ETHNOBIOLOGY LETTERS

Data, Methods & Taxonomies

Using Indigenous Science to Protect Wetlands: The Swinomish Tribe's Wetland Cultural Assessment

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Abstract While wetland functional assessment or rating systems may include cultural, socioeconomic, or site value components, they are insufficient to evaluate the cultural functions of wetlands to resource-centric communities like Native Nations. The Swinomish Indian Tribal Community has developed a cultural module for use in conjunction with standard physical wetland assessment approaches to incorporate Tribal cultural values and functions in wetland rating. The Swinomish cultural module leverages traditional plant use data from historical and community sources to create a comprehensive plant list and database and identify evaluation categories for assessment. Six categories were used: four use-based categories (construction/household uses, medicinal uses, subsistence uses, and spiritual/ceremonial uses), and two weighting categories (common use, plant rarity). Botanical surveys of fourteen wetlands produced a botanical inventory that was compared to the list of traditionally used plants. Each wetland was given a cultural module score and cultural value rating based on the number of species of traditional use plants observed. Wetlands for which surveys were not available were evaluated for similarity to surveyed wetlands and assigned scores from the most similar. The cultural module score is used in combination with traditional physical functional rating systems to produce a robust, culturally relevant, overall wetland rating. The Swinomish cultural module was designed to be easy to use and update as additional cultural plant data or wetland site data become available or physical functional assessment methods change. The resultant wetland ratings are used in regulating land-use to protect wetland function, both physical and cultural.

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Introduction

The terms *cultural values* and *environmental protection* are not usually seen together and are often considered separately. However, ecosystem health affects all facets of life for the Swinomish Indian Tribal Community (SITC or Tribe). The Swinomish people are among those descended from the Indigenous tribes and bands that have lived in the Skagit River Valley and islands of the central Salish Sea since time immemorial. These Coast Salish groups maintained a culture centered on abundant salt-water resources that included salmon, shellfish, and marine mammals, as well as upland resources like trees, roots and bulbs, berries, and wild game. Natural resources remain vital to present-day Tribal members for subsistence harvest activities and other traditional life practices and remain inextricably tied to Swinomish cultural beliefs and values. The environment cannot be adequately protected without being attentive to cultural values and Tribal cultural values cannot be maintained without protecting the environment. As McGregor et. al. (2020:38) note, "Alternate laws, knowledges, legal and governance structures at every level and scale are required if we, as humanity, are to live well with the Earth and support the continuance of life. Existing Indigenous systems of understanding offer living examples and insights into the development of such sustainable alternatives." Tribal sovereignty over

Indian lands is intended, in part, to ensure that cultural values are incorporated in their governance.

The Swinomish Indian Tribal Community is a federally recognized Indian tribe and political successor in interest to certain tribes and bands who signed the 1855 Treaty of Point Elliott that, among other things, reserved fishing, hunting, and gathering rights in vast areas of land and water in northern Puget Sound and beyond, and established the Swinomish Reservation on Fidalgo Island in Skagit County, Washington. As a Federally recognized tribe, Swinomish operates under a constitution originally approved in 1936 that created the Swinomish Senate as an elected body to self-govern and manage the affairs of the Tribe including natural resources protection, policy development, and regulatory authority. Through sovereign authority and delicate management of complex cross-jurisdictional regulatory relationships, the Tribe has developed and maintains the necessary capacity to regulate land-use and activities within the Reservation to protect and advance the Tribe's sovereign interests, cultural values, and the interests of both member and non-member Reservation residents. This includes the development of culturally relevant natural resources protection ordinances and policies.

The Tribe recognized that a wetland protection policy reflecting cultural and ecological wetland values required a comprehensive assessment of those values. The Tribe's wetlands were first assessed using the current methodology of that time for wetlands of Washington State (Cooke 1996; Reppert et al. 1979; Swinomish 1999): a functional wetland assessment that used a physical module divided into eight scoring categories (flood/storm water control, baseflow/ groundwater support, erosion/shoreline protection, water quality improvement, natural biological support, overall habitat functions, specific habitat functions, and cultural and socioeconomic) to describe a wetland's physical characteristics. Although the assessment already had a generic cultural and socioeconomic category, it "lacked input from the Tribe, and therefore no relationship to tribal cultural values could be assessed" (Swinomish 1999:4). Development of the Tribe's Wetland Cultural Assessment was initiated in 2000 to replace the generic category with a new, pertinent cultural module. This article illustrates how this cultural module was developed and used to produce environmentally and culturally sound wetland policy and management.

Methods

Traditional Plant Uses

The most important step in developing this wetland protection method was the collection and collation of ethnobotanical data. We further defined that our data would only come from sources that we or the sources directly attributed to specific Swinomish or Skagit Elders and ancestors by name, thus tracking down sources was a lengthy process since our Tribes are mainly an oral tradition and many of the ethnographic or testimonial documents were obscure and difficult to find or obtain. The first phase of the project focused on interviewing Tribal Elders to gather information on traditional uses of native wetland plants. The Tribal Cultural Planner and Enrollment Officer helped produce a list of Elders with possible knowledge of plant uses whether by first-hand knowledge or knowledge gained from practicing family members (Swinomish 2003). Eleven interviews with twelve Elders were conducted and recorded in the respective Elders' homes where they were asked a list of questions about plant uses, including medicinal, ceremonial, or spiritual uses. The interviews were transcribed, and the information entered into the Traditional Plant Uses List table of the Swinomish Wetlands Database. Though several of the Tribal Elders interviewed lamented that they did not learn or have good recollection of their ancestors' plant use and did not continue plant practices themselves (Mitchell 2005), their memories helped identify 62 plants as having at least one traditional use in this phase (Swinomish 2003).

Additional archival information was sought to compile a more comprehensive species list and supplement our Tribal Elder interview data. We focused on sources within the Skagit River Valley, including Gunther (1981), Snyder (1955), and the Lushootseed Dictionary (Bates et al. 1994), as the tribes in this region are closely related. These source materials were reviewed for mentions of plants and their uses (plant species mentions). Detailed information for each individual plant mention was recorded in the Traditional Plant Uses List table of the Swinomish Wetlands Database, including name, traditional use, plant part used, and preparation method. Through this work, we were able to expand our Traditional Plant Uses List from 62 species in

2003 to 99 species spanning over 600 mentions based on our research through 2016.

Botanical Surveys of Wetlands

The 1999 wetland assessment report of Reservation lands (Swinomish 1999) identified 54 wetlands by aerial photo interpretation; 36 of these wetlands were field-verified as wetlands and assessed. The remaining eighteen wetlands were non-verified but were included in the report. The verified wetland data included only a basic plant species list, making it impossible to reassess wetland rating based on the presence or abundance of traditionally used plants. To fill that gap, botanical surveys were conducted yielding comprehensive botanical species lists for selected wetlands. We selected 14 wetlands for survey, including 13 of the 36 field-verified wetlands and one newly-identified wetland. Wetlands of varying United States Fish and Wildlife Service wetland classifications (Cowardin classes) were selected for botanical surveys to capture the wetland and plant diversity found within Reservation lands (Cowardin et al. 1979). Botanical surveys were conducted in two phases several years apart due to budgetary constraints. Six wetlands were selected based solely on Cowardin class (palustrine: forested, scrub shrub, or emergent; and estuarine) and were surveyed in phase one. An additional eight wetlands were chosen in phase two to include: wetlands with high similarity scores as calculated using methodology described below (to check the accuracy of our calculations); wetlands that were dissimilar, again, based on similarity scoring described below, to all known wetlands to increase the robustness of our calculations (choosing an outlier to add to the known group); and an estuarine wetland to increase the variety of surveyed wetlands.

The wetland field botanical inventory surveys and wetland classification conducted in this study focused on vascular plants and involved: (1) a full walk-through of each wetland to document Cowardin classes, vegetation communities, and individual plant species; and (2) botanical survey of representative plots to further develop the plant species list and their relative percent cover. Survey plots were 11.3 m radius circular plot(s) for scrub-shrub and forested wetlands and average 1 to 2 plots per wetland, or multiple 1 m^2 quadrats for emergent and open water wetlands and range from 4 to 12 quadrats depending on wetland size. In many cases, an average of two stratified plots were established in each wetland, and the data were averaged for the final wetland plant abundance and composition information. Information was entered in the Botanical List table of the Swinomish Wetlands Database including:

- wetland and representative plot(s) location;
- scientific name;
- common name;
- United States Department of Agriculture (USDA) plant symbol;
- percent cover;
- size class for trees;
- plant type/form;
- wetland status (USACE 2016).

These botanical surveys resulted in the documentation of 304 unique species with over 970 individual plant observations in the surveyed wetlands.

Identifying Reference Wetlands for Wetlands Without Botanical Surveys

Since we do not have botanical surveys for all 36 verified wetlands, we developed a method to apply the botanical data from surveyed wetlands to the non-surveyed wetlands to which they were the most hydrologically similar, assuming that the hydrologic properties of a wetland inform its botanical properties. Each of the non-surveyed wetlands was compared to all surveyed wetlands (reference wetlands) across the seven physical module categories (cultural socioeconomic excluded) assessed in the 1998 wetland surveys (Swinomish 1999).

Scores from the 1998 wetland assessment were used to calculate a similarity score for each physical module category. The residual of the calculation for percent difference was used to produce a decimal number that is a quantification of similarity between values or percent similarity:

$$S_{nr} = 1 - \left| \frac{(P_n - P_r)}{P_r} \right|$$

Where:

- n is a specific non-surveyed wetland,
- r is a specific reference wetland,
- S_{nr} is the similarity score between the non-surveyed wetland (n) and the reference wetland (r),

- P_n is the proportion of possible points (actual score divided by maximum possible score) for the non-surveyed wetland (n),
- and P_r is the proportion of possible points (actual score divided by maximum possible score) for the reference wetland (r).

This calculation produces a result between 0 and 1, with higher numbers indicating higher similarity that are used as point values in calculating the final similarity score.

Similarity of non-surveyed wetlands to reference wetlands was assessed based on location and physical characteristics. Geographic location was compared to evaluate similarity based on associated watershed. One similarity point was given if the reference wetland and non-surveyed wetland pair were in the same watershed and zero points if in different watersheds. Wetland type (palustrine or estuarine) was also compared for each reference and non-surveyed wetland pair and similarity was again scored on a binary basis, as same (1 point) or different (0 point). Physical characteristics and geomorphic position were compared based on wetlands' Cowardin and Hydrogeomorphic (HGM) classes, respectively. Many wetlands contain multiple Cowardin and/or HGM (depressional, slope, riverine, or estuarine) classes, so we scored similarity by comparing whether the classifications in each system for each reference and non-surveyed wetland pair were exactly the same (3 points), overlapped with 1–2 classifications (1–2 points), or no overlap (0 points). We weighted the Cowardin classification and HGM class more heavily than wetland type or watershed location as they more directly represent vegetation community conditions.

There were 15 possible similarity points: seven from the physical module categories, and eight points from the comparison of location and physical characteristics. The reference wetland with the highest similarity score for each non-surveyed wetland was designated as its reference wetland and its botanical information and cultural score assigned to the non-surveyed wetland. The similarity scoring was completed twice, first with the six botanically surveyed wetlands in phase one which were used to help refine additional wetlands to botanically survey, and second with the additional eight botanical surveyed wetlands for a total of 14 reference wetlands possible to be used as designated references. Scores from the 14 surveyed wetlands were applied to the 23 remaining verified but non-surveyed wetlands.

Developing the Cultural Module

We wanted to develop a module that was easy to use, considered the versatility of species that have multiple uses, and was updatable when new traditional use or botanical information became available. We built a system that was based on the presence of traditionally used plants in varying categories of use. We reviewed over 600 unique traditional plant use mentions among the 99 traditionally used plant species and identified four traditional use categories for scoring metrics: construction/household (39 species), medicinal (76 species), subsistence (46 species), and spiritual/ceremonial (15 species).

The 600 unique plant mentions provided information to develop a rating metric called *common use* based on the number of times a species was mentioned in the Traditional Plant Use List table. We decided species that are more versatile and have many uses should be weighted more heavily than species with fewer documented uses or that are only mentioned once by one informant, and wetlands containing more of these high-use species should be ranked higher. We queried the database for the number of mentions by species. Plant species with fewer than four mentions were considered low rank since they did not appear to be widely used and that was a natural break in the data near the median. Of the 99 plants in our list, 47 were considered high common use rank, and 52 species were considered low rank. Western red cedar (*Thuja plicata*) had the most mentions (65), followed by stinging nettle (*Urtica dioica*) (27), willow (*Salix spp.*) (19), oceanspray or ironwood (*Holodiscus discolor*) (18), broadleaf cattail (*Typha latifolia*) (16), and salmonberry (*Rubus spectabilis*) (16). Including the count of observed species with high common use rank as a discrete metric in the Cultural Module created a weighting factor to prioritize wetlands with high value for common use plants.

The Botanical List also lent itself to the development of another rating metric called *rarity* that considers frequency of plant observations during field botanical surveys. This created a weighting factor to prioritize protection of wetlands with rare or less common species. The Traditional Plant Use List was subset to include only those species occurring or likely to occur on or near the Reservation. Range determinations for individual plant species relied on two herbaria data sources (Burke Museum 2019; CPNWH 2019). If a plant species was documented

within Skagit County or in the lowland-coastal regions of a neighboring county (Island, Whatcom, Snohomish), the species was considered in range. If it was not found there or only in mountainous regions of eastern Skagit County, the species was considered out of range. The Traditional Plant Use List subset was reviewed against the Botanical List to determine those species consistently observed and documented during previous botanical surveys (2003–2016) yielding 60 species. Plants were ranked by relative rarity, with higher significance based on lower rates of occurrence. Five or fewer total species observations were chosen as a natural break cut-off value designating about one third, or 19 plant species total as high rarity rank and 41 species as not rare. The rarest species were goat's beard (*Aruncus dioicus*), crevice alumroot (*Heuchera micrantha*), and swordleaf rush (*Juncus ensifolius*) with one observation each.

The final scoring value is past or present place of value, with a resulting high, medium or low score. We found it important to assign value to wetlands that were currently harvested or near other places of high value and use since the resources would be easy to access and utilize either now (spiritual/ceremonial) or the past (archeological sites). Thus, a high score was given if a wetland is within 200 ft (~61 m) of a known archaeological site, a site currently used for harvesting, or a spiritual/ceremonial area. A medium score was given to wetlands that are easily accessible within 200 ft of shoreline or a maintained road or trail or mention of historical place value in Tribal elder accounts. A low score was given if there is no known place value. Scoring on this section has been reserved until locations can be verified with the Tribe's Cultural Resources Office.

The overall cultural score and overall rating for each wetland was determined by comparing the wetland's Botanical List with the Traditional Plant Use List to identify the number of traditionally used species found. The cultural module rating matrix (Table 1) shows the thresholds for rating and assigned points for each category. The cultural module score is then calculated by summing the rating points for each of the six categories. The total possible score for the

Table 1 Botanical survey counts of traditionally used plant species present in each reference wetland by Swinomish traditional plant use category and their scoring results.

	Construction/ Household	Medicinal	Subsistence	Spiritual/ Ceremonial	Common Use	Rarity
EMG1	9	23	12	4	17	3
FC4 A & F	16	32	18	6	26	6
KB1	6	13	9	2	9	1
KB5	18	28	21	6	23	3
LTC4	11	19	14	7	17	2
LTC5	11	18	13	7	16	1
LTC1	14	26	18	7	23	2
LTC7	14	25	14	6	22	1
MC1	15	28	19	6	23	2
S1	16	30	17	6	23	5
S2	12	20	14	5	18	1
SBT1	6	12	7	2	8	0
SBT3	13	24	17	5	19	3
SBT4	0	1	0	0	1	0
Cultural Module Scoring Matrix						
Minimum for High Rating (3 points)	13	24	14	6	19	2
Minimum for Moderate Rating (2 points)	9	18	12	4	16	1
Maximum Score for Low Rating (1 point)	8	17	11	3	15	0

cultural module is currently 18 instead of 21, pending development of the three-point *place of value* category. The resulting scores from minimum (6 points or 33%) to maximum (18 points or 100%) are divided into thirds by quantile to assign low (<9.9 points or 55%), moderate (9.9–13.86 or 55–77%), and high (≥13.86 points or 77%) cultural rating to each wetland. The resulting cultural value rating are 19 wetlands as high, 12 as moderate, and 6 as low (Cultural Rating in Table 2).

Overall Wetland Rating, Combining Cultural and Physical Modules

The cultural module score and cultural value rating for each wetland provide information on the richness of traditional species and form an intermediate step in determining the final wetland rating. The final wetland functional rating is determined by adding the cultural module score and physical module score and dividing that point total by the total possible score to calculate a final percent score. The total possible scores for the physical module varied from 96 to 114 points depending on which physical attributes could be measured and scored for a particular wetland (Cooke 1996; Reppert et al. 1979). The resulting percent scores, ranging from minimum (47%) to maximum (90.9%), were used to calculate the median and first quartile percent scores, and overall wetland ratings are assigned as in the cultural module categories above (Table 2). The new wetland functional ratings include 18 wetlands rated as high, 10 as moderate, and 8 as low, with eleven wetlands rated as moderate under the physical rating module upgraded to high when the cultural module was also applied.

Application of Wetland Ratings in Tribal Wetland Protection Policy

The Tribe's Shorelines and Sensitive Areas Code (SSAC) Title 19 Chapter 4 (Swinomish 2018) was enacted in 2005 and includes wetland protection policy. The SSAC establishes buffers around wetlands to protect wetland functions and values with the buffer subject to the same use restrictions as the wetland it buffers. Until the cultural module could be completed, the SSAC used the physical module wetland ratings only to assign buffers of 200 ft (~61 m) for high, 100 ft (~30.5 m) for moderate, and 25 ft (~7.6 m) for low ratings. With the completion of the cultural module, the Swinomish Wetland Ratings System is now referred to and incorporated in the code and we are using the above wetland ratings for ongoing permit review near or in wetlands.

Revision of Wetland Assessment Methods and Application to Future Ratings

Wetland researchers at Washington Department of Ecology developed a new, widely accepted physical module, the Washington State Wetland Rating System (WSWRS) (Hruby 2004, Hruby 2014), during development of the Swinomish cultural module. The new physical system uses scores in nine sections by assessing a wetland's three functions (improving water quality, hydrology, and habitat) for site potential, landscape potential, and site value to rate wetlands. Our existing physical scores have not yet been updated to be consistent with the WSWRS. While, as a sovereign nation, the Tribe has no obligation to adopt the revised module or provide assessments on wetlands for private or individual trust landowners, we have initiated the process of reassessing all Reservation wetlands using the WSWRS physical module to facilitate use by Tribal permitting and comparison to workers in adjacent jurisdictions. We are also completing new botanical surveys in wetlands without previous surveys, with the intent to survey half of all wetlands to develop updated cultural scores, reduce the number of cultural scores derived from reference wetlands, and further validate the method used to score and assign reference wetlands.

Swinomish cultural value rating as described here will be used to provide Swinomish culturally relevant input to ongoing wetland rating, though the exact mechanism for inclusion is still under development. One option being considered is to use the Swinomish cultural value rating as an alternate to the WSWRS's Habitat-(Site) Value rating where the higher of the Cultural or the Habitat-(Site) Value would be the score for that rating. These WSWRS value category scores are based on presence of threatened, endangered, or state priority species; high conservation value as determined by State; or importance to other local governments. For example, if the wetland had a habitat-site value rating of moderate, but the Swinomish cultural rating was high the resulting Habitat-site value would be high. However, if the Swinomish cultural rating was low, the Habitat-site value would remain moderate. This allows the cultural value of the wetland to potentially increase the total score by 1 to 2 points. Total scores yield the category of wetland (I-IV). To ensure protection for high functioning wetlands, the WSWRS

Table 2 Incorporating the physical and new cultural module scores.

Wetland	1999 Report Physical Module Score				New Swinomish Cultural Module Score					Combined Physical & Cultural Modules Score			
	Score	Max	Percent Score	Wetland Rating	Reference Wetland*	Cultural Score	Max Cultural Score	Percent Score	Cultural Rating	Score	Max	Percent Score	Swinomish Wetlands Rating
EMG1	88	114	77.20%	High	bot.survey 2003	13	18	72.20%	Moderate	101	132	76.52%	High
FC1	65	96	67.70%	Moderate	SBT3	17	18	94.40%	High	82	114	71.93%	High
FC2	60	96	62.50%	Moderate	LTC4,5	13	18	72.20%	Moderate	73	114	64.04%	Moderate
FC3	70	96	72.90%	High	SBT3	17	18	94.40%	High	87	114	76.32%	High
FC4	71	102	69.60%	Moderate	bot.survey 2016	18	18	100.00%	High	89	120	74.17%	High
FC5	53	99	53.50%	Low	LTC4,5	13	18	72.20%	Moderate	66	117	56.41%	Low
KB1	72	114	63.20%	Moderate	bot.survey 2016	7	18	38.90%	Low	79	132	59.85%	Moderate
KB5[1]					bot.survey 2016	18	18	100.00%	High				N/A
LTC1	53	114	46.50%	Low	bot.survey 2003	18	18	100.00%	High	71	132	53.79%	Low
LTC4	62	96	64.60%	Moderate	bot.survey 2016	15	18	83.30%	High	77	114	67.54%	High
LTC5	62	96	64.60%	Moderate	bot.survey 2016	13	18	72.20%	Moderate	75	114	65.79%	High
LTC7	62	114	54.40%	Low	bot.survey 2003	17	18	94.40%	High	79	132	59.85%	Moderate
LTC8	58	96	60.40%	Moderate	LTC4,5	13	18	72.20%	Moderate	71	114	62.28%	Moderate
MC1	66	102	64.70%	Moderate	bot.survey 2003	18	18	100.00%	High	84	120	70.00%	High
MC2	69	96	71.90%	Moderate	SBT3	17	18	94.40%	High	86	114	75.44%	High
PB1	83	111	74.80%	High	KB1	7	18	38.90%	Low	90	129	69.77%	High
S1	102	114	89.50%	High	bot.survey 2003	18	18	100.00%	High	120	132	90.91%	High
S2	66	114	57.90%	Moderate	bot.survey 2003	13	18	72.20%	Moderate	79	132	59.85%	Moderate
SB1	69	96	71.90%	Moderate	LTC4,5	13	18	72.20%	Moderate	82	114	71.93%	High
SB2	63	96	65.60%	Moderate	LTC4,5	13	18	72.20%	Moderate	76	114	66.67%	High
SB3	64	102	62.70%	Moderate	LTC4,5	13	18	72.20%	Moderate	77	120	64.17%	High
SB4	60	96	62.50%	Moderate	FC4	18	18	100.00%	High	78	114	68.42%	High
SB5	37	99	37.40%	Low	LTC1	18	18	100.00%	High	55	117	47.01%	Low
SB6	81	111	73.00%	High	SBT1	6	18	33.30%	Low	87	129	67.44%	High
SBT1	84	114	73.70%	High	bot.survey 2016	6	18	33.30%	Low	90	132	68.18%	High
SBT2	47	96	49.00%	Low	FC4	18	18	100.00%	High	65	114	57.02%	Low
SBT3	65	99	65.70%	Moderate	bot.survey 2016	17	18	94.40%	High	82	117	70.09%	High
SBT4	67	111	60.40%	Moderate	bot.survey 2016	6	18	33.30%	Low	73	129	56.59%	Low
SC1	65	111	58.60%	Moderate	KB1	7	18	38.90%	Low	72	129	55.81%	Low
SC14, SC8	47	96	49.00%	Low	LTC4,5	13	18	72.20%	Moderate	60	114	52.63%	Low
SC2	59	102	57.80%	Moderate	LTC4,5	13	18	72.20%	Moderate	72	120	60.00%	Moderate
SC3	59	96	61.50%	Moderate	LTC4,5	13	18	72.20%	Moderate	72	114	63.16%	Moderate
SC4	53	111	47.70%	Low	LTC1	18	18	100.00%	High	71	129	55.04%	Low
SC5	52	96	54.20%	Low	SBT3	17	18	94.40%	High	69	114	60.53%	Moderate
SC6	55	96	57.30%	Moderate	SBT3	17	18	94.40%	High	72	114	63.16%	Moderate
SC7	86	102	84.30%	High	FC4	18	18	100.00%	High	104	120	86.67%	High
SC9	55	96	57.30%	Moderate	SBT3	17	18	94.40%	High	72	114	63.16%	Moderate

[1]Wetland identified after Swinomish 1999 report completed.
*Based on Similarity score.

Categories I and II are considered equivalent to the High Class 1 in the SSAC classification, Category III to Moderate Class 2, and Category IV to Low Class 3. Another option may be to select the higher of the WSWRS Rating or the Swinomish Cultural Value as the final wetland score. We intend to evaluate these and/or other options based on analysis of all available WSWRS and botanical survey data collected.

Discussion

Developing a cultural module establishes a way to include tribal cultural values in wetland assessments to protect traditionally used plants as a resource for the community. This method is an evaluation of current cultural valuation but does not take into account future plant availability. One limitation is this does not include other wetland resources like fauna or cultural practices related to wetlands as valuable places. However, having any method to include local cultural values in wetland evaluation is a significant improvement over the generic physical rating system.

This method should be transferrable and adaptable to other communities. It should be noted that this method required large amounts of data and information from the traditional uses, botanical surveys, and wetland assessments and the expertise to collect the data. Due to the amount of data and various ways we needed to combine or separate the data, the management of the data relied on the ability to gather, input, relate, and query the data within a database that was created for this purpose.

We found it important to use the information in the module to protect all traditional species whether these resources had a current, past, or future use. This approach is protective of continuing traditional harvesting and any subsequent expansion or reinvigoration of a wide variety of traditional plant use by younger generations, either as a result of our efforts or others in the Tribe. Further work will develop an ethnobotanical journal article of our collected data and database for a future submission and more importantly for the Tribe we are writing a guidebook of Swinomish traditional plants compiling uses, Lushootseed names, and Elder quotes on traditional methods into an easy to read and use book for the community. Coupling the guidebook with wetland locations, species present, and relative plant abundance in wetlands will help the community in continuing, expanding, or reviving traditional plant harvests.

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Declarations

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