlands, uplands, and open water) **AND** if they are of the same HGM class.

Wetlands comprising multiple HGM classes. Different HGM classes should be separated into different AAs. There are inherent differences between the functions of various HGM classes. Each HGM class typically has low or moderate performance capacity for some functions relative to other HGM classes and vice-versa. For instance, Flats – Organic Soil wetlands have a moderate capacity to store surface water and shallow groundwater due to their large size, flat topography and organic soil, but a low capacity to cycle nutrients due to their limited nutrient inputs and slow decomposition rates. In contrast, Lacustrine Fringe wetlands tend to have a low capacity to store water due to their landscape position, but a moderate capacity to cycle nutrients due to their higher nutrient inputs and faster decomposition rates.

Assessment Areas defined too narrowly. A common mistake made by evaluators is to assess only the wetland area within a specific project impact area or area for which site access has been granted. It is important to remember that the AA will frequently extend beyond these areas (Figure 2).

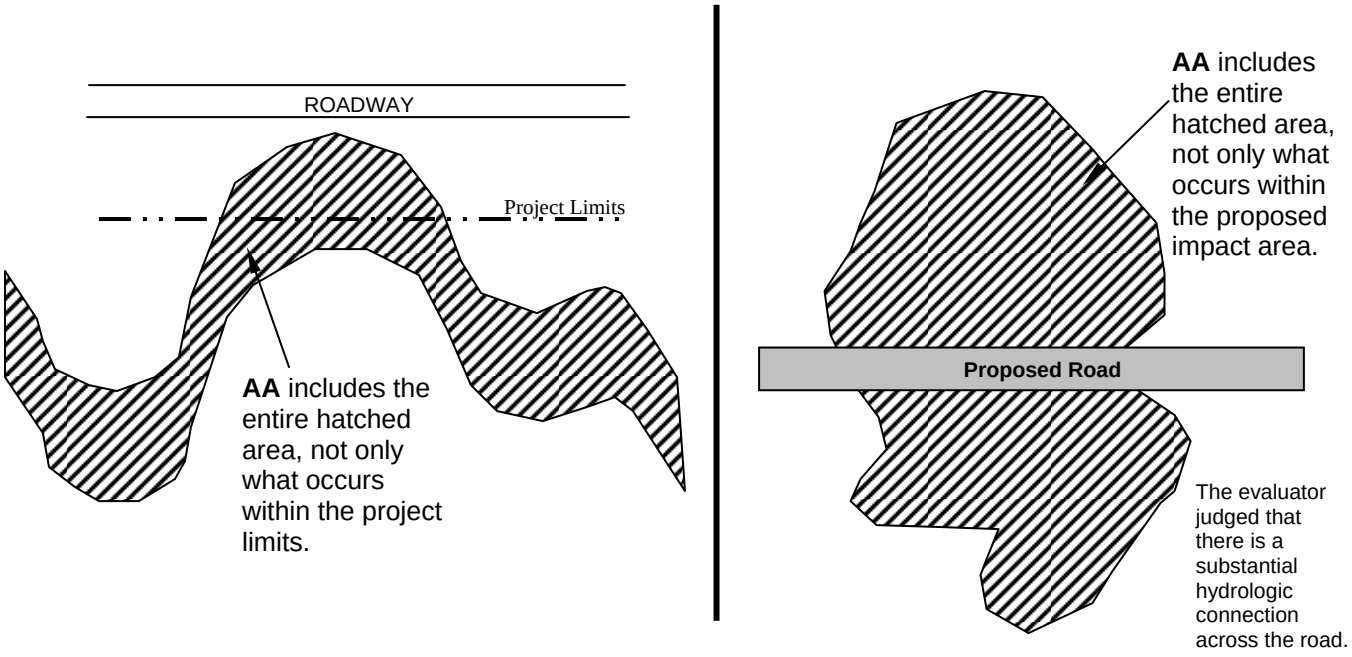


Figure 2: Examples of Assessment Areas Extending Beyond Impact Limits

AAs for created or restored wetlands. When a wetland area is constructed adjacent to an existing wetland, as for compensatory mitigation, consider the entire contiguous wetland to physical points of significant hydrologic change or a maximum distance of 1,000 feet, not only the mitigation area (Figure 3).

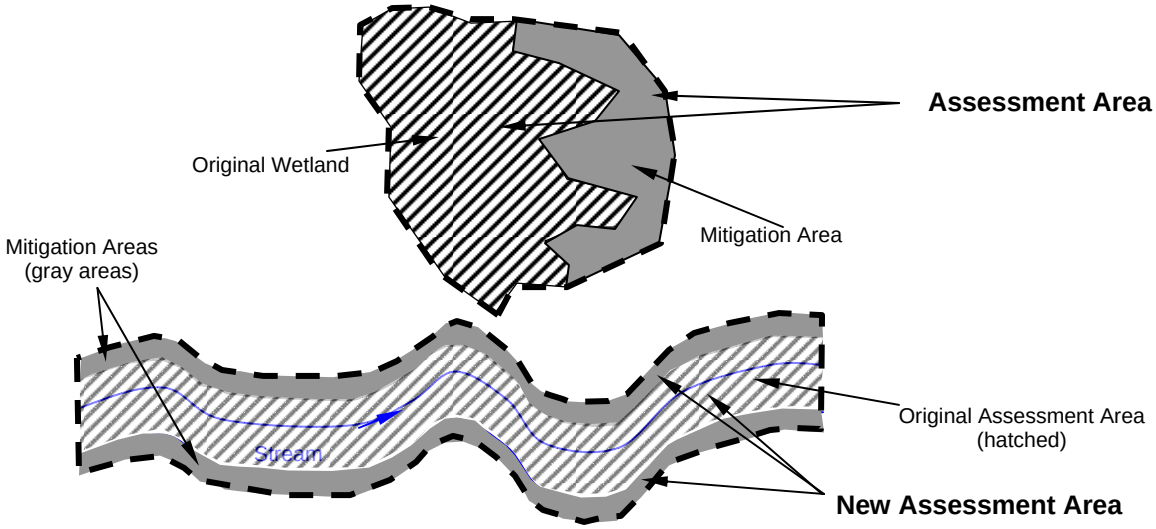


Figure 3: Example Assessment Area for a Mitigation Site

Extensive wetlands. In some cases, the evaluator may be faced with defining AAs in an area with no proposed project footprint and potentially containing extensive wetlands. Because, in these cases, the AA may not easily be defined by a 1,000-foot distance from the project area, the evaluator must use some other logical approach to delimit AAs. Apply the concepts described above, in the following approximate order.

1. Identify each individual wetland surrounded by uplands as its own AA unless it occurs in a complex as described above, in which case evaluate the multiple similar wetlands together as a single AA.
2. If an individual wetland extends more than approximately 2,000 feet in any one dimension, consider dividing it into smaller units:
    a. Divide it into areas with homogeneous water sources and hydrodynamics, such as contiguous areas with the same HGM class.
    b. Divide it at approximate watershed boundaries.
    c. Divide it at areas where it is constricted by uplands extending into the wetland area.

Do not split an extensive wetland along vegetation boundaries; the mosaic formed by a diverse vegetation structure within a contiguous wetland is an important indicator of wildlife support.

Do not split a wetland into AAs along vegetation boundaries; the mosaic formed by a diverse vegetation structure within a contiguous wetland is an important indicator of wildlife support.

Assessment Areas that misrepresent a project's effects. In **exceptional** circumstances, defining the AA as instructed above might result in misrepresentation of a project's potential effects and a reduction in the size of the AA might

be justified. In no case should an AA be reduced so that it no longer includes the full area that might potentially be affected by the proposed project. Reducing the AA's extent might be justified if the most distant end of the AA includes wetlands of a different HGM class from the wetlands that would be affected by the proposed project, or when the wetland abuts a waterbody only at the most distant end of the AA. In these cases, the evaluator could reduce the extent of the AA the minimum amount necessary to eliminate the factor that would lead to misrepresentation of the project's effects and clearly explain that decision on the data form.

Assessment of multiple similar wetlands not within an interacting complex. Generally, it is appropriate to evaluate each assessment area individually on its own data form. However, in limited circumstances, it is also appropriate to address several AAs on one data form if the AAs are very similar with respect to size, hydrology (including water source), species composition, exposure to disturbance, and other features. For example, several very similar roadside ditch wetland AAs along a proposed highway project might be assessed on one data form. Note, however, that when several similar AAs are assessed on one form, they should **not** be assessed collectively (that is, do not sum the acreage of the AAs or "pool" scores). Rather, assess them individually; if each of these similar AAs were assessed on separate forms, the scores and ratings would be identical (until functional units that consider acreage are calculated). AAs that differ enough from one another such that they would receive different ratings for various functions and services should be assessed on separate data forms.

C. Completing the Wetland Assessment Data Form

1. Project name and ADOT&PF #:

Enter the project name that is complete enough to distinguish it from all others, and the ADOT&PF State AKSAS project number (typically found on the contract or cover of other project documents).

2. Assessment Area #(s):

Enter the wetland investigator's identification number(s) and/or name(s) for this assessment area.

3. Evaluation date:

Enter the date(s) of the field evaluation.

4. Evaluator(s) and affiliation:

Enter the name(s) and affiliation(s) of the personnel conducting the evaluation.

5. Purpose of evaluation:

Check the appropriate project category.

6. Wetland location(s):

Enter the appropriate legal descriptions, stationing or mileposts, latitude/longitude, and other desired location information for the evaluated wetlands.

7. Identifying numbers of related data and the map depicting the AA:

If a wetland determination form was done in the AA or data recorded elsewhere than on this form, include information to allow the records to be linked. Sketch the AA on a map and number

the AA. Describe the features used to define the AA (e.g., hydrologic changes, 1,000-foot limit).

8. Estimated total wetland size:

Enter the estimated or measured size of the entire wetland that includes the AA. If the AA is delineated such that the entire wetland is included, the responses to 8 and 9 will be the same. If evaluating more than one AA on a single data form, enter the range of wetland sizes and the average wetland size.

9. Estimated acreage of AA:

Indicate the estimated or measured acreage within the boundaries of the AA. If evaluating more than one AA on a single data form, enter the range of sizes and the average AA size.

10. Wetland classifications of AA:

Both the HGM and parts of the USFWS classification systems (modified from Cowardin et al. 1979) are recorded because they provide different types of information potentially useful to project reviewers. Be aware that some terms (for example, "riverine" and "lacustrine") are used in both systems, but their meanings differ between the two systems. For the USFWS classification, divide the AA into parts that have different vegetation structures (see discussion below). Then, do this exercise separately for HGM classes and record the percentages in the second table. The AA is unlikely to be divided the same way under the two systems. For simplicity, do not break out part of the AA unless it represents at least 10% of the AA.

In **column 1** on the form, list the USFWS wetland types found in the AA (modified from Cowardin et al. 1979; see that document if more explanation is needed). Sketch on the AA map the major different vegetation types within the AA. Vegetation types are distinguished on the basis of what species constitute the tallest layer (or "stratum") of the vegetation type; a stratum should cover at least 30% of the ground within the vegetation type to be counted as the tallest layer. Two examples may help illustrate this. If part of the AA (comprising 20% of the AA's acreage) is an area with 50% areal coverage of trees over a dense shrub layer, then 20% of the AA is forested wetland. In a different part of the AA (comprising 70% of the AA), there is 20% areal coverage of trees over a shrub layer with 60% areal coverage; this 70% of the AA would be classified as scrub-shrub wetland because the tree cover is too sparse to consider the area forested. When trees or shrubs alone cover less than 30% of an area but in combination cover 30% or more, the wetland is classified as scrub-shrub. When trees plus shrubs cover less than 30% of a part of the AA but the total vegetative cover is 30% or greater, the wetland is assigned to the appropriate class for the predominant life form (e.g., emergent) below the shrub layer. Although it is done in the Cowardin system, **for this assessment, do not mix classes, or identify subclasses**. Classes likely to be encountered are defined below:

Forested class:	Has woody vegetation that is ≥20 feet tall, and those trees have ≥30% areal cover within that part of the AA.
Scrub-shrub class:	A part of the AA that has >30% areal cover of woody vegetation < 20 feet tall (shrubs, young trees, and stunted trees).

For purposes of dividing the AA into Cowardin vegetated classes, disregard a vegetated class if it constitutes less than 10% of the AA.

Emergent class: A part of the AA that has < 30% tree-plus-shrub cover but has ≥ 30% cover of herbaceous plants that extend above the water surface (or saturated soil surface) during the growing season (e.g., sedge, rush, grass, bulrush, cattail).

Aquatic bed class: Any area of open water dominated by plants that grow principally on or below the water surface for most of the growing season. Vegetation is non-persistent and includes submerged or floating-leaved rooted vascular plants, free-floating vascular plants, submerged mosses, and algae. This vegetation type would be found in waterbody parts of wetland AAs.

Moss-lichen class: Wetland where mosses or lichens cover substrates other than rock and where herbs, shrubs, and trees together make up <30% of areal cover.

Unvegetated class: Areas with < 30% cover of vegetation.

Source: Modified from Cowardin et al. (1979)

In **column 2** on the form, enter the AKWAM water regimes that apply to the AA (modified from Cowardin et al. 1979):

Permanent/perennial (P/P): Surface water is present throughout the year except during years of extreme drought.

Seasonal/intermittent (S/I): Surface water is present for extended periods, especially early in the growing season, or may persist throughout the growing season, but may be absent at the end of the growing season; or surface water does not flow continuously, as when water losses from evaporation or seepage exceed the available stream flow.

Temporary/ephemeral (T/E): Surface water is present for brief periods during the growing season, but the water table is well below the surface for most of the year; or surface water flows briefly in direct response to precipitation in the immediate vicinity and the channel is above the water table.

Source: Modified from Cowardin et al. (1979)

The relationship between the AKWAM and Cowardin et al. (1979) water regimes is presented in Table 1.

Table 1: Correlations between AKWAM and Cowardin et al. (1979) Water Regimes

Alaska Wetland Assessment Method Surface Water Regimes	**Cowardin et al. (1979) Water Regimes**
Permanent / Perennial	Permanently Flooded
	Intermittently Exposed
Seasonal / Intermittent	Semi-permanently Flooded
	Seasonally Flooded
Temporary / Ephemeral	Saturated (rarely with surface water)
	Temporarily Flooded

The water regime classifications you assign in #10 will be used in different ways, and water regimes will be interpreted slightly differently, based on the functions you are evaluating. A table showing how the water regime information is applied differently for the different functions is included in Appendix D.

In **column 3** on the form, enter the codes for any appropriate modifiers that describe possible AA alterations. In **column 4** on the form, enter the estimated percentage of the AA that corresponds to each Cowardin class combination. A chart illustrating various cover percentages is included in Appendix E.

In the second table on the form, enter the HGM class(es) (Smith et al. 1995) pertaining to all or part (≥10%) of the AA. Smith et al. (1995) describe the HGM classification as:

> *"…based on three fundamental factors that influence how wetlands function, including geomorphic setting, water source, and hydrodynamics. Geomorphic setting refers to the landform of a wetland, its geologic evolution, and its topographic position in the landscape. Water source refers to the location of water just prior to entry into the wetland. Hydrodynamics refers to the energy level of moving water, and the direction that surface and near-surface water moves in the wetland."*

HGM classes found in Alaska's non-tidal areas are riverine, slope, depressional, flat, and lacustrine fringe. Table 2 describes these HGM classes, as does Appendix C. Chapter 3 of Smith et al. (1995) is a thorough reference. **Waterbodies are not assigned HGM classes**, so your percentages in the second table may not total 100.

Table 2: Hydrogeomorphic Wetland Classes in Alaska

HGM Class (Geomorphic Setting)	Dominant Water Source	Dominant Hydrodynamics	Alaska Examples
Riverine (for wetlands only, not the channel)	Overbank flooding from river channel or subsurface hydraulic connections between stream channel and wetlands	Unidirectional (parallel to the river), horizontal flow	Wet vegetated bars on braided rivers, wetlands associated with overflow channels
Slope	Groundwater	Unidirectional, horizontal flow	Wetlands downslope from seeps, open scrub on hillsides of SE AK
Depressional	Groundwater and flow through the unsaturated zone above the water table	Vertical fluctuates	Wetlands in kettles on moraines
Flat	Precipitation	Vertical fluctuates	Polygonal wetlands on North Slope, many poor fens, bogs, black spruce permafrost wetlands
Lacustrine Fringe (for the part with emergent vegetation, not the open water area)	Overbank flow from lake or expansion of lake area during periods of high runoff	Bi-directional, horizontal flow	Wetlands along Goose Lake in Anchorage

Source: Adapted from Smith et al. (1995) and Brinson et al. (1995)

11. Relative abundance of similar wetlands within the same Alaska 6th level hydrologic unit watershed:

Circle the estimated relative abundance of sites within the same 6th level hydrologic unit (HU) watershed that are basically similar in vegetation type and hydrology to the AA. Use the following definitions:

Rare estimated < 10% of wetland area in the 6th level HU is similar to the AA
Common estimated 10-50% of wetland area in the 6th level HU is similar to the AA
Abundant estimated >50% of wetland area in the 6th level HU is similar to the AA

Completed 6th level HU boundary data are available to download on the Alaska Geographic Data Committee website (http://agdcftp.wr.usgs.gov/pub/projects/AWSHED/), provided as a part of the State of Alaska Watershed and Stream Hydrography Enhanced Datasets (AWSHED) Project (AGDC 2002). These data can be downloaded and viewed as maps using ARCGIS software or Google Earth software. The online data are available as shapefiles and can be directly imported for use in ARCGIS, or can be translated to Keyhole Markup Language (KML) files for use in Google Earth. Metadata for the AWSHED data specify the projection and datum to be used. HUs in KML or zipped KMZ format may also be posted on the website where AKWAM is distributed.

Currently, there are limited data available for estimating the relative abundance of wetlands within Alaska, but several resources are available that may be helpful for this estimate. National Wetlands Inventory (NWI) maps show the wetland classifications for select areas of Alaska and, if available for your region, may give you an idea of the wetland types in the region. Available data can be viewed online through the U.S. Fish and Wildlife Service Wetland Mapper Tool website (http://www.fws.gov/wetlands/Data/Mapper.html) (USFWS 2010). Also, wetland maps on the borough or municipality scale may be available through local agencies. In addition, a

report of wetland status for the state of Alaska (Hall 1994) showed that, when looking at distribution of wetland types across and within regions, the following general wetland types are less abundant among and within regions:

- Distribution of Wetland Types *among* Regions
    a. When comparing the distribution of palustrine emergent wetlands (wet sedge/grass tundra and marshes) by ecoregion, these wetland types are less abundant in southern Alaska than in other regions of the state (Hall 1994, Figure 16).
    b. When comparing the distribution of palustrine scrub-shrub wetlands (moist shrub tundra and shrub bogs/muskegs, scrub swamps) by region, these wetland types are less abundant in southern Alaska regions (than in other regions of the state (Hall 1994, Figure 18).
    c. When comparing the distribution of palustrine forested wetlands (forested bogs/muskegs and forested swamps) by region, these wetland types are less abundant in northern and western Alaska regions than in other regions of the state (Hall 1994, Figure 20).
- Distribution of Wetland Types *within* Regions
    a. Within southern regions, palustrine emergent wetlands are less abundant than palustrine scrub/shrub or palustrine forested wetlands (Hall 1994, Figure 12).
    b. Within interior regions, palustrine emergent and palustrine forested wetlands are less abundant than palustrine scrub/shrub wetlands (Hall 1994, Figure 13).
    c. Within northern and western regions, palustrine forested wetlands are less abundant than palustrine scrub/shrub or palustrine emergent wetlands (Hall 1994, Figure 14).

If wetland maps are not available, use the best information available, then your best professional judgment. Soil maps, if available, could be interpreted with the topography of an area to give an idea of hydrologic regime. Other sources include resource inventory and management documents for nearby federal lands, land management professionals, and natural resource agency staff.

12. General condition of the AA:

i. **AA Disturbance.** Condition of the AA is based on land use both within the AA and on surrounding lands. Land use in surrounding areas may cause disturbance within AAs and negatively influence their overall quality and functionality, even though the AAs themselves may be relatively undisturbed. Disturbance refers to any human work or activity that results in modification of the soil, vegetation, or hydrologic characteristics. Examples include excavating, grading, dredging, ditching, plowing, seeding, backfilling, topsoil stripping, vegetation clearing or cutting, peat removal, compacting soil, exposing soil by use of ATVs, redirecting surface water, blocking water flow, flooding, and sedimentation, including sedimentation resulting from off-site activities.

Choose among the following categories to describe conditions both within the AA and on surrounding lands. For surrounding lands, consider any land within 500 feet of the AA, plus any additional area that may drain into the AA.

- Land in a “natural state” would not have experienced vegetation clearing or soil

disturbance, would not support roads or buildings, would not experience human-caused sedimentation or altered hydrology, and would have less than 2% cover of invasive plants.

- Land with "minimal or minor" disturbance could have soil disturbed by compaction but not grading; only minor clearing would have occurred; would support few human developments; natural hydrology would not be more than minimally altered; would have <10% cover of invasive plants; and would support no reproducing invasive animal species.
- Land that is "substantially disturbed" would have extensive soil, vegetation, or hydrologic alteration; high road density; impervious substrates or exposed soils; >10% invasive plant species cover; or reproducing invasive animal species.

Use the matrix on the form to arrive at an overall determination of a "low," "moderate," or "high" level of disturbance at the AA. Describe the disturbance within the AA.

ii. Watershed Disturbance. Then, modify the disturbance rating by considering the level of disturbance within the same 6th level HU as the AA, as follows. If more than 10% of the land within the same 6th level HU as the AA is disturbed, modify the AA's disturbance level by assigning it the next higher disturbance level. For example, if it was categorized as "low disturbance" using the matrix in 12i., and about 20% of the watershed is disturbed, circle "moderate" under 12ii. to characterize the AA's overall level of disturbance.

iii. Noxious and Invasive Plants and Animals. List any noxious or invasive plant or animal species that occur within the AA. In this User's Manual, the terms "noxious" and "invasive" plants refer to plant species listed as noxious by the State of Alaska and plant species considered invasive by the Alaska Committee for Noxious and Invasive Plant Management. *Noxious weeds* are "…any species of plants, either annual, biennial, or perennial, reproduced by seed, root, underground stem, or bulblet, which when established is or may become destructive and difficult to control by ordinary means of cultivation or other farm practices" (Title 11 Chapter 34 Alaska Administrative Code). An *invasive species* is: 1) non-native to the ecosystem under consideration, and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112). Information on Alaska noxious and invasive plants, including species lists, is included in Appendix F. A preliminary list of invasive animal species in Alaska is included in Appendix G.

iv. Descriptive Summary. Briefly describe the AA and surrounding area. The description may include dominant species, topography, slope and aspect, water source, inlets and outlets, disturbance types, estimated age and source of disturbance, land use, and relationship of the AA to other wetlands.

13. Structural Diversity:

This refers to the number of vertical vegetative strata found in AA wetlands and is evaluated by the number of Cowardin et al. (1979) vegetated wetland types identified in section 10 (adapted from Roth et al. 1993). For wetlands with only one Cowardin vegetation type, the AA's natural vegetative potential is also considered: if clearing or other human activity limits the site's vegetation to a single Cowardin type, the rating is lower than if the AA naturally only has one

vegetation type.

Using the table provided on the form, determine the existing structural diversity rating for the AA. Rate the existing structural diversity based on the "best case" for a given wetland. For example, if non-persistent floating-leaved vegetation is absent during the evaluation, but the reviewer knows that such vegetation is present during some portion of the year, then this class should be counted in addition to other vegetated classes. As you did in question 10, disregard any vegetated class if it constitutes less than 10% of the AA.

14. Functions and Services

14A. Habitat for Federally Listed or Candidate Threatened or Endangered (T&E) Plants or Animals and Other Species of Concern:

This section assesses habitat for the following: 1) species receiving protection under provisions of the Endangered Species Act; that is, Listed or Candidate *Threatened or Endangered (T&E) Species;* and 2) plants and animals tracked by the Alaska Natural Heritage Program (AKNHP) or listed as a priority bird of the northwest interior forest of North America. Names of listed threatened and endangered species and their ranges are shown in Appendix H. Visit the USFWS Alaska website (http://alaska.fws.gov/fisheries/endangered/listing.htm) for more detailed descriptions of the threatened and endangered species in Alaska. Lists of plants and animals rated S1 (critically imperiled), S2 (imperiled), or S3 (vulnerable) by the AKNHP are shown in Appendix H. A list of priority birds, covering boreal forest habitat in interior Alaska, was compiled by the Alaska Bird Observatory. These birds are also listed in Appendix H as species of concern.

NOTE: Relatively few observations of AKNHP tracked S1, S2, or S3 plants and animals occur in Alaska. Knowledge of the species and habitat of these plants and animals is an advanced skill in which most investigators will not be proficient. Investigators should answer this question only if knowledge of species identification and habitat for these species is within their expertise, or if they obtain solid information from the AKNHP. Otherwise, investigators should skip to question 14B.

i. Species, Documentation, and Habitat Importance. Circle D (documented) or S (suspected) to indicate whether habitat for listed or candidate T&E species or species of concern is documented or suspected to occur *within* the AA at the specified level. Use the definitions provided below. For a species to be considered *documented* within the AA, an individual or group of individuals should have been reported as physically occurring within the AA itself, not merely in the vicinity. A "report" may constitute information in a government or university agency file, or a documented conversation with the named observer. For a species to be *suspected* of occurring within the AA, the species should have been reported as occurring in the general vicinity of the AA and there should be reasonable certainty that the species could occur in the AA based on its life history requirements. It may be appropriate to indicate more than one use level for multiple species. For example, an AA may contain secondary habitat for Steller's eiders and incidental habitat for polar bears. List the species that correspond to each habitat level determined to apply to the AA. If no T&E species or species of concern use is documented or suspected in the AA, then select the "suspected no usable habitat" option.

Primary Habitat: Habitat essential to the short- or long-term viability of individuals or populations. The presence of traditional breeding, spawning, nesting, denning, or critical migratory habitat, large seasonal congregations (including communal roosts, staging habitat, traditional foraging congregations, etc.), or USFWS-designated critical habitat or core areas in the AA indicates primary habitat, as does any occurrence of a T&E plant.

Secondary Habitat: Habitat that is occasionally or semi-regularly used by a given species, but that is not necessarily essential to the short or long-term viability of individuals or populations. Examples would include non-specific migration areas and occasional forage or perch sites. Primary habitat, as defined above, may occur in the general vicinity (e.g., within the project area, section, drainage, watershed, etc.), but not in the AA.

Incidental Habitat: Habitat that receives chance, inconsequential use by a given species or habitat conditions or the known distribution of the species would indicate this level of use. This term implies that, while it may be conceivable that a given species may occur at an AA at some point, the chance is remote and the use is not likely to be repeated.

ii. Rating. Use the highest level habitat rating (e.g., the level that corresponds to the highest functional point value) determined under 14A.i. to determine the functional point value for the AA. If T&E species or species of concern habitat is documented at the AA, indicate the source of the documentation.

14B. General Wildlife Support:

This field assesses general wildlife habitat potential of the AA based upon evidence of wildlife use and habitat features. The combination of these two variables is considered to more accurately assess this function than if habitat features alone were used. A site may contain what are perceived to be outstanding habitat features for wildlife, but for reasons difficult to detect, may only receive minimal to moderate use. Conversely, a site may contain few desirable habitat features, but may receive significant use due to a general lack of habitat in the area or other factors and may be under-rated for this function if wildlife use was not considered.

To assess habitat features, variables include structural diversity, how evenly the AA is divided among vegetated classes, duration of surface water in at least 10 % of the AA, and degree of disturbance. Structural diversity and evenness of vegetated classes relate to the abundance of niches available in an area. More niches are potentially available as more layers of habitat occur, so more wildlife species potentially are supported by more structurally complex habitats (Cooperrider et al. 1986). Similarly, Hauer et al. (2002a) state that pothole wetlands with the highest level of ecosystem complexity and diversity tend to have a relatively even spatial distribution of wetland zones.

The duration of surface water, whether perennial or intermittent, plays an important role in the habitat function of wetlands. Free water is an extremely important habitat component of wetlands, particularly during summer (Brown 1985). Generally, the longer surface water is present during the year, the more available it is for wildlife use at a variety of life stages. Degree

of disturbance at a wetland can greatly influence its use by wildlife. Examples of disturbance include direct conversion to human uses, conversion of nearby supporting habitats to human uses, and encroachment by human activities, such as residences, roads, and recreation.

i. Evidence of Overall Wildlife Use in the AA. First, determine the level of evidence indicating wildlife use in the AA based on direct observations (auditory detections are counted as observations), presence of wildlife sign, adjacent upland food sources, presence of extremely limiting habitat features, and/or interviews with local biologists with knowledge of the AA. Whether or not a habitat feature would be considered extremely limiting depends on the feature itself as well as the estimated availability of that feature in the general vicinity. For example, springs observed where these features rarely occur would be considered extremely limiting habitat features. Circle "substantial", "moderate", or "minimal" *evidence of use* based on the criteria listed on the data form. For further guidance, refer to the definitions of substantial, moderate, or minimal use provided below. *Evidence of use* is considered to be indicative of *level of use*.

Substantial use: AA is regularly used by a high number of individuals.

Moderate use: AA is regularly used by a small to moderate number of individuals, or infrequently or sporadically used by low to high numbers.

Minimal use: AA is used by an extremely low number of individuals, or receives only chance, inconsequential use by a low to high number of individuals.

ii. Wildlife Habitat Features. Working from top to bottom within the double vertical lines, circle the appropriate AA attributes in the matrix provided on the data form to arrive at an exceptional (E), high (H), moderate (M), or low (L) rating. The first variable considered is the structural diversity rating from #13. The second variable is the evenness of distribution of the AA's vegetated class cover. For class cover to be considered evenly distributed, percent composition of the AA for the most and least prevalent vegetated classes must be within 20% of each other (refer to the percentages listed under #10). This is simply considering the percentage of the AA that each vegetated class comprises – not interspersion or geographic distribution of the vegetation class type throughout the AA.

The third variable is the maximum duration of surface water (any water above the ground surface that is available to wildlife; not necessarily open water) covering at least 10% of the AA. Record the longest duration of surface water ***in ≥10% of the AA***. This may be different from the longest duration present in the AA if the longest duration occurs in <10% of the AA. (Distinctions between how water regime data are applied to various evaluated functions are listed in a table in Appendix D.)

The duration of surface water in ≥ 10% of the AA criterion should be considered a rule of thumb. The intent of this criterion is to recognize the benefit to wildlife that significant amounts of surface water impart to an area.

The 10% criterion should be considered a rule of thumb and is intended to be applied primarily at smaller (e.g., less than 1 or 2 acres), rather than larger, sites. For example, 9 acres of surface

water should not be dismissed at a 100-acre AA simply because this 10% guidance is not met. The intent of this criterion is to allow consideration of significant surface water amounts within an AA relative to wildlife habitat, while disallowing insignificant surface water amounts. The final call will depend on the specific situation at hand, and is therefore left to the evaluator.

The final variable is the degree of disturbance at the AA as determined under #12. This will determine the habitat features rating.

iii. Rating. Determine and circle the general wildlife habitat rating and functional points for the AA by applying the results of 14B.i. and ii. to the matrix provided in the data form.

14C. General Fish Support:

Assess this function only if the AA is used by fish or the existing situation is "correctable" such that the AA could be used by fish (for example, fish use is precluded by perched culvert or other removable barrier). Note that fish use may be limited to the waterbody part of a wetland AA, and fish do not need to use the wetland parts of the AA to be considered. If no part of the AA is used by fish due to lack of habitat (including duration of surface water) or access (that is, the AA does not have the opportunity to provide habitat for fish) AND fish use is not restorable or correctable due to habitat constraints or fish use is not desired from a management perspective (for example, because it would attract large birds to a ditch adjacent to an airport runway), circle **NA** on the data form and proceed to the next function. An AA (or the waterbody part of it) may be considered potential fish habitat if fish are observed, if it is listed in the Anadromous Waters Catalog (AWC), if it is connected to a waterbody listed in the AWC, or if the waterbody is otherwise known or suspected to support fish. It is currently estimated that the AWC documents only 50% or less of the streams actually used by anadromous fish (pers. comm., R. McLean); therefore, it is important that other sources are considered when determining whether or not fish are present in the AA.

Variables assessed to determine a rating for fish habitat quality include duration of surface water and quality of useable aquatic hiding, resting, or escape cover.

Duration of surface water in AA

Presence of surface water is an obvious critical component of fish habitat. Seasonally flooded areas can be important nursery and foraging areas for fish (and can result in "high" habitat quality ratings using this assessment); however, longer duration of surface water generally results in higher ratings because surface waters of such duration are available to fish for greater periods of time and number of life stages. Flow or water level stability is an important habitat component for many fish species (Raleigh et al. 1984, McConnell et al. 1984, Hickman and Raleigh 1982, Marcus et al. 1984, Inskip 1982). Use the surface water duration categories presented in section 10 and Table 1 to work through the matrix on the data form.

Aquatic cover

Abundant structural cover and well-vegetated streambanks and shorelines are also important habitat components for many fish species (Raleigh et al. 1984, McConnell et al. 1984, Hickman and Raleigh 1982, Inskip 1982). Structural cover includes (but may not be limited to):

- submerged logs and vegetation,
- other woody debris,
- undercut banks,
- spawning substrate (clean gravels),
- floating-leaved vegetation, and
- large rocks.

Structural cover provides resting areas, refuge from predators, hiding areas for predators, and functions as a substrate for insect larva (an important food source for many fish species). Aquatic cover categories are provided in Table 3 (adapted from Bartoldus et al. 1994).

Table 3: Aquatic Cover Categories and Criteria

Aquatic Cover Categories	Percentage of Substrate Under a Vertical Projection of Structural Cover
Optimal	20-50% cover
Adequate	5-19% cover
Poor	<5% or >50% cover

Fish species categorization

The presence of certain groups of fish in the AA is considered along with habitat features to derive an overall fish habitat rating. Categorization of species was included in the assessment to reflect ADF&G fisheries management priorities. The ranking of such groups was based on the unique ecological role of anadromous fish, and the subsistence, commercial, personal use, and sport-fishing needs of Alaskans.

This analysis places fish species into three categories, each of which is valued based on conservation need and protection status. Anadromous salmon species are scored the highest as their habitats are protected under Alaska and federal law and form an important link between ocean, stream, and upland habitats. Resident and non-salmon fish species used for sport or subsistence form the second group due to their cultural and economic value. All other resident species comprise the third category. Stocked fisheries of salmon and sport fish should be given the same scoring as natural stocks (pers. comm., R. McLean).

If fish are not observed or known to occur in the AA, other sources may be used to score the fish habitat function. Listing of the waterbody in the AWC or connectivity to a waterbody listed in the AWC may validate the presence of anadromous salmon species, or other species listed in the catalog. If a catalog listing or connectivity is not available and the investigator does not observe fish in the AA or waterbody, the investigator should consider other information sources. Lacking any other information source and the opportunity to sample the waterbody, use the following approach. If a pond or stream is a) permanently or perennially wetted, b) is not likely to freeze to the bottom in winter, c) drains through a channel to a downstream waterbody, and d) that channel is not known to have a barrier to fish migration, assume it supports the same fish species as does the downstream waterbody and at a minimum supports resident fish not used by humans. If the waterbody meet fewer than three of the conditions in the previous sentence, assume it does not

support fish. If it meets three of the four conditions, assume it supports resident fish not used by humans.

For purposes of this assessment methodology, this complex assortment of factors and their interactions has been greatly simplified. However, it is important to recognize the wide range of fish habitat types found throughout Alaska. The variables used here may not accurately characterize all waterbodies if applied without professional judgment. Outside sources, such as fisheries biologists, published studies, and traditional knowledge should be considered when necessary, and care should be taken not to misrepresent fish habitat that does not conform to the criteria used in this analysis.

Modifiers

Although the physical habitat attributes of a site may be attractive to fish, use of the area may be significantly reduced or precluded due to the presence of inadequately-sized culverts, dikes, continual sources of degradation, or other causes. Consequently, such potential "habitat modifiers" are also considered in the assessment. In addition to the presence of undersized culverts, dikes, and other such structural habitat modifiers, the method considers whether a waterbody within the AA is listed on the Alaska Department of Environmental Conservation (ADEC) *Integrated Water Quality Monitoring and Assessment Report* as a Category 5/ Section 303(d) Impaired Waterbody (unless the waterbody's probable impaired uses are listed and they do NOT include "Growth and Propagation of Fish, Shellfish, Other Aquatic Life, Wildlife." The impaired waterbodies are described in Appendix A of the document named above and it is available at the ADEC website at: http://www.dec.state.ak.us/water/index.htm. The 2008 list is shown in Appendix I of this manual; check the ADEC website for updates in 2010 or beyond.

While Alaska's fisheries are uniquely intact and pristine in most cases, noxious or invasive fish species should be considered. These species include Northern Pike, Atlantic Salmon, and Yellow Perch. Invasive status for some species may vary throughout the state (e.g., Northern Pike are native to much of the state but invasive to parts of southcentral Alaska), so investigators should verify what species are considered noxious or invasive in their project area before using this modifier. A 2008 listing of invasive species in Alaska, based on McClory and Gotthardt (2008), is shown in Appendix G. Also considered by this modifier is the presence of invasive plant species that may also have an adverse effect on fishery quality.

i. Habitat Quality and Known or Suspected Fish Species in the AA and Initial Rating.

Working from top to bottom within the double vertical lines in the matrix on the data form, circle the appropriate AA attributes to arrive at an exceptional (E), high (H), moderate (M), or low (L) rating.

The first variable considered is the maximum duration of surface water in the AA (see section 10 and Table 1). Record the longest duration of surface water in the AA, unless this duration does not correspond to the actual fish habitat being evaluated in the AA. Example: the AA includes a small permanent pond with no fish, and a seasonal stream with fish. In this case, seasonal/intermittent duration would be selected as it applies to the fish habitat.

The second variable is useable aquatic hiding/resting/spawning cover. Estimate the percentage of

the waterbody within the AA that contains cover objects such as submerged logs, large rocks and boulders, overhanging banks, and submerged and floating-leaved vegetation and refer to Table 3 above to select a cover category.

From the last three rows, and within the column that the above two steps have led you to, choose the uppermost row that describes any of the fish that you know or suspect use the AA.

ii. Modified Rating. Several factors may decrease or increase the overall general fish habitat score; however, the final score for this function cannot exceed 1.0 or be less than 0.1 if fish are known or suspected to use the AA. On the data form, circle the appropriate response to questions *a)* and *b)* and modify the rating developed in 14C.i. as specified.

14D. Water Storage:

This field assesses the capability of the *wetland* in the AA to slow overbank flow during high water or flood events and the potential of the AA to capture, retain, and make available surface water originating from precipitation and overland flow from uplands (the "sponge effect"). If wetlands in the AA are not subject to inundation or ponding, circle **NA** on the data form and proceed to 14E.

Variables used to assess the water storage function are: the estimated dynamic water storage volume; proportion of the area subject to flooding that supports woody vegetation or hummocks; and the presence/absence of a restricted outlet.

Wetlands able to contain more water volume (acre-feet) are more effective at storing water than wetlands restricted to less capacity under the same conditions. The acreage categories used were adapted from Roth et al. (1993). Water velocity is reduced by spreading water over a larger area, by surface roughness, and by obstructions. Wetlands with dense woody vegetation are better able to slow floodwaters than are wetlands dominated by open water or low-growing or herbaceous vegetation, which offers little resistance to such flows. Wetlands with no outlet or with restricted outlets can attenuate and capture floodwaters more effectively than wetlands with unrestricted outlets. Examples of wetlands with a restricted outlet include one in an oxbow or a wetland in a kettle depression but drained by a stream channel. Culverts and bridges that substantially constrict flow and thereby slow floodwaters could also be considered restricted outlets that cause an upstream wetland to perform this function.

i. Rating. Working from top to bottom, use the matrix on the data form to arrive at the functional points and rating [H = high, M = moderate, or L = low] for this function. First, estimate the maximum acre-feet of water contained within the ***wetland*** subject to periodic flooding or ponding within the AA. This may be based on observation, aerial photos, water marks, and other physical evidence (indicate basis in comments). Next, determine the approximate percentage of wetland subject to flooding that is classified as forested or scrub-shrub, or is hummocky. Finally, determine whether or not the wetland contains a restricted outlet and circle the appropriate functional points and rating.

ii. Potential Property Protection. Indicate whether there are residences, businesses, or other human features (parks, sports fields, historic sites, roads) that could be damaged by floodwaters located within 0.5 mile downstream of the AA. Describe these features in the comments section.

This factor is considered in the final overall rating of the AA.

14E. Sediment/Nutrient/Toxicant Retention and Removal:

This field assesses the ability of the AA to retain deleterious sediments and retain and remove excess nutrients and toxicants. This is sometimes referred to as the "water quality improvement" function of wetlands. This field only applies to wetlands with potential to receive sediments and excess nutrients or toxicants through influx of surface or ground water or direct input. This potential includes inputs that might increase if the project under consideration is built, such as those resulting from loss of vegetation cover and increase of impervious surface. This function is not intended to encompass the process of natural and gradual sediment accretion that occurs along a glacial stream. It is, however, intended to apply to minor sediment inputs resulting from fire or landslides. If no wetlands in the AA are (or will be) subject to input of pollutants, circle **NA** on the data form and skip to the next function.

Nitrogen and phosphorus are the nutrients most often associated with water pollution; both occur in high concentrations in fertilizers and discharges from sewage treatment plants, septic systems, and stormwater collection systems. Excessive amounts of these nutrients may result in algal blooms and subsequent oxygen deficits in receiving waters. Toxicants include pesticides, herbicides, wastewater pathogens, deleterious organic compounds, petroleum products, metals, and other potentially harmful constituents. These may reach wetlands by overland or subsurface flow from adjacent areas, seepage from failed septic systems, storm drain discharges, dust, snow plowed from a road, or spills directly into the wetlands.

The assessment is based on the site's proximity to sediment/nutrient/toxicant sources; percent cover of vegetation; evidence of flooding or ponding; and presence or absence of an outlet. Wetlands with the potential to receive *and successfully process* sediment, nutrients, and toxicants provide these functions at a higher capacity than do wetlands that receive excessive amounts of these constituents such that other functions are impaired. Generally, a wetland's ability to take up nutrients and toxicants and filter sediment increases with the density of its vegetation. Flooded or ponded wetlands are indicative of sites that retain water; these areas allow sediments to settle out and increase nutrient and toxicant contact time with vegetation, soil, and microbes, which enhances uptake. Sites with no outlets or restricted outlets retain water longer (thus allow more settling and contact with vegetation and soil) than do sites with unrestricted outlets.

Examples and additional guidance for determining whether this function should be evaluated are provided below.

- A wetland downgradient from a developed or disturbed area (e.g., mining, roads, residential development, plowing, logging, or naturally-induced disturbance such as landslides, thermokarst, or fire) or area proposed for development would be evaluated if sediments or contaminants might reach the wetland.
- A roadside ditch wetland subject to stormwater runoff, sanding, plowed snow, and dust would be evaluated.
- Wetlands traversed by off-road vehicle trails with exposed soils would be evaluated if entrained soil would likely settle in the wetland.
- A depressional wetland in a field that is cropped, grazed, or fertilized routinely or which would receive runoff from a disturbance would be evaluated.

- A wetland receiving runoff from a dog yard, residential subdivision, or borrow source would be evaluated.

If it is *conceivable* that the AA could receive pollutants from the surrounding landscape, but *unlikely* and there is no evidence that pollutants are being transported to the site by overland flow, groundwater, or flow through the unsaturated zone above the water table, then this function should **not** be evaluated. For example, if an AA occurs below a beaver dam and it is conceivable, but not reasonably certain, that the dam will someday fail and deliver the accumulated sediments to the site, this function would **not** be evaluated. Similarly, if a gravel road is located several hundred yards up gradient of an AA and dense vegetated ground cover exists between the AA and the road, it is conceivable, but unlikely, that pollutants from the road could reach the AA, and therefore this function would **not** be evaluated. The degree of upland buffer integrity is important to the applicability of this function. If the buffer surrounding a wetland is fully functional, then the buffer, rather than the wetland, may perform the bulk of water quality improvement. In this instance, this function would **not** be evaluated.

The location of a riverine system in the landscape may be considered when evaluating the level of functionality of the related wetlands in improving water quality. In a broad sense, streams and rivers occur in three main types of landforms that dictate their sediment transport capabilities, and thus the ability of adjacent wetlands to perform water quality improvement: erosional, transport, and depositional. Erosional stream types occur in steep-gradient (e.g., headwater) areas and have little overbank flow or capability to improve water quality. Transport stream types are efficient at moving sediment and other materials, occur in areas with lower gradient than erosional areas, and generally have a moderate capability to improve water quality. Depositional stream types occur in lower-gradient areas and have the highest capability to improve water quality.

i. Rating. Working from top to bottom, use the matrix on the data form to arrive at the functional points and rating [H = high, M = moderate, or L = low] for this function. First, determine whether the AA receives, or surrounding lands have the potential to deliver, low to moderate levels of sediments, nutrients, or toxicants such that other functions in the AA are not substantially impaired (e.g., the wetland is processing these inputs but is not significantly affected by them). Observation of some sedimentation, relatively minor potential sources of nutrients or toxicants, or signs of minor to moderate eutrophication would indicate this input level.

If the waterbody within the AA is on Alaska's most recent List of Category 5/303(d) Impaired Waterbodies, indicating failure to meet water quality standards related to sediment, turbidity, nutrients (or low dissolved oxygen), or toxicants, then the second column of the matrix should be used. The water quality standard that is not met by the impaired waterbody may include toxic and other deleterious organic and inorganic substances, petroleum hydrocarbons, siltation, turbidity, dissolved gas, seafood residues and processing waste, bark and woody debris, salinity, or total dissolved solids. The 2008 impaired waterbody list is included in this manual as Appendix I, and the full 2008 report is available on the internet at: http://www.dec.state.ak.us/water/wqsar/waterbody/integratedreport.htm. An updated list will be issued in 2010; the user should check the above website for the 2010 update.

If the AA is not included on the List of Category 5/303(d) Impaired Waterbodies, but high levels of a pollutant such as one listed above are observed or suspected, then the second column of the matrix should be used.

The next two variables address the percentage of wetland vegetated cover and whether evidence of ponding or flooding occurs in the AA, respectively. The final variable pertains to whether or not the AA contains an outlet or a restricted outlet.

14F. Sediment/Shoreline Stabilization:

This field assesses the ability of the AA to dissipate flow or wave energy and stabilize soil at the water's edge or in shallow water, reducing erosion during major storm events, unusually high runoff, point-source waves from boats, and even substantial groundwater discharge. Complete this field only if the wetland within the AA occurs on the banks of a river, stream, or other natural or manmade channel; occurs on the shoreline of a standing waterbody that is subject to wave action; or is a site where groundwater is discharged at a high rate (i.e., visibly flows). If this field does not apply, circle **NA** on the data form and proceed to the next function.

Factors to consider when determining whether a waterbody is subject to wave action include estimated wind velocity and direction, water depth, and fetch (distance across the water needed to generate a wave). Although not required for application of this assessment method, Linsley and Franzini (1979) cite the following equation for determining wave height: rise of wave (feet) = (wind velocity [mph]^2 x fetch [miles]) (1,400 x water depth [feet]).

Variables used to assess this function are: percent cover of the wetland streambank or shoreline by species with deep, binding root masses; and duration of surface water adjacent to rooted vegetation. Generally, plant species with deep, binding root masses are more effective at stabilizing soils on streambanks and shorelines than are species with less dense root systems. Wetlands that are adjacent to surface waters for a longer duration generally provide this function more frequently than do wetlands that are adjacent to surface waters for a shorter (less total) duration.

i. Rating. Working from top to bottom, use the matrix on the data form to arrive at the functional points and rating [H = high, M = moderate, or L = low] for this function. Trees and shrubs are generally considered to have deep, soil-binding root masses. Annual herbaceous plants are considered to lack such root masses. Perennial herbaceous species vary with respect to their root masses and should be considered individually. Perennial sedges, rushes, and grasses, for example, provide rhizomes, stolons or dense fibrous root systems for good soil stabilization. Annual grasses or forbs may not. There may be other overriding factors affecting bank stability, such as soil texture (sand and gravel are highly erodible whereas soil with cohesive aggregates is not); ice content in permafrost (permafrost with high ice content is more erodible than permafrost with low ice content); and soil layering (e.g., a layer of cobbles or gravel will be stable in low velocity water but less so in higher velocity water). Where such factors apply, best professional judgment should be used when rating this function.

Next, determine the longest duration of surface water *adjacent to rooted vegetation in the AA*. Your determination may be based on the location of plants, water marks on the shoreline, aerial

photographs, classification in NWI mapping, NRCS soil data, precipitation records, interviews, knowledge of the area, and best professional judgment. (Note that this duration may be different from the longest duration present in the AA.) Using the descriptions of the durations provided in the instructions for question 10 (including Table 1), circle the appropriate functional points and rating.

14G. Production Export/Terrestrial and Aquatic Food Chain Support:
This field assesses the potential of the AA to produce and export food/nutrients for both terrestrial and aquatic organisms. For the purposes of this assessment, "food/nutrients" include particulate and dissolved organic matter, plant forage species, invertebrates, and wildlife prey species. Variables used to assess this function are: area of vegetated wetland in the AA; level of biological activity; outlet (surface or subsurface) presence or absence; duration of surface water; and presence of a vegetated upland buffer.

Generally, wetlands with greater areas of vegetation have potential for more forage plant production and particulate and dissolved organic material production than do wetlands containing smaller areas of vegetation. Due to their proximity and interconnectedness to wetlands, the vegetated upland areas adjacent to wetlands (i.e., vegetated buffers) contribute to this function and are also considered in the ultimate rating. The buffer width threshold of 50 feet used in AKWAM was adapted from COE guidance on riparian buffer widths (Fischer and Fischenich 2000). This width should incorporate most buffers that provide detrital input to wetlands and waterbodies, while also incorporating habitat considerations to some extent.

The level of biological activity is evaluated by synthesizing the ratings for the General Fish Habitat function and the General Wildlife Habitat function. The rationale for this indicator is that the greater the wildlife and fish species use and habitat quality of the AA, the greater the AA is contributing to terrestrial and aquatic food webs in the area.

Wetlands with surface or subsurface outlets can more readily export organic material to downstream habitats than can wetlands without outlets. Note that the outlet need not be a channel, but could also be overland flow where it is conceivable that water moves across the wetland surface. In general, wetlands that have seasonal variability in soil saturation are more productive than wetlands that are permanently inundated (Mitsch and Gosselink 2000); however, this does not address the importance of permanent water to wildlife, fish, crustaceans, and insect species, and their contribution to production export. For this reason, perennial surface water is considered superior to seasonal/intermittent or temporary/ephemeral hydrologic regimes. In addition, opportunities for breakdown and export of organic materials to downstream aquatic habitats via surface water are generally greater at wetlands containing water for longer, rather than shorter, durations.

i. Level of Biological Activity. Use the general wildlife habitat rating from 14B.iii. and the general fish habitat rating from 14C.iii. to determine the composite biological activity rating on the table provided.

ii. Rating. Working from top to bottom, use the matrix on the data form to arrive at the functional points and rating [H = high, M = moderate, or L = low] for this function. For Factor A, estimate the acreage of the vegetated component (all vegetation including persistent, non-

persistent, rooted, and floating) within the AA. Factor B pertains to the biological activity level rating, determined under 14G.i. above. For Factor C, indicate (yes or no) whether the AA contains a surface or likely subsurface outlet (see indicators of recharge under 14H below). Next, circle the appropriate initial functional points and rating based on the longest duration of surface water in the AA.

iii. Modified Rating. Answer the question under 14G.iii. and increase the rating if the AA has a sufficient vegetated upland buffer, using the definitions shown on the data form.

14H. Groundwater Discharge/Recharge:

This field assesses groundwater discharge and recharge potential at the site. Indicators of discharge include observed springs or seeps (e.g., slope wetlands), vegetation growing during dormant seasons (earlier in spring or later in autumn relative to other sites), wetlands at the toe of a natural slope, permanent flooding during drought periods, and presence of an outlet but no inlet. Indicators of recharge can be more difficult to discern in the field and include observation of a permeable substrate without an underlying impeding layer, or presence of an inlet but no outlet. Permafrost would indicate that neither discharge nor recharge occurs in the wetland.

The indicators used to assess this function include the duration of inundation or soil saturation in the upper 12 inches of the soil profile attributed to: 1) groundwater discharging within or upslope from the wetland, or 2) surface water that is determined or reasonably estimated to be recharging the water table.

14H.i. and ii. provide lists of common groundwater discharge and recharge indicators. Check all that apply. You may add other site-specific indicators that you identify in the field.

iii. Rating. Working from top to bottom, use the matrix on the data form to arrive at the functional points and rating [H = high, L = low, N/A = Not Applicable] for this function. First select the corresponding duration of inundation or soil saturation attributable to *groundwater* (for discharge) or to water recharging the groundwater system (for recharge), then rate the function accordingly. If it is determined that groundwater discharge/recharge potential cannot be reasonably ascertained in the AA at this level of analysis, explain this in the comments section and indicate the rating as *Insufficient Information* and functional points as "**NA**" on the data form. For wetlands underlain by permafrost, this function is not applicable; circle "**NA**."

14I. Uniqueness:

This field expresses the general uniqueness of the AA in terms of: 1) either its replacement potential or rarity statewide, 2) the relative abundance of the AA's wetland type in the same 6th level hydrologic unit subregion, and 3) the degree of human disturbance.

Replacement Potential and Rarity

Replacement potential refers to the ability to successfully replicate a particular type of wetland at mitigation sites. The following wetlands may be very difficult, and in some cases are not possible, to successfully replicate at mitigation sites within a time period similar to the design life of a project:

Bog: A peat-accumulating wetland that has no significant inflows or outflows

and supports acidophilic mosses, particularly sphagnum (Mitch and Gosselink 2000). It typically supports more evergreen plants than does a fen.

Fen: A peat-accumulating wetland that receives some drainage from surrounding mineral substrates and usually supports more deciduous vegetation, including sedges, than does a bog (Mitch and Gosselink 2000).

Spring or Seep: A place where water issues from the ground naturally.

Forested Wetland: See discussion and definition under #10, Classification of AA. These are difficult to replace because of the time needed for mature trees to grow.

This field also considers the scarcity of the wetland's particular plant associations; that is, whether it has been documented as rare or vulnerable to extinction. One goal of the Alaska Natural Heritage Program (AKNHP) is to describe and globally rank all plant associations within Alaska. This goal has been accomplished for the forest plant associations of coastal rainforests in Southeast and Southcentral Alaska. The list is presented in Appendix J. Plant associations dominated by shrubs and herbs are still in the ranking process.

The AKNHP is also working to describe and rank plant associations as part of the National Park Service's Landcover Mapping program for the following areas: Gates of the Arctic National Park and Preserve, Glacier Bay National Park and Preserve, Yukon-Charley National Park and Preserve, and Kenai Fjords National Park. The descriptions and rankings of plant associations are found in the User's Guides and are available from the National Park Service, Alaska Support Office, 240 West 5th Avenue, Anchorage, AK 99501 or from the AKNHP website: http://aknhp.uaa.alaska.edu/ECOLOGY/Ecology_Plant_Association_Projects.htm.

In the absence of bog, fen, spring or seep, or forested wetland types, wetlands with higher structural diversity or higher AKNHP rank are considered more difficult to replicate than sites with low structural diversity or lower AKNHP ranks. If available for your area, consult AKNHP lists for ranking. Structural diversity is evaluated in question 13.

Relative Abundance (see question 11)
Wetland types that occur infrequently within the AA's 6th level hydrologic unit subregion are considered to have low relative abundance and are more unique than wetlands that occur commonly or abundantly within the same hydrologic unit subregion.

Degree of Human Disturbance (see question 12)
Wetlands with low disturbance that are functioning under primarily natural conditions are considered more unique than are wetlands exposed to moderate or high disturbance levels.

i. Rating. Working from top to bottom, use the matrix on the data form to arrive at the functional points and rating [H = high, M = moderate, or L = low] for this function. First, determine whether the AA is or contains a bog, fen, spring, seep, or mature forested wetland, or supports a plant community ranked S1, S2, S3, S?, G1, G2, G3, or G? by the AKNHP (see Appendix J). When determining whether the AA contains a mature forested wetland, take care to ensure that

non-wetland riparian areas are not counted as wetland.

Next, indicate the estimated occurrence frequency of similarly classified sites within the same 6th level hydrologic unit subregion using the answer from question 11. Finally, circle the appropriate functional points and rating based on the degree of disturbance at the AA as determined under question 12.

14J. Recreation/Education Potential:

This field gives the evaluator an opportunity to assign "bonus points" to an AA based on its potential to support recreation or education activities. If a site does not potentially support such activities, then this field does not affect the overall rating. In the absence of known recreational or educational properties of a site, the rating is based on the evaluator's assessment of potential for such use, along with ownership of and degree of disturbance at the AA. Sites that are publicly owned or contain public easements generally offer better access opportunities than do privately owned sites.

i. Is the AA a Known or Potential Recreation or Education Site? If the AA is a known or potential recreation or education site, circle "Yes" and continue with the evaluation. If the site is not a known or potential recreation or education site, circle **NA**; no further assessment is completed for this function. When considering the site's potential for recreation or education, consider its proximity to a community, whether it has characteristics that would draw people to it (viewable wildlife, fish, berries, unique plants), whether any amenities exist (for example, parking), whether it offers a unique view, and whether it might provide a favored travel route.

ii. Recreation and Education Categories That Apply to the AA. Check the categories that apply to the AA.

iii. Rating. Working from top to bottom, use the matrix on the data form to arrive at the functional points and rating [H = high, M = moderate, or L = low] for this function. First, indicate whether the site is a known education or recreation site or if it is a potential education or recreation site. Next, determine ownership and level of access permitted at the site based on the three options provided. Finally, circle the appropriate functional points and rating.

D. Wetland Functions and Services Summary and Overall Rating

15. Functions and Services Summary

Record the AA number on the top line of the form. Transfer the ratings and functional points assigned for each of the 12 functions and services in items 14A through 14J to the appropriate fields on the summary form. For functions that do not apply to a given AA (e.g., water storage for AAs that do not flood or pond), enter "NA" under each of the column headings. Record values of 1 under the Possible Functional Points column for all the other functions on the form. For an explanation of the second-to-last column and ideas for its use, see Appendix K. Taking into consideration site-specific conditions and adjacent land uses (i.e., landscape setting), indicate with an asterisk (*) the four most prominent functions that the evaluator perceives for this site. Although judgment-based and therefore subjective, labeling prominent functions is a good check on what the more objective analysis shows, and can also be helpful for defining appropriate mitigation measures.

16. Overall Rating

Determine the appropriate overall rating based on the criteria presented on the form. These overall ratings may be used for establishing wetland protection strategies at the planning stage and prioritizing impact avoidance when developing projects. For example, if wetland impacts are unavoidable for a given project, and alternatives allow a choice between affecting a Category 1 or a Category 3 site, the applicant and reviewing agencies should direct impacts to the Category 3 site, if practicable. The overall rating also may help regulators determine appropriate compensation ratios specific to each category. These categories are defined in Appendix A of the Corps of Engineers' Regulatory Guidance Letter No. 09-01 on implementation of the Federal Rule on Compensatory Mitigation in Alaska (COE 2009) and are copied below. The examples used in these descriptions are illustrations of the types of wetlands that fall into each category and do not comprise comprehensive lists. Placement of each wetland into a category will require use of professional judgment by wetland investigators, resource agency staff, and regulators.

Category 1 -- High functioning wetlands. These wetlands are the "cream of the crop." Generally, these wetlands are less common. These are wetlands that: 1) provide a life support function for [a] threatened or endangered species that has been documented; 2) represent a high quality example of a rare wetland type; 3) are rare within a given region; or 4) are undisturbed and contain ecological attributes that are impossible or difficult to replace within a human lifetime, if at all. Examples of the latter are mature forested wetlands that may take a century to develop, and certain bogs and fens with their special plant populations that have taken centuries to develop. The position of the wetland in the landscape plays an integral role in overall watershed health.

Category 2 – High to moderate functioning wetlands. These wetlands are those that: 1) provide habitat for very sensitive or important wildlife or plants; 2) are either difficult to replace (such as bogs); or 3) provide very high functions, particularly for wildlife habitat. These wetlands may occur more commonly than Category 1 wetlands, but still need a high level of protection.

Category 3 -- Moderate to low functioning wetlands. These wetlands can provide important functions and values. They can be important for a variety of wildlife species and can provide watershed protection functions depending on where they are located. Generally these wetlands will be smaller and/or less diverse in the landscape than Category 2 wetlands. These wetlands usually have experienced some form of degradation, but to a lesser degree than Category 4 wetlands.

Category 4 -- Degraded and low functioning wetlands. These wetlands are the smallest, most isolated, have the least diverse vegetation, may contain invasive species, and have been degraded by humankind. These are wetlands that we should be able to replace and, in some cases, improve from a habitat standpoint. These wetlands can provide important functions and values, and should to some degree be protected depending on where they are located in the watershed and the condition of that watershed (urban vs. rural). In some areas, these wetlands may be providing groundwater recharge and water pollution prevention functions and, therefore, may be more important from a local point of view. Thus regional differences may call for a more narrow definition of this category.

E. Categorizing Waterbodies

The approach to assessing waterbodies is much simpler than for wetlands: waterbodies are placed into categories based on a few of their characteristics. Individual functions are not analyzed explicitly, but some are used in the process of placing the waterbody into a category. The approach to categorization was adopted from the Anchorage Debit-Credit Method (U.S. Army Corps of Engineers et al. 2010), which has been developed and revised by an interagency team over the course of more than a decade. That method places waterbodies into categories that reflect professionals' judgment of their relative ecological values and that ultimately determine how impacts to those waterbodies will be compensated. For AKWAM, the Anchorage classification has been simplified, and a few factors added to reflect the need for it to be applied to waterbodies throughout Alaska. The categories reflect the degree of physical alteration of the waterbody and the status of its recovery, whether it is used by species of concern, the type of fish it supports, and some of its human uses. Use applicable guidance presented for the wetland assessment method when deciding how to answer questions for the waterbody assessment.

The waterbody categorization does not require definition of a specific assessment area as the wetland rating does. The evaluator should generally focus on the part of the waterbody that lies within the "project area" as it was described in section III.A above. This will typically include any area that would be directly or indirectly affected by the project, including construction activities, and should extend at least to the limits of the construction easement and the permanent right-of-way. However, for some waterbody characteristics, consideration of the full waterbody is appropriate, and these cases are indicated on the rating form. As for wetlands, it is generally appropriate to evaluate waterbodies individually on separate data forms, but for many similar waterbodies, it may be possible to rate several on one form.

Recall that wetland AAs often encompass waterbodies or parts of waterbodies. Even though the waterbody may be considered as part of a wetland assessment area, it is ALSO categorized based on its own characteristics. For consideration during permitting, the waterbody's category, as determined using the Waterbody form, is likely to be applied to the full waterbody, and the wetland AA's rating and category will be used for the wetland part of a wetland AA. If a waterbody is rated on its own, and it is also within a wetland AA, and the wetland AA is placed in a higher (lower number) category than the waterbody is, investigators and agency staff will need to consider what factors resulted in the categorization to determine the most appropriate category for the waterbody.

The rating form is shown in Appendix B. The questions are self-explanatory after using the wetland data form.

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V. GLOSSARY

Abundant (wetland type): An estimated 50% or more of wetlands in the same Alaska hydrologic unit subregion are similar in composition to the AA.

Aquatic bed class: Any areas of open water dominated by plants that grow principally on or below the water surface for most of the growing season. Vegetation is non-persistent and includes submerged or floating-leaved rooted vascular plants, free-floating vascular plants, submergent mosses, and algae.

Bankfull discharge: The discharge that corresponds with the water level when the water just begins to leave the channel and spread out onto the floodplain (FISRWG 1998).

Bankfull width: The width of the channel measured at a section perpendicular to streamflow at bankfull discharge (Lawlor 2004).

Bog: A peat-accumulating wetland that has no significant inflows or outflows and supports acidophilic mosses, particularly sphagnum (Mitsch and Gosselink 2000).

Common (wetland type): An estimated 10-50% of wetlands in the same Alaska hydrologic unit subregion are similar in composition to the AA.

Contiguous: Touching, in actual contact. Hydrologic interaction would be expected within a contiguous wetland or waterbody.

Depressional wetland: These occur in topographic depressions with a closed elevation contour that allows accumulation of surface water. Dominant sources of water are precipitation, groundwater discharge, and flow through soils from adjacent uplands (Smith et al. 1995).

Emergent wetland class: Vegetated wetland characterized by erect, herbaceous hydrophytes (e.g., sedges, rushes, grasses, bulrush, cattail), excluding mosses and lichens.

Entrenchment ratio: A ratio used to describe stream channel incisement, calculated by dividing flood-prone width by bankfull width (Rosgen 1994, 1996). The lower the ratio, the greater the incisement.

Fen: A peat-accumulating wetland that receives some drainage from surrounding mineral soil and usually supports marsh-like vegetation. (Mitsch and Gosselink 2000)

Flood-prone width: That area of the floodplain that is inundated by flows 2 times the maximum bankfull depth (Rosgen 1994, 1996).

Forested wetland class:	Vegetated wetland characterized by woody vegetation that is 20 feet tall or taller and comprises > 30% areal cover.
Fringe wetlands:	Vegetated or unvegetated wetlands that are found between a water body, such us a river, lake, or pond, and an upland. Located within an area that is less than 3 times the bankfull width of the waterbody.
Functional unit:	A figure derived by multiplying functional points for a given AA by its estimated acreage.
Functional point:	A numerical rating, ranging from 0 to 1, assigned to a particular function or service based on given criteria.
Functions:	The physical, chemical, and biological processes that occur in ecosystems.
Groundwater:	That portion of the water below the ground surface that is under greater pressure than atmospheric pressure (Environmental Laboratory 1987).
Incidental habitat:	Habitat that receives chance, inconsequential use by a given species, or habitat conditions or the known distribution of the species would indicate this level of use. This term implies that, while it may be conceivable that a given species may occur at an AA at a given point in time, the chance is remote and the use is not likely to be repeated.
Minimal (wildlife) use:	AA is used by extremely small numbers relative to local populations, or receives chance, inconsequential use in any numbers relative to transient populations.
Moderate (wildlife) use:	AA is regularly used in small to moderate numbers relative to local populations, or infrequently or sporadically used in small to high numbers relative to local or transient populations.
Moss-lichen wetland class:	Wetland where mosses or lichens cover substrates other than rock and where emergents, shrubs, or trees make up less than 30% of areal cover.
Native fish species:	Implies a species indigenous to Alaska; but not necessarily to a given drainage or waterbody.
Non-fringe wetlands:	Wetlands that are removed from a waterbody, such us a river, lake, or pond. These wetlands are located in an area that is outside 3

	times the bankfull width of a waterbody.
Open water:	Any area of standing or flowing water without emergent (not including pioneer species), scrub-shrub, or forested vegetation (e.g., in most cases, a flooded wet meadow would not be considered to contain open water) .
Permanent/perennial:	Surface water is present throughout the year except during years of extreme drought.
Primary habitat:	Habitat essential to the short or long-term viability of individuals or populations. The presence of traditional breeding, spawning, nesting, denning, or critical migratory habitat, large seasonal congregations (including communal roosts, staging habitat, traditional foraging congregations, etc.), or USFWS-designated critical habitat or core areas in the AA indicates primary habitat, as does any occurrence of a T&E plant.
Project area:	The proposed project construction footprint plus indirectly affected area. Note that this "project area" may differ from the "project area" defined for other purposes.
Rare (wetland type):	An estimated < 10% of wetlands in the same Alaska hydrologic unit subregion are similar in composition to the AA.
Scrub-shrub class:	Vegetated wetland dominated (> 30% areal cover) by woody vegetation less than 20 feet tall. Species include shrubs, young trees, and stunted trees and shrubs.
Seasonal/intermittent:	Surface water is present for extended periods, especially early in the growing season, or may persist throughout the growing season, but may be absent at the end of the growing season; or surface water does not flow continuously, as when water losses from evaporation or seepage exceed the available streamflow.
Secondary habitat:	Habitat that is occasionally or semi-regularly used by a given species, but that is not necessarily essential to the short or long-term viability of individuals or populations. Examples would include non-specific migration areas and occasional forage or perch sites. Primary habitat, as defined above, may occur in the general vicinity (e.g., within the project area, section, drainage, watershed, etc.), but not in the AA.
Services:	The benefits that human populations receive from the functions that occur in ecosystems.

Substantial (wildlife) use:	AA is regularly used in high numbers relative to local or transient populations.
Temporary/ephemeral:	Surface water is present for brief periods during the growing season, but the water table is well below the surface most of the year; or surface water flows briefly in direct response to precipitation in the immediate vicinity and the channel is above the water table.
Vegetated wetland buffer:	Area adjacent to AA with ≥ 30% plant cover, ≤ 15% noxious weed or ANVS cover, and that is not subjected to periodic mechanical mowing or clearing (unless for weed control).
Wetland:	The Code of Federal Regulations defines wetlands as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." (33 CFR Part 328.3)

Appendix A
Wetland Assessment Data Form

Use this form to assess areas that are primarily wetlands (versus waterbodies). For waterbodies, use the Waterbody Categorization Form.

1. Project name and ADOT&PF #:_____ **2. Assessment Area #(s):**_____

3. Evaluation date: Mo._____ Day____ Yr._____ 4**. Evaluator(s) and affiliation:** _____

5. Purpose of evaluation:

____ Wetland/waterbody potentially affected by a proposed project ____ Mitigation wetlands; pre-construction

____ Mitigation wetlands; post-construction ____ Other _____

6. Wetland location(s):

Legal: T ____ N or S (circle one); R ____ E or W; S _____ ; and T ____ N or S; R ____ E or W; S _____ ; _____ Meridian

Approx. stationing or mileposts or pertinent project component: _____

Lat/long: _____ **Datum:** _NAD 83_____ **Nearest community:** _____

Watershed: _____ (smallest named stream), tributary of _____ Ecoregion (from USCOE 2007): _____

7. Identifying numbers of related data: wetland determination forms _____ photos _____

GPS waypoint # _____ other _____

Map (#) showing AA: _____ (closely follow the user's manual instructions for identifying the AA)

Briefly describe the features that define the limits of the AA (e.g., tributary, wetland/upland boundary, extreme low tide elevation)**:**

8. Wetland size (total acres, not just AA): _____ (visually estimated) or _____ (measured, e.g., in GIS)

9. Assessment area (AA) size: _____ acres (visually estimated) or _____acres (measured)

Acreage of the AA MINUS the part that is waterbody that will be separately assessed using the waterbody form: _____ acres of wetland in AA

10. Classification of Wetland and Waterbody in the Wetland AA:

Class (Cowardin)	Water Regime (Cowardin)	Modifier (if any; Cowardin)	% of AA

Abbreviations:

Cowardin Classes: Forested Wetland (**FO**), Scrub-Shrub Wetland (**SS**), Emergent Wetland (**EM**), Moss-lichen Wetland (**ML**), Aquatic Bed (**AB**), Unvegetated (**UN**)

Water (Inundation) Regimes: Permanent/Perennial (**P/P**), Seasonal/Intermittent (**S/I**), Temporary/Ephemeral/Saturated (**T/E**)

Modifiers: Excavated (**X**), Impounded (**I**), Diked (**D**), Partly Drained (**PD**), Farmed (**F**), Artificial (**A**), Beaver-modified (**B**)

HGM Class (Brinson)	% of AA

HGM Classes: Riverine (**R**), Depressional (**D**), Slope (**S**), Flat (**F**), Lacustrine Fringe (**LF)**

11. Estimated relative abundance (of similar wetlands within the same 6th level hydrologic unit subregion, see definitions in user's manual)**:**

(Circle one) Unknown Rare Common Abundant

What information sources did you use for this estimate?

12. **General condition of AA:**

i. Disturbance (see User's manual for descriptions of disturbance levels):

Conditions adjacent to AA / *Conditions within AA*	*Predominant conditions adjacent to (within 500 feet of) the AA, plus any area that drains into the AA*		
	Adjacent land is in a natural state	*Adjacent land has experienced minimal or minor disturbance*	*Adjacent land is substantially disturbed*
AA is in a natural state	low disturbance	low disturbance	moderate disturbance
AA has experienced minimal or minor disturbance	moderate disturbance	moderate disturbance	high disturbance
AA is substantially disturbed	high disturbance	high disturbance	high disturbance

Describe the disturbance within the AA (type, age, intensity, source of disturbance, location)**:**

ii. Consider the 6th level HU containing the AA again. If you estimate that **more than 10% of the land in the 6th level HU is disturbed**, circle those bold words, cross out the disturbance level you selected in the matrix above and write in the next higher level of disturbance in the same box.

iii. List any noxious or invasive plant or animal species in the AA or surrounding lands (specify which are in the AA):

iv. Briefly describe the AA and surrounding land use and habitat types (dominant species, water source, topography, approximate slope, inlets and outlets, land use, relationship to other AAs, adjacent vegetation types and land uses)**:**

13. **Structural Diversity of AA:** (based on number of simplified Cowardin **vegetated** classes present, listed in #10 above)

Existing # of Cowardin vegetated classes in AA	***Rating***
≥3 classes; or 2 classes if 1 is forested	H
2 classes; or 1 class if forested	M
1 class, and humans do not prevent establishment of additional classes	M
1 class, and humans limit establishment of additional classes	L

14A. Habitat for Federally Listed or Candidate Threatened or Endangered Plants or Animals or Other Species of Concern:

i. Species, Documentation, and Habitat Importance.

AA is Documented (D) or Suspected (S) to contain (circle one based on definitions contained in instructions):

Primary or critical habitat (**list species**) D S species: _____

Secondary habitat (**list species**) D S species: _____

Incidental habitat (**list species**) D S species: _____

None or unknown ☐

ii. Rating (use the conclusions from 14A.i. above and the matrix below to arrive at [circle] the functional points and rating)

Highest Habitat Level	***doc/ primary***	***sus/ primary***	***doc/ secondary***	***sus/ secondary***	***doc/ incidental***	***sus/ incidental***	***none or unknown***
One or more of the species listed in 14A.i. is a federally Listed or Candidate Threatened or Endangered Species	1H	.8H	.9M	.7M	.3L	.1L	0L
Species listed in 14A.i. are all "Other Species of Concern" (i.e., not listed under the Endangered Species Act)	.8M	.7M	.6M	.5M	.2L	.1L	0L

Sources for documented or suspected use (e.g., observations, records, etc):

iii. Final Score and Rating: _____ Enter on the summary page on the Habitat for Federally Listed Species row.

14B. General Wildlife Support Rating:

i. Evidence of overall wildlife use in the AA (circle substantial, moderate, or low based on supporting evidence):

Substantial (based on any of the following [check]):
__ observations of abundant wildlife #s or high species diversity (during any period)
__ abundant wildlife sign such as scat, tracks, nest structures, game trails, etc.
__ presence of extremely limiting habitat features not available in the surrounding area
__ interviews with local biologists with knowledge of the AA or its habitat type

Minimal (based on any of the following [check]):
__ few or no wildlife observations during peak use periods
__ little to no wildlife sign
__ sparse adjacent upland food sources
__ interviews with local biologists with knowledge of the AA

Moderate (based on any of the following [check]):
__ observations of scattered wildlife groups or individuals or relatively few species during peak periods
__ common occurrence of wildlife sign such as scat, tracks, nest structures, game trails, etc.
__ upland food sources exist in moderate quantity
__ interviews with local biologists with knowledge of the AA or its habitat type

ii. Wildlife habitat features Working from top to bottom, circle appropriate AA attributes in matrix to arrive at rating.
Structural diversity is from #13.
For class cover to be considered evenly distributed, the most and least prevalent **vegetated** classes must be within 20% of each other in terms of their percentage of the AA (see #10).
Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral; and A = absent See instructions for further definitions of these terms.

Structural diversity (from #13)	***High***								***Moderate***								***Low***			
Class cover distribution (all vegetated classes)	***Even***				***Uneven***				***Even***				***Uneven***				***Even***			
Longest duration of surface water in ≥ 10% of AA, or immediately abutting the AA	***P/P***	***S/I***	***T/E***	***A***	***P/P***	***S/I***	***T/E***	***A***	***P/P***	***S/I***	***T/E***	***A***	***P/P***	***S/I***	***T/E***	***A***	***P/P***	***S/I***	***T/E***	***A***
Low *disturbance at AA (see #12i & 12ii)*	E	E	E	H	E	E	H	H	E	H	H	M	E	H	M	M	E	H	M	M
Moderate *disturbance at AA (see #12i & 12ii)*	H	H	H	H	H	H	H	M	H	H	M	M	H	M	M	L	H	M	L	L
High *disturbance at AA (see #12i & 12ii)*	M	M	M	L	M	M	L	L	M	M	L	L	M	L	L	L	L	L	L	L

iii. Rating (use the conclusions from i. and ii. above and the matrix below to arrive at [circle] the functional points and rating)

	Wildlife habitat features rating (ii)			
Evidence of wildlife use (i)	***Exceptional***	***High***	***Moderate***	***Low***
Substantial	1E	.9H	.8H	.7M
Moderate	.9H	.7M	.5M	.3L
Minimal	.6M	.4M	.2L	.1L

iv. Final Score and Rating: _____ Enter on the summary page on the General Wildlife Support row.
Comments:

14C. **General Fish Support Rating:** (Assess this function if any part of the AA (including the waterbody part of a wetland AA) is used by fish or the existing situation is "correctable" such that the AA could be used by fish. If the AA is not used by fish, fish use is not restorable, or is not desired from a management perspective, then circle **NA** here and proceed to 14D.)

i. Habitat Quality and Known / Suspected Fish Species in AA (use matrix to arrive at [circle] the functional points and rating)

Duration of surface water in AA	***Permanent / Perennial***			***Seasonal / Intermittent***			***Temporary / Ephemeral***		
Aquatic hiding / resting / escape cover in waterbody(Table 3 in manual)	***Optimal***	***Adequate***	***Poor***	***Optimal***	***Adequate***	***Poor***	***Optimal***	***Adequate***	***Poor***
Anadromous salmon species	1E	.8H	.6M	.9H	.7M	.5M	.7M	.5M	.3L
Resident and non-salmon sport and subsistence species	.9H	.7M	.5M	.8H	.6M	.4M	.6M	.4M	.2L
Other resident species	.8H	.6M	.4M	.7M	.5M	.3L	.5M	.3L	.1L

Sources used to identify fish species potentially found in AA:

ii. Modified Rating (**NOTE:** Modified score cannot exceed 1 or be less than 0.1)

a) Is fish use of the AA precluded or substantially reduced by a culvert, dike, or other man-made structure or activity **or** is the waterbody included on the current Alaska Department of Environmental Conservation list of Category 5 / Section 303(d) Impaired Waterbodies (unless its impaired uses are named and aquatic life is not listed as impaired)?

Y **N** If yes, reduce the score in 14C.i. by 0.1:_____ (If no, do not change the score.)

b) Do noxious or invasive plant species or invasive fish species (see Appendices F and G) occur in the AA?

Y **N** If yes, reduce the score in 14C.i. by 0.1:_____ (If no, do not change the score.)

iii. Final Score and Rating: _____ Enter on the summary page on the General Fish Support row.

Comments:

14D. **Water Storage:** (Applies to wetlands that flood or pond from overbank flooding, precipitation, or overland flow from uplands. If no wetlands in the AA are subject to inundation or ponding, circle **NA** here and proceed to 14E.)

i. Rating

Estimate the variation in the water volume stored in the **wetland** portion of the AA **that experiences surface ponding or flooding** during the typical year, between break-up and freeze-up. First, identify the part of the AA that is both wetland and has surface water sometime between breakup and freezeup (the "flooded wetland"). Estimate its area in acres: _____ acres = A.

Second, estimate the range in that flooded wetland's water surface elevation between its lowest and highest elevation during the unfrozen period, in feet. Call this D for depth: _____ feet = D. For example, if the water table is typically one foot below the ground surface during the driest part of summer, and is typically 6 inches above the surface following breakup, the range is 18 inches, or 1.5 feet. Consider evidence such as water marks, staining on vegetation or rocks, drift lines, and the depth to the water table in your soil pit. Consider also the elevation of the wetland surface relative to the elevation of the water surface in an adjacent stream (i.e., does the channel overflow its banks into the wetland?). During a flood, the depth of water over a stream channel is likely to be double its depth when the stream is full to its banks. Consider the area the stream would flood when the water is that deep.

Multiply the range in the flooded wetland's water surface elevation (D) times the area (A) to estimate the maximum storage volume in acre-feet. D _____ feet X A _____ acres = _____ acre-feet. Use this storage volume estimate in the matrix below.

Next, determine the portion of the flooded wetland that is forested, shrub-dominated, or is neither of those but is dominated by hummocks or tussocks at least one foot in height: % of AA that experiences water surface fluctuation that is forested or scrub/shrub _____% plus the additional % of the flooded wetland that is hummocky _____% = _____ % of flooded wetland with water-slowing roughness. Use this percentage in the second row of the matrix below.

Working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating.

Estimated maximum acre-feet of water contained in wetlands within the AA that are subject to periodic flooding or ponding	**>5 acre-feet**			**1 to 5 acre-feet**			**<1 acre-foot**		
% of flooded wetland classified as forested or scrub/shrub or dominated by hummocks > 1 foot tall	>75%	25-75%	<25%	>75%	25-75%	<25%	>75%	25-75%	<25%
AA contains **no outlet or restricted outlet**	1H	.9H	.6M	.8H	.7M	.5M	.4M	.3L	.2L
AA contains **unrestricted outlet**	.9H	.8H	.5M	.7M	.6M	.4M	.3L	.2L	.1L

ii. Final Score and Rating: _____ Enter on the summary page on the Water Storage row.

Comments:

iii. Potential Property Protection

Are ≥10 acres of wetland in the AA subject to flooding **AND** are man-made features which may be significantly damaged by floods located within 0.5 mile downstream of the AA (circle)? **Y** **N** **Comments:**

14E. **Sediment/Nutrient/Toxicant Retention and Removal:** (Applies to wetlands with potential to receive sediments, nutrients, or toxicants through influx of surface or ground water or direct input. If no wetlands in the AA are, or with the planned project will be, subject to such input, circle **NA** here and proceed to 14F.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low])

Sediment, nutrient, and toxicant input levels within AA	**AA receives or surrounding land use (including proposed future land use) has potential to deliver levels of sediments, nutrients, or toxicants at levels such that other functions are not substantially impaired. Minor sedimentation, sources of nutrients or toxicants, or signs of eutrophication are present, or sources are suspected.**				**Waterbody is on Alaska's Section 303(d) List of Impaired Waterbodies or AA receives or surrounding land use has potential to deliver high levels of sediments, nutrients, or toxicants such that other functions are substantially impaired. Major sedimentation, sources of nutrients or toxicants, unnatural turbidity, or signs of eutrophication are present.**			
% cover of vegetation in AA	≥ 70%		< 70%		≥ 70%		< 70%	
Evidence of flooding / ponding in AA	Yes	No	Yes	No	Yes	No	Yes	No
AA contains **no or restricted outlet**	1H	.8H	.7M	.5M	.5M	.4M	.3L	.2L
AA contains **unrestricted outlet**	.9H	.7M	.6M	.4M	.4M	.3L	.2L	.1L

ii. Final Score and Rating: _____ Enter on the summary page on the Sediment/Nutrient/Toxicant Retention row.
Comments:

14F. Sediment/Shoreline Stabilization: (Applies only if AA occurs on or within the banks of a river, stream, or other natural or man-made drainage, or on the shoreline of a standing water body which is subject to wave action. If 14F does not apply, circle **NA** here and proceed to 14G.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating)

For the wetland area subjected to erosive forces, % cover of species with deep, soil-binding root masses	***Duration of surface water adjacent to rooted vegetation in the AA***		
	Permanent / Perennial	***Seasonal / Intermittent***	***Temporary / Ephemeral***
≥ 65%	1H	.9H	.7M
35-64%	.7M	.6M	.5M
< 35%	.3L	.2L	.1L

ii. Final Score and Rating: _____ Enter on the summary page on the Sediment/Shoreline Stabilization row.
Comments:

14G. Production Export/Terrestrial and Aquatic Food Chain Support:

i. Level of Biological Activity (synthesis of wildlife and fish habitat ratings [circle])

General Fish Habitat Rating (14C.iii.)	***General Wildlife Habitat Rating (14B.iii.)***		
	E/H	***M***	***L***
E/H	H	H	M
M	H	M	M
L	M	M	L
NA	M	M	L

ii. Rating (Working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating.
Factor A = acreage of vegetated wetland component in the AA; Factor B = level of biological activity rating from above (14G.i.); Factor C = whether or not the AA contains a surface or subsurface outlet; the final three rows pertain to duration of surface water in the AA, where P/P, S/I, and T/E are as defined under #10 above, and A = "absent".)

A	***Vegetated component >5 acres***						***Vegetated component 1-5 acres***						***Vegetated component <1 acre***					
B	***High***		***Moderate***		***Low***		***High***		***Moderate***		***Low***		***High***		***Moderate***		***Low***	
C	***Yes***	***No***	***Yes***	***No***	***Yes***	***No***	***Yes***	***No***	***Yes***	***No***	***Yes***	***No***	***Yes***	***No***	***Yes***	***No***	***Yes***	***No***
P/P	1H	.7M	.8H	.5M	.6M	.4M	.9H	.6M	.7M	.4M	.5M	.3L	.8H	.6M	.6M	.4M	.3L	.2L
S/I	.9H	.6M	.7M	.4M	.5M	.3L	.8H	.5M	.6M	.3L	.4M	.2L	.7M	.5M	.5M	.3L	.3L	.2L
T/E or A	.8H	.5M	.6M	.3L	.4M	.2L	.7M	.4M	.5M	.2L	.3L	.1L	.6M	.4M	.4M	.2L	.2L	.1L

iii. Modified Rating (**NOTE:** Modified score cannot exceed 1 or be less than 0.1.)
Vegetated Upland Buffer: Area with ≥ 30% plant cover, ≤ 2% noxious or invasive plant cover, and that is not subjected to periodic mechanical mowing or clearing (unless for weed control).
a) Is there an average ≥50-foot-wide vegetated upland buffer around ≥75% of the AA circumference?
Y **N** *If yes, add 0.1 to the score in 14G.ii. above and adjust the rating accordingly:*_____

iv. Final Score and Rating: _____ Enter on the summary page on the Production Export row.

Comments:

14H. **Groundwater Discharge/Recharge:** (Check the appropriate indicators in i. and ii. below.)

i. Discharge Indicators

____ The AA is a slope wetland (HGM type)
____ Springs or seeps are known or observed
____ Vegetation growing during dormant season
____ Wetland occurs at the toe of a natural slope
____ AA permanently flooded during dry periods
____ Wetland contains an outlet, but no inlet
____ Other:_____

ii. Recharge Indicators (NA for fringe wetlands)

____ Permeable substrate present without underlying impeding layer
____ Wetland contains inlet but no outlet
____ Stream is a known 'losing' stream; discharge decreases downstream
____ Other:_____

iii. Rating (use the information from i. and ii. above and the table below to arrive at [circle] the functional points and rating)

Criteria	**Duration of saturation at AA Wetlands *FROM GROUNDWATER DISCHARGE OR WITH WATER THAT IS RECHARGING THE GROUNDWATER SYSTEM***			
	P/P	*S/I*	*T/E*	*None*
Groundwater Discharge or Recharge Indicators Exist	1H	.7M	.4M	.1L
Permafrost Underlies Wetland or Insufficient Information Exists	NA			

iv. Final Score and Rating: _____ Enter on the summary page on the Groundwater Discharge/Recharge row.
Comments:

14I. Uniqueness:

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating)

Replacement potential	**AA contains irreplaceable wetland types [fens, bogs, springs, seeps, or mature (>80-yr-old) forested wetland type] OR a plant association listed as S1, S2, G1, or G2 by the AKNHP (Appendix J)**			**AA does not contain irreplaceable wetland types and structural diversity (#13) is high OR contains plant association listed as S3, G3, S?, or G? by the AKNHP (Appendix J)**			**AA does not contain irreplaceable wetland types and structural diversity (#13) is low to moderate (Appendix J)**		
Estimated relative abundance of wetland types (from 11)	***rare***	***common***	***abundant***	***rare***	***common***	***abundant***	***rare***	***common***	***abundant***
***Low** disturbance at AA (from 12.i. and ii.)*	1H	.6M	.5M	.8H	.5M	.4M	.7M	.4M	.3L
***Moderate** disturbance at AA (from 12.i. and ii.)*	.9H	.5M	.4M	.7M	.4M	.3L	.6M	.3L	.2L
***High** disturbance at AA (from12.i. and ii.)*	.7M	.3L	.2L	.5M	.2L	.1L	.4M	.1L	.1L

ii. Final Score and Rating: _____ Enter on the summary page on the Uniqueness row.

Comments:

14J. Recreation/Education Potential: (affords "bonus" points if AA provides recreation or education opportunity)

i. Is the AA a known or potential recreation or education site: (circle) **Y N** (if 'Yes' continue with the evaluation; if 'No' then circle **NA** here and proceed to the overall summary and rating page)

ii. Check categories that apply to the AA: ___ Educational/scientific study; ___ Consumptive rec.; ___ Non-consumptive rec.; ___Other

iii. Rating (use the matrix below to arrive at [circle] the functional points and rating)

Known or Potential Recreation or Education Area	***Known***	***Potential***
Public ownership or public easement with general public access (no permission required)	.2H	.15H
Private ownership with general public access (no permission required)	.15H	.1M
Private or public ownership without general public access, or requiring permission for public access	.1M	.05L

iv. Final Score and Rating: _____ Enter on the summary page on the Recreation/Education Potential row.
Comments:

General Site Notes:

FUNCTION AND SERVICE SUMMARY AND OVERALL RATING FOR WETLAND AA #(s):_____

Functions and Services	Rating (E, H, M, L)	Actual Functional Points (0 to 1.0)	Possible Functional Points	Optional: Functional Units Affected (Actual Points x AA Acreage Affected)	Indicate the four most prominent functions with an asterisk (*)
A. Habitat for Federally Listed/Candidate T&E Species or Other Species of Concern					
B. General Wildlife Support			1.0		
C. General Fish Support					
D. Water Storage					
E. Sediment/Nutrient/Toxicant Removal					
F. Sediment/Shoreline Stabilization					
G. Production Export/Food Chain Support			1.0		
H. Groundwater Discharge/Recharge					
I. Uniqueness			1.0		
J. Recreation/Education Potential (bonus points)			NA		
Totals:					
Percentage of Possible Score (actual points divided by possible points)		%			

Category 1 Wetland: Must satisfy **one** of the following criteria; otherwise go to Category 2.

___ Score of 0.9 to 1 functional point for Threatened or Endangered Species or Other Species of Concern; **or**
___ Score of 0.9 or 1 functional point for Uniqueness; **or**
___ Score of 0.9 or 1 functional point for Water Storage **and** answer to Question 14D.ii. is "yes"; **or**
___ Score of 0.9 or 1 functional point for General Fish Support; **or**
___ Percent of possible score ≥ 70% (round to nearest whole number); or
___ Percent of possible score ≥ 50% **and** 6th level hydrologic unit subregion has already experienced ≥15% land development.

Category 2 Wetland: Criteria for Category 1 not satisfied **and** meets any **one** of the following criteria; otherwise go to Category 4.

___ Score of 0.8 functional point for Threatened or Endangered Species or Other Species of Concern; **or**
___ Score of 0.9 or 1 functional point for General Wildlife Support; **or**
___ Score of 0.6 to 0.8 functional point for General Fish Support; **or**
___ Score of 0.8 functional point for Uniqueness; **or**
___ Score 0.7 or 0.8 functional point for Water Storage **and** answer to Question 14D.ii. is "yes"; **or**
___ Percent of possible score ≥ 50% (round to nearest whole number).

Category 3 Wetland: Criteria for Categories 1, 2, and 4 are not satisfied.

___ Does not qualify as Category 1, 2, or 4

Category 4 Wetland: Criteria for Categories 1 and 2 not satisfied **and** all of the following criteria are met; if not, go to Category 3.

___ Vegetated wetland component of AA < 1 acre (do not include upland vegetated buffer); **and**
___ Score of 0.5 or lower for Uniqueness; **and**
___ General Wildlife Support is 0.4 or lower; **and**
___ General Fish Support score is 0.3 or lower; **and**
___ If answer to 14D.ii. is "no", score for Water Storage is 0.2, 0.1, or NA; **and**
___ Is not rated "High" for any function or service; **and**
___ Percent of possible score < 35% (round to nearest whole number).

OVERALL ASSESSMENT AREA RATING: (circle appropriate category based on the criteria outlined above)

Category: 1 2 3 4

Appendix B
Waterbody Data and Categorization Form

Even if all or part of a waterbody is being rated as part of a wetland Assessment Area, it should also be rated separately on this form. Evaluate any waterbody that lies within your project's potential direct or indirect effect area, extending at least as far as the project's right-of-way limits.

The landward extent of the waterbody is the Ordinary High Water line for a non-tidal waterbody or the wetland boundary, whichever of those limits is located least landward.

1. **Project name and ADOT&PF #:**_____

2. Waterbody name (if applicable)**:**_____ **Project-specific waterbody identifier** (if applicable):_____

3. **Evaluation date:** Mo._____ Day____ Yr._____ 4**. Evaluator(s) and affiliation:** _____

5. Purpose of evaluation:

____ Waterbody potentially affected by a proposed project ____ Mitigation waterbody; pre-construction

____ Mitigation waterbody; post-construction ____ Other: _____

6. **Waterbody location(s):**

Legal: T ____ N or S (circle one); R ____ E or W; S _____; and T ____ N or S; R ____ E or W; S _____ ; _____ Meridian

Approx. stationing or mileposts or pertinent project component:

_____

Lat/long: _____ **Datum:** _NAD 83____ **Nearest community:** _____

Watershed: _____ (smallest named stream), tributary of _____

7. Relationship to wetland AA:

Is this waterbody also part of one or more wetland AAs? **Y** **N** (circle one) If yes, pertinent AA numbers: _____

Identifying numbers of related data: photos _____ GPS waypoint # _____ other: _____

Map (#) showing waterbody: _____

8. **Waterbody description:**

If a pond or lake, total area: _____ acres estimated or measured ? (circle one)

If a stream: **width** in project area: _____feet (avg) _____feet (range) **gradient** (% slope): _____%

Diameter and condition of any **culverts** in the project area on this waterbody: _____

For any waterbody: avg. **depth at low water**_____ feet avg. **depth at bankfull** _____ feet

description or average diameter of **substrate**, if observable (e.g., silt, sand, 2", 10") _____

Sketch the typical cross-sectional bank shape(s) :

Describe the waterbody and surrounding land use and habitat types (water source, inlets, outlets, topography, adjacent land uses, relationship to other waterbodies and wetlands):

Briefly describe the condition of the 6th level hydrologic unit subregion with respect to human activities. Estimate the % that is modified, and list the predominant types of modification.

9. **Classification of Waterbody:**

Is the waterbody a

___ Stream – flowing water

___ Lake – larger than 20 acres in size when full of water

___ Pond – a still waterbody smaller than 20 acres in size when full, unvegetated or with floating or submerged vegetation

Class (Cowardin)	Water Regime	Modifier (if any)	% of the Waterbody

Abbreviations:

Cowardin Classes (modified): Aquatic Bed (**AB**), Unvegetated **(UN)**

Water (Inundation) Regimes (see section 10 and Table 1 in the User's Manual): Permanent/Perennial I(**P/P**), Seasonal/Intermittent (**S/I**), Temporary/Ephemeral (**T/E**)

Modifiers: Excavated (**X**), Impounded (**I**), Diked (**D**), Partly Drained (**PD**), Artificial (**A**), Beaver-modified (**B**)

10. **Disturbance of waterbody:** Place check marks in the rows below that describe any past or present types of disturbance that may affect the waterbody within the project area. Describe any disturbance below.

____ On the Category 5/Section 303(d) Impaired Waterbodies list (see Appendix I).

____ Receives potentially low-quality runoff from development within the project area.

____ Receives potentially low-quality runoff as non-point discharges from human activities upstream.

____ Pipes discharge water from human developments upstream of, or within, the project area.

____ Within the project area, the waterbody's banks or bed have been altered by grading, re-routing, placement of fill, excavation, or similar activities.

____ The hydrologic regime has been altered by upstream developments (extensive storm drain systems, water withdrawals, a dam, etc.).

____ The banks or bed are mildly altered by human activities such as trampling, removal of some vegetation, building or clearing to the top of bank.

____ The waterbody has been affected by disturbance such as described above, but it has physically regained some features of natural banks or bed ("naturalized") such as development of pools and riffles, slight sinuosity, vertical or overhanging banks, overhanging vegetation.

____ Known or suspected to contain invasive or exotic plants or animals – anywhere in the waterbody. (See User's manual Appendix F for noxious and invasive plant information and Appendix G for a list of invasive animal species.) Write **NA** if not within your expertise.

____ Disturbance other than described above.

____ None of the above; waterbody is in essentially pristine condition.

Describe any disturbance (types, age, intensity, source, location):

List any noxious or invasive plant or animal species in the waterbody (Appendices F and G). If it is not within your expertise to accurately answer this question, or you were unable to investigate this, just cross out this question or record explanatory notes.

11. Habitat for Federally Listed or Candidate Threatened or Endangered Animals or Other Species of Concern (see Appendix H):

Waterbody is Documented (D) or Suspected (S) to support (circle one based on definitions contained in instructions):

Primary or critical habitat (**list species**) D S _____

Secondary habitat (**list species**) D S _____

Incidental habitat (**list species**) D S _____

Sources for documented use (e.g., observations, records, etc):

12. Wildlife Habitat:

Evidence of overall wildlife use in/on the waterbody (circle substantial, moderate, or low based on supporting evidence):

Substantial (based on any of the following [check]):

__ observations of abundant wildlife or high species diversity (during any period)
__ abundant wildlife sign such as scat, tracks, nest structures, game trails, etc.
__ presence of extremely limiting habitat features not available in the surrounding area
__ interviews with local biologists with knowledge of the AA

Minimal (based on any of the following [check]):

__ few or no wildlife observed during peak use periods
__ little to no wildlife sign
__ sparse adjacent upland food sources
__ interviews with biologists with knowledge of the AA

Moderate (based on any of the following [check]):

__ observations of scattered wildlife groups or individuals or relatively few species during peak periods
__ common occurrence of wildlife sign such as scat, tracks, nest structures, game trails, etc.
__ adequate adjacent upland food sources
__ interviews with local biologists with knowledge of the AA

Other special wildlife features not addressed above:

13. **Fish Habitat:** (Answer this if the waterbody is used by fish or the existing situation is "correctable" such that the waterbody could be used by fish. If the waterbody is not used by fish, fish use is not restorable, or is not desired from a management perspective, then circle **NA**.)

Is the part of the waterbody within the project area shown in the ADF&G Anadromous Waters Catalog? **Y** **N**

Fish species or groups known or suspected to use the waterbody (any part of it):

Sources used for identifying fish species potentially found in the waterbody:

Aquatic cover category (see Table 3) (circle one): Optimal Adequate Poor

Is fish use of the waterbody precluded or substantially reduced by a culvert, dike, or other man-made structure or activity? **Y** **N**

Does the waterbody contain a documented spawning area or other critical habitat feature (i.e., sanctuary pool, upwelling area, etc.- specify in comments) for anadromous fish or sport fish? **Y** **N**

Do noxious or invasive plant species (see **Appendix F**) or invasive fish species (see **Appendix G**) occur in the waterbody (anywhere)? **Y** **N**

Comments, or refer to section 10 above:

14. Recreation or Subsistence Potential:

Is the waterbody a known or potential recreation site? **Y** **N** Used for subsistence activities? **Y** **N**

If 'Yes,' describe (travel, transport, boating, fishing, trail parallels or crosses it, next to a park or camping area, in proximity to where kids play, etc.).

Which best describes the current waterbody ownership in the project area?

____ Public ownership or public easement with general public access (no permission required)

____ Private ownership with general public access (no permission required)

____ Private or public ownership without general public access, or requiring permission for public access

Chart for Assignment of a Waterbody to a Management Category

Determine the appropriate category for the waterbody by working through the chart below. Look at the choices in the first column and choose the one that best describes the waterbody. Then, look at the choices in the second column to the right of the category you chose in column 1; choose the best type from column 2. To the right of that choice, select the best choice from column 3. Continue working to right through the chart until you reach the last column, where the Waterbody Category is assigned.

Waterbody Type	Waterbody Characteristics				Category
Flowing Waterbody	Any flowing waterbody that is documented or suspected critical or primary habitat for listed or candidate threatened or endangered species (see Appendix H)				1
	Any flowing waterbody that is secondary habitat for listed or candidate threatened or endangered species or primary habitat for other species of concern (see Appendix H)				2
	stream	open channel—perennial, seasonal, intermittent, temporary, or ephemeral	natural (undisturbed) or naturalized (recovered from disturbance, with natural-like banks, sinuosity, substrate)	supports salmon	1
				Supports resident and other non-salmon fish species	2
				Not known or thought to support fish	3
			Channelized and not naturalized	supports salmon	1
				does not support salmon	3
		Originally a stream, now in a culvert			4
	ditch (originally formed by excavation; did not originally replace a stream)	open channel, supports salmon			2
		Naturalized, does not support salmon			3
		Not naturalized, does not support salmon			4
	Inactive (abandoned) channel	Seasonally or more often connected to active channel			same as active channel
		irregularly (less than annually) connected to active channel that is…	Category 1		2
			Category 2		3
			Category 3		
			Category 4		4
		No existing connection to an active channel, even at high water			4
Still Waterbody (pond, lake)	*Any still waterbody that is documented or suspected critical or primary habitat for listed or candidate threatened or endangered species (see Appendix H)*				1
	Any still waterbody that is secondary habitat for listed or candidate threatened or endangered species or primary habitat for other species of concern (see Appendix H)				2
	Other still waterbodies	supports *salmon*	Spawning or rearing in potentially affected area		1
			Affected area is migratory route only		2
		Supports resident and other non-salmon fish species used for subsistence or recreation	Spawning or rearing in potentially affected area		1
			Affected area is migratory route only		2
		Supports fish not used by humans			3
		Does not support fish			3

Assigned Waterbody Category: 1 2 3 4

Appendix C
Descriptions of Hydrogeomorphic Classification Types

Riverine - Riverine wetlands occur in floodplains and riparian corridors in association with stream or river channels. They lie in the active floodplain and have important hydrologic links to the water dynamics of the river or stream. The distinguishing characteristic of Riverine wetlands is that they are frequently flooded by overbank flow from the stream or river. Flood waters are a major factor that structures the ecosystem in these wetlands. Wetlands that lie in floodplains but are **not** frequently flooded are not classified as Riverine.

Depressional - Depressional wetlands occur in topographic depressions. Dominant water sources are precipitation, groundwater discharge, and interflow from adjacent uplands. The direction of flow is normally from the surrounding uplands toward the center of the depression. Elevation contours are closed, thus allowing the accumulation of surface water. Depressional wetlands may have any combination of inlets and outlets or may lack them completely. Dominat hydrodynamics are vertical fluctuations, primarily seasonal. Depressional wetlands may lose water through intermittent or perennial drainage from an outlet and by evapotranspiration and, if they are not receiving groundwater discharge, may slowly contribute to groundwater.

Lacustrine Fringe - Lacustrine fringe wetlands are adjacent to lakes where the water elevation of the lake maintains the water table in the wetland. In some cases, these wetlands consist of a floating mat attached to land. Additional sources of water are precipitation and groundwater discharge, the latter dominating where lacustrine fringe wetlands intergrade with uplands or slope wetlands. Surface water flow is bidirectional, usually controlled by water-level fluctuations such as seiches in the adjoining lake.Lacustrine fringe wetlands are indistinguishable from depressional wetlands where the size of the lake becomes so small relative to fringe wetlands that the lake is incapable of stabilizing water tables. Lacustrine wetlands lose water by flow returning to the lake after flooding, by saturation surface flow, and by evapotranspiration.

Tidal Fringe - Tidal Estuarine wetlands occur along coasts and estuaries and are under the influence of the 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 tidal fringe and riverine classes is where bidirectional flows from tides dominate over unidirectional ones 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. Tidal fringe wetlands lose water by tidal exchange, by saturated overland flow to tidal creek channels, and by evapotranspiration.

Slope - Slope Wetlands normally are found where there is a discharge of groundwater to the land surface. They normally occur on sloping land; elevation gradients may range from steep hillsides to slight slopes. Slope wetlands are usually incapable of depressional storage because they lack the necessary closed contours. Principal water sources are usually groundwater return flow and interflow from surrounding uplands as well as precipitation. Hydrodynamics are dominated by downslope unidirectional water flow. Slope wetlands can occur in nearly flat landscapes if groundwater discharge is a dominant source to the wetland surface. Slope wetlands lose water primarily by saturation subsurface and surface flows, and by evapotranspiration. Slope wetlands may develop channels, but the channels serve only to convey water away from the slope wetland.

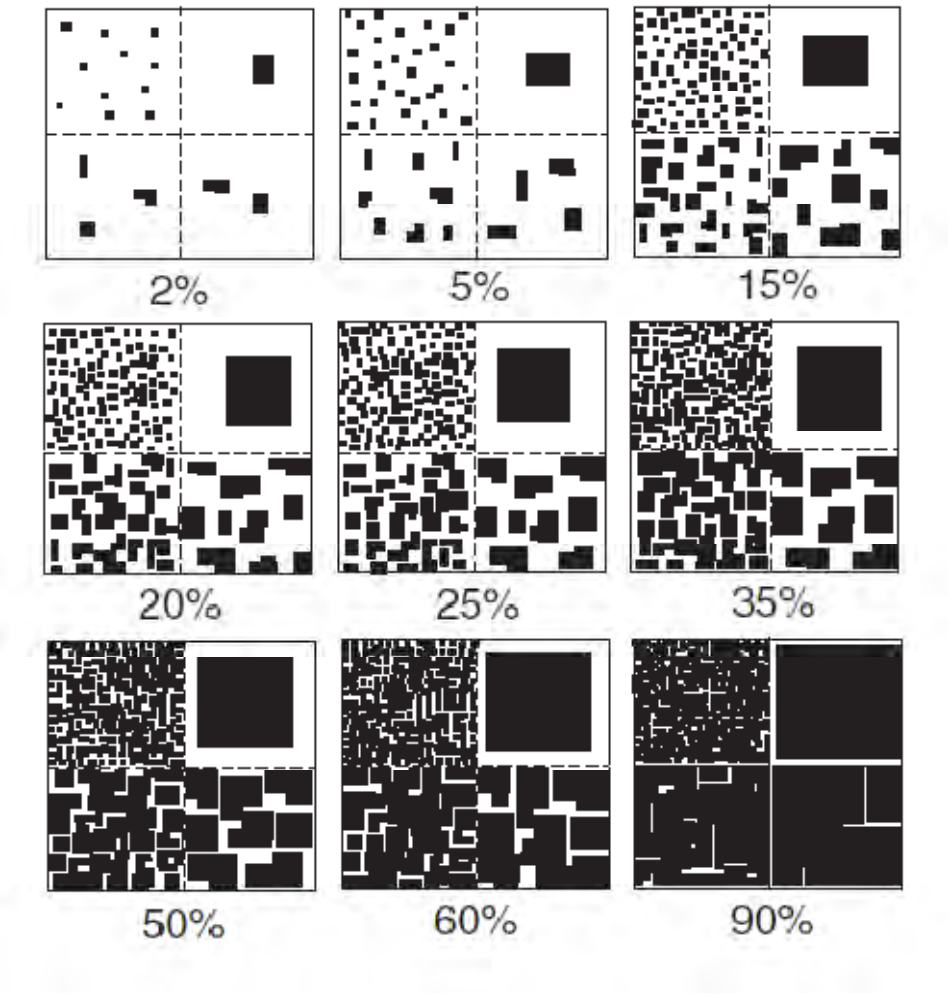
Flats - Flats wetlands occur in topographically flat areas that are hydrologically isolated from surrounding ground or surface water. The main source of water in these wetlands is precipitation. They receive virtually no groundwater discharge. This characteristic distinguishes them from Depressional and Slope wetlands.

Source: U.S. Army Corps of Engineers 2009

Appendix D
Application of Water Regimes for Specific Functions

Function	Water Regime Application
Wildlife Support	Record the longest duration of surface water ***in ≥ 10% of the AA***. This may be different from the longest duration present in the AA if the longest duration occurs in < 10% of the AA.
Fish Support	Record the longest duration of surface water ***in the AA,*** unless this duration does not correspond to the actual fish habitat being evaluated in the AA. Example: the AA includes a small permanent pond with no fish, and a seasonal stream with fish. In this case, seasonal / intermittent duration would be selected as it applies to fish habitat.
Water Storage	Record the longest duration of surface water ***at wetlands in the AA***. This does not include non-wetland aquatic habitats in the AA, and so may be different from the longest duration present in the AA.
Sediment/Shoreline Stabilization	Record the longest duration of surface water ***adjacent to rooted vegetation in the AA.*** This may be different from the longest duration present in the AA.
Production Export	Record the longest duration of surface water ***in the AA.***
Groundwater Discharge / Recharge	Record the duration of inundation ***or soil saturation*** attributed to ***groundwater discharging within the wetland or surface water that is reasonably estimated to be recharging the water table***. This may be different from the longest duration present in the AA.

Appendix E
Guide to Estimating Percent Cover



Source: Schoeneberger et al. 2002

Appendix F
Alaska Noxious and Invasive Plant Species Information

Noxious Weeds of Alaska[a]

Common Name	Scientific Name
bindweed, field	*Convolvulus arvensis*
fieldcress, Austrian	*Rorippa austriaca*
galinsoga	*Galensoga parviflora*
hempnettle	*Galeopsis tetrahit*
horsenettle	*Solanum carolinense*
knapweed, Russian	*Centaurea repens*
lettuce, blue-flowering	*Lactuca puichella*
orange hawkweed	*Hieracium aurantiacum*
purple loosestrife	*Lythrum salicaria*
quackgrass	*Agropyron repens*
sowthistle, perennial	*Sonchus arvensis*
spurge, leafy	*Euphorbia esula*
thistle, Canada	*Cirsium arvense*
whitetops and its varieties	*Cardaria drabe, C. pubescens, Lepidium latifolium*
annual bluegrass	*Poa annua*
blue burr	*Lappula echinatata*
mustard	*Brassica kaber*
oats wild	*Avena fatua*
plantain, buckhorn	*Plantago* sp.
radish	*Raphanus raphanistrum*
toadflax, yellow	*Linaria vulgaris*
vetch, tufted	*Vicia cracca*
wild buckwheat	*Polygonum convolvulus*

[a] Noxious weed defined by Alaska Administrative Code Title 11 Chapter 34 (1987).

Invasive Plants of Alaska[a]

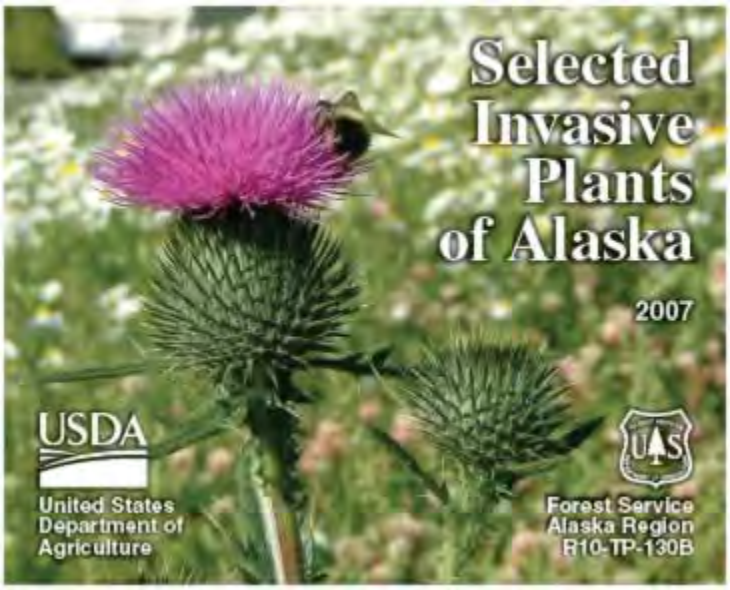
Plant species	Invasiveness Rank 0-100 (low - high)	South Coastal ecogeographic region	Interior Boreal ecogeographic region	Arctic Alpine ecogeographic region
Myriophyllum spicatum L.	**90**	**Yes**	**Yes**	**Yes**
Polygonum sachalinensis (F. Schmidt ex Maxim.) R. Decr., *P. X bohemica,* and *P. cuspidatum* Sieb. & Zucc.	**87**	**Yes**	**Yes**	No
Centaurea biebersteinii DC	**86**	**Yes**	**Yes**	No
Lythrum salicaria L. & *L. virgatum* L.	**84**	No	**Yes**	No
Phalaris arundinacea L.	**83**	**Yes**	**Yes**	**Yes**
Impatiens glandulifera Royle	**82**	**Yes**	**Yes**	No
Melilotus alba Medikus	**80**	**Yes**	**Yes**	**Yes**
Nymphaea odorata ssp. *odorata* Ait.	**80**	**Yes**	No	No
Hieracium aurantiacum L. & *H. caespitosum* Dumort.	**79**	**Yes**	**Yes**	**Yes**
Bromus tectorum L.	**78**	**Yes**	**Yes**	**Yes**
Rubus discolor Weihe & Nees	**77**	**Yes**	No	No
Cirsium arvense (L.) Scop.	**76**	**Yes**	**Yes**	**Yes**
Prunus padus L.	**74**	**Yes**	**Yes**	No
Vicia cracca L.	**73**	**Yes**	**Yes**	**Yes**
Alliaria petiolata (Bieb.) Cavara & Grande	**70**	**Yes**	No	No
Cytisus scoparius (L.) Link	**69**	**Yes**	No	No
Linaria vulgaris Miller	**69**	**Yes**	**Yes**	**Yes**
Caragana arborescens Lam.	**66**	No	**Yes**	**Yes**
Lonicera tatarica L.	**66**	**Yes**	**Yes**	No
Melilotus officinalis (L.) Lam	**65**	**Yes**	**Yes**	**Yes**
Campanula rapunculoides L.	**64**	**Yes**	**Yes**	**Yes**
Medicago sativa ssp. *falcata* (L.) Arcang.	**64**	**Yes**	**Yes**	**Yes**
Hordeum jubatum L.	**63**	**Yes**	**Yes**	**Yes**
Senecio jacobaea L.	**63**	**Yes**	**Yes**	**Yes**
Bromus inermis ssp. *inermis* Leyss.	**62**	**Yes**	**Yes**	**Yes**
Cirsium vulgare (Savi) Ten.	**61**	**Yes**	**Yes**	**Yes**
Leucanthemum vulgare Lam.	**61**	**Yes**	**Yes**	**Yes**
Sonchus arvensis ssp. *uliginosus* (Bieb.) Nyman	**61**	**Yes**	**Yes**	No
Hordeum murinum ssp. *leporinum*	**60**	No	**Yes**	No
Elymus repens (L.) Gould	**59**	**Yes**	**Yes**	**Yes**
Medicago sativa ssp. *sativa* L.	**59**	**Yes**	**Yes**	**Yes**
Sorbus aucuparia L.	**59**	**Yes**	No	No
Trifolium repens L.	**59**	**Yes**	**Yes**	**Yes**
Convolvulus arvensis L.	**58**	**Yes**	**Yes**	**Yes**
Taraxacum officinale G.H. Weber ex Wiggers	**58**	**Yes**	**Yes**	**Yes**
Gypsophila paniculata L.	**57**	**Yes**	**Yes**	**Yes**
Tanacetum vulgare L.	**57**	**Yes**	**Yes**	**Yes**
Trifolium hybridum L.	**57**	**Yes**	**Yes**	**Yes**
Phleum pratense L.	**56**	**Yes**	**Yes**	**Yes**
Crepis tectorum L.	**54**	**Yes**	**Yes**	**Yes**
Ranunculus repens L. and *R. acris*	**54**	**Yes**	**Yes**	**Yes**
Stellaria media (L.)Vill./sea bird colonies	**54**	**Yes**	**Yes**	**Yes**
Dactylis glomerata L.	**53**	**Yes**	**Yes**	**Yes**
Trifolium pratense L.	**53**	**Yes**	**Yes**	**Yes**
Vicia villosa Roth	**53**	**Yes**	**Yes**	No
Hypericum perforatum L.	**52**	**Yes**	**Yes**	**Yes**
Poa pratensis ssp. *pratensis* L., *P. pratensis* ssp. *irrigata* (Lindm.) Lindb. f. & *P. trivialis* L.	**52**	**Yes**	**Yes**	**Yes**
Verbascum thapsus L.	**52**	**Yes**	**Yes**	No
Digitalis purpurea L.	**51**	**Yes**	**Yes**	No
Rumex acetosella L.	**51**	**Yes**	**Yes**	**Yes**

Fallopia convolvulus (L.) Löve	**50**	**Yes**	**Yes**	**Yes**
Tragopogon dubius L.	**50**	**Yes**	**Yes**	No
Glechoma hederacea L.	**48**	**Yes**	**Yes**	**Yes**
Medicago lupulina L.	**48**	**Yes**	**Yes**	**Yes**
Rumex crispus L., *R. obtusifolius* L. & *R. longifolius* DC	**48**	**Yes**	**Yes**	**Yes**
Tripleurospermum perforata L	**48**	**Yes**	**Yes**	**Yes**
Persicaria maculosa Gray *& P. lapathifolia* (Linnaeus) Gray	**47**	**Yes**	**Yes**	**Yes**
Achillea ptarmica L.	**46**	**Yes**	**Yes**	**Yes**
Hieracium umbellatum L.	**46**	**Yes**	**Yes**	**Yes**
Poa annua L.	**46**	**Yes**	**Yes**	**Yes**
Polygonum aviculare L.	**45**	**Yes**	**Yes**	**Yes**
Silene noctiflora, S. dioica, S. latifolia	**45**	**Yes**	**Yes**	**Yes**
Lappula squarrosa (Retz.) Dumort	**44**	**Yes**	**Yes**	**Yes**
Plantago major L.	**44**	**Yes**	**Yes**	**Yes**
Cotula coronopifolia L.	**42**	**Yes**	No	No
Stellaria media (L.) Vill./disturbed sites	**42**	**Yes**	**Yes**	**Yes**
Anthemis cotula L.	**41**	**Yes**	**Yes**	No
Descurainia sophia (L.) Webb ex Prantl.	**41**	**Yes**	**Yes**	**Yes**
Hesperis matronalis L.	**41**	**Yes**	**Yes**	No
Lolium perenne ssp. *multiflorum*	**41**	**Yes**	**Yes**	**Yes**
Capsella bursa-pastoris (L.) Medik.	**40**	**Yes**	**Yes**	**Yes**
Galeopsis bifida Boenn. and *G. tetrahit* L.	**40**	**Yes**	**Yes**	**Yes**
Cerastium fontanum ssp. *vulgare* (Hartman) Greuter & Burdet and *C. glomeratum* Thuill.	**39**	**Yes**	**Yes**	**Yes**
Poa compressa L.	**39**	**Yes**	**Yes**	**Yes**
Chenopodium album L.	**35**	**Yes**	**Yes**	**Yes**
Senecio vulgaris L.	**35**	**Yes**	**Yes**	**Yes**
Matricaria discoidea DC.	**32**	**Yes**	**Yes**	**Yes**
*Mycelis muralis (*L.) Dumort.	**32**	**Yes**	No	No
Spergula arvensis L.	**32**	**Yes**	**Yes**	**Yes**
Lepidium densiflorum Schrad.	**25**	**Yes**	**Yes**	**Yes**

[a]**Note to Reader**: While there is no official "list" of invasive plants of Alaska, the Alaska Natural Heritage Program (AKNHP) maintains records of non-native plants occurring in Alaska, and most of those non-native plants have been given an "invasiveness ranking" based on potential impacts on resources of value, biological characteristics, and ease of control. The above list of non-native plants of Alaska and their invasiveness rankings is found at the AKNHP website (AKNHP 2004): http://akweeds.uaa.alaska.edu/akweeds_ranking_page.htm

Noxious and Invasive Plant Identification

U.S. Department of Agriculture Publication: Selected Invasive Plants of Alaska



Booklet available at the U.S. Forest Service website (See USFS 2007)

University of Alaska Cooperative Extension Service Invasive Species Profiles


Tansy Ragwort


Oxeye Daisy


Narrow-Leaf Hawksbeard


Orange Hawkweed


Canada Thistle


Scotch Thistle


Spotted Knapweed


Russian Knapweed


Perennial Sowthistle


Garlic Mustard


Corn Spurry


Field Bindweed


Leafy Spurge


Scotch Broom


Tufted Vetch,
Bird Vetch


White Sweetclover


Eurasian Watermilfoil


Hempnettle


Foxtail Barley


Quackgrass


Japanese Knotweed


Wild Buckwheat,


Butter ‘n’ Eggs, Yellow Toadflax


Purple Loosestrife

Disclaimer: Listed above are the species for which the Cooperative Extension has completed species profiles. This is not a list of all invasive plant species, nor does it have any regulatory implications. These profiles are an educational informational tool.

Available at the Alaska Committee for Invasive Plants Management website (CNIPM 2004): http://www.uaf.edu/ces/cnipm/plants.html

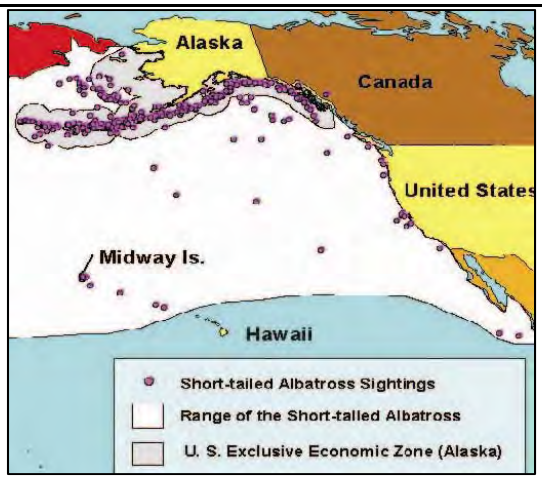
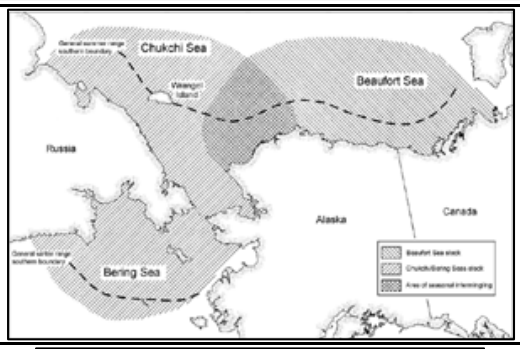
Appendix G
Invasive Animals of Alaska

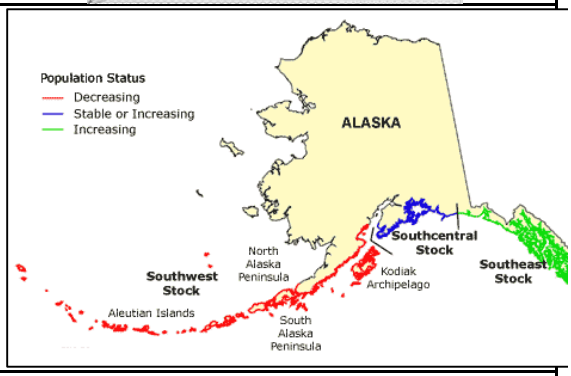
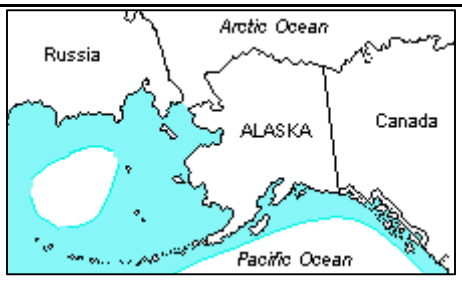
Group	Scientific Name	Common Name	Invasiveness Rank
Amphibians	*Rana aurora*	Red-legged frog	High
Amphibians	*Pseudacris regilla*	Pacific chorus frog	Low
Birds	*Columba livia*	Rock dove, rock pigeon	Low
Birds	*Sturnus vulgaris*	Starling	Low, High
Fishes	*Salmo salar*	Atlantic salmon	High
Fishes	*Esox lucius*	Northern pike (check whether it is native in your project location)	High
Fishes	*Perca flavescens*	Yellow perch	High
Fishes	*Gambusia affinis*	Western mosquitofish	High
Fishes	*Salvelinus fontinalis*	Brook trout	Low
Fishes	*Carassius auratus*	Goldfish	Low
Fishes	*Oncorhynchus mykiss*	Rainbow trout (check whether it is native in your project location)	Low, High
Invertebrates	*Profenusa thomsoni*	Amber-marked birch leafminer	High
Invertebrates	*Pristiphora erichsonii*	Larch sawfly	High
Invertebrates	*Pacifastacus leniusculus*	Signal crayfish	High
Invertebrates	*Malacosoma californicum*	Western tent caterpillar	High
Invertebrates	*Lymantria dispar*	European gypsy moth, Asian gypsy moth	High
Invertebrates	*Arion* sp.	Garden slug	Low
Invertebrates	*Eriocampa ovata*	Alder woolly sawfly	Low
Invertebrates	*Heterarthrus nemoratus*	Birch-edge leafminer	Low
Invertebrates	*Nematus ribesii*	Currantworm	Low
Invertebrates	*Adelges piceae*	Eastern spruce gall aphid	Low
Invertebrates	*Arion ater*	European black slug	Low
Invertebrates	*Rhyacionia buoliana*	European pine shoot moth	Low
Invertebrates	*Limax maximus*	Leopard slug	Low
Invertebrates	*Otiorhynchus ovatus*	Strawberry root weevil	Low
Invertebrates	*Archips cerasivorana*	Uglynest caterpillar	Low
Invertebrates	*Fenusa pusilla*	Birch leafminer	Moderate
Invertebrates	*Epinotia solandriana*	Birch leafroller	Moderate
Invertebrates	*Pissodes strobi*	Sitka spruce weevil, white pine weevil	Moderate
Invertebrates	*Elatobium abietinum*	Spruce aphid	Moderate
Mammals	*Rattus norvegicus*	Norway rat, Brown rat	High
Mammals	*Rattus rattus*	Black rat, Roof rat	High
Mammals	*Felis catus*	Domestic cat	High
Mammals	*Canis familiaris*	Domestic dog	High
Mammals	*Vulpes vulpes*	Red fox	High
Mammals	*Sus scrofa*	Wild boar, feral swine, feral hog	High
Mammals	*Oryctolagus cuniculus*	European rabbit	High
Mammals	*Mus musculus*	House mouse	Low, High
Mammals	*Cervus canadensis*	Elk	Moderate, High

[a] **Note to Reader**: While there is no official list of invasive animals of Alaska, the Alaska Natural Heritage Program (AKNHP) maintains records of non-native animals occurring in Alaska. Some of those non-native animals have been given an "invasiveness ranking" based on potential impacts on resources of value, biological characteristics, and ease of control. The above list of non-native animals of Alaska includes only those assigned invasiveness rankings. It was published by McClory and Gotthardt (2008).

Appendix H
Special Status Species in Alaska

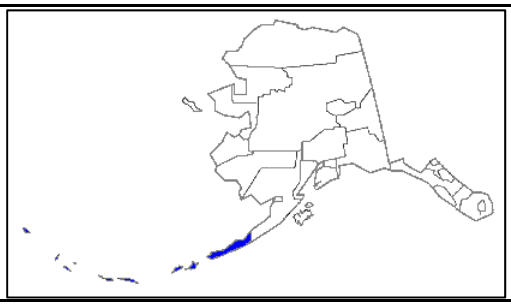
Federally Listed Threatened, Endangered, and Candidate Species

Animals			
Status	**Name**	**Habitat** [a]	**Range** [b, c, d, e]
E	Albatross, short-tailed (*Phoebastria* (=*Diomedea*) *albatrus*)	Nests on the ground on small oceanic islands; on volcanic ash slopes with sparse vegetation.	
T	Bear, polar (*Ursus maritimus*)	Stays close to arctic pack ice but may wander inland as much as 150 km. Female denning habitat may be found in mountain, fjord, or even relatively flat tundra areas, but generally it is near the coast.	
E	Curlew, Eskimo (*Numenius borealis*)	Nests in open arctic tundra, tundra or tundra interspersed with scattered trees. Also tundra marshes and tidal marshes near Arctic Ocean.	
T	Eider, spectacled (*Somateria fischeri*)	Nesting occurs primarily in lowland wetlands on coastal tundra; these are usually large shallow bodies of water that flood after snowmelt and have well-developed emergent and shoreline vegetation.	
T	Eider, Steller's (Alaska breeding population) (*Polysticta stelleri*)	Nests on grassy edges of tundra lakes and ponds, or within drained lake basins. At Barrow, AK nests in moss-lichen polygonal tundra. Usually nests some distance inland, away from salt water.	

Animals			
Status	**Name**	**Habitat** [a]	**Range** [b, c, d, e]
C	Loon, yellow-billed *(Gavia adamsii)*	Nest exclusively in coastal and inland low-lying tundra, in association with permanent, fish-bearing lakes	
C	Murrelet, Kittilitz *(Brachyramphus brevirostrus)*	Mostly pelagic and along rocky seacoasts also in bays. Non-breeding or off-duty breeders spend summer in inshore areas, especially along glaciated coasts	
T	Otter, northern sea (southwest Alaska distinct population segment) (*Enhydra lutris kenyoni*)	Occupy nearly all coastal marine habitats, from fine sediment bays and estuaries to rocky shores exposed to oceanic swells.	
E	Sea turtle, leatherback (*Dermochelys coriacea*)	Marine; open ocean, often near edge of continental shelf; also seas, gulfs, bays, and estuaries. Mainly pelagic, seldom approaching land except for nesting.	No map available. Records exist for Juneau and Yakutat
T and E	Sea lion, Steller eastern pop. (*Eumetopias jubatus*) Threatened population east of Yakutat, Endangered population west of Yakutat	Rookeries on beaches of remote islands. Haulout locations on exposed rocks, reefs, beaches, jetties, breakwaters, navigational aids, floating docks, and sea ice.	
E	Whale, beluga	In very shallow waters	Throughout Cook Inlet.

Animals			
Status	**Name**	**Habitat** [a]	**Range** [b, c, d, e]
	(Cook Inlet) (*Delphinapterus leucas)*	near river mouths of upper Cook Inlet in summer, following eulachon and salmon runs. Shallow and deep waters in upper to lower inlet in winter.	
E	Whale, bowhead (*Balaena mysticetus*)	Favors close packs and patches of ice; not often observed in extensive areas of open water.	
E	Whale, finback (*Balaenoptera physalus*)	Pelagic; usually found in largest numbers 25 miles or more from shore.	
E	Whale, humpback (*Megaptera novaeangliae*)	Open ocean and coastal waters, sometimes including inshore areas such as bays.	

Plant

Status	Species/Listing Name		
E	Fern, Aleutian shield (*Polystichum aleuticum*)	Cliffs and and rock outcrops on east-facing volcanic slopes at 365 to 525 m elevation. Found in protected gullies and grottos and on ledges.	

C=Candidate (species for which there is enough information to indicate that listing as threatened or endangered is warranted, but preparing a listing proposal is precluded by other, higher priority listing activities)
T= Listed as threatened
E=Listed as endangered

Sources:
[a] NatureServe Explorer Species Reports (NatureServe 2009)
[b] U.S. Fish and Wildlife Service (USFWS 2009)
[c] Alaska Department of Fish and Game (ADFG 2009a)
[d] NOAA Fisheries (NOAA 2009)
[e] U.S. Geological Survey (USGS 2009)

Plants Tracked by the Alaska Natural Heritage Program

Source: AKNHP (2008a): http://aknhp.uaa.alaska.edu/botany/pdfs/Rare%20PLant%20List%202008.pdf.

Scientific Name	Global Rank	State[a] Rank
Abies amabilis	G5	S3
Agoseris aurantiaca	G5	S1S2
Agoseris glauca	G5	S2
Agrostis clavata	G4G5	S1S2
Agrostis thurberiana	G5	S2
Allium victorialis	G5	S1
Alyssum obovatum	G5?	S2S3
Ambrosia chamissonis	G4G5	S1S2
Antennaria densifolia	G3	S2
Antennaria dioica	G5	S2S3
Aphragmus eschscholtzianus	G3	S3
Apocynum androsaemifolium	G5	S2S3
Arabidopsis salsuginea	G4G5	SP
Arenaria longipedunculata	G3Q	S3
Arnica diversifolia	G5	S1
Arnica lessingii ssp. *norbergii*	G5T2Q	S2
Arnica lonchophylla	G4	S1S2
Arnica mollis	G5	S1
Artemisia aleutica	G1	S1
Artemisia arctica ssp. *beringensis*	G5T3?	S2S3
Artemisia dracunculus	G5	S1S2
Artemisia globularia var. *lutea*	G4T1T2	S1S2
Artemisia michauxiana	G4G5	SP
Artemisia rupestris ssp. *woodii*	G3?T2	SP
Artemisia senjavinensis	G3	S2S3
Artemisia stelleriana	G4?	S1
Artemisia tanacetifolia	G4?	S2
Artemisia tilesii ssp. *unalaschcensis*	G5T3Q	S3
Artemisia unalaskensis var. *aleutica*	GNRT2T3Q	S2S3
Asplenium trichomanes	G5	S1
Asplenium trichomanes-ramosum	G4	S3
Astragalus agrestis	G5	SP
Astragalus robbinsii ssp. *harringtonii*	G5T3	S3
Astragalus williamsii	G4	S2S3
Betula papyrifera var. *commutata*	G5T5	S2
Blysmopsis rufa	G5	S1
Boechera calderi	G4?	S1
Boechera drepanoloba	G4?	S1?

Scientific Name	Global Rank	State Rank
Boechera lemmonii	G5	S1
Boechera lyallii	G5	S1
Bolboschoenus maritimus	G5	S2?
Boschniakia hookeri	G5	SP
Botrychium alaskense	G2G3	S2S3
Botrychium ascendens	G2G3	S2
Botrychium lineare	G1	S1
Botrychium montanum	G3	S1
Botrychium pedunculosum	G2G3	S1
Botrychium robustum	G4G5	S1S2
Botrychium spathulatum	G3	S1
Botrychium tunux	G1	S2
Botrychium virginianum	G5	S2
Botrychium yaaxudakeit	G2	S2
Brasenia schreberi	G5	S1
Campanula aurita	G4	S3S4
Campanula scouleri	G5	S1
Cardamine angulata	G5	S3
Carex adelostoma	G4	S1
Carex atherodes	G5	S3
Carex athrostachya	G5	S1S2
Carex atratiformis	G5	S2
Carex bebbii	G5	S1
Carex brunnescens ssp. *alaskana*	G5T3T4	S2S4
Carex crawfordii	G5	S3
Carex deflexa	G5	S1S2
Carex deweyana	G5	S2?
Carex eburnea	G5	S3
Carex echinata ssp. *echinata*	G5T5	S1S2
Carex glareosa ssp. *pribylovensis*	G4G5T2T3	S2S3
Carex heleonastes	G4	S2S3
Carex holostoma	G4?	S3
Carex hoodii	G5	S1
Carex interior	G5	S1
Carex lapponica	G4G5Q	S2
Carex laxa	G5?	S1S2
Carex leptalea ssp. *pacifica*	G5T4T5	S1S2
Carex parryana	G4	S1
Carex phaeocephala	G4	S3
Carex praegracilis	G5	S1
Carex preslii	G4	S1
Carex sabulosa	G5	S1
Carex sartwellii var. *sartwellii*	G4G5T4T5	S1
Carex sprengelii	G5?	S1
Carex stipata	G5	S1
Carex sychnocephala	G4	S1

Scientific Name	Global Rank	State Rank
Carex tahoensis	G3G4Q	S1
Carex xerantica	G5	S1S2
Cassiope lycopodioides var. *cristapilosa*	G4T2	S1
Castilleja hyetophila	G4G5	S2S4
Castilleja parviflora	G5?	S2S4
Catabrosa aquatica	G5	S1
Cerastium aleuticum	G3	S3
Cerastium maximum	G4	S3
Cerastium regelii	G4	S3
Ceratophyllum demersum	G5	S1
Chamaerhodos erecta ssp. *nuttallii*	G5T4	S1S2
Chenopodium salinum	G5	S1
Chimaphila umbellata ssp. *occidentalis*	G5T5	S3
Chrysosplenium rosendahlii	G3?	S1S2
Cicuta bulbifera	G5	S2
Cirsium edule	G4	S1
Cirsium foliosum	G5	SR
Cirsium kamtschaticum	G3?	S2S3
Claytonia arctica	G3	S1
Claytonia ogilviensis	G1	SP
Cochlearia sessilifolia	G1G2Q	S1S2
Corispermum ochotense	G3G4	S3
Crassula aquatica	G5	S3
Crataegus douglasii var. *douglasii*	G5T4	S1S2
Cryptantha shackletteana	G1Q	S1
Cryptogramma stelleri	G5	S2S3
Cypripedium montanum	G4	S1
Cypripedium parviflorum	G5	S2S3
Dactylorhiza aristata var. *kodiakensis*	G4T2T3	S2S3
Danthonia spicata	G5	S1
Douglasia alaskana	G3	S3
Douglasia arctica	G3	S2S3
Douglasia beringensis	G2	S2
Douglasia gormanii	G4	S3
Draba aleutica	G2	S2
Draba densifolia	G5	S1
Draba incerta	G5	S2S3
Draba kamtschatica	G3Q	S2?
Draba lonchocarpa var. *thompsonii*	G5T3T4Q	S1
Draba micropetala	G4	S1S2
Draba murrayi	G2	S2
Draba ogilviensis	G2	S2
Draba pauciflora	G4	S1
Draba paysonii	G5	SR
Draba praealta	G5	SR
Draba ruaxes	G3	S3

Scientific Name	Global Rank	State Rank
Draba subcapitata	G4	S1
Dulichium arundinaceum	G5	S1
Eleocharis kamtschatica	G4	S2S3
Eleocharis nitida	G3G4	S1
Eleocharis quinqueflora	G5	S1
Elymus calderi	G3G4	S2S3
Epilobium leptophyllum	G5	SP
Erigeron acris ssp. *kamtschaticus*	G5T4T5	S1
Erigeron glacialis	G4G5	S2S3
Erigeron muirii	G2	S2
Erigeron ochroleucus	G5	S1S2
Erigeron porsildii	G3G4	S3
Erigeron yukonensis	G2G4	S1
Eriogonum flavum var. *aquilinum*	G5T2	S2
Eriophorum viridicarinatum	G5	S2
Erysimum asperum var. *angustatum*	G5T2	S1S2
Festuca edlundiae	G3G4	S1
Festuca lenensis	G4G5	S3
Festuca minutiflora	G5	S1
Festuca occidentalis	G5	S1
Filipendula kamtschatica	G3G4	SR
Galium kamtschaticum	G5	S2
Gaultheria miqueliana	G3G4	S1
Gentianella auriculata	G4G5	S1
Gentianella propinqua ssp. *aleutica*	G5T2T4	S2S4
Gentianopsis detonsa ssp. *detonsa*	G3G5T3T5	S1
Geum aleppicum var. *strictum*	G5T5	S1S2
Geum pentapetala	G3G4	S2S3
Geum schofieldii	G2Q	SP
Glehnia littoralis ssp. *leiocarpa*	G5T5	S3
Glyceria leptostachya	G3	S2
Glyceria pulchella	G5	S2S3
Glyceria striata var. *stricta*	G5T5Q	S2
Hymenophyllum wrightii	G4?	S2S3
Isoetes occidentalis	G4G5	S1S2
Isolepis cernua	G5	S1
Juncus articulatus	G5	S1
Juncus nodosus	G5	S2
Juncus tenuis	G5	S2S3
Juniperus horizontalis	G5	S1S2
Koeleria asiatica	G4	S2S3
Koeleria macrantha	G5	S1
Lactuca biennis	G5	S1S2
Lathyrus ochroleucus	G4G5	S1
Lathyrus venosus var. *intonsus*	G5T5	S1
Lewisia pygmaea	G5	SP

Scientific Name	Global Rank	State Rank
Ligusticum calderi	G3	S1
Limosella aquatica	G5	S3
Listera convallarioides	G5	S2
Lobelia dortmanna	G4G5	S1
Lonicera involucrata	G4G5	S2
Lupinus kuschei	G3	S2
Lupinus lepidus	G5	S1?
Luzula comosa	G4G5	S1
Lycopodiella inundata	G5	S3
Lycopus americanus	G5	S1
Lycopus uniflorus	G5	S3
Maianthemum racemosum	G5	S2
Maianthemum stellatum	G5	S2
Malaxis paludosa	G4	S3
Melica subulata	G5	S1
Mertensia drummondii	G2	S2
Mertensia eastwoodiae	G3	S3
Mertensia paniculata var. *alaskana*	G5T3	S3?
Mimulus lewisii	G5	S2
Mimulus tilingii	G5	S1
Minuartia yukonensis	G4?	S3
Mitella nuda	G5	S2
Mitella trifida	G5	S2
Monotropa uniflora	G5	S1S2
Montia bostockii	G3	S3
Myriophyllum farwellii	G5	S1
Myriophyllum verticillatum	G5	S3
Najas flexilis	G5	S1S2
Ophioglossum pusillum	G5	SH
Orobanche fasciculata	G4	S1S2
Orobanche uniflora	G5	S2
Oxytropis arctica var. *barnebyana*	G4?T2Q	S2
Oxytropis huddelsonii	G3	S2S3
Oxytropis kobukensis	G2	S2
Oxytropis kokrinensis	G3	S3
Oxytropis tananensis	G2G3Q	S2S3
Packera moresbiensis	G3	S2S3
Papaver alboroseum	G3G4	S3
Papaver gorodkovii	G3	S2S3
Papaver nudicaule ssp. *americanum*	G4G5T4T5	S3
Papaver walpolei	G3	S3
Parasenecio auriculata	G2	S2
Parrya nauruaq	G2	S2
Pedicularis groenlandica	G4G5	S1S2
Pedicularis hirsuta	G5?	S1
Pedicularis macrodonta	G4Q	S3

Scientific Name	Global Rank	State Rank
Penstemon serrulatus	G4	S1
Phacelia franklinii	G5	S2S3
Phacelia mollis	G2G3	S2S3
Phacelia sericea	G5	S2
Phalaris arundinacea	G5	S3SE
Phippsia concinna	G4	S1
Phlox hoodii	G5	S2
Phyllodoce empetriformis	G5	S1S2
Phyllospadix serrulatus	G4	S2
Physaria calderi	G3G4	S2
Physocarpus capitatus	G5	S2S3
Picris hieracioides	G5	S1S2
Pinus contorta var. *latifolia*	G5T5	S3
Piperia unalascensis	G5	S2
Plagiobothrys orientalis	G3G4	S3
Plantago major var. *pilgeri*	G5TUQ	S2S3
Platanthera gracilis	G3G5Q	S2?
Platanthera orbiculata	G5	S2
Platanthera tipuloides var. *behringiana*	G4G5T2?	S2?
Pleuropogon sabinei	G4G5	S1
Poa hartzii ssp. *alaskana*	G3G4T1	S1
Poa laxiflora	G3G4	S2S3
Poa leptocoma	G5	S2
Poa macrantha	G5T5	S1
Poa occidentalis	G4	SR
Poa porsildii	G3	S2S3
Poa secunda ssp. *juncifolia*	G5TNR	S1
Poa secunda ssp. *secunda*	G5TNR	S1
Podistera yukonensis	G2	S1
Polygonum boreale	G3G4	S2S4
Polygonum hydropiperoides	G5	S1
Polygonum minimum	G5	S1
Polypodium sibiricum	G5?	S2
Polystichum aleuticum	G1	S1
Polystichum kruckebergii	G4	S1
Polystichum microchlamys	G4?	S1
Polystichum setigerum	G2G3	S2S3
Potamogeton obtusifolius	G5	S2S3
Potamogeton robbinsii	G5	S1S2
Potamogeton subsibiricus	G3	S3
Potentilla drummondii	G5	S2
Potentilla fragiformis	G4	S1S2
Potentilla hippiana	G5	S1
Potentilla rubricaulis	G4	S2?
Potentilla stipularis	G5	S1
Primula cuneifolia ssp. *cuneifolia*	G5T3T4	S1S2

Scientific Name	Global Rank	State Rank
Primula tschuktschorum	G2G3	S2S3
Puccinellia angustata	G4Q	S3S4
Puccinellia arctica	G2Q	S1
Puccinellia vaginata	G4	S1?
Puccinellia vahliana	G4	S2S3
Puccinellia wrightii	G3G4	S2S3
Ranunculus auricomus	G5	S2
Ranunculus gelidus var. *shumaginensis*	G4T1Q	S1
Ranunculus glacialis var. *1 (cf.* var. *glacialis)*	G4T2	S2
Ranunculus glacialis var. *chamissonis*	G4T3T4	S2
Ranunculus kamchaticus	G4G5	S2S3
Ranunculus pacificus	G3	S3
Ranunculus sabinei	G4	S1
Ranunculus turneri	G2G3	S2
Romanzoffia unalaschcensis	G3	S3
Rorippa curvisiliqua	G5	S1
Rorippa nasturtium-aquaticum	GNR	S1S2
Rorippa obtusa	G5	S1
Rosa woodsii var. *woodsii*	G5T5	S1S2
Rumex beringensis	G3	S3
Rumex graminifolius	G4?	S1
Rumex krausei	G2	S2
Rumex paucifolius	G5	SP
Rumex utahensis	G5	SP
Salix athabascensis	G4G5	S2S3
Salix candida	G5	S3
Salix hookeriana	G5	S2
Salix nummularia	G5	SH
Salix planifolia ssp. *planifolia*	G5T5	S1
Salix prolixa	G5	S1
Salix setchelliana	G4	S3
Satureja douglasii	G4	S1
Saussurea americana	G5	S3
Saussurea sp. 1 (cf. triangulata)	G1	S1
Saxifraga adscendens ssp. *oregonensis*	G5T4T5	S2S3
Saxifraga aizoides	G5	S1
Saxifraga aleutica	G2G3	S2S3
Saxifraga nudicaulis	G3G4Q	S2S3
Saxifraga occidentalis	G5	S1
Saxifraga rivularis ssp. *arctolitoralis*	G5T2T3	S2S3
Saxifraga taylorii	G3	SP
Schizachne purpurascens	G5	S2
Schoenoplectus pungens	G5	S1
Schoenoplectus subterminalis	G4G5	S1
Scolochloa festucacea	G5	S1
Sedum divergens	G5?	S1

Scientific Name	Global Rank	State Rank
Sedum lanceolatum	G5	S1S2
Sedum oreganum	G5	S1S2
Senecio cannabifolius	G4?	S1S2
Sidalcea hendersonii	G3	S1
Silene uralensis ssp. *ogilviensis*	G4T1	S1?
Sisyrinchium montanum	G5	S1
Smelowskia johnsonii	G1	S1
Smelowskia media	G2G3	S2S3
Smelowskia pyriformis	G2	S2
Sphenopholis intermedia	G5	S1
Spiraea douglasii	G5	S3
Stachys emersonii	G5	S1
Stellaria alaskana	G3	S3
Stellaria dicranoides	G3	S3
Stellaria ruscifolia ssp. *aleutica*	G4T3	S3
Stellaria umbellata	G5	S2S3
Suaeda occidentalis	G5	S1
Symphoricarpos albus ssp. *laevigatus*	G5T5	S2
Symphyotrichum falcatum var. *falcatum*	G5T4T5	S1S2
Symphyotrichum pygmaeum	G2G4	S2
Symphyotrichum yukonense	G3	S3
Tanacetum bipinnatum ssp. *huronense*	G5T4T5	S3?
Taraxacum carneocoloratum	G3Q	S3
Taxus brevifolia	G4G5	S2
Thalictrum minus	GNR	S2S3
Thalictrum occidentale	G5	S1
Thlaspi arcticum	G3	S3
Thuja plicata	G5	S3
Tiarella trifoliata var. *laciniata*	G5T5?	S1S2
Townsendia hookeri	G5	S1
Trichophorum pumilum var. *rollandii*	G5	S1
Trifolium wormskjoldii	G5	S1
Trisetum sibiricum ssp. *litorale*	G5T4Q	S2
Trollius riederianus	G4G5	S1
Utricularia ochroleuca	G4?	S1?
Veronica grandiflora	G3	S3
Vicia americana	G5	S2
Viola selkirkii	G5?	S3
Viola sempervirens	G5	S1
Zannichellia palustris	G5	S3

Animals Tracked by the Alaska Natural Heritage Program and Rated S1, S2, or S3

Source: AKNHP (2008b)
http://aknhp.uaa.alaska.edu/zoology/pdfs/tracking_lists/2008_VertebrateSpeciesTrackingList.pdf.

ORDER AND SCIENTIFIC NAME	COMMON NAME	STATE RANK[a]
INSECTIVORA		
Sorex pribilofensis	Pribilof Island shrew	S3
Sorex yukonicus	Alaska tiny shrew	S3
Sorex monticolus malitiosus	Warren Island dusky shrew	S3Q
CHIROPTERA		
Myotis keenii	Keen's myotis	S1S2
Lasionycteris noctivagans	Silver-haired bat	S2
Myotis californicus	Californian myotis	S2
Myotis volans	Long-legged myotis	S2
CARNIVORA		
Canis lupus ligoni	Alexander Archipelago wolf	S3
Vulpes lagopus pribilofensis	Pribilof Island arctic fox	S3S4
Martes americana	American marten	S2
Mustela erminea salva	Admiralty Island ermine	S2S3
Enhydra lutris kenyoni	Northern Sea otter, SW Alaska population	S3
Lontra canadensis mira	Prince Of Wales river otter	S3
Mustela erminea seclusa	Suemez Island ermine	S3
Mustela erminea celenda	Prince Of Wales Island ermine	S3
Mustela erminea initis	Baranof Island ermine	S3
Odobenus rosmarus	Walrus	S3
Callorhinus ursinus	Northern fur seal	S2S3
Eumetopias jubatus	Steller sea lion	S3
Zalophus californianus	California Sea Lion	S3
Histriophoca fasciata	Ribbon seal	S3
Phoca largha	Spotted seal	S3S4
Ursus maritimus	Polar bear	S2
CETACEA		
Eubalaena japonica	North Pacific right whale	S1
Balaena mysticetus pop. 2	Bowhead Whale - Bering-Chukchi-Beaufort population	S3
Balaenoptera musculus, pop. 2	Blue Whale, North Pacific	S2
Balaenoptera borealis, pop. 2	Sei Whale, North Pacific	S3
Balaenoptera physalus, pop. 2	Fin Whale, northeast Pacific	S3
Megaptera novaeangliae, pop. 1	Humpback Whale, North Pacific	S3
Delphinapterus leucas pop. 4	Beluga -Cook Inlet population	S1

Physeter macrocephalus	Sperm whale	S3S4
Mesoplodon stejnegeri	Stejneger's beaked whale	S3
Ziphius cavirostris	Cuvier's beaked whale	S3S4

ARTIODACTYLA

Ovis dalli kenaiensis	Kenai Dall sheep	S3S4

RODENTIA

Glaucomys sabrinus griseifrons	Prince of Wales flying squirrel	S2
Marmota caligata sheldoni	Montague Island hoary marmot	S2S3
Marmota monax	Woodchuck	S2S3
Marmota caligata vigilis	Glacier Bay hoary marmot	S3
Spermophilus parryii lyratus	St. Lawrence Island ground squirrel	S3
Spermophilus parryii kodiacensis	Kodiak Island arctic ground squirrel	S3
Spermophilus parryii nebulicola	Shumagin Islands arctic ground squirrel	S3
Spermophilus parryii osgoodi	Odgood's arctic ground squirrel	S3
Tamiasciurus hudsonicus picatus	Kupreanof red squirrel	S3
Castor canadensis phaeus	Admiralty beaver	S3
Neotoma cinerea	Bushy-tailed woodrat	S1
Lemmus trimucronatus nigripes	Black-footed brown lemming	S2
Microtus oeconomus punukensis	Punuk Island tundra vole	S2
Microtus oeconomus popofensis	Shumagin Island root vole	S2
Microtus oeconomus sitkensis	Sitka root vole	S2
Microtus oeconomus amakensis	Amak Island tundra vole	S2S3
Myodes gapperi solus	Revillagigedo Island red-backed vole	S3
Myodes gapperi wrangeli	Wrangell Island red-backed vole	S3
Myodes rutilus glacialis	Glacier Bay red-backed vole	S3
Myodes rutilus insularis	Island red-backed vole	S3
Dicrostonyx unalascensis	Unalaska collared lemming	S3
Dicrostonyx groenlandicus exul	St. Lawrence Island collared lemming	S3
Microtus abbreviatus	Insular vole	S3
Microtus abbreviatus abbreviatus	Hall Island insular vole	S3
Microtus abbreviatus fisheri	St. Matthew Island insular vole	S3
Microtus longicaudus coronarius	Coronation Island vole	S3
Microtus oeconomus elymocetes	Montague Island tundra vole	S3
Microtus oeconomus innuitus	St. Lawrence Island root vole	S3
Microtus oeconomus	Unalaska tundra vole	S3
Microtus oeconomus	Yakatat tundra vole	S3
Microtus pennsylvanicus admiraltiae	Admiralty meadow vole	S3
Myodes rutilus albiventer	St. Lawrence Island red-backed vole	S3S4
Lemmus trimucronatus harroldi	Nunivak Island brown lemming	S3S4
Lepus othus	Alaskan hare	S3S4

BIRDS

ANSERIFORMES

Anser albifrons elgasi	Tule White-fronted Goose	S1S2B
Cygnus cygnus	Whooper Swan	S2B
Somateria fischeri	Spectacled Eider	S2B,S2N
Polysticta stelleri	Steller's Eider	S2B,S3N
Mergellus albellus	Smew	S2N
Aythya collaris	Ring-necked Duck	S2N,S3B
Branta hutchinsii leucopareia	Aleutian Canada Goose	S3B
Branta canadensis occidentalis	Dusky Canada Goose	S3B
Lophodytes cucullatus	Hooded Merganser	S3B
Somateria spectabilis	King Eider	S3B, S3N
Anas penelope	Eurasian Wigeon	S3N
Aythya fuligula	Tufted Duck	S3N
Aythya affinis	Lesser Scaup	S3N,S5B
Chen canagica	Emperor Goose	S3S4
Anas crecca nimia	Aleutian Green-winged Teal	S3S4B
Aythya americana	Redhead	S3S4B
Melanitta nigra	Black Scoter	S3S4B, S3N
PELECANIFORMES		
Phalacrocorax penicillatus	Brandt's Cormorant	S1B
Phalacrocorax auritus	Double-crested Cormorant	S3
Phalacrocorax urile	Red-faced Cormorant	S3
CHARADRIIFORMES		
Charadrius hiaticula	Common Ringed Plover	S1M
Charadrius morinellus	Eurasian Dotterel	S2B
Charadrius mongolus	Lesser Sand- Plover	S3M
Charadrius vociferus	Killdeer	S3S4B
Haematopus bachmani	Black Oystercatcher	S2S3B,S2N
Numenius tahitiensis	Bristle-thighed Curlew	S2B
Limosa fedoa beringiae	Beringian Marbled Godwit	S2B
Calidris alba	Sanderling	S2B
Tryngites subruficollis	Buff-breasted Sandpiper	S2B
Tringa glareola	Wood Sandpiper	S2B, S2M
Gallinago gallinago	Common Snipe	S2B,S2M
Xenus cinereus	Terek Sandpiper	S2M
Actitis hypoleucos	Common Sandpiper	S2M
Tringa nebularia	Common Greenshank	S2M
Philomachus pugnax	Ruff	S2M
Aphriza virgata	Surfbird	S2N,S3B
Calidris ptilocnemis ptilocnemis	Pribilof Rock Sandpiper	S2N,S3B
Calidris ptilocnemis Tschuktschorum	Bering Sea Rock Sandpiper	S2N,S3B
Calidris ptilocnemis couesi	Aleutian Rock Sandpiper	S2S3
Limosa haemastica	Hudsonian Godwit	S2S3B
Calidris canutus	Red Knot	S2S3B

Limosa lapponica	Bar-tailed Godwit	S3B
Calidris ruficollis	Red-necked Stint	S3B
Calidris fuscicollis	White-rumped Sandpiper	S3B
Calidris himantopus	Stilt Sandpiper	S3B
Tringa brevipes	Gray-tailed Tattler	S3M
Calidris subminuta	Long-toed Stint	S3M
Arenaria melanocephala	Black Turnstone	S3N,S4B
Calidris ptilocnemis	Rock Sandpiper	S3N,S4B
Numenius phaeopus	Whimbrel	S3S4B
Hydroprogne caspia	Caspian Tern	S1S2B
Larus schistisagus	Slaty-backed Gull	S2B
Sterna hirundo	Common Tern	S2M
Rissa brevirostris	Red-legged Kittiwake	S2S3B,S2N
Onychoprison aleuticus	Aleutian Tern	S3B
Larus ridibundus	Black-headed Gull	S3M
Larus delawarensis	Ring-billed Gull	S3N
Larus californicus	California Gull	S3N
Pagophila eburnea	Ivory Gull	S3N
Rhodostethia rosea	Ross's Gull	S3S4M
Alle alle	Dovekie	S1S2B
Cepphus grylle	Black Guillemot	S2
Brachyramphus marmoratus	Marbled Murrelet	S2S3
Brachyramphus brevirostris	Kittlitz's Murrelet	S2B,S2N

GALLIFORMES

Lagopus muta evermanni	Evermann's Rock Ptarmigan	S2
Lagopus muta atkhensis	Turner's Rock Ptarmigan	S2S3
Lagopus muta chamberlaini	Chamberlain's Rock Ptarmigan	S2S3
Lagopus muta gabrielsoni	Amchitka Rock Ptarmigan	S2S3
Lagopus muta sanfordi	Sanford's Rock Ptarmigan	S2S3
Lagopus muta townsendi	Townsend's Rock Ptarmigan	S2S3
Lagopus muta yunaskensis	Yunaska Rock Ptarmigan	S3

CICONIIFORMES

Ardea herodias fannini	Pacific Great Blue Heron	S2S3
Botaurus lentiginosus	American Bittern	S3B

COLUMBIFORMES

Patagioenas fasciata	Band-tailed Pigeon	S3B
Zenaida macroura	Mourning Dove	S3N

APODIFORMES

Cypseloides niger	Black Swift	S2N

Chaetura vauxi	Vaux's Swift	S2S3B
PICIFORMES		
Picoides arcticus	Black-backed Woodpecker	S3
GAVIIFORMES		
Gavia arctica	Arctic Loon	S1S2B
Gavia adamsii	Yellow-billed Loon	S2S3B, S3N
PODICIPEDIFORMES		
Podilymbus podiceps	Pied-billed Grebe	S2S3B
Aechmophorus occidentalis	Western Grebe	S3N
FALCONIFORMES		
Accipiter gentilis laingi	Queen Charlotte Goshawk	S2
Buteo swainsoni	Swainson's Hawk	S2S3B
Pandion haliaetus	Osprey	S3S4B
Falco peregrinus pealei	Peale's Peregrine Falcon	S2S3
Falco columbarius suckleyi	Black Merlin	S3
Falco peregrinus anatum	American Peregrine Falcon	S3B
Falco peregrinus tundrius	Arctic Peregrine Falcon	S3B
Falco peregrinus	Peregrine Falcon	S3B, S3N
PASSERIFORMES		
Empidonax flaviventris	Yellow-bellied Flycatcher	S2B
Vireo olivaceus	Red-eyed Vireo	S3B
Corvus brachyrhynchos	American Crow	S3
Alauda arvensis	Sky Lark	S2B
Stelgidopteryx serripennis	Northern Rough-winged Swallow	S3B
Poecile cincta	Gray-headed Chickadee	S3
Troglodytes troglodytes alascensis	Pribilof Winter Wren	S2
Troglodytes troglodytes kiskensis	Kiska Winter Wren	S2S3
Troglodytes troglodytes semidiensis	Sedimi Winter Wren	S2S3
Troglodytes troglodytes helleri	Kodiak Winter Wren	S3
Troglodytes troglodytes meligerus	Attu Winter Wren	S3
Luscinia calliope	Siberian Rubythroat	S2M
Sialia currucoides	Mountain Bluebird	S3B
Turdus obscurus	Eye-browed Thrush	S3M
Motacilla alba	White Wagtail	S3B
Anthus cervinus	Red-throated Pipit	S3S4B

Bombycilla cedrorum	Cedar Waxwing	S3B
Dendroica magnolia	Magnolia Warbler	S2B
Vermivora peregrina	Tennessee Warbler	S2S3B
Setophaga ruticilla	American Redstart	S3B
Melospiza melodia sanaka	Aleutian Song Sparrow	S2
Spizella breweri	Brewer's Sparrow	S2B
Zonotrichia albicollis	White-throated Sparrow	S2N
Plectrophenax hyperboreus	Mckay's Bunting	S3
Emberiza rustica	Rustic Bunting	S3M
Calcarius pictus	Smith's Longspur	S3S4B
Molothrus ater	Brown-headed Cowbird	S3B
Euphagus carolinus	Rusty Blackbird	S4B,S3N
Fringilla montifringilla	Brambling	S3N
Leucosticte tephrocotis	Gray-crowned Rosy Finch	S3N,S5B
PROCELLARIIFORMES		
Phoebastria albatrus	Short-tailed Albatross	S1N
Phoebastria immutabilis	Laysan Albatross	S3N
Phoebastria nigripes	Black-footed Albatross	S3S4N
Puffinus creatopus	Pink-footed Shearwater	S1S2N
Pterodroma inexpectata	Mottled Petrel	S3N
Puffinus bulleri	Buller's Shearwater	S3N
GRUIFORMES		
Fulica americana	American Coot	S2B,S2N
Porzana carolina	Sora	S3B
STRIGIFORMES		
Megascops kennicottii	Western Screech-Owl	S2
Glaucidium gnoma	Northern Pygmy-owl	S3
Aegolius acadicus	Northern Saw-whet Owl	S3
Bubo scandiacus	Snowy Owl	S3S4
Strix varia	Barred Owl	S3S4
FISH		
PETROMYZONTIFORMES		
Lampetra richardsoni	Western Brook Lamprey	S1S2
Lampetra ayresii	River Lamprey	S2
Lampetra alaskensis	Alaskan Brook Lamprey	S3Q
ACIPENSERIFORMES		

Acipenser transmontanus	White Sturgeon	S3S4
ESOCIFORMES		
Esox lucius pop. 1	Northern Pike (Pike Lakes Population)	S2S3
OSMERIFORMES		
Thaleichthys pacificus	Eulachon	S3S4
Osmerus mordax	Rainbow Smelt	S3S5
SALMONIFORMES		
Salvelinus anaktuvukensis	Angayukaksurak Char	S2
Oncorhynchus keta pop. 1	Chum Salmon (Fish Creek Run)	S2S3B
Oncorhynchus tshawytscha pop. 4	King Salmon (Wheeler Creek Run)	S2S3B
Oncorhynchus tshawytscha pop. 5	King Salmon (King Salmon River Run)	S2S3B
PERSCOPSIFORMES		
Percopsis omiscomaycus	Trout-Perch	S3
PERCIFORMES		
Zaprora silenus	Prowfish	S3S5
AMPHIBIANS and REPTILES		
CAUDATA		
Ambystoma gracile	Northwestern Salamander	S3
Ambystoma macrodactylum	Long-toed Salamander	S3
ANURA		
Bufo boreas	Western Toad	S3S4
Rana luteiventris	Columbia Spotted Frog	S2
TESTUDINES		
Dermochelys coriacea	Leatherback	S2
INVERTEBRATES		
AMPHIPODA		
Stygobromus quatsinensis	A Cave Obligate Amphipod	S2S3
ARCHAEOGASTROPODA		
Haliotis kamtschatkana	Pinto Abalone	S2S3
BASOMMATOHORA		

Lymnaea atkaensis	Frigid Lymnaea	S3S5
Physa skinneri	Glass Physa	S1
COLEOPTERA		
Cicindela depressula	Dispirited Tiger Beetle	S3
EPHEMEROPTERA		
Rhithrogena ingalik	A mayfly	S1S3
HETEROSTROPHA		
Valvata mergella	Rams-Horn Valvata	S1
Valvata sincera	Mossy Valvata	S3
LEPIDOPTERA		
Speyeria zerene	Zerene Fritillary	S2
Oeneis alpina	Eskimo Arctic	S3
ODONATA		
Somatochlora sahlbergi	Treeline Emerald	S3S4
ORTHOPTERA		
Melanoplus gordonae	A Spur-throat Grasshopper	S1
UNIONOIDA		
Anodonta beringiana	Yukon Floater	S3S4

[a]State Rank Definitions:

S1	**Critically Imperiled** —Critically imperiled in the state because of extreme rarity or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the jurisdiction.
S2	**Imperiled** —Imperiled in the state because of rarity due to very restricted range, very few populations, steep declines, or other factors making it very vulnerable to extirpation from jurisdiction.
S3	**Vulnerable**—Vulnerable in the state due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation.
S4	**Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors.

Further details on rankings can be found at the NatureServe website:
http://www.natureserve.org/explorer/ranking.htm

Priority Birds of the Northwest Interior Forest of North America

Source: Sharbaugh (2007)

Anseriformes – Anatidae
Trumpeter Swan
Northern Pintail
Lesser Scaup
Harlequin Duck
Surf Scoter
White-winged Scoter
Barrow's Goldeneye
Long-tailed Duck

Galliformes – Phasianidae
Ruffed Grouse
Rock Ptarmigan
White-tailed Ptarmigan
Dusky Grouse
Sharp-tailed Grouse

Gaviiformes – Gavidae
Red-throated Loon

Podicipediformes – Podicipedidae
Horned Grebe

Pelecaniformes – Phalacrocoracidae
Pelagic Cormarant

Falconiformes - Accipitridae
Northern Goshawk
Golden Eagle

Falconiformes - Falconidae
American Kestrel
Merlin
Gyrfalcon
Peregrine Falcon

Charadriiformes – Charadriidae
American Golden-Plover

Charadriiformes – Scolopacidae
Solitary Sandpiper
Wandering Tattler
Lesser Yellowlegs
Upland Sandpiper
Whimbrel
Black Turnstone
Surfbird
Least Sandpiper
Rock Sandpiper
Short-billed Dowitcher
Red-necked Phalarope

Charadriiformes – Laridae
Bonaparte's Gull
Arctic Tern

Charadriiformes – Alcidae
Marbled Murrelet

Strigiformes – Strigidae
Great Horned Owl
Northern Hawk Owl
Great Gray Owl
Short-eared Owl
Boreal Owl

Piciformes – Picidae
American Three-toed Woodpecker

Passeriformes – Tyrannidae
Olive-sided Flycatcher
Alder Flycatcher
Hammond's Flycatcher

Passeriformes – Laniidae
Northern Shrike

Passeriformes – Corvidae
Gray Jay

Passeriformes – Paridae
Boreal Chickadee

Passeriformes – Cinclidae
American Dipper

Passeriformes – Regulidae
Golden-crowned Kinglet

Passeriformes – Sylviidae
Arctic Warbler

Passeriformes – Turdidae
Gray-cheeked Thrush
Varied Thrush

Passeriformes – Motacillidae
Eastern Yellow Wagtail
American Pipit

Passeriformes – Bombycillidae
Bohemian Waxwing

Passeriformes – Parulidae
Townsend's Warbler
Blackpoll Warbler
Wilson's Warbler

Passeriformes – Emberizidae
Brewer's Sparrow
White-crowned Sparrow
Golden-crowned Sparrow
Smith's Longspur

Passeriformes – Icteridae
Rusty Blackbird

Passeriformes – Fringillidae
Pine Grosbeak
White-winged Crossbill

Appendix I

2008 Alaska Category 5/Section 303(d) List of Impaired Waterbodies

Source: ADEC. 2008. Alaska's Final 2008 Integrated Water Quality Monitoring and Assessment Report. April 1. Available on the world wide web at: http://www.dec.state.ak.us/water/wqsar/waterbody/2008FinalIntegratedReport3-19-08.pdf. Accessed 11/10/09.

APPENDIX E List of Alaska's Category 5/Section 303(d) Impaired Waters

NOTE: This appendix is an abbreviated and alphabetical list by Alaska regions of the Category 5/Section 303(d) list of impaired waters. The waters are listed alphabetically by region: Interior, Southcentral, and Southeast.

#	Region	Category	Alaska ID Number	Waterbody	Location	Area of Concern	Water Quality Standard	Pollutant Parameters	Pollutant Sources
1	IN	Category 5 Section 303(d) listed	20502-101	Caribou Creek	Denali National Park	16.1 miles	Turbidity	Turbidity	Mining
2	IN	Category 5 Section 303(d) listed	40506-007	Chena River	Fairbanks	15 miles	Petroleum Hydrocarbons, Oil & Grease Sediment	Petroleum Products, Sediment	Urban Runoff
3	IN	Category 5 Section 303(d) listed	40506-002	Chena Slough	Fairbanks	13 miles	Petroleum Hydrocarbons, Oil & Grease Sediment	Petroleum Products, Sediment	Urban Runoff,
4	IN	Category 5 Section 303(d) listed	40402-010	Crooked Creek Bonanza Crooked Deadwood Ketchem Mammoth Mastodon Porcupine	North of Fairbanks	77 miles	Turbidity	Turbidity	Placer Mining
5	IN	Category 5 Section 303(d) listed	40509-001	Goldstream Creek	Fairbanks	70 miles	Turbidity	Turbidity	Placer Mining
6	IN	Category 5 Section 303(d) listed	40506-003	Noyes Slough	Fairbanks	7 miles	Sediment Petroleum Hydrocarbons, Oil & Grease Residues	Sediment, Petroleum, Products, Debris	Urban Runoff
7	IN	Category 5 Section 303(d) listed	40510-101	Slate Creek	Denali National Park	2.5 miles	Turbidity	Turbidity	Mining

E. CATEGORY 5/SECTION 303(d) LIST OF IMPAIRED WATERS

#	Region	Category	Alaska ID Number	Waterbody	Location	Area of Concern	Water Quality Standard	Pollutant Parameter	Pollutant Source
8	SC	Category 5 Section 303(d) listed	20505-401	Big Lake	Wasilla	1,250 acres	Petroleum Hydrocarbons	Total Aromatic Hydrocarbons (TAH)	Motorized Watercraft
9	SC	Category 5 Section 303(d) listed	30101-503	Cold Bay	King Cove, Alaska Peninsula	0.01 acre	Petroleum Hydrocarbons, Oil & Grease	Petroleum Products	Military, Fuel Storage
10	SC	Category 5 Section 303(d) listed	20505-001	Cottonwood Creek	Wasilla	Entire 13 miles	Residues	Foam & Debris	Urban Runoff, Urban Development
11	SC	Category 5 Section 303(d) listed	30401-601	Dutch Harbor	Unalaska Island	0.5 acre	Petroleum Hydrocarbons, Oil & Grease	Petroleum Products	Industrial, Urban Runoff
12	SC	Category 5 Section 303(d) listed	30203-001	Egegik River	Egegik	0.25 mile	Petroleum Hydrocarbons, Oil & Grease	Petroleum Products	Spills, Fuel Tanks, Under-ground Fuel Tanks
13	SC	Category 5 Section 303(d) listed	20201-401	Eyak Lake	Cordova	50 feet of shore-line	Petroleum Hydrocarbons, Oil & Grease	Petroleum Products, Petroleum Contamination, Sheen	Above Ground Storage Tanks, Spills
14	SC	Category 5 Section 303(d) listed	20401-412	Hood/Spenard Lake	Anchorage	307 acres	Dissolved Gas	Low Dissolved Oxygen	Urban Runoff, Industrial
15	SC	Category 5 Section 303(d) listed	30102-602	Iliuliuk Bay/Harbor	Dutch Harbor	1.4 acres	Petroleum Hydrocarbons, Oil & Grease	Petroleum Products	Urban Runoff
16	SC	Category 5 Section 303(d) listed	20402-001	Matanuska River	Palmer	½ mile	Residues	Debris	Landfill
17	SC	Category 5 Section 303(d) listed	30101-502	Popof Strait	East Aleutians Borough	5 miles	Residues	Seafood Waste Residue	Seafood Processor

E. CATEGORY 5/SECTION 303(d) LIST OF IMPAIRED WATERS

#	Region	Category	Alaska ID Number	Waterbody	Location	Area of Concern	Water Quality Standard	Pollutant Parameters	Pollutant Sources
18	SC	Category 5 Section 303(d) listed	30102-409	Red Lake Anton Road Ponds	Kodiak	2.0 acres	Toxic & Other Deleterious Organic and Inorganic Substances	Metals	Urban Runoff
19	SC	Category 5 Section 303(d) listed	20401-020	Ship Creek Glenn Hwy Bridge Down to Mouth	Anchorage	11 miles Glenn Hwy Bridge Down to Mouth	Petroleum Hydrocarbons Oil & Grease	Petroleum Products	Urban Runoff
20	SE	Category 5 Section 303(d) listed	10301-004	Jordan Creek	Juneau	3 miles from tide-water up-stream	Sediment Dissolved Gas	Sediment Low Dissolved Oxygen	Land Develop-ment, Road Runoff
21	SE	Category 5 Section 303(d) listed	10203-002	Katlian River	N of Sitka Baranof Island	4.5 miles	Sediment Turbidity	Sediment Turbidity	Timber Harvest
22	SE	Category 5 Section 303(d) listed	10203-602	Klag Bay	West Chichagof Island	1.25 acres	Toxic & Other Deleterious Organic and Inorganic Substances	Metals	Mining
23	SE	Category 5 Section 303(d) listed	10203-001	Nakwasina River	Baranof Island Sitka	8 miles	Sediment Turbidity	Sediment Turbidity	Timber Harvest
24	SE	Category 5 Section 303(d) listed	10303-004	Pullen Creek (Lower Mile)	Skagway	Lower mile of Pullen Creek	Toxic & Other Deleterious Organic and Inorganic Substances	Metals	Industrial
25	SE	Category 5 Section 303(d) listed	10303-601	Skagway Harbor	Skagway	1.0 acre	Toxic & Other Deleterious Organic and Inorganic Substances	Metals	Industrial

Appendix J
Plant Associations of Coastal Rainforests in Southeast and Southcentral Alaska (AKNHP 1995)

CROSSWALKED PLANT COMMUNITIES FOR REGION 10 U.S. FOREST SERVICE – 1995

The crosswalk includes the scientific and common names for each community type, the first author(s) to describe the community, and the community's global and state ranks.

MIXED CONIFER/COPPERBUSH/DEER CABBAGE
MIXED CONIFER/Cladothamnus pyrolaeflorus/Fauria crista-galli
DeMeo et.al, 1992
Global and State Ranks: G4 S4

MIXED CONIFER/SALAL
MIXED CONIFER/Gaultheria shallon
DeMeo et.al, 1992
Global and State Ranks: G? S?

MIXED CONIFER/SALAL/YELLOW SKUNK CABBAGE
MIXED CONIFER/Gaultheria shallon/Lysichiton americanum
DeMeo et.al, 1992
Global and State Ranks: G5 S5

MIXED CONIFER/YELLOW SKUNK CABBAGE-LADY FERN
MIXED CONIFER/Lysichiton americanum-Athyrium filix-femina
Martin et.al, 1995
Global and State Ranks: G3G4 S3S4

MIXED CONIFER/BLUEBERRY
MIXED CONIFER/Vaccinium sp.
DeMeo et.al, 1992
Global and State Ranks: G5 S5

MIXED CONIFER/BLUEBERRY/DEER CABBAGE
MIXED CONIFER/Vaccinium sp./Fauria crista-galli
DeMeo et.al, 1992
Global and State Ranks: G5 S5

MIXED CONIFER/BLUEBERRY/SALAL
MIXED CONIFER/Vaccinium sp./Gaultheria shallon
DeMeo et.al, 1992
Global and State Ranks: G5 S5

MIXED CONIFER/BLUEBERRY/SALAL/DEER CABBAGE
MIXED CONIFER/Vaccinium sp./Gaultheria shallon/Fauria crista-galli
DeMeo et.al, 1992
Global and State Ranks: G5 S5

MIXED CONIFER/BLUEBERRY/YELLOW SKUNK CABBAGE
MIXED CONIFER/Vaccinium sp./Lysichiton americanum
DeMeo et.al, 1992
Global and State Ranks:G5 S5

SITKA SPRUCE-RED ALDER/SALMONBERRY
Picea sitchensis-Alnus rubra/Rubus spectabilis
Martin et.al, 1995
Global and State Ranks: G? S3

SITKA SPRUCE-BLACK COTTONWOOD
Picea sitchensis-Populus trichocarpa
DeVelice et al., 1994
Global and State Ranks: G? S?

SITKA SPRUCE-BLACK COTTONWOOD/SITKA ALDER
Picea sitchensis-Populus trichocarpa/Alnus sinuata
Shephard, 1995
Global and State Ranks: G4 S4

SITKA SPRUCE-BLACK COTTONWOOD/DEVIL'S CLUB
Picea sitchensis-Populus trichocarpa/Oplopanax horridum
Shephard, 1995
Global and State Ranks: G3 S3

SITKA SPRUCE-BLACK COTTONWOOD/DEVIL'S CLUB/ENCHANTER'S NIGHT
Picea sitchensis-Populus trichocarpa/Oplopanax horridum/Circaea alpina
Pawuk and Kissinger, 1989
Global and State Ranks: G1 S1

STIKA SPRUCE-BLACK COTTONWOOD/SERAL
Picea sitchensis-Populus trichocarpa seral
Shephard, 1995
Global and State Ranks: G3 S3

SITKA SPRUCE-MOUNTAIN HEMLOCK/TALL BLUEBERRY SP.
Picea sitchensis-Tsuga mertensiana/Vaccinium sp.
DeMeo et.al, 1992
Global and State Ranks: G5 S5

SITKA SPRUCE-MOUNTAIN HEMLOCK/TALL BLUEBERRY SP.-DEVIL'S CLUB
Picea sitchensis-Tsuga mertensiana/Vaccinium sp.-Oplopanax horridum
Pawuk and Kissinger, 1989
Global and State Ranks: G4 S4

SITKA SPRUCE-MOUNTAIN HEMLOCK/TALL BLUEBERRY SP./MARSH MARIGOLD
Picea sitchensis-Tsuga mertensiana/Vaccinium sp./Caltha biflora
Pawuk and Kissinger, 1989
Global and State Ranks: G? S?

SITKA SPRUCE/SITKA ALDER
Picea sitchensis/Alnus sinuata
Shephard, 1995
Global and State Ranks: G5 S5

SITKA SPRUCE/LADY FERN

Picea sitchensis/Athyrium filix-femina
DeVelice et al., 1994
Global and State Ranks: G? S?

SITKA SPRUCE/BRYOPHYTE
Picea sitchensis/Bryophyte
Boggs, 1996
Global and State Ranks: G4 G4

SITKA SPRUCE/BLUEJOINT
Picea sitchensis/Calamagrostis canadensis
DeVelice et al., 1994
Global and State Ranks: G5 S5

SITKA SPRUCE/PACIFIC REEDGRASS
Picea sitchensis/Calamagrostis nutkatensis
DeMeo et.al, 1992
Global and State Ranks: G3G4 S3S4

SITKA SPRUCE/SHIELD FERN
Picea sitchensis/Dryopteris dilitata
DeVelice et al., 1994
Global and State Ranks: G? S?

SITKA SPRUCE/CROWBERRY
Picea sitchensis/Empetrum nigrum
Global and State Ranks: G? S?

SITKA SPRUCE/FEATHERMOSS
Picea sitchensis/feathermoss
Global and State Ranks: G? S?

SITKA SPRUCE/FORB-FEATHERMOSS
Picea sitchensis/forb-feathermoss
Global and State Ranks: G5 S5

SITKA SPRUCE/YELLOW YELLOW SKUNK-CABBAGE
Picea sitchensis/Lysichiton americanum
DeVelice et al., 1994
Global and State Ranks: G3 S3

SITKA SPRUCE/DEVIL'S CLUB
Picea sitchensis/Oplopanax horridum
DeMeo et.al, 1992
Global and State Ranks: G5 S5

SITKA SPRUCE/DEVIL'S CLUB-SALMONBERRY
Picea sitchensis/Oplopanax horridum-Rubus spectabilis

DeMeo et.al, 1992
Global and State Ranks: G4 S4

SITKA SPRUCE/DEVIL'S CLUB/ENCHANTER'S NIGHTSHADE
Picea sitchensis/Oplopanax horridum/Circaea alpina
Pawuk and Kissinger, 1989
Global and State Ranks: G1 S1

SITKA SPRUCE/DEVIL'S CLUB/SHIELD FERN
Picea sitchensis/Oplopanax horridum/Dryopteris dilitata
DeVelice et al., 1994
Global and State Ranks: G5 S5

SITKA SPRUCE/DEVIL'S CLUB/FORB
Picea sitchensis/Oplopanax horridum/Forb
Global and State Ranks: G? S?

SITKA SPRUCE/DEVIL'S CLUB/YELLOW YELLOW SKUNK-CABBAGE
Picea sitchensis/Oplopanax horridum/Lysichiton americanum
DeMeo et.al, 1992
Global and State Ranks: G4 S4

SITKA SPRUCE/SALMONBERRY
Picea sitchensis/Rubus spectabilis
DeMeo et.al, 1992
Global and State Ranks: G3G4 S3S4

SITKA SPRUCE/PEAT MOSS
Picea sitchensis/Sphagnum sp.
Shephard, 1995
Global and State Ranks: G2G3 S2S3

SITKA SPRUCE/TALL BLUEBERRY SP.
Picea sitchensis/Vaccinium sp.
DeMeo et.al, 1992
Global and State Ranks: G5 S5

SITKA SPRUCE/TALL BLUEBERRY SP.- DEVIL'S CLUB
Picea sitchensis/Vaccinium sp.- Oplopanax horridum
DeMeo et.al, 1992
Global and State Ranks: G5 S5

SITKA SPRUCE/TALL BLUEBERRY SP./LADY FERN
Picea sitchensis/Vaccinium sp./Athyrium filix-femina
DeVelice et al., 1994
Global and State Ranks: G3 S3

SITKA SPRUCE/TALL BLUEBERRY /SHIELD FERN
Picea sitchensis/Vaccinium ovaliflorum/Dryopteris dilitata
DeVelice et al., 1994
Global and State Ranks: G? S?

SITKA SPRUCE/TALL BLUEBERRY SP./YELLOW YELLOW SKUNK-CABBAGE
Picea sitchensis/Vaccinium sp./Lysichiton americanum
DeMeo et.al, 1992
Global and State Ranks: G5 S5

SHORE PINE/ SITKA SEDGE
Pinus contorta/Carex sitchensis
Martin et.al, 1995
Global and State Ranks: G3 S3

SHORE PINE/HEATH
Pinus contorta/Cassiope sp.
PawUk and Kissinger, 1989
Global and State Ranks: G2 S2

SHORE PINE/CROWBERRY
Pinus contorta/Empetrum nigrum
DeMeo et.al, 1992
Global and State Ranks: G5 S5

SHORE PINE/SALAL
Pinus contorta/Gaultheria shallon
DeMeo et.al, 1992
Global and State Ranks: G4G5 S4S5

SHORE PINE/TUFTED CLUBRUSH
Pinus contorta/Scirpus caespitosum
DeMeo et.al, 1992
Global and State Ranks: G4G5 S4S5

SHORE PINE/PEAT MOSS
Pinus contorta/Sphagnum sp.
Shephard, 1995
Global and State Ranks: G3 S3

SHORE PINE/BLUEBERRY
Pinus contorta/Vaccinium sp.
Pawuk and Kissinger, 1989
Global and State Ranks: G3 S3

BLACK COTTONWOOD/DEVIL'S CLUB
Populus trichocarpa/Oplopanax horridum
Shephard, 1995
Global and State Ranks: G3 S3

BLACK COTTONWOOD/SALMONBERRY
Populus trichocarpa/Rubus spectabilis
Shephard, 1995

Global and State Ranks: G3 S3

BLACK COTTONWOOD/WILLOW
Populus trichocarpa/Salix sp.
Shephard, 1995
Global and State Ranks: G? S?

WESTERN HEMLOCK-YELLOW CEDAR/TALL BLUEBERRY
Tsuga heterophylla-Chameaecyparis nootkatensis/Vaccinium sp.
DeMeo et.al, 1992
Global and State Ranks: G5 S5

WESTERN HEMLOCK-YELLOW CEDAR/TALL BLUEBERRY/YELLOW SKUNK CABBAGE
Tsuga heterophylla-Chameaecyparis nootkatensis/Vaccinium sp./Lysichiton americanum
DeMeo et.al, 1992
Global and State Ranks: G5 S5

WESTERN HEMLOCK-WESTERN REDCEDAR/SALAL
Tsuga heterophylla-Thuja plicata/Gaultheria shallon
DeMeo et.al, 1992
Global and State Ranks: G5 S5

WESTERN HEMLOCK-WESTERN REDCEDAR/SWORDFERN
Tsuga heterophylla-Thuja plicata/Polystichum munitum
DeMeo et.al, 1992
Global and State Ranks: G5 S5

WESTERN HEMLOCK-WESTERN REDCEDAR/BLUEBERRY
Tsuga heterophylla-Thuja plicata/Vaccinium sp.
DeMeo et.al, 1992
Global and State Ranks: G5 S5

WESTERN HEMLOCK-WESTERN REDCEDAT/BLUEBERRY, WELL DRAINED.
Tsuga heterophylla-Thuja plicata/Vaccinium sp., well drained
DeMeo et.al, 1992
Global and State Ranks: G5 S5

WESTERN HEMLOCK-WESTERN REDCEDAR/BLUEBERRY-SALAL
Tsuga heterophylla-Thuja plicata/Vaccinium sp.-Gaultheria shallon
DeMeo et.al, 1992
Global and State Ranks: G5 S5

WESTERN HEMLOCK-WESTERN REDCEDAR/BLUEBERRY-SALAL/YELLOW SKUNK CABBAGE
Tsuga heterophylla-Thuja plicata/Vaccinium sp.-Gaultheria shallon
DeMeo et.al, 1992
Global and State Ranks: G5 S5

WESTERN HEMLOCK-WESTERN REDCEDAR/BLUEBERRY/YELLOW SKUNK CABBAGE
Tsuga heterophylla-Thuja plicata/Vaccinium sp./Lysichiton americanum
DeMeo et.al, 1992
Global and State Ranks: G5 S5

WESTERN HEMLOCK/PACIFIC REEDGRASS
Tsuga heterophylla/Calamagrostis nutkatensis
DeVelice et al., 1994
Global and State Ranks: G3 S3

WESTERN HEMLOCK/RUSTY MENZIESIA
Tsuga heterophylla/Menziesia ferruginea
Martin et.al, 1995
Global and State Ranks: G4 S4

WESTERN HEMLOCK/MOSS
Tsuga heterophylla/Moss
DeVelice et al., 1994
Global and State Ranks: G4G5 S4S5

WESTERN HEMLOCK/DEVIL'S CLUB
Tsuga heterophylla/Oplopanax horridum
Martin et.al, 1995
Global and State Ranks: G? S3S4

WESTERN HEMLOCK/DEVIL'S CLUB-SHALLOW SOILS
Tsuga heterophylla/Oplopanax horridum
Martin et.al, 1995
Global and State Ranks: G? S3S4

WESTERN HEMLOCK/DEVIL'S CLUB/YELLOW YELLOW SKUNK-CABBAGE
Tsuga heterophylla/Oplopanax horridum/Lysichiton americanum
Martin et.al, 1995
Global and State Ranks: G4G5 S4S5

WESTERN HEMLOCK/BLUEBERRY
Tsuga heterophylla/Vaccinium sp.
DeMeo et.al, 1992
Global and State Ranks: G5 S5

WESTERN HEMLOCK/TALL BLUEBERRY SP.-DEVIL'S CLUB
Tsuga heterophylla/Vaccinium sp.-Oplophananx horridum
DeMeo et.al, 1992
Global and State Ranks: G5 S5

WESTERN HEMLOCK/TALL BLUEBERRY SP./YELLOW YELLOW SKUNK-CABBAGE
Tsuga heterophylla/Vaccinium sp./Lysichiton americanum
DeMeo et.al, 1992
Global and State Ranks: G5 S5

WESTERN HEMLOCK-YELLOW CEDAR/TALL BLUEBERRY -DEVIL'S CLUB
Tsuga heteropylla-Chameaecyparis nootkatensis/Vaccinium sp.-Oplopanax horridum
Martin et.al, 1995
Global and State Ranks: G4 S4

WESTERN HEMLOCK/DEVIL'S CLUB-SALMONBERRY
Tsuga heteropylla/Oplopanax horridum-Rubus spectabilis
DeMeo et.al, 1992
Global and State Ranks: G? S4

WESTERN HEMLOCK- YELLOW CEDAR/TALL BLUEBERRY -MENZIESIA
Tsuga heterphylla-Chameaecyparis nootkatensis/Vaccinium sp.-Menziesia ferruginea
DeMeo et.al, 1992
Global and State Ranks: G3 S3

WESTERN HEMLOCK/BLUEBERRY/SHIELD FERN
Tsuga heterophylla/Vaccinium sp./Dryopteris dilitata
DeMeo et.al, 1992
Global and State Ranks: G5 S5

MOUNTAIN HEMLOCK-WESTERN HEMLOCK/BLUEBERRY-MENZIESIA
Tsuga mertensiana-Tsuga heterophylla/Vaccinium sp.-Menziesia ferruginea
DeVelice, 1994
Global and State Ranks: G? S?

MOUNTAIN HEMLOCK-WESTERN HEMLOCK/SITKA ALDER
Tsuga mertensiana-Tsuga heterophylla/Alnus sinuata
DeVelice et al., 1994
Global and State Ranks: G? S?

MOUNTAIN HEMLOCK-WESTERN HEMLOCK/BLUEBERRY
Tsuga mertensiana-Tsuga heterophylla/Vaccinium sp.
Shephard, 1995
Global and State Ranks: G5 S5

MOUNTAIN HEMLOCK-WESTERN REDCEDAR/BLUEBERRY/DEER CABBAGE
Tsuga mertensiana-Tsuga heterophylla/Vaccinium sp./Fauria crista galli
DeVelice et al., 1994
Global and State Ranks: G? S?

MOUNTAIN HEMLOCK-WESTERN HEMLOCK/BLUEBERRY-YELLOW SKUNK CABBAGE
Tsuga mertensiana-Tsuga heterophylla/Vaccinium sp./Lysichiton americanum
Shephard, 1995
Global and State Ranks: G5 S5

MOUNTAIN HEMLOCK/SITKA ALDER
Tsuga mertensiana/Alnus sinuata
DeVelice et al., 1994
Global and State Ranks: G? S?

MOUNTAIN HEMLOCK/CASSIOPE SP./DEER CABBAGE
Tsuga mertensiana/Cassiope sp./Fauria crista-galli
Pawuk and Kissinger, 1989
Global and State Ranks: G5 S5

MOUNTAIN HEMLOCK/ALASKA MOSS HEATH
Tsuga mertensiana/Cassiope stellariana
DeVelice et al., 1994
Global and State Ranks: G? S?

MOUNTAIN HEMLOCK/COPPERBUSH
Tsuga mertensiana/Cladothamnus pyrolaeflorus
DeMeo et.al, 1992
Global and State Ranks: G4G5 S4S5

MOUNTAIN HEMLOCK/MOUNTAIN HEATHER/DEER CABBAGE
Tsuga mertensiana/Phyllodoce aleutica/Fauria crista-galli
DeVelice et al., 1994
Global and State Ranks: G? S?

MOUNTAIN HEMLOCK/TALL BLUEBERRY SP.
Tsuga mertensiana/Vaccinium sp.
DeMeo et.al, 1992
Global and State Ranks: G5 S5

MOUNTAIN HEMLOCK/TALL BLUEBERRY-ALASKA MOSS HEATHER
Tsuga mertensiana/Vaccinium ovaliflorum-Cassiope stellariana
DeVelice et al., 1994

Global and State Ranks: G5 S5
MOUNTAIN HEMLOCK/TALL BLUEBERRY SP./MARSH MARIGOLD
Tsuga mertensiana/Vaccinium sp./Caltha biflora
Pawuk and Kissinger, 1989
Global and State Ranks: G5 S5

MOUNTAIN HEMLOCK/TALL BLUEBERRY SP./DEER CABBAGE
Tsuga mertensiana/Vaccinium sp./Fauria crista-galli
Martin et.al, 1995
Global and State Ranks: G5 S5

MOUNTAIN HEMLOCK/BOG BLUEBERRY/DEER CABBAGE
Tsuga mertensiana/Vaccinium uliginosum/Fauria crista-galli
DeVelice et al., 1994
Global and State Ranks: G? S?

Appendix K

Calculation and Use of Functional Units

Adapted from Montana Department of Transportation (2008).

Functional units are not used in determining the overall rating of an AA, but are provided for the evaluator's consideration in assessing project impacts, mitigation needs, or in assessing mitigation plans or the success of constructed projects.

If desired, calculate the functional units **that will be affected** for each function by multiplying the actual functional points for the AA by the acreage in the AA that will be adversely affected by the project. This is optional and will not affect the site's overall rating. **Note that you should use only the wetland acreage of the AA if you are also rating the waterbody part of the AA separately.** Note that when more than one AA is evaluated on a single form, functional unit calculations cannot be performed using the average size of the AAs; this must be done on an individual AA basis. When more than one site is assessed on a single form, the functional units column should be left blank.

Note that when more than one AA is evaluated on a single form, functional unit calculations cannot be performed using an average size of the AAs evaluated.

Later in your project evaluation process, you may wish to show the calculated functional units, summed for each function, for each alternative under consideration. Then, you can compare the alternatives' effects on each function. If desired, you can then also sum the functional units lost for all the functions for a single alternative to determine a single number for each alternative. While this sum allows you to easily compare among alternatives, you lose the information on which functions are most affected. That approach would also, in effect, weight each of the functions equally, which may or may not be appropriate.

An example of how functional units could be used to develop mitigation that would replace overall functions and services for a given AA is presented below.

The total actual functional points for a given 8-acre AA is 6.3. Total functional units for the AA would be calculated by multiplying 6.3 points x 8 acres = 50.4 functional units. A proposed highway project would impact 2 acres of the AA. Assuming a relatively uniform distribution of functional capacity across the AA, the loss in functional units to the AA would be 2 acres x 6.3 points = 12.6 functional units. To compensate for lost wetland functions and services, mitigation would need to be designed that would replace the 12.6 functional units. If the predicted total actual functional points for a mitigation project was 5.1, and the goal were to replace 12.6 functional units, the applicant would need at least 2.5 acres of mitigation to compensate for the loss (2.5 x 5.1 = 12.6). If limited to a two-acre mitigation site, the applicant could, in theory, design the mitigation project such that the predicted functional points met or exceeded 6.3, resulting in the replacement of at least 12.6 functional units (2 x 6.3 = 12.6), or could obtain an additional site such that the sum of the functional units for the two sites met or exceeded the total 12.6 point replacement requirement.

Functional units can also be examined on a function-by-function basis to compare existing pre-project conditions with predicted post-project conditions. This concept is employed by the HGM method (Smith et al. 1995), and is illustrated by the following table, which assumes a 2-acre impact to a 10-acre AA for a hypothetical project.

Function or Service	Pre-Project			Post-Project			
	Functional Points	Size of AA in Acres	Functional Units	Functional Points	Size of AA in Acres	Functional Units	Change in Functional Units
A	0.8	10	8	0.4	8	3.2	- 4.8
B	1	10	10	0.6	8	4.8	- 5.2

There are several possible ways to determine mitigation needs using this approach, including:

- designing mitigation for individual functions or cumulatively for all functions using the **greatest** predicted loss in functional units as the replacement target (*using the example above, designing mitigation such that each function provides a minimum 5.2 functional units or designing the mitigation such that, cumulatively, 5.2 + 5.2 = 10.4 functional units are replaced*); or

- designing mitigation for individual functions or cumulatively for all functions using the **average** predicted loss in functional units as the replacement target (*in this case, designing mitigation such that each function provides a minimum 5 functional units [(4.8 + 5.2) / 2 = 5] or designing the mitigation such that, cumulatively, 5 + 5 = 10 functional units are replaced*); or

- designing mitigation for individual functions or cumulatively for all functions using **individual** predicted changes in functional units as the target (*in this case, 4.8 for function A and 5.2 for function B, or cumulatively using 4.8 + 5.2 = 10 functional units*).

There may be circumstances that simply preclude the replacement of a given function or service at the same level at which it is rated for an affected wetland. For example, if a project impacts a wetland rated “high” for uniqueness due to the presence of a bog, it is very unlikely that the uniqueness parameter could be compensated at the same level at a replacement wetland because of the difficulty associated with bog replacement. In virtually all cases, appropriate compensation of lost wetland functions and services will be subject to coordination and negotiation with the regulatory agencies involved with the project.

It is not the purpose of this evaluation method to dictate wetland mitigation policy. What is and is not considered appropriate mitigation will ultimately be determined by the regulatory agencies; primarily the COE and EPA. While this evaluation method does provide a means for quantifying predicted impacts to wetland functions and services, it is important to stress that coordination with the regulatory agencies on the application of this method and use of functional units to develop mitigation strategies is crucial and needs to be carried out on a project-by-project basis.