Guide for Assessing Permanence of Wetland Basins

January 2016

Version History:			
Version No.	**Date**	**Summary of Changes**	**Authority**
1.0	June 16, 2014	New document.	G. Haekel
1.0	June 16, 2014	Final document approved for public release.	K. Singh
1.1	August 20, 2015	1. As the common use of this protocol by practitioners has been extended by practice beyond municipal planning, the background section has been amended to reflect this broader usage. 2. Clarified that AWCS Permanence Type III (S&K Class 3 seasonal) wetlands are generally not claimed by the Crown but that caution should be exercised in the interpretation and assessment of permanence. 3. Wetland classification section and tables amended to align and include new wetland classes according to the Alberta Wetland Classification System. 4. Organizational name changes.	G. Haekel
1.1	January 29, 2016	Revised document approved for public release.	K. Singh

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Purpose

This document is not meant to guide the delineation of wetland boundaries.

The purpose of these guidelines is to provide land users and their environmental practitioners with a standardized methodology acceptable to Alberta Environment and Parks (AEP) for assessing the permanence of one or more wetlands on one or more parcels of land. Those water features determined to be permanent are likely to have their ownership claimed by the provincial Crown under Section 3 of the *Public Lands Act*.

These guidelines can be used to assess wetland permanence of an individual wetland basin on a single parcel of land, or multiple wetland basins within multiple land parcels.

The use of this protocol serves two broad functions:

1. To align with AEP's Wetland Identification and Delineation Directive and to support the Wetland Assessment Impact Report (WAIR) requirements associated with the implementation of Alberta's wetland policy and its related regulatory elements; or
2. As a separate stand-alone procedure for determining wetland permanence to support other land ownership enquiries (e.g., general land owner enquiries), resource management (e.g., planning initiatives), or other regulatory requirements (e.g., compliance assurance).

Background

Wetlands are a common type of water feature that are interspersed across the landscape in the settled area of Alberta. Although wetlands and activities that may impact them are regulated under the *Water Act* (wetlands are part of the definition of a water body) and by Alberta's Wetland Policy (2013), they may also be subject to the *Public Lands Act* if they are permanent and naturally occurring bodies of water. In such cases, the ownership and title to the bed and shores of the basin is held by the provincial Crown, not the adjoining landowner.

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Assessment of wetland permanence and subsequently ownership is generally undertaken for the following reasons:

1. An industrial land use[1], such as oil and gas infrastructure or facility, is intended to occur on a land parcel and if a wetland is Crown owned and likely to be impacted, will trigger a regulatory requirement under the *Public Lands Act* or the *Public Lands Administration Regulation*.

2. A commercial land use is intended to occur on a land parcel and if a wetland is Crown owned and likely to be impacted, will trigger a regulatory requirement under the *Public Lands Act* or the *Public Lands Administration Regulation*.

3. Municipal planning requires that ownership of all lands subject to future development is known. Municipalities may have their own policies that dictate how wetlands should be treated through land use planning, zoning and subdivision processes. When private land undergoes subdivision and development, it is normally a municipal requirement that provincial interests are identified including whether or not a body of water may be Crown owned. If Crown owned, this land asset will have further implications which may impact the design of any future plan. The Crown ownership identification step occurs early on in the planning and development process, usually at the Area Structure Plan or Neighbourhood Structure Plan stage.

Alberta Environment and Parks (AEP) normally conducts the primary assessment of a wetland basin for the purpose of determining its permanence. AEP will then assert the Crown's claim to ownership for all permanent and naturally occurring bodies of water. As this work is done for lands throughout the settled area, enquiries submitted for assessment late in the disposition, land sale, or subdivision development process can cause a significant time delay for the proponent.

The assessment of permanence can be resource and time intensive. AEP will normally conduct the assessment for individual landowners involving one or two wetlands. However when enquiries involve multiple basins or are required for industrial/commercial purposes, the volume and scope of assessment can be significant and requires considerable time to complete by AEP staff. To expedite the time required to conduct the assessment of permanency for multiple wetland basins or for industrial/ commercial proponents, it is preferable for the proponent to engage the services an appropriate environmental consultant to conduct the primary assessment for AEP review and confirmation of basin ownership.

Procedural/Guidance

Limitations on Crown Ownership Claimability

The Crown's ownership to the beds and shores of water bodies has existed since the Dominion of Canada enacted the *Northwest Irrigation Act* in 1894 and whose provisions were carried forward into the first *Provincial Lands Act* after Canada transferred the province's natural resources to Alberta in 1930 (*Transfer of Natural Resources Act*). Today, Section 3 of the *Public Lands Act* continues to provide the legislative authority for having the ownership of permanent and naturally occurring bodies of water held by the provincial Crown. Most land titles are silent to the Crown's claim to water bodies; however this ownership is a subsisting reservation or exception from the original grant and hence according to Section

[1] Transmission lines are exempt from a *Public Lands Act* approval requirement under Section 35(1) of the *Hydro and Electric Power Act*.

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61 of the *Land Titles Act,* is deemed an implied condition without need of any special mention on a certificate of title.

The Crown's ownership claim to a wetland basin's bed and shore is limited to only those water features which meet the following criteria:

1. **The wetland must be a "body of water"**. There is a distinct difference between "ownership" under the *Public Lands Act* and the regulatory provisions in the *Water Act* whose definition of a "water body" includes all "wetlands" as part of the definition. The wetland basin must be more than land that is simply wet and generally must have a character and depth of ponds that support open water and associated aquatic vegetation.

2. **The wetland must be "naturally occurring"**. The wetland feature must be of geomorphic origin and not a man-made landscape feature (e.g. a dugout, constructed wetland, etc.).

3. **The wetland must be "permanent" (or reasonably so)**. The wetland feature must have persistent inundation period but need not be perpetually or continuously inundated. Wetlands normally respond to changes in annual climate through a well-defined cycle and may from time to time become dry during periods of low precipitation followed by another period of inundation. Their boundaries will vary over time as well[2].

Wetland Permanence

Wetlands are highly variable water features on the landscape. The Crown will assert its ownership to a natural wetland if it is permanent. Establishing permanence is then necessary to confirm ownership and whether or not an activity that may potentially impact it, becomes subject to the regulatory authority under the *Public Lands Act*. In addition, Alberta's new wetland policy requires wetlands to have their permanence assessed as part of the *Water Act* regulatory process.

Wetlands throughout the settled area are varied by distribution and by type. Those in southern Alberta exist in a dry climate and tend to be temporary or at most seasonal in nature. One would generally expect wetlands in these areas not to be permanent. Wetlands tend to become more permanent the further north they are located.

Seasonal variation in rainfall, snow accumulation and melt, evapotranspiration, water table and the geomorphology of each basin are reflected in the water fluctuations within these wetlands. The duration of inundation plays a major role in the character of many wetland functions, including the diversity, structure and distribution of vegetation.

Change in duration of flooding within the wetland can be expressed as the number of weeks in a year that ponded water is present (see Table 1). This is based on the duration of flooding in a typical year

[2] As a "permanent and naturally occurring body of water", **the wetland must have a boundary that can be clearly defined which separates one landowner from another.** In Alberta, water body ownership boundaries are legally defined under Section 17 of *the Survey's Act* as a "bank" that represents the limit or extent of the bed and shore of that water body. A distinct change in vegetation is one of the primary determinants in defining this boundary. As wetlands commonly have multiple vegetation communities aligned along a moisture gradient, many changes in vegetation can be represented. For the purpose of determining the "ownership boundary" of the claimable wetland, the provincial Crown normally considers the upland boundary of the emergent aquatic plant community to be the boundary delineating the body of water under Section 3 of the *Public Lands Act*.

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since water storage can be significantly less following long-term drought or greatly extended following a long wet period (Hauer et al, 2000).

Table 1. Cowardin Water Regime Modifiers (modified from Hauer et al, 2000 and Cowardin et al, 1979).

Water Regime Modifier (Wetland Inundation)	Weeks Flooded	AWCS Wetland Type
Temporary Flooded	1-4	Temporary (II)
Seasonally Flooded	5-17	Seasonal (III)
Semi-Permanently Flooded	18-40	Semi-permanent (IV)
Intermittently Exposed	41-51	Intermittent (VI)
Permanently Flooded	52	Permanent (V)

Hauer (2000) recommended that inundation be evaluated directly by observation at the wetland site and if this were not possible, then indicators be used to estimate the number of weeks of inundation by observing the soil and vegetation in the deepest part of the wetland basin (as defined by Stewart and Kantrud 1971).

Prairie wetlands exhibit distinctive wetland vegetation zonation that corresponds to hydrogeomorphic ecosystem drivers (Hauer et all, 2000)[3]. Stewart and Kantrud (1971)[4] and others examined this vegetation zonation in detail. The inundation and vegetation indicators lend themselves to classifying wetlands. In turn, a particular wetland class can be used to determine a wetland's permanence characteristics.

Given that the Crown only has an ownership interest in reasonably permanent wetlands, a wetland classification approach can then be employed as a coarse filter or to triage and quickly filter out wetlands that do not have the characteristics that would lend themselves meeting the claimability criteria, and thereby limit the time and resources required to undertake detailed ownership assessments.

Use of Wetland Classification Systems

Wetland classification helps describe and group wetlands into general categories. Alberta adopted its own standardized provincial wetland classification system in 2015. The Alberta Wetland Classification System (AWCS) includes S & K wetland class equivalents at the Type sub-classification level. Wetland permanence (i.e., the length of time the basin is inundated with water) is a key identifier and uses characteristic vegetation zonation to determine wetland type. Associated vegetation indicators for the central basin of a wetland are a robust diagnostic for each permanence type. The shallow marsh, deep marsh, and open water zones are considered to be, under most circumstances, synonymous with the seasonal, semi-permanent, and permanent wetland zones, respectively, defined by Cowardin et al.

[3] Hauer, F. Richard, Bradley J. Cook, Michael C. Gilbert, Ellis C. Clairain, and R. Daniel Smith. **A Regional Guidebook for Assessing the Functions of Intermontaine Prairie Pothole Wetlands in the Northern Rocky Mountains.** U.S. Army Corps of Engineers. April 2000.

[4] Stewart, R and H. Kantrud. 1971. **Classification of Natural Ponds and Lakes in the Glaciated Prairie Region**. Resource Publication 92. Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, United States Department of the Interior. 58 pg.

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(1979)[5] and Stewart and Kantrud. The classification system also takes into account the variances in wetland form due to fluctuations in water levels.

The water permanence type modifiers in the AWCS, confirmed with and evaluation of the historical photo record, should be used to determine the permanency of a wetland.

Wetland assessors must also be very familiar with the variety of cover types described by Stewart and Kantrud (1971) when interpreting aerial photography or verifying wetland classes in a field setting (see Appendix 1 for examples of the major wetland classes).

AEP is reasonably confident that AWCS classified semi-permanent and permanent wetland types by their nature are permanent and Crown claimable. In AEP's experience, seasonal (Permanence Type III) wetlands are generally not claimed by the Crown. However as these wetlands can shift up and down between Permanence Type IV wetlands depending on the current local climate condition (highly variable) and where the wetland is in its regeneration cycle, or if the wetland may have been anthropomorphically altered in the past (see Section 2 under Assessment Process for more information), AEP cautions practitioners to check the photo record to be certain about such a wetland's overall permanence.

Table 2 includes the wetland classes, forms and permanence types in the Alberta Wetland Classification System cross-referenced to the Stewart and Kantrud wetland classes.

Table 2. The major wetland groupings of the Alberta Wetland Classification System and their Stewart and Kantrud equivalents.

Alberta Wetland Classification System			**S & K Equivalent**	**Permanency**	**Dominant Vegetation Zone**	**Potential Crown Claimability**
Class	**Form**	**Type**				
-	-	Ephemeral	Class I	Ephemeral	Local Vegetation	No
Marsh (M)	Graminoid (G)	Temporary	Class II	Temporary	Wet Meadow	No
Marsh (M) Shallow Open Water (W)	Graminoid (G) Submersed / Floating Aquatic Vegetation (A)	Seasonal	Class III	Seasonal	Shallow Marsh	Generally* No
Marsh (M) Shallow Open Water (W)	Graminoid (G) Submersed / Floating Aquatic Vegetation (A)	Semi-Permanent	Class IV	Semi-Permanent	Deep Marsh	Yes
Shallow Open Water (W)	Submersed / Floating Aquatic Vegetation (A)	Permanent	Class V	Permanent	Open Water	Yes
Shallow Open Water (W)	Bare (B)	Intermittent	Class VI (Akaline)	Variable	Open water or bare ground	Case-by-case
Fen (F)	Wooded, coniferous (Wc) Shrubby (S) Graminoid (G)	-	Class VII (Fen)	-	Form will determine dominant vegetation	No

[5] Cowardin, L. M., V. Carter, F. C. Golet, E. T. LaRoe. 1979. **Classification of Wetlands and Deepwater Habitats of the United States**. U. S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Jamestown, ND: Northern Prairie Wildlife Research Center. 131pp.

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Alberta Wetland Classification System			S & K Equivalent	Permanency	Dominant Vegetation Zone	Potential Crown Claimability
Class	Form	Type				

* The assessor should exercise caution when encountering altered basins and be certain that what currently appears to be a Permanence Type III seasonal wetland is not in fact a Permanence Type IV semi-permanent wetland in its drawdown phase or a permanent feature that has been altered in the past. If the precipitation record preceding the observation record indicates a period drier than normal, a review and assessment of a wider range of historical aerial photography for the wetland in question may be required to accurately determine its permanency and potential Crown ownership.

Note: In and of itself however, a particular wetland's classification is not the determinant factor in whether the Crown will claim ownership to a wetland - permanence is, determined by the long-term nature of the body of water. As such, a review of the wetland's inundation characteristics over its historical record is required to accurately determine permanence.

Qualified wetland assessment practitioners[6]: Who can undertake a wetland permanence assessment?

Since the environmental consultant will be undertaking the primary assessment of wetland permanence that may impact a landowner's ownership interests and lead to a decision by AEP to claim or not claim ownership to the wetland, a high degree of care, due diligence and accuracy must be applied when conducting the assessment to minimize liability and avoid litigation. The assessment of wetland permanency requires specialized skills and experience. The assessor is or shall work under the guidance of a professional (e.g. biologist, agrologist, etc.) who is a member of a Professional Regulatory Organization (e.g. Alberta Society of Professional Biologists, Alberta Institute of Agrologists, etc.) and shall possess the following skills and skill level:

Table 3. Skills required for assessing wetland permanence.

Skill	Skill Level
Aerial photography interpretation	**Strong:** As this is primarily a desktop exercise, interpretation of photographic features is critical.
Geomorphology	**Basic:** A basic understanding of landforms and the formation of wetland basins on the landscape is required.
Wetland botany	**Moderate:** The assessor must be able to identify the dominant wetland plant species and major plant associations in each of the wetland zones found across eco-regions in Alberta.
Wetland ecology	**Moderate:** The assessor must understand wetland functions and how wetlands respond to climate variability.

Assessment Signoff Requirements

The final assessment of wetland permanency must be signed-off by a professional in Alberta regulated under the *Professional and Occupational Associations Registration Act* or corresponding legislation that governs the practice of its professional members. The sign-off authority must also:

- Only work within the scope of their professional knowledge, training, and practice, and
- Take ownership and verify the accuracy of the work conducted.

[6] This is not intended to be a formal professional designation rather only that a regulated professional is to perform and certify the assessment.

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The Assessment Process

1. Current State of the Water Feature

Based on a site visit and/or recent aerial photography, determine what water features exist on the ground today and what their current state is. Using a base image, identify each wetland with a unique identifier and evaluate whether it is one of the following:

- A natural lake or pond?
- A man-made feature such as a dugout or reservoir? A flooded excavation?
- A dammed stream/beaver pond? Water impounded by a misplaced culvert?
- Is it something else? A constructed wetland for storm water retention or treatment purposes? Is it a wetland created by leaky irrigation infrastructure?
- A natural wetland? If yes, what is the current AWCS wetland permanence type?

Has the proponent/consultant conducted a site assessment of the feature and documented its state, or obtained documentation conducted previously? The documentation could consist of a field report, a biophysical report, or a specific wetland assessment. If the documentation is not a recent one, is it still representative of the condition on the site today?

2. Consider the Phase of the Wetland in the Inundation Cycle

Wetlands assessed and documented in the field are like photographs that capture an image at one point in time. They provide the current baseline condition at the time of the assessment and are reflective of the conditions of the site and the climate at a given point in time. The variance in snowpack, spring runoff, and precipitation results in dynamic water level changes in individual basins over time.

Plant species reflect water fluctuations by forming characteristic assemblages that are visibly observed, generally as concentric plant zones. Plants within the zones have similar requirements for germination and persistence, and they have similar tolerances for water level permanence and chemistry (Grosshans and Kenkel, 1997)[7].

Permanence type III (seasonal) and permanence type IV (semi-permanent) wetlands will exhibit the most variability and can shift a wetland class up or down depending where in the inundation cycle the wetland exists. A good understanding of this wet-dry cycle is required to accurately interpret the dominant class of the wetland.

In semi-permanent wetlands (i.e., wetlands that hold water throughout the growing season during most years), wet or dry periods induce changes in the ratio of emergent cover to open water (see S&K cover types) which over time form and represent the wetland inundation cycle (see Figure 1). The cycle ranges from open water to complete emergent cover, is irregular and can vary in length from 5 to ≥ 30 years (Poiani and Johnson, 1993)[8]. Low water and occasional drying of the marsh bottom during droughts (drawdown) initiates the cycle (dry marsh phase) and stimulates plant re-colonization of exposed mudflats from a diverse seed bank by annual and emergent species. Rainfall and re-flooding eventually re-establishes open water (lake marsh phase) causing a turnover in plant populations to create greater interspersion of emergent cover and open water.

[7] Grosshans, R., and N. Kenkel. 1997. **Dynamics of emergent vegetation along natural gradients of water depth and salinity in a prairie marsh: delayed influences of competition**. UFS (Delta Marsh) Annual Report, Vol.32, 1997. Pg 83-93.

[8] Poiani, K., and W.C. Johnson. 1993. **A spatial simulation model of hydrology and vegetation dynamics in semi-permanent prairie wetlands**. Ecological Applications, 3(2). Pg 279-293.

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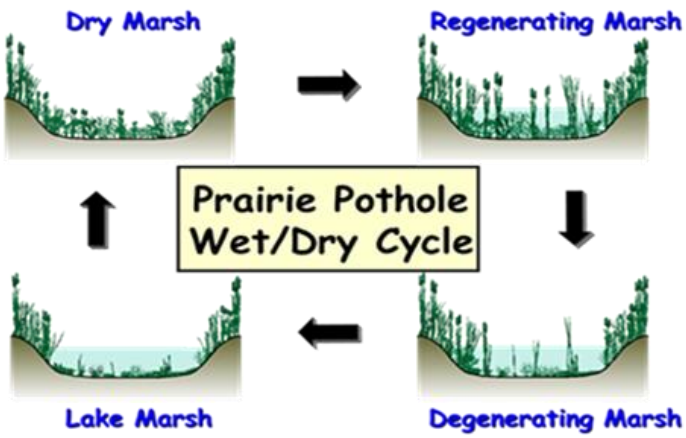
Figure 1. The Prairie pothole inundation cycle[9].



It is incumbent that the assessor understands where in the inundation cycle the wetlands under investigation are. As the inundation cycle is tied to variances in climate, it is helpful to also gain an understanding whether or not the climate is wetter or dryer than expected from the norm (Figure 2). This is extremely helpful when interpreting wetland cover from aerial photography.

3. Consider deviations from the climate norm when interpreting aerial photography

As illustrated above, climate has a direct effect on the period or extent of inundation of a water body. Historic climate data is useful in understanding the environmental conditions that may have existed during a specified time period, or leading up to a specific date. This is especially important when reviewing the sequence of historical aerial photographs for a given location.

Climate data can be used to assist in interpreting what is seen on aerial photographs and in determining the permanence of a water body. For example, winter precipitation (snowfall and snow depth at month end) leading into Spring is a useful predictor of whether or not wetland basins will fill or are expected to be inundated. Similarly, the departure from the average precipitation from the climatic norm for any given area is useful when interpreting aerial photographs and whether climate for that year.

Environment Canada calculates the climate norms for a given region. Climate normals are the average values for climate characteristics such as temperature, precipitation, wind and humidity for a particular location. At the completion of each decade, climate normals are updated for as many locations and as many climatic characteristics as possible. The climate normals are based on Canadian climate stations with at least 20 years of data between 1961 and 1990, or with at least 15 years of data between 1971 and 2000.

Average values allow quick and easy comparison of the climate of different areas, but they do not describe the inherent variability of climate at any given location. Year-to-year variations result in values that are usually above or below the average. Variability is an expected feature of our climate, which must be remembered when looking at the average values.

In response to this variability, Alberta Agriculture and Forestry through its AgroClimatic Information Service (ACIS), provides historical weather data including precipitation data sets that look at the annual departure of precipitation during the growing season from the climate norms (Figure 2).

[9] van der Valk, A.G., and C.B. Davis. 1978. **The role of seed banks in the vegetation dynamics of prairie glacial marshes**. Ecology 59:322-335.

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The data are available in tabular or map form and can help in answering common questions such as:

- Was the climate normal, wetter than normal, or drier than normal for the location based on the date the aerial photo was taken?
- What were the climate conditions in the previous year(s) leading to the time period of interest? Does the data show the trend to be approaching climatic norms, a drying trend indicating possible drought, or a trend to conditions that are wetter than expected? How does this relate to what is seen on an aerial photograph?
- Were there any high precipitation events (months) that would result in water bodies to be inundated beyond what would be normally expected based on climate norms?
- Were there any extended years of drought or below than normal precipitation that would result in even permanent water bodies temporarily drying out?

4. Methods for correlating local climate data to aerial photography aid in interpretation of wetland permanence

The steps below provide standard methods for selection and interpretation of imagery and are consistent with the protocol used in the **Alberta Wetland Identification and Delineation Directive**.

1. Correlate precipitation levels (relative to norms) with dates of available air photos. Alberta Agriculture and Forestry's AgroClimatic Information Service (ACIS) provides a convenient set of maps and tools for working with precipitation records. The data sources are available on-line from:

   - **Alberta Agriculture and Forestry, Alberta Climate and Atlas Maps**

   For any aerial photograph of a given area of land, compare (for quick reference) the image capture date with the precipitation (growing season) map for that year. This will give the user a broad indication which parts of the province during the entire growing season were wetter or drier than normal.

   From the "Climate and Atlas Maps" tab in the ACIS tool, choose the "Precipitation" tab at the top of the application, then the "Historical Summaries (1961 to 2012)" tab on the left. Then select "Accumulation Relative to Normal (Long Term)" followed by the "Growing Season" option. Finally, select the year of interest.

   For example, in Figure 2 the 1962 map clearly indicates that SW Alberta was very dry and that the North half of the province including a region south and east of Edmonton were very wet, well above what is normally expected. One would expect wetlands in an aerial photograph for SW Alberta to show wetlands to be potentially dried out basins. Temporary or semi-permanent wetlands in the wetter regions would likely be fully inundated perhaps well into the fall.

   For each aerial photo assessed, record in the Wetland Assessment Table whether or not the date of that photograph represents normal climate conditions, or if the conditions were wetter or drier than the norm.

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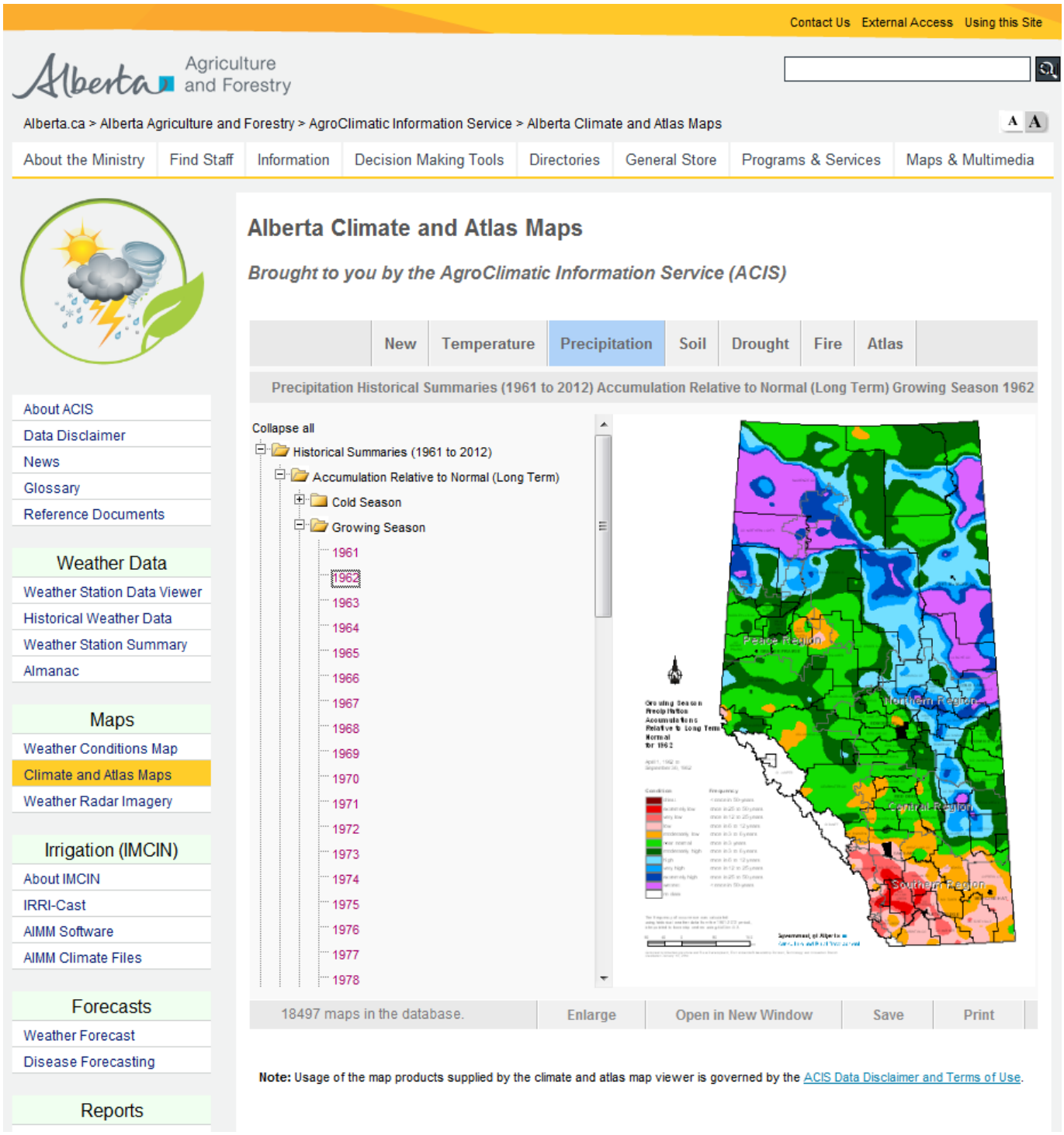
Figure 2. Image capture of the web interface showing Alberta Agriculture and Forestry's AgroClimatic Information Service (ACIS) website.



2. Precipitation data specific to the area of interest can be obtained through the Interpolated Weather Data Viewer for Alberta Townships using the same application (Figure 3). This application is used for the purpose of selecting aerial photography to use for interpretation purposes as well as to determine what the precipitation record may have been days or months prior to the date of an aerial photograph to assist in interpretation.

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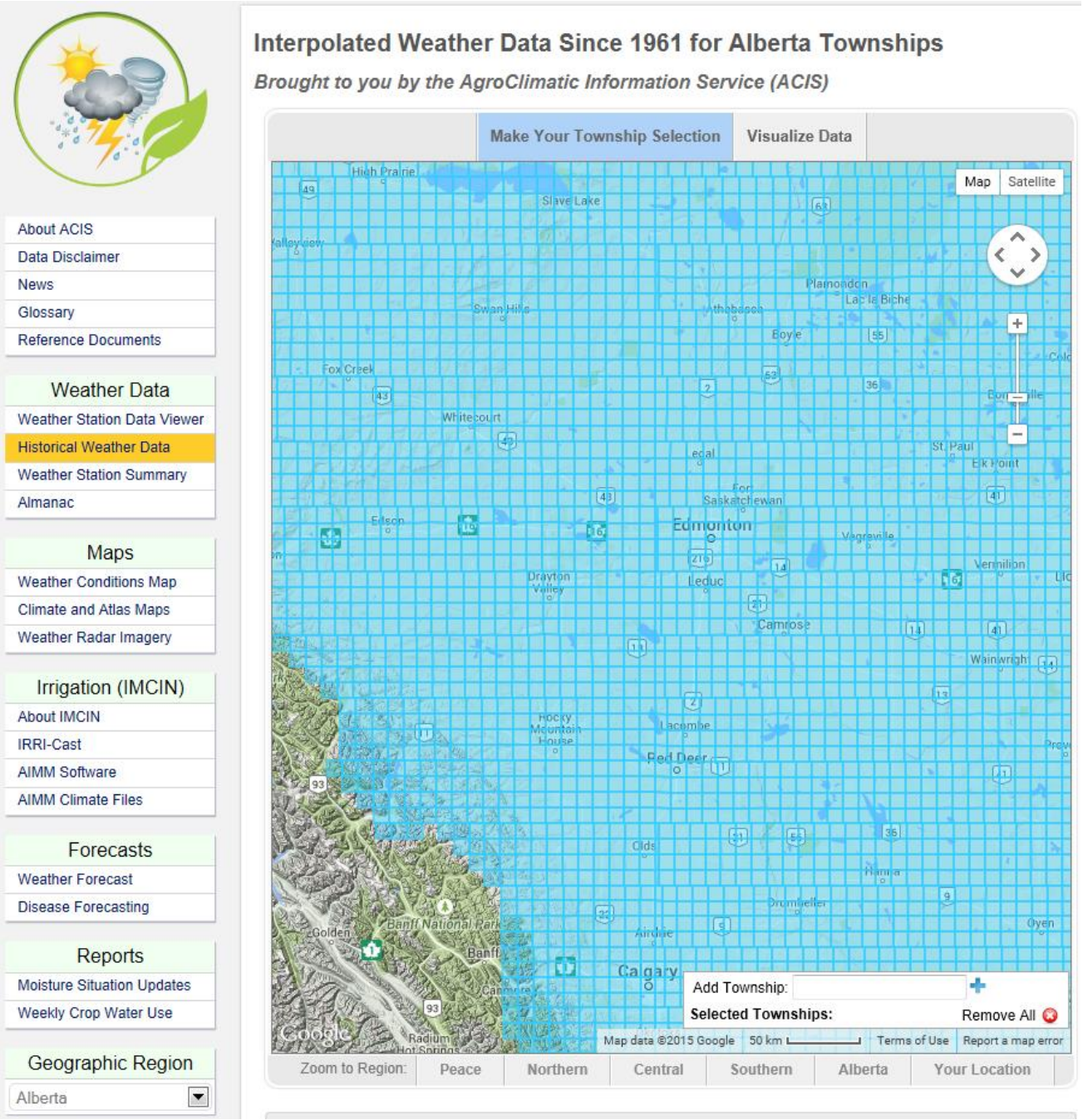
Figure 3. Image capture of the web interface highlighting the township selection feature for weather data. Clicking on a township will yield data for that township.



Selecting the “Historical Weather Data” tab under “Weather Data” will launch the township viewer. A zoomable map of Alberta is shown overlain by the township grid. The user uses the computer cursor to select one or more townships of interest. Selecting the

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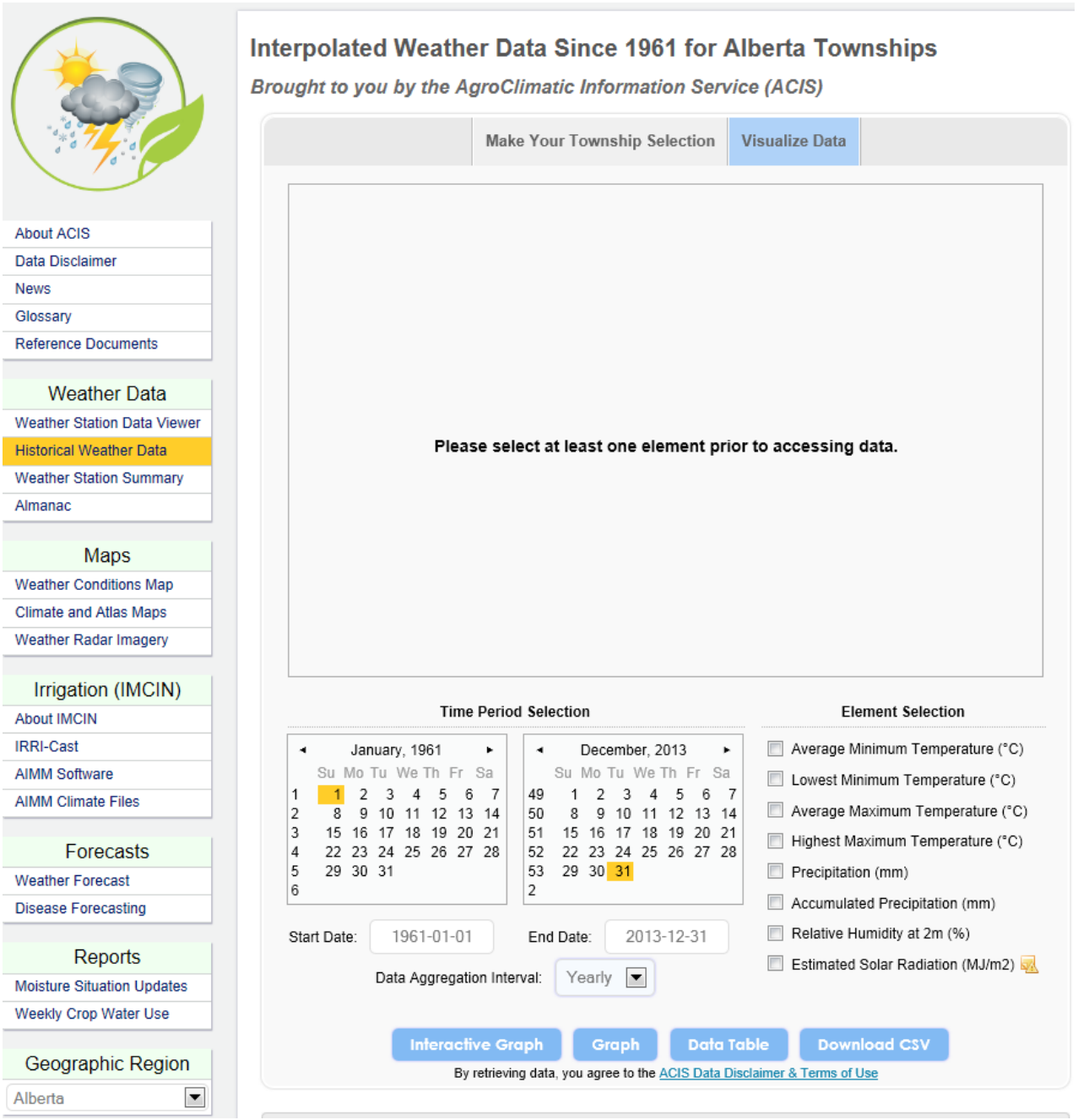
"Visualize Data" tab at the top of the application will initiate the next data selection options (Figure 4).

Figure 4. Image capture of the web interface showing the Township Weather Data viewer.



3. Select precipitation using the toggle boxes on the right, then select the time period (data range) and time interval (daily, monthly or yearly). Using the tabs at the bottom to graph, select to view or download the data (Figure 5 or Figure 6 respectively).

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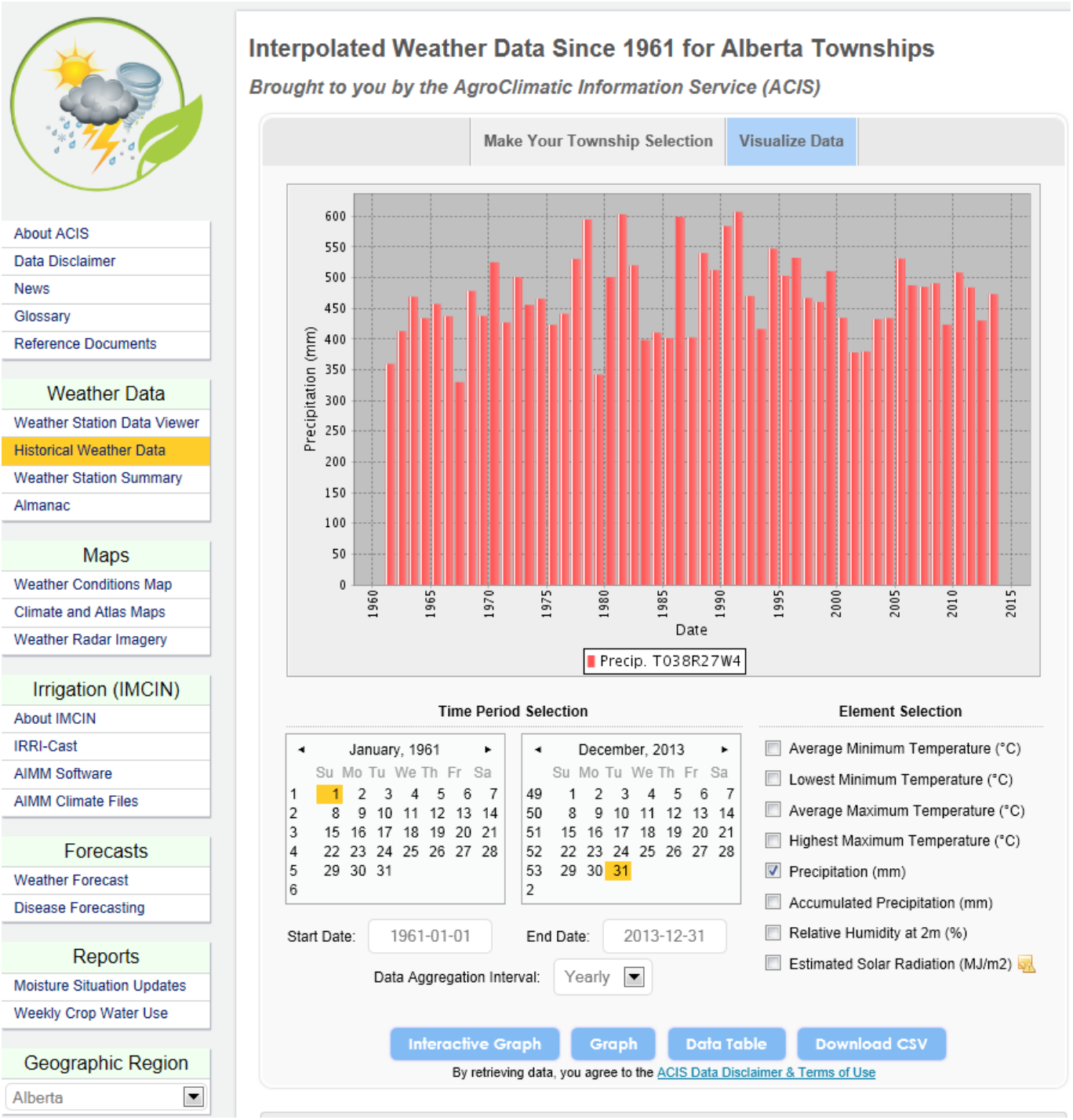
Figure 5. Image capture of yearly precipitation in township T038, range R27, meridian W4 between January 1, 1961 and December 31, 2013.



4. Download yearly data from the earliest available date to present. Calculate the Average, Maximum and Minimum precipitation levels for later use in interpretation (Figure 6).

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Figure 6. Example of yearly precipitation tables downloaded as csv files.

Township	Date	Precip. (mm)
T037R24W4	1975	469.12
T037R24W4	1976	474.38
T037R24W4	1977	503.95
T037R24W4	1978	621.75
T037R24W4	1979	342.84
T037R24W4	1980	533.88
T037R24W4	1981	504.14
T037R24W4	1982	482.44
T037R24W4	1983	366.99
T037R24W4	1984	472.36
T037R24W4	1985	416.84
T037R24W4	1986	562.76
T037R24W4	1987	345.5
T037R24W4	1988	487.2
T037R24W4	1989	493.45
T037R24W4	1990	600.94
T037R24W4	1991	638.75
T037R24W4	1992	456.39
T037R24W4	1993	454.33
T037R24W4	1994	548.01

Township	Date	Precip. (mm)
T037R24W4	1995	471.6
T037R24W4	1996	523.22
T037R24W4	1997	430.41
T037R24W4	1998	454.66
T037R24W4	1999	571.11
T037R24W4	2000	438.47
T037R24W4	2001	333.67
T037R24W4	2002	382.03
T037R24W4	2003	447.17
T037R24W4	2004	441
T037R24W4	2005	485.72
T037R24W4	2006	490.27
T037R24W4	2007	454.63
T037R24W4	2008	350.59
T037R24W4	2009	329.72
T037R24W4	2010	549.66
T037R24W4	2011	388.27
T037R24W4	2012	451.6
T037R24W4	2013	434.42

AVG	466.7754
MIN	329.72
MAX	638.75

Similarly, the monthly and daily data can be downloaded for further interpretation.

By correlating meteorological data to imagery, one can make better decisions for choosing appropriate images for interpretation. Note that the correlation between the date the image was captured and daily, seasonal or yearly precipitation data does not guarantee accurate representation of contemporaneous water levels in the wetland of interest. It is highly recommended to consider precipitation levels in the two or three years and the trend preceding and following the exact date of the available image of interest. Vegetation often has a time lag associated with response to changing water levels.

5. The downloaded precipitation data can be plotted to assist in photo selection that represent normal wetland conditions.

   Using the search tools available from the imagery provider, determine what imagery is available for the land location of interest. Note when the image was taken and correlate this date to the plotted precipitation record. This will provide an indication as to whether the image is representative of a dry, moderate or wet year in the precipitation record. Part of the review should include an analysis of the climatic conditions preceding the date of photo capture to determine if any significant dry periods are likely to influence the characterization of the wetland. For example, if the image date is July 14, 1987, examine the precipitation for the year, and the preceding few years. Prior to the photo, was the climate in previous years drier or wetter? Then, to ensure the data interpretation is not skewed, look at the monthly data from July, 1987 to determine whether or not any monthly

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precipitation occurred after the photo was taken, and finally, examine precipitation data around the day the image was taken (if available) and document whether the image is reflective of “normal”, “dry” or “wet” conditions.

Caution! Do not rely on photos representing drought or overly wet conditions. Choose appropriate photos using years and seasons that are most appropriate for the wetland class you are examining.

4. Choosing Landscape Imagery for Assessments

The assessment of permanence is generally conducted as a desktop exercise with historical imagery and other available and supporting documentary evidence. The assessor has a variety of imagery available to assess the presence and long-term permanence of a wetland. Recent high-resolution colour satellite imagery is generally available from various providers for the region of interest, but is costly. Aerial photography is also readily available for all regions of the province back to the 1950’s or earlier. It is available primarily in black and white, but colour infrared and true colour images are available depending on the project. Larger municipalities may also have available high resolution aerial photography to assist the assessor.

A. *Choosing initial imagery* using the precipitation record for nearest climate station

The assessor should obtain the precipitation data for the entire period of record for the climate station nearest the site of interest or through the use of the Interpolated Weather Data Viewer for any given township. This record will indicate the periods of time (years) that precipitation in the area of interest is above or below the average (Figure 7). This will be used to compare the dates of available aerial photographs with the precipitation graph and to determine which of the available photographs align with normal precipitation years and those photos which deviate from it. Photos representative of normal conditions occur with dates that intersect with the average precipitation line.

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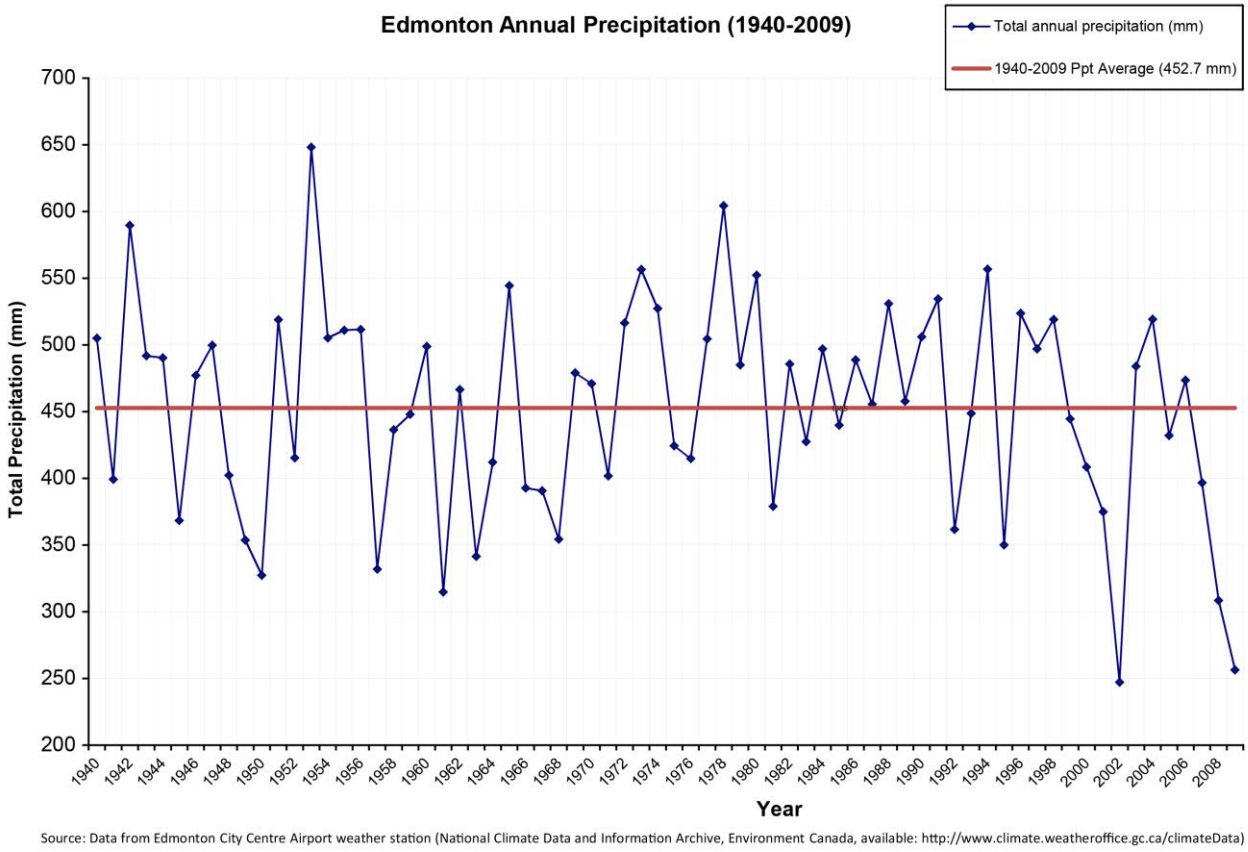
Figure 7. Example of historic annual precipitation record for site of interest.



Source: Data from Edmonton City Centre Airport weather station (National Climate Data and Information Archive, Environment Canada, available: http://www.climate.weatheroffice.gc.ca/climateData)

The assessor should determine:

i. the years in the record that represent the average or norm;
ii. the years in the record of lower than normal precipitation; and
iii. the years in the record of higher than normal precipitation.

B. Choosing additional imagery from the available photo record

The aerial photo record is the most definitive evidence available to evaluate the history of the water feature. Fortunately historical aerial photography is still readily available. The availability of aerial photography can be determined from the AEP aerial photo reference library and distribution centre by accessing its website at:

- **Air Photos - AEP.Alberta.ca**

After entering the search feature, the available photography is listed once the legal land survey location (e.g. Section - Township - Range - Meridian) is entered. For each project the date, scale and emulsion type of the photography is listed (Figure 8).

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Figure 8. Sample output from APRS Search.

APRS Search Results

When ordering aerial photography there are two methods:

- provide the roll and print/frame numbers (e.g. AS-5112-014) from the flight index maps (refer to "Readme" file in the zip file for more instructions).

User Information:

- Blue Underlined Project numbers (e.g. 92-159) - click on the project number to download and view the flight index map(s) associated with that project. Index maps show photo centres/locations not the actual photographic image.
- "P" (in red) - identifies incomplete or partial coverage of the specified section. View the index map(s) to determine if second/third choices should be included with your request.
- "Tr" Projects (e.g. 06-078**Tr**) - in general projects with this suffix are of superior quality. For example, well-site details can usually be observed even at small scales (e.g. 1:60,000). Check "Comments" column for product availability.
- More detailed instructions on using the flight indices (a "Read Me" file) are included as part of the map download.

Legal Description (Sec. Twp. Rge. Meridian): 14 - 53 - 25 - 4

Project No.	Sub. ID	Coverage (Partial/Complete)	Date	Scale (1:)	Emulsion	Comments
T08-270	11	C	2008-10-02	20000	B/W	Neg.scans-2,032 ppi
07-007	2	P	2007-08-30	30000	True Colour*	Big Lake
07-EDM	9	C	2007-00-00	20000	B/W	Laser/Digital only
05-EDM	22	C	2005-04-21	20000	B/W Pan-80	
03-EDM	13	C	2003-05-14	20000	B/W Ap-80	
01-EDM	7	C	2001-04-00	20000	B/W	Roll:ED-2001-01,02
T97-83F	90	C	1997-00-00	20000	B&W	
92-146	2	C	1992-07-00	20000	B/W PAN	
T91-077 P9	4	C	1991-09-26	20000	B/W Pan-XX	Hwy.16; Roll:AS-4213
T91-077 P7	1	P	1991-09-25	20000	B/W Pan-XX	Hwy.16 - Roll:AS-4212
T90-182	6	C	1990-11-06	40000	B/W Kodak-2405	Roll:AS-4075
T90-185	5	C	1990-10-00	20000	B/W Kodak-2405	
T90-185	3	C	1990-10-00	20000	B/W Kodak-2405	
S88-026 P10	3	C	1988-09-01	20000	B/W Pan-XX	Hwy.2; Roll:AS-3695
87-089 83H	3	C	1987-00-00	30000	B/W Pan-2405	
S86-030	1	P	1986-05-30	25000	B/W Kodak-2405	Hwy.16X; Roll:AS-3285
S85-021I	4	P	1985-06-28	25000	B/W Pan-2405	Jasper Ave.; Roll: AS-3164
S85-021H P7	8	C	1985-05-05	25000	B/W Kodak-2405	Hwy.16; Roll: AS-3114
S85-021D-1 P6	6	C	1985-04-12	25000	B/W Kodak-2405	Hwy. 2; Roll:AS-3110
S84-057	1	P	1984-04-15	25000	B/W Pan-2405	Hwy.16
83-145 83H 6	1	C	1983-10-01	60000	B/W Pan-2405	Roll: AS-2793
83-303	1	P	1983-05-12	25000	B/W Pan-2405	Roll:AS-2698
F82-124 P9	23	C	1982-10-01	25000	B/W Pan	Roll:AS-2582
82-089 83H	5	C	1982-09-00	30000	B/W Pan-2405	Neg. scan-1270dpi
S82-015B P2	3	C	1982-04-29	25000	B/W Pan-2405	Hwy.16; Roll:AS-2454
80-121 83H	3	C	1980-00-00	60000	B/W Pan-2405	
F79-085	1	P	1979-10-26	10000	B/W Pan-2405	Roll:AS-1829
79-099	1	C	1979-00-00	30000	B/W Pan-2405	Rolls:AS-1955,2118
S78-208	1	P	1978-05-18	10000	B/W Pan-2405	Hwy.2; Roll:AS-2944
S78-200 P2	12	C	1978-04-26	25000	B/W Pan-2405	Hwy 2; Roll:AS-2945
77-102	27	C	1977-06-07	31680	B/W Pan-2405	Rolls:AS-1591,1592,1593
76-170 83H	21	C	1976-09-00	20000	B/W Pan-2405	Rolls:AS-1545-1549
76-023B 83H	4	C	1976-07-00	31680	B/W Pan-2405	Rolls:AS-1540,1541
S76-173	9	C	1976-04-30	25000	B/W Pan-2405	Roll: AS-2983
75-148	1	C	1975-07-19	40000	B/W Pan-2405	Roll:AS-1391
75-094	6	C	1975-05-21	12000	B/W Pan-2405	Roll:AS-1372
73-186	2	C	1973-10-08	12000	B/W Estar-Pan	Roll:AS-1289
73-025 83H	15	C	1973-07-00	31680	B/W IR-2424.	Rolls: AS-1248,1249
70-268	1	P	1970-04-16	12000	B/W Pan-2405	Roll:AS-1466
70-322 83H	3	C	1970-00-00	80000	B/W Pan-2405	Rolls:AS-1109,1110,1113
69-200	12	C	1969-11-06	24000	B/W	Roll:AS-1043
69-225	4	C	1969-04-28	24000	B/W Pan-2405	Roll:AS-1034
67-83H	19	C	1967-00-00	31680	B/W.	Neg.Scan-1270dpi
62-83H	14	C	1962-06-00	31680	B/W.	Neg.Scan-1270dpi
S52-017	25	C	1952-00-00	11600	B/W Pan-2405	Roll: AS-0004
49-83H	3	C	1949-00-00	40000	B/W Super XX.	Years 49-51; Neg. Scan-1270dpi
20-315	1	C	1920-00-00	VARY	B/W	Lasers/Scans only

The assessor should:

i. initially choose the most recent available photo and one of the earliest photos on record representing the average precipitation to determine if the feature exists throughout the record, then

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ii. note which dates in the remaining photo record are Spring, Summer, and Fall photography. This will have implications for interpreting permanence (see table 4).

Table 4. Expected inundation characteristics by season

Photo Date (Seasonality)	Inundation Characteristics
Spring	Useful in identifying all potential wetlands. All basins are expected to be full.
Mid-Late Summer	All ephemeral, temporary and seasonal (permanence type 1-3) wetlands are expected to be dry by the end of August. The remaining wetlands are the potential semi-permanent and permanent wetlands for analysis.
Fall	Fall dates generally represent permanent bodies of water that show persistent inundation (permanence type 5 wetland) or characteristic vegetation indicators for semi-permanent (permanence type 4) wetlands.

This information will be critical in the final selection choice and in the evaluation of permanency throughout the photo record.

iii. Review and include enough late season photography to substantiate the permanence class of the wetland(s).

5. The Analysis

The assessor should review the precipitation record and compare the dates of the aerial photo record with periods that correspond with periods of normal precipitation. The assessor should then review all the late-season photography in the record and determine how the basins exhibit or change during below-average or above average precipitation years.

In addition, the assessor is to identify, note and assess any disturbances or alterations to a wetland that may have had an effect on its permanence class. This may require viewing additional photos in the record to establish when an alteration occurred and its effect. The following are cautionary flags for further evaluation:

- **Ditching –** Ditching can be used to drain and completely remove a wetland from the landscape, or to consolidate multiple wetlands into a single catchment basin. Such works are not always successful and the wetland basin may remain on the landscape along with the ditch, but now exist as a different wetland type.

- **Dugouts –** Existing wetlands may have their basin deepened to retain water longer into the season.

- **Roads and other impounding works –** Roads, berms, etc., may bisect or impound the basin or the natural flow into them. This can result in drying out of the wetland on one half or the bisected basin, increased permanence on another part of the bisected basin, or have no effect at all.

- **Constructed and Treatment wetlands –** Constructed wetlands are not considered natural features and are not considered for ownership purposes. Treatment wetlands may consist of naturally occurring wetlands that have been enhanced to allow for enhanced inflows and

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retention. The assessor should look at the status of the wetland in its pre-disturbance state and classification.

- **Wetlands created as a result of leaky irrigation infrastructure –** Wetlands may appear as naturally occurring on the landscape but in fact are the resultant outcome of leaky irrigation infrastructure. A more in-depth review of the photo record may be required to determine their origin. These types of wetlands are considered to be man-made.

- **Abrupt changes in wetland class –** Any abrupt change in wetland class should be investigated for the cause of change.

The assessor should also continually be cognisant that relying solely on the use of a single wetland classification conducted during the present year (desktop or on-site) may be misleading. This may represent the current state of the wetland but not its representation throughout the record. For the purpose of determining wetland permanence, wetland classification should be viewed as a guide not an absolute determinant of permanence! The assessor should consider:

- **Permanence type III (Seasonal) Wetlands –** Wetlands that currently appear to be seasonal in nature should be evaluated with some care. The photo record may in fact reveal that they may meet the ownership claimability criteria.

- **Permanence type IV (Semi-Permanent) Wetlands –** The assessor must consider where the wetland is in the inundation cycle. The wetland through the photo record may have a range of cover types and interspersion of open water with vegetation, yet maintain a consistent character as a permanence type IV wetland. Use of stereoscopes and photo pairs may be necessary to differentiate wet meadow zones from emergent plant communities.

- **Permanence type V (Permanent) Wetlands –** These wetlands will be readily evident throughout the record as wetlands that have persistent open water into fall.

- **Permanence type VI (Alkaline) Wetlands –** Although these wetland types frequently dry, if evidence within the photo record establishes that the wetland is relatively permanent over time, the Crown is likely to assert its ownership claim to it.

With the available information on hand, the assessor should interpret the photo record along with any other available supporting information and tabulate the wetland basin characteristics. Based on the current site conditions, class of the wetland(s), and from the overall photo record, determine on the balance of available evidence and probability whether or not the water feature is reasonably permanent (see Figure 9).

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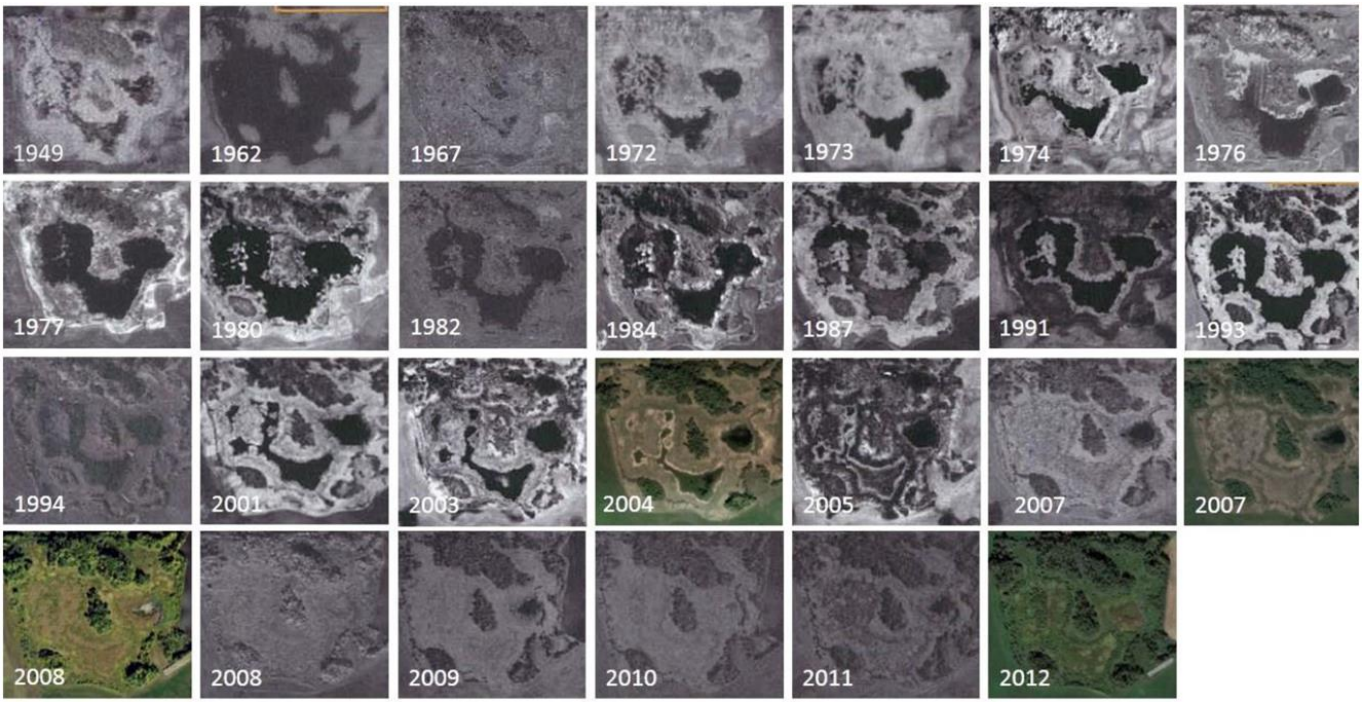
Figure 9. Example of a wetland through the sequential historical aerial photo record.



Where multiple wetlands are assessed in one land location, assessment summaries (e.g. Table 5) and associated photos for each wetland should be compiled and attached in an appendix. The assessor should also summarize and tabulate the information for any wetlands involving multiple land locations in a similar fashion as in Table 6.

Tables 5 and 6 are provided as guidance only and the assessor is free to build upon the suggested categories of information to summarize the information in any practical form. In all cases, a column should be left blank for AEP to add their notes regarding their claim. To enable this, the summary table should also be provided as a separate MS Word or MS Excel file.

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Table 5. Sample template of wetland assessment table for AEP review.

Ownership Assessment of Water Body in <Qtr-Sec-Twp-Rg-M>

Photo Date (MM/DD/YYYY)	Photo ID (Roll AS# - Photo#)	Season*	AWCS Wetland Classification	Precipitation (Year)**	Precipitation (Preceding Month) Analysis**	Precipitation (Preceding Day) Analysis**	Open Water Visible or Consistent Wetland Vegetation Signature***	Assessment of Permanence****	Photo Notes
5/16/1974	1455-022	Sum	M (G)(IV)	Normal	N		W	Y	Site currently has a ditch draining wetland.
Date		F		N/A			W	Y	
Date		S					W	Y	
Date									
Date									
				Years Dry Over Photo Record (# Years)	#		#		

Analysis Comments	

AEP Evaluation / Ownership Claim	

* S=Spring (April to June); Sum=Mid-Late Summer (June to September); F=Fall (September to November): Seasonality based on aerial photo capture date.

** D=Dryer; N=Normal; W=Wetter

*** W=Water present/inundated; D=Dry; DV=Dry, vegetated (consistent with wetland class); DVI=Dry, vegetated (indistinguishable from surrounding uplands)

**** Y=Yes (Reasonably Permanent, a Sec 3 *Public Lands Act* body of water); N=No (Not Permanent, but wetland regulated under *Water Act*)

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Table 6. Sample template of multiple wetland assessment table for AEP review.

Wetland ID	Legal Land Location					Photo Date (MM/DD/YYYY)	Photo ID (Roll AS# - Photo#)	Season*	AWCS Wetland Classification	Precipitation (Year)**	Precipitation (Preceding Month) Analysis**	Precipitation (Preceding Day) Analysis	Open Water Visible or Consistent Wetland Vegetation Signature***	Assessment of Permanence****	Photo Notes	AEP Evaluation / Claim
	Sec	Twp	Rg	M	Qtr											
001	Sec	Twp	Rg	M	NW			Sum	M (G)(IV)	N			W	Y	Site currently has a ditch draining wetland.	
								F		D			W	Y		
								S		W			W	Y		
00#	Sec	Twp	Rg	M	SW SE			F		D			DV (Class IV Veg)	Y		

* S=Spring; Sum=Mid-Late Summer; F=Fall: Seasonality based on aerial photo capture date.

** D=Dryer; N=Normal; W=Wetter

*** W=Water present/inundated; D=Dry; DV=Dry, vegetated (consistent with wetland class); DVI=Dry, vegetated (indistinguishable from surrounding uplands)

**** Y=Yes (Reasonably Permanent, a Sec 3 *Public Lands Act* body of water); N=No (Not Permanent, a wetland regulated under *Water Act*)

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Assessment Submission & Reporting Requirements

The assessor must submit the following to AEP:

1. Summary Report of the assessment undertaken, including a description of any constraints to undertaking the assessment;
2. Aerial photographs (scanned) including all late season photography and any site photographs utilized in the assessment (may be part of summary report);
3. Assessment Table that allows AEP to input its ownership information (also provide as a separate file in MS Excel);
4. Any associated documentation used to support the assessment (e.g., biophysical report, wetland assessment report, etc.).

The assessment materials must be in digital format. The materials are to be sent to AEP by either email or surface mail.

Email: water.boundaries@gov.ab.ca

Provincial Wetland and Water Boundaries Unit
Provincial Programs Branch
Operations Division
Alberta Environment and Parks
2rd Floor, 9915 – 108 Street NW
Petroleum Plaza, South Tower
Edmonton, Alberta T5K 2G8

Reference Documents

Alberta Environment and Parks (AEP). 2015. Alberta Wetland Classification System. Water Policy Branch, Policy and Planning Division, Edmonton, AB.

Stewart, Robert E., and Harold A. Kantrud. 1971. Classification of natural ponds and lakes in the glaciated prairie region. Resource Publication 92, Bureau of Sport Fisheries and Wildlife, U.S. Fish and Wildlife Service, Washington, D.C. 57pp.

Original signed by: Kem Singh — Date: January 29, 2016

Lands Policy Branch

Executive Director

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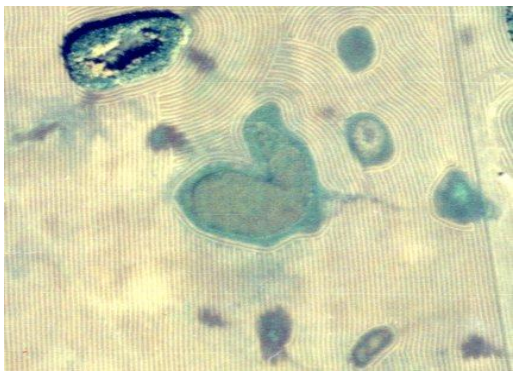
Appendix 1. Identifying Wetlands by Class (Alberta Wetland Classification System and Stewart & Kantrud Equivalents)

Ephemeral water features (Stewart & Kantrud Class 1 wetland; no AWCS equivalent)

Low-lying areas where water is briefly ponded in early spring before soils are thawed or after a storm event. Central basin of the wetted area typically has the same vegetation and soils as the surrounding land. In agricultural areas, these low-lying areas are typically cultivated. *These features are not always recognized as wetlands or as water bodies due to their short-term presence on the landscape.*

Temporary wetlands (AWCS-M(G)[II]); Stewart & Kantrud Class 2 wetland)

Surface water exists for only a few weeks after snow melt and only several days after heavy rainstorm events. Vegetation in the centre of the basin consists of low-stature wet meadow plants (i.e., fine-textured grasses, rushes, and sedges).



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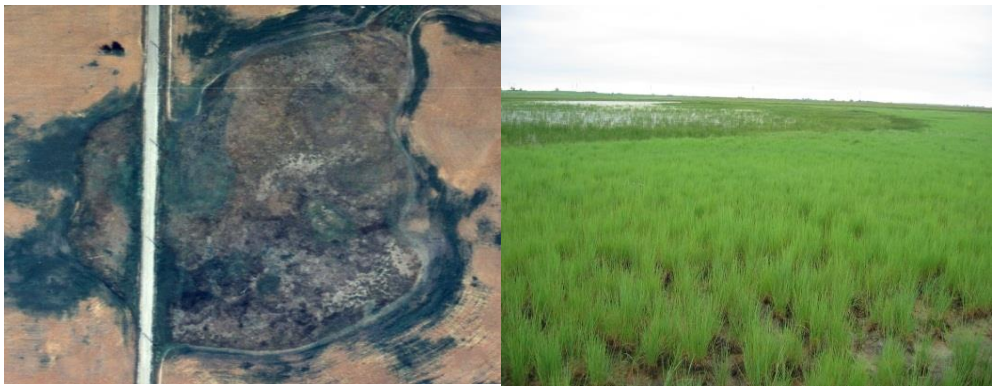
Seasonal wetland (AWCS-M(G)[III] or W(A)[III]); Stewart & Kantrud Class 3 wetland)

Basins are typically inundated by water for more than three weeks, but usually dry by late July. Central part of basin is represented by shallow marsh vegetation (moderately coarse grasses and sedges with associated forbs).



Semi-permanent wetlands (AWCS-M(G)[IV] or W(A)[IV]); (Stewart & Kantrud Class 4 wetland)

Water persists into autumn in 7 of 10 years. Only intermittently exposed. Central basin is represented by deep marsh vegetation (relatively coarse marsh emergents or associated submerged aquatics).

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Ponds and lakes (AWCS-W(A)[V]); Stewart & Kantrud Class 5 wetland)

The central portion of the water body is permanently inundated with water throughout the year. The open water is surrounded by deep-marsh, shallow-marsh, or wet-meadow vegetation zones. During droughts, bare bed will be evident during the drawdown phase and may be temporarily vegetated with annual weeds or other primary successional plants.

Alkali wetlands (AWCS-W(B)[VI]); Stewart & Kantrud Class 6 wetland)

Shallow, with highly variable water levels. Basin is typically devoid of emergent vegetation. Vegetation adapted to highly saline environments is generally limited to periphery. Frequently bounded by exposed soils forming a dry alkali ring.

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