Aquatic Ecosystem Services Survey:

Round One Results

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1. Introduction

Wetlands, streams, and floodplains (hereafter called aquatic systems) are an important resource for social and ecological wellbeing. Since the early 1990s, Federal policy has required a no overall net loss (NNL) of wetland area (i.e. aquatic systems), functions, and values in the United States (US). Past efforts to build assessment tools have focused primarily on wetland structure and function, and less on inherent services provided by aquatic ecosystems that are valued by people (hereafter referred to as ecosystem services (ES)). Moreover, there has been little effort to develop assessment tools that measure wetland services in a rapid and repeatable manner. Our intent with this research is to develop a framework and generalized methodology for the rapid assessment of ES provided by wetlands, streams and their riparian buffers for use in permitting, compensatory mitigation, and preservation decisions. Moreover, we seek to understand aquatic systems decision-makers' perceptions of planning and land use surrounding wetland protection and mitigation.

This document reports the results (n=179) of Round 1 of a Delphi survey that includes the following topics:

- Ranked lists of cultural, provisioning, and regulating ES according to respondents reported disagreement or agreement on the importance of each ES.
- Respondents' perceptions of the importance of different components of wetland protection such as public access, public and wetland-decision makers' understanding of wetland ecosystem services, collaborative planning processes, communication between different scales of government agencies, federal and state polices, and local government land-use decisions and processes.
- Respondents' attitudes toward the importance of which wetlands should be protected and where mitigated wetlands should be located, ranging from purely biophysical components to considerations of public access.
- Lists of rapid assessment tools respondents use in their work, with corresponding rankings of various aspects of tool utility.

2. Data collection and analysis

We conducted a survey of wetland experts in the Mountain West using a Delphi method approach. The Delphi method is a technique that is used to arrive at a group consensus through expert judgement. The process entails systematically and iteratively asking an expert panel to rank statements/issues until a group consensus as achieved, producing quantitative metrics along with participants' rationale for their selection (Powell 2003, Taylor and Ryder 2003a, Cole et al. 2013). The purpose of the survey was to understand which assessment tools respondents used and why, as well as to determine a subset of services and benefits to include in the rapid wetland services assessment module. The list of ecosystem services we inquired about for this survey were generated from relevant theory and case study papers found in the literature as well as guidance documents provided by USEPA (landers and Nahlik 2013, US EPA 2020). Prior to administering the survey, we piloted the survey with five wetlands experts to ensure the survey's efficacy; feedback from the survey resulted a few changes to statement wording. We distributed the survey through online Qualtrics survey software to two groups: 1) a panel of Federal, State, Local and Tribal wetland decision-makers (e.g., MT-DEQ, MTNHP, MT-DOT, ACOE, and local agencies and Tribes) determined through our own knowledge, publicly available data, and recommendations for other experts (n=56); and 2) email distribution listservs of aquatic resource organizations – Montana Wetland Council, Montana Watershed Coordination Council, and the Pacific Northwest and Rocky Mountain chapters of the Society of Wetland Scientists (we do not know how many people this distribution method reached). We administered the survey in December 2020 and January 2021. We sent initial survey invitations through email and sent respondents up to three reminders. The survey is covered under MSU's Institutional Review Board approval (SC100820-EX). This document reports descriptive statistics from the first survey round of the Delphi method. We analyzed data using IBM SPSS Statistics Version 26.

3. Results

Overall, we received 179 survey responses: 157 responses resulted from the expert distribution list because the emails were forwarded to other experts; 22 responses resulted from the listserv email distribution.

TABLE 1 DISTRIBUTION TYPE

	Frequency	Percent
Listserv	22	12.3%
MSU	157	87.7%
Total	179	100%

3.1. Respondent Demographics

TABLE 2 LEVEL OF FORMAL EDUCATION

"What is your highest level of formal education?"		
	Frequency	Percent
Some formal schooling	0	0%
High school diploma/GED	0	0%
Some college	0	0%
2-year college degree	0	0%
4-year college degree	28	25.5%
Post-graduate degree	82	74.5%
Total	110	100%

TABLE 3 GENDER

"Which best describes your gender?"		
	Frequency	Percent
Female	41	37.6%
Male	62	56.9%
Prefer not to say	6	5.5%
Prefer to self-describe	0	0%
Total	109	100%

3.2. Employment Information

TABLE 4 PRIMARY EMPLOYMENT STATE

"In which state do you primarily work?"		
State	Frequency	Percent
Montana	53	44.5%
Other	30	25.2%
Washington	24	20.2%
Idaho	6	5%
Wyoming	5	4.2%
North Dakota	1	0.8%
South Dakota	0	0%
Total	148	100%

TABLE 5 PRIMARY EMPLOYMENT STATE - OTHER

"In which state do you primarily work" Other (please specify) write-in answers: One person selected other, but did not provide additional information	
Write-in answer	**Frequency**
Colorado	15
Oregon	4
Multiple states	3
Nationwide	2
New Mexico	1
California	1
Pennsylvania	1
Utah	1
Canada	1
Total	29

TABLE 6 EMPLOYMENT CATEGORIES

"For which organization do you currently work?" Responses were categorized into employer types by the research team.	
Employer Type	**Frequency**
No response	72
State Government	24
Consulting	17
Non-governmental Organization	15
Federal Government	13
Local Government	10
Retired	7
University	7
Engineering	5
Multiple	3
Tribal Organization/Agency	3
Self-employed	2
Unemployed	1
Total	179

TABLE 7 YEARS AT CURRENT ORGANIZATION

"How many years have you been working for your current organization?"	
Mean	12.2
Median	10.0
Range	0 - 40
Total Responses	107

3.3. Wetland and Aquatic Ecosystems Experience

TABLE 8 YEARS IN AQUATIC SYSTEMS-RELATED FIELD

"How many years have you been working in an aquatic systems-related field?"	
Mean	22
Minimum	1
Maximum	50
Total responses	109

TABLE 9 PROFESSIONAL WETLAND SCIENTIST CERTIFICATION

Do you have Professional Wetland Scientist Certification?"		
	Frequency	**Percent**
Yes	27	24.5%
No	80	72.7%
Unsure/Don't know	3	2.7%
Total	110	100%

TABLE 10 AQUATIC ECOSYSTEMS ASSESSMENT TOOL USE

"Do you, or have you ever, used an aquatic ecosystems assessment tool?"		
	Frequency	**Percent**
Yes	119	72.6%
No	45	27.4%
Total	164	100%

TABLE 11 TIME SPENT ON AQUATIC SYSTEMS-RELATED WORK

"What is the approximate percentage of time you spend on aquatic systems-related work as part of your current job?"	
Mean	67.6%
Minimum	0%
Maximum	100%
Total responses	104

3.4. Ecosystem Services Ranking

TABLE 12 CULTURAL ECOSYSTEM SERVICES RANKING

"Please indicate your level of disagreement or agreement below. The following cultural aquatic ecosystem services are important to how land management decisions are made:"

n*= indicates the number of respondents that provided answers to the question.
Table is sorted by highest mean and then by highest percentage of strongly agree. sd= standard deviation.

Cultural Ecosystem Services	N	Strongly Disagree (1)	Disagree (2)	Neither Agree nor Disagree (3)	Agree (4)	Strongly Agree (5)	n*	Mean (sd)
		Frequency (%)						
Education	179	1.7	5.2	7.0	40.9	45.2	115	4.2 (.918)
Viewscapes	179	0	1.7	18.3	49.6	30.4	115	4.0 (.744)
Intrinsic value	179	0.9	4.3	14.8	40.0	40.0	115	4.1 (.887)
Recreational bird watching	179	0.9	6.1	11.3	45.2	36.5	115	4.1 (.892)
Recreational wildlife watching	179	0.9	2.6	14.8	50.4	31.3	115	4.0 (.801)
Recreational boating/floating	179	0.9	4.3	10.4	54.8	29.6	115	4.0 (.807)
Historical/archaeological/ heritage	179	0	4.3	17.4	43.5	34.8	115	4.0 (.833)
Research	179	0.9	7.0	12.2	40.0	40.0	115	4.1 (.934)
Connectedness to nature	179	1.7	7.8	5.2	40.9	44.3	115	4.1 (.970)
Naturalist Activities	179	1.8	4.4	14.0	50.9	28.9	114	4.0 (.877)
Restorative experience	179	2.6	7.8	15.7	44.3	29.6	115	3.9 (1.000)
Recreational swimming	179	3.5	14.0	19.3	44.7	18.4	114	3.6 (1.053)
Spiritual/ceremonial	179	3.5	12.2	25.2	32.2	27.0	115	3.6 (1.106)
Other sensory experiences (not related to art/media inspiration)	179	4.4	8.8	36.8	36.0	14.0	114	3.4 (.988)
Sensory experiences that inspire art and media	179	5.2	13.0	27.0	40.9	13.9	115	3.4 (1.053)
Transportation of goods and/or people	179	2.6	21.1	28.9	37.7	9.6	114	3.3 (.997)
Military use	179	14.9	37.7	38.6	7.9	0.9	114	2.4 (.871)

TABLE 13 REGULATING ECOSYSTEM SERVICES RANKING

"Please indicate your level of disagreement or agreement below. The following regulating aquatic ecosystem services are important to how land management decisions are made:"

n*= indicates the number of respondents that provided answers to the question.
Table is sorted by highest mean and then by highest percentage of strongly agree. sd= standard deviation.

Regulating Ecosystem Services	N	Strongly Disagree (1)	Disagree (2)	Neither Agree nor Disagree (3)	Agree (4)	Strongly Agree (5)	n*	Mean (sd)
		Frequency (%)						
Reduction of erosion	179	0	0	4.4	38.9	56.6	113	4.5 (.584)
Baseflow support	179	0	2.7	4.4	29.2	63.7	113	4.5 (.708)
Flood control	179	0.9	0.9	4.4	33.6	60.2	113	4.5 (.709)
Removal of contaminants	179	0	0.9	8.8	42.1	48.2	114	4.3 (.683)
Sediment capture	179	0	1.8	7.9	41.2	49.1	114	4.3 (.709)
Groundwater exchange	179	1.8	3.5	8.0	31.0	55.8	113	4.3 (.906)
Disaster control	179	1.8	2.7	13.3	37.2	45.1	113	4.2 (.901)
Nutrient/toxin cycling and retention	179	1.8	4.4	8.8	39.8	45.1	113	4.2 (.914)
Landscape integrity	179	0	8.0	10.6	32.7	48.7	113	4.2 (.933)
Soil moisture	179	2.7	4.4	13.3	31.0	48.7	113	4.1 (1.005)
Nutrient production	179	2.7	6.2	18.6	34.5	38.1	113	3.9 (1.031)
Carbon sequestration	179	2.7	8.8	16.8	35.4	36.3	113	3.9 (1.063)
Microclimate	179	3.5	9.7	21.2	27.4	38.1	113	3.8 (1.138)

TABLE 14 PROVISIONING ECOSYSTEM SERVICES RANKING

"Please indicate your level of disagreement or agreement below. The following provisioning aquatic ecosystem services are important to how land management decisions are made:"

n*= indicates the number of respondents that provided answers to the question.
Table is sorted by highest mean and then by highest percentage of strongly agree. sd= standard deviation.

Provisioning Ecosystem Services	N	Strongly Disagree (1)	Disagree (2)	Neither Agree nor Disagree (3)	Agree (4)	Strongly Agree (5)	n*	Mean (sd)
		Frequency (%)						
Drinking water	179	0	0.9	3.6	29.5	66.1	112	4.6 (.606)
Support of beneficial invertebrates (e.g. pollinators)	179	0.9	4.5	11.6	37.5	45.5	112	4.2 (.887)
Irrigation	179	0.9	5.4	10.7	45.5	37.5	112	4.1 (.875)
Hunting	179	1.8	5.4	11.6	48.2	33.0	112	4.0 (.909)
Crop production	179	0.9	5.4	16.1	50.0	27.7	112	3.9 (.859)
Support of beneficial bird populations to help manage pests	179	3.6	8.9	12.5	34.8	40.2	112	3.9 (1.103)
Support of beneficial mammals to help manage pests	179	3.6	8.9	15.2	33.9	38.4	112	3.9 (1.106)
Energy generation	179	1.8	8.1	25.2	45.0	19.8	111	3.7 (.934)
Stock grazing	179	3.6	11.7	9.9	48.6	26.1	111	3.8 (1.063)
Support of beneficial amphibians and reptiles to help manage pests	179	4.5	11.6	12.5	33.0	38.4	112	3.8 (1.173)
Subsistence fishing	179	3.6	13.4	16.1	42.9	24.1	112	3.7 (1.088)
Commercial food production	179	3.6	12.5	19.6	45.5	18.8	112	3.6 (1.040)
Gathering	179	2.7	14.4	25.2	35.1	22.5	111	3.6 (1.073)
Commercial fishing	179	4.5	15.2	10.7	50.9	18.8	112	3.6 (1.089)
Timber production	179	1.8	16.1	29.5	41.1	11.6	112	3.4 (.957)
Industrial water use (cooling water)	179	3.6	17.3	32.7	34.5	11.8	110	3.3 (1.016)
Fiber production	179	2.7	18.9	34.2	35.1	9.0	111	3.2 (.967)
Aquaculture	179	6.3	17.0	18.8	47.3	10.7	112	3.3 (1.085)
Food processing	179	4.6	16.5	37.6	31.2	10.1	109	3.2 (1.004)
Pharmaceuticals	179	8.2	24.5	36.4	21.8	9.1	110	2.9 (1.079)
Fur/feather/ornamental production	179	8.9	33.0	34.8	16.1	7.1	112	2.7 (1.050)

TABLE 15 ECOSYSTEM SERVICES RANKED BY MEAN

This table shows the rank of each ecosystem service by mean from high to low.
The mean is calculated from the responses of all participants to each ecosystem service, n represents the number of people who responded to each question.

Rank	Ecosystem Service	Category	Mean	n	Standard Deviation
1	Drinking water	Provisioning	4.61	112	0.606
2	Baseflow support	Regulating	4.54	113	0.708
3	Reduction of erosion	Regulating	4.52	113	0.584
4	Flood control	Regulating	4.51	113	0.709
5	Removal of contaminants	Regulating	4.38	114	0.683
6	Sediment capture	Regulating	4.38	114	0.709
7	Groundwater exchange	Regulating	4.35	113	0.906
8	Education	Cultural	4.23	115	0.918
9	Nutrient/toxin cycling and retention	Regulating	4.22	113	0.914
10	Support of beneficial invertebrates (e.g., pollinators)	Provisioning	4.22	112	0.887
11	Landscape integrity	Regulating	4.22	113	0.933
12	Disaster control	Regulating	4.21	113	0.901
13	Soil moisture	Regulating	4.19	113	1.005
14	Connectedness to nature	Cultural	4.18	115	0.970
15	Intrinsic value	Cultural	4.14	115	0.887
16	Irrigation	Provisioning	4.13	112	0.875
17	Research	Cultural	4.11	115	0.934
18	Recreational bird watching	Cultural	4.10	115	0.892

This table shows the rank of each ecosystem service by mean from high to low.
The mean is calculated from the responses of all participants to each ecosystem service, n represents the number of people who responded to each question.

Rank	Ecosystem Service	Category	Mean	n	Standard Deviation
19	Viewscapes	Cultural	4.09	115	0.744
20	Recreational wildlife watching	Cultural	4.09	115	0.801
21	Historical/archaeological/heritage	Cultural	4.09	115	0.833
22	Recreational boating/floating	Cultural	4.08	115	0.807
23	Hunting	Provisioning	4.05	112	0.909
24	Naturalist Activities	Cultural	4.01	114	0.877
25	Nutrient production	Regulating	3.99	113	1.031
26	Support of beneficial bird populations to help manage pests	Provisioning	3.99	112	1.103
27	Crop production	Provisioning	3.98	112	0.859
28	Support of beneficial mammals to help manage pests	Provisioning	3.95	112	1.106
29	Carbon sequestration	Regulating	3.94	113	1.063
30	Restorative experience	Cultural	3.90	115	1.000
31	Support of beneficial amphibians and reptiles to help manage pests	Provisioning	3.89	112	1.173
32	Microclimate	Regulating	3.87	113	1.138
33	Stock grazing	Provisioning	3.82	111	1.063
34	Energy generation	Provisioning	3.73	111	0.934
35	Subsistence fishing	Provisioning	3.71	112	1.088
36	Spiritual/ceremonial	Cultural	3.67	115	1.106
37	Commercial fishing	Provisioning	3.64	112	1.089
38	Commercial food production	Provisioning	3.63	112	1.040
39	Recreational swimming	Cultural	3.61	114	1.053
40	Gathering	Provisioning	3.60	111	1.073
41	Other sensory experiences (not related to art/media inspiration)	Cultural	3.46	114	0.988
42	Timber production	Provisioning	3.45	112	0.957
43	Sensory experiences that inspire art and media	Cultural	3.45	115	1.053
44	Aquaculture	Provisioning	3.39	112	1.085
45	Industrial water use (cooling water)	Provisioning	3.34	110	1.016
46	Transportation of goods and/or people	Cultural	3.31	114	0.997
47	Fiber production	Provisioning	3.29	111	0.967
48	Food processing	Provisioning	3.26	109	1.004
49	Pharmaceuticals	Provisioning	2.99	110	1.079
50	Fur/feather/ornamental production	Provisioning	2.79	112	1.050
51	Military use	Cultural	2.42	114	0.871

TABLE 16 CULTURAL ES BY ORGANIZATION OR AGENCY TYPE

"Please indicate your level of disagreement or agreement below. The following cultural aquatic ecosystem services are important to how land management decisions are made."

This table shows the answers to this question filtered by organization type, mean responses and n are indicated for each ecosystem service. Respondents who indicated that they work for multiple organizations/agencies, are unemployed, retired, or self-employed are included in the "all respondents" column, but not assigned to an employment category. 72 respondents did not indicate which organization they work for. Green cells indicate a higher mean score for the ecosystem service than the mean for all respondents. Yellow cells indicate that the mean given by all respondents matches the mean given by the employment category. SD = Standard deviation.

Cultural Ecosystem Services	Consulting	Engineering	Federal Government	Local Government	State Government	Tribal Organization /Agency	Non-governmental Organization	University	All Respondents		
	Mean (n)								Mean (n)	Rank	SD
Education	3.94 (16)	4.50 (4)	4.38 (13)	4.50 (10)	4.04 (23)	4.67 (3)	4.53 (15)	4.57 (7)	4.23 (115)	8	0.918
Connectedness to nature	4.25 (16)	4.00 (4)	4.31 (13)	4.60 (10)	3.83 (23)	4.67 (3)	4.47 (15)	3.86 (7)	4.18 (115)	14	0.970
Intrinsic value	3.75 (16)	4.25 (4)	4.31 (13)	4.50 (10)	4.13 (23)	5.00 (3)	4.20 (15)	4.43 (7)	4.14 (115)	15	0.887
Research	4.00 (16)	4.25 (4)	4.31 (13)	4.40 (10)	3.91 (23)	5.00 (3)	4.13 (15)	4.00 (7)	4.11 (115)	17	0.934
Recreational bird watching	4.13 (16)	4.00 (4)	4.31 (13)	4.30 (10)	3.96 (23)	5.00 (3)	4.20 (15)	3.86 (7)	4.10 (115)	18	0.892
Historical/ archaeological /heritage	4.06 (16)	3.50 (4)	4.23 (13)	3.90 (10)	4.09 (23)	5.00 (3)	4.00 (15)	4.00 (7)	4.09 (115)	19	0.833
Recreational wildlife watching	3.88 (16)	3.75 (4)	4.38 (13)	4.30 (10)	4.09 (23)	5.00 (3)	4.13 (15)	4.00 (7)	4.09 (115)	20	0.801
Viewscapes	3.75 (16)	4.00 (4)	4.23 (13)	4.20 (10)	4.17 (23)	5.00 (3)	4.20 (15)	4.00 (7)	4.09 (115)	21	0.744
Recreational boating/ floating	4.06 (16)	4.00 (4)	4.23 (13)	4.10 (10)	4.26 (23)	4.33 (3)	4.20 (15)	4.00 (7)	4.08 (115)	22	0.807
Naturalist activities	3.75 (16)	4.00 (4)	4.08 (13)	4.10 (10)	4.00 (23)	4.67 (3)	4.14 (14)	4.14 (7)	4.01 (114)	24	0.877
Restorative experience	3.69 (16)	4.00 (4)	4.23 (13)	4.20 (10)	3.70 (23)	5.00 (3)	4.20 (15)	3.86 (7)	3.90 (115)	30	1.000
Spiritual/ ceremonial	3.50 (16)	3.25 (4)	4.00 (13)	4.10 (10)	3.57 (23)	5.00 (3)	3.73 (15)	3.57 (7)	3.67 (115)	36	1.106
Recreational swimming	3.19 (16)	3.75 (4)	3.46 (13)	3.90 (10)	4.04 (23)	4.67 (3)	3.60 (15)	3.86 (7)	3.61 (114)	39	1.053
Other sensory experiences (not related to art/media inspiration)	3.44 (16)	3.25 (4)	3.46 (13)	4.10 (10)	3.26 (23)	5.00 (3)	3.60 (15)	3.57 (7)	3.46 (114)	41	0.988
Sensory experiences that inspire art and media	3.44 (16)	3.25 (4)	3.54 (13)	4.10 (10)	3.22 (23)	4.67 (3)	3.47 (15)	3.71 (7)	3.45 (115)	43	1.053
Transportation of goods and/or people	3.31 (16)	3.25 (4)	3.15 (13)	3.50 (10)	3.35 (23)	3.67 (3)	3.07 (14)	3.00 (7)	3.31 (114)	46	0.997
Military use	2.31 (16)	2.25 (4)	2.38 (13)	2.30 (10)	2.52 (23)	2.67 (3)	2.14 (14)	2.71 (7)	2.42 (114)	51	0.871

TABLE 17 PROVISIONING ES BY ORGANIZATION OR AGENCY TYPE

"Please indicate your level of disagreement or agreement below. The following provisioning aquatic ecosystem services are important to how land management decisions are made."

This table shows the answers to this question filtered by organization type, mean responses and n are indicated for each ecosystem service. Respondents who indicated that they work for multiple organizations/agencies, are unemployed, retired, or self-employed are included in the "all respondents" column, but not assigned to an employment category. 72 respondents did not indicate which organization they work for. Green cells indicate a higher mean score for the ecosystem service than the mean for all respondents. Yellow cells indicate that the mean given by all respondents matches the mean given by the employment category. SD = Standard deviation.

Provisioning Ecosystem Services	Consulting	Engineering	Federal Government	Local Government	State Government	Tribal Organization /Agency	Non-governmental Organization	University	All Respondents		
	Mean (n)								Mean (n)	Rank	SD
Drinking Water	4.69 (16)	4.80 (5)	4.46 (13)	4.67 (9)	4.70 (23)	5.00 (2)	4.87 (15)	4.71 (7)	4.61 (112)	1	0.606
Support of beneficial invertebrates (e.g. pollinators)	4.19 (16)	4.20 (5)	4.15 (13)	4.67 (9)	4.04 (23)	5.00 (2)	4.53 (15)	3.71 (7)	4.22 (112)	10	0.887
Irrigation	4.19 (16)	4.00 (5)	4.31 (13)	4.11 (9)	4.39 (23)	2.50 (2)	4.27 (15)	4.43 (7)	4.13 (112)	16	0.875
Hunting	4.06 (16)	4.20 (5)	4.38 (13)	4.00 (9)	4.17 (23)	5.00 (2)	4.07 (15)	3.86 (7)	4.05 (112)	23	0.909
Support of beneficial bird populations to help manage pests	3.94 (16)	4.00 (5)	4.08 (13)	4.67 (9)	3.70 (23)	5.00 (2)	4.20 (15)	3.71 (7)	3.99 (112)	26	1.103
Crop production	3.94 (16)	4.20 (5)	3.92 (13)	4.22 (9)	3.91 (23)	3.00 (2)	4.13 (15)	4.43 (7)	3.98 (112)	27	0.859
Support of beneficial mammals to help manage pests	3.88 (16)	4.00 (5)	3.92 (13)	4.56 (9)	3.70 (23)	5.00 (2)	4.13 (15)	3.86 (7)	3.95 (112)	28	1.106
Support of beneficial amphibians and reptiles to help manage pests	3.75 (16)	4.00 (5)	3.92 (13)	4.67 (9)	3.61 (23)	5.00 (2)	4.20 (15)	3.43 (7)	3.89 (112)	31	1.173
Stock grazing	3.69 (16)	3.75 (4)	4.08 (13)	3.44 (9)	3.96 (23)	4.00 (2)	3.80 (15)	4.29 (7)	3.82 (111)	33	1.063
Energy Generation	3.81 (16)	4.00 (5)	3.92 (13)	3.56 (9)	3.87 (23)	3.50 (2)	3.40 (15)	4.14 (7)	3.73 (111)	34	0.934
Subsistence fishing	3.63 (16)	4.00 (5)	3.77 (13)	4.22 (9)	3.61 (23)	4.50 (2)	3.53 (15)	3.29 (7)	3.71 (112)	35	1.088
Commercial fishing	3.88 (16)	3.40 (5)	3.77 (13)	3.89 (9)	3.43 (23)	4.00 (2)	3.60 (15)	3.57 (7)	3.64 (112)	37	1.089
Commercial food production	3.69 (16)	4.20 (5)	3.62 (13)	3.78 (9)	3.65 (23)	3.50 (2)	3.47 (15)	3.86 (7)	3.63 (112)	38	1.040
Gathering	3.56 (16)	3.80 (5)	3.77 (13)	3.67 (9)	3.52 (23)	5.00 (2)	3.67 (15)	3.14 (7)	3.60 (111)	40	1.073
Timber production	3.44 (16)	4.00 (5)	3.38 (13)	3.44 (9)	3.52 (23)	4.00 (2)	3.27 (15)	3.57 (7)	3.45 (112)	42	0.957
Aquaculture	3.38 (16)	3.40 (5)	3.69 (13)	3.56 (9)	3.30 (23)	3.00 (2)	3.27 (15)	3.29 (7)	3.39 (112)	44	1.085
Industrial water use (cooling water)	3.38 (16)	3.40 (5)	3.75 (12)	3.44 (9)	3.39 (23)	2.00 (2)	3.14 (14)	3.29 (7)	3.34 (110)	45	1.016
Fiber Production	3.06 (16)	3.20 (5)	3.31 (13)	3.44 (9)	3.41 (22)	4.00 (2)	3.20 (15)	3.14 (7)	3.29 (111)	47	0.967
Food processing	3.06 (16)	3.60 (5)	3.23 (13)	3.56 (9)	3.59 (22)	3.50 (2)	3.07 (15)	2.86 (7)	3.26 (109)	48	1.004
Pharmaceuticals	2.75 (16)	2.60 (5)	3.23 (13)	3.22 (9)	3.04 (23)	3.00 (2)	2.79 (14)	2.71 (7)	2.99 (110)	49	1.079
Fur/feather /ornamental production	2.94 (16)	2.40 (5)	2.85 (13)	2.78 (9)	2.83 (23)	5.00 (2)	2.40 (15)	2.71 (7)	2.79 (112)	50	1.050

TABLE 18 REGULATING ES BY ORGANIZATION OR AGENCY TYPE

"Please indicate your level of disagreement or agreement below. The following regulating aquatic ecosystem services are important to how land management decisions are made."

This table shows the answers to this question filtered by organization type, mean responses and n are indicated for each ecosystem service. Respondents who indicated that they work for multiple organizations/agencies, are unemployed, retired, or self-employed are included in the "all respondents" column, but not assigned to an employment category. 72 respondents did not indicate which organization they work for. Green cells indicate a higher mean score for the ecosystem service than the mean for all respondents. Yellow cells indicate that the mean given by all respondents matches the mean given by the employment category. SD = Standard deviation.

Regulating Ecosystem Services	Consulting	Engineering	Federal Government	Local Government	State Government	Tribal Organization /Agency	Non-governmental Organization	University	All Respondents		
	Mean (n)								Mean (n)	Rank	SD
Baseflow support	4.71 (17)	4.60 (5)	4.46 (13)	4.56 (9)	4.39 (23)	4.67 (3)	4.73 (15)	4.57 (7)	4.54 (113)	2	0.708
Reduction of erosion	4.59 (17)	4.60 (5)	4.54 (13)	4.67 (9)	4.48 (23)	5.00 (3)	4.33 (15)	4.71 (7)	4.52 (113)	3	0.584
Flood control	4.59 (17)	4.60 (5)	4.62 (13)	4.89 (9)	4.22 (23)	5.00 (3)	4.67 (15)	4.71 (7)	4.51 (113)	4	0.709
Removal of contaminants	4.53 (17)	4.20 (5)	4.54 (13)	4.20 (10)	4.39 (23)	5.00 (3)	4.40 (15)	4.29 (7)	4.38 (114)	5	0.683
Sediment capture	4.53 (17)	4.40 (5)	4.46 (13)	4.50 (10)	4.26 (23)	5.00 (3)	4.40 (15)	4.29 (7)	4.38 (114)	6	0.709
Ground water exchange	4.47 (17)	4.40 (5)	4.54 (13)	4.67 (9)	4.13 (23)	5.00 (3)	4.53 (15)	4.14 (7)	4.35 (113)	7	0.906
Landscape integrity	4.24 (17)	4.00 (5)	4.38 (13)	4.56 (9)	4.00 (23)	5.00 (3)	4.47 (15)	4.14 (7)	4.22 (113)	9	0.933
Nutrient/toxin cycling and retention	4.12 (17)	3.80 (5)	4.31 (13)	4.56 (9)	4.13 (23)	5.00 (3)	4.20 (15)	4.14 (7)	4.22 (113)	11	0.914
Disaster control	4.00 (17)	4.40 (5)	4.08 (13)	4.67 (9)	4.17 (23)	5.00 (3)	4.40 (15)	4.29 (7)	4.21 (113)	12	0.901
Soil moisture	4.18 (17)	4.20 (5)	4.38 (13)	4.56 (9)	3.91 (23)	5.00 (3)	4.27 (15)	4.29 (7)	4.19 (113)	13	1.005
Nutrient production	4.18 (17)	3.80 (5)	4.23 (13)	4.44 (9)	3.61 (23)	5.00 (3)	4.00 (15)	3.86 (7)	3.99 (113)	25	1.031
Carbon sequestration	3.94 (17)	4.00 (5)	3.92 (13)	4.22 (9)	3.57 (23)	5.00 (3)	4.00 (15)	4.14 (7)	3.94 (113)	29	1.063
Microclimate	4.06 (17)	3.60 (5)	4.00 (13)	4.33 (9)	3.61 (23)	4.67 (3)	4.00 (15)	3.86 (7)	3.87 (113)	32	1.138

Wetland Mitigation

TABLE 19 WETLAND MITIGATION

"Please indicate your level of disagreement or agreement with the following statements:" n* indicated number of respondents who provided answers to the question "Unsure/Don't Know" responses were not included in the mean									
Statement	**N**	**Strongly Disagree (1)**	**Disagree (2)**	**Neither Agree nor Disagree (3)**	**Agree (4)**	**Strongly Agree (5)**	**Unsure/ Don't Know (6)**	**n***	**Mean (sd)**
		Frequency (%)							
Wetland ecosystem services should be considered in wetland mitigation decisions	179	0	0	0.9	20.5	78.6	0	112	4.7 (.439)
Wetland ecosystem services should be considered when deciding where to locate wetland banks, in-lieu-fee, or other mitigation projects	179	0	0.9	0.9	25.2	73.0	0	111	4.7 (.532)
Understanding context (biophysical/social/cultural) is necessary when making wetland mitigation decisions	179	0	1.9	9.4	29.2	59.4	0	106	4.4 (.745)
Wetlands that have public access should have more protection than those on private land	179	9.1	30.0	30.9	17.3	12.7	0	110	2.9 (1.164)
It is okay to fill in a wetland if a wetland of equal biophysical quality replaces it	179	16.2	36.0	22.5	18.9	6.3	0	111	2.6 (1.152)
It is okay to fill in a wetland if it is replaced by a wetland with equal or better bio-physical qualities (e.g. wetland functions) but lesser social and cultural qualities	179	16.1	35.7	26.8	15.2	6.3	0	112	2.6 (1.119)
It is okay to fill in a wetland if it is replaced by a wetland with equal or better social and cultural qualities but lesser bio-physical qualities	179	24.1	49.1	20.5	5.4	0.9	0	112	2.1 (.859)

TABLE 20 WETLAND MITIGATION BY STATE AFFILIATION

"Please indicate your level of disagreement or agreement with the following statements:"

This table shows the question filtered by the state the participant indicated that they primarily worked in. The "other" category contains states with low n, those who work in multiple states, and those who work nationwide. "Unsure/Don't Know" responses are not included in the mean. This table does not reflect the responses of participants who did not provide a state affiliation.
Strongly disagree =1 Disagree=2 Neither agree nor disagree=3 Agree=4 Strongly agree=5

Statement	Idaho	Colorado	Montana	Washington	Wyoming	Other
	Mean (n)					
Wetland ecosystem services should be considered in wetland mitigation decisions	5.0 (3)	4.9 (10)	4.8 (30)	4.8 (15)	4.6 (5)	4.9 (14)
Wetland ecosystem services should be considered when deciding where to locate wetland banks, in-lieu-fee, or other mitigation projects	5.0 (2)	4.8 (10)	4.6 (30)	4.8 (15)	5.0 (5)	4.7 (14)
Understanding context (biophysical/social/cultural) is necessary when making wetland mitigation decisions	4.6 (3)	4.4 (9)	4.5 (26)	4.5 (14)	4.6 (5)	4.2 (13)
Wetlands that have public access should have more protection than those on private land	3.3 (3)	2.9 (10)	2.4 (29)	3.0 (14)	3.8 (5)	3.1 (14)
It is okay to fill in a wetland if a wetland of equal biophysical quality replaces it	2.6 (3)	3.2 (10)	2.4 (30)	3.0 (14)	(5)	2.2 (14)
It is okay to fill in a wetland if it is replaced by a wetland with equal or better bio-physical qualities (e.g. wetland functions) but lesser social and cultural qualities	2.3 (3)	3.1 (10)	2.3 (29)	2.7 (15)	3.2 (5)	2.4 (14)
It is okay to fill in a wetland if it is replaced by a wetland with equal or better social and cultural qualities but lesser bio-physical qualities	2.0 (3)	2.1 (10)	2.0 (29)	2.1 (15)	2.6 (5)	2.0 (14)

TABLE 21 WETLAND MITIGATION BY ORGANIZATION OR AGENCY AFFILIATION

"Please indicate your level of disagreement or agreement with the following statements:"

This table shows the question filtered by the organization or agency that the participant indicated they work for. The "other" category contains respondents who indicated that they work for multiple organizations/agencies, are unemployed, retired, or self-employed. The "Unsure/Don't Know" responses are not included in the mean. Strongly disagree =1 Disagree=2 Neither agree nor disagree=3 Agree=4 Strongly agree=5

Statement	Consulting	Engineering	Federal Government	Local Government	State Government	Tribal Organization/ Agency	Non-governmental organization	University	Other
	Mean (n)								
Wetland ecosystem services should be considered in wetland mitigation decisions	4.9 (17)	4.8 (5)	4.6 (13)	4.7 (9)	4.7 (24)	5.0 (3)	4.8 (15)	4.7 (7)	4.8 (13)
Wetland ecosystem services should be considered when deciding where to locate wetland banks, in-lieu-fee, or other mitigation projects	4.8 (17)	4.8 (5)	4.5 (13)	4.6 (9)	4.7 (23)	5.0 (3)	4.7 (15)	4.8 (7)	4.6 (13)
Understanding context (biophysical/social/cultural) is necessary when making wetland mitigation decisions	4.2 (15)	4.6 (5)	4.5 (12)	4.3 (10)	4.6 (23)	5.0 (2)	4.3 (14)	4.8 (6)	4.1 (13)
Wetlands that have public access should have more protection than those on private land	3.0 (16)	3.4 (5)	2.9 (12)	3.0 (10)	3.0 (24)	3.6 (3)	2.5 (14)	3.0 (7)	2.7 (13)
It is okay to fill in a wetland if a wetland of equal biophysical quality replaces it	3.0 (16)	3.0 (5)	2.8 (13)	2.9 (10)	2.4 (23)	1.6 (3)	2.4 (15)	1.7 (7)	2.4 (13)
It is okay to fill in a wetland if it is replaced by a wetland with equal or better bio-physical qualities (e.g. wetland functions) but lesser social and cultural qualities	3.2 (17)	2.6 (5)	3.0 (13)	2.4 (10)	2.3 (24)	1.6 (3)	2.5 (14)	1.8 (7)	2.3 (13)
It is okay to fill in a wetland if it is replaced by a wetland with equal or better social and cultural qualities but lesser bio-physical qualities	2.2 (17)	2.6 (5)	2.4 (13)	2.6 (10)	1.9 (24)	1.6 (3)	1.8 (14)	1.8 (7)	1.7 (13)

TABLE 22 SMITHVILLE WETLAND MITIGATION

"In the town of Smithville, USA, there is a wetland located near the town's center. A developer has proposed filling this wetland for a residential building. The wetland assessment determined that it provides moderate bird habitat (function) and supports recreational bird watching (service). To make up for the loss of this function, service credits will be purchased from a wetland mitigation bank a number of miles away from Smithville. Ideally, how many miles away from the original Smithville wetland should this wetland bank be located? (choose one)"

n*= indicates number of respondents that provided answers to the question.

N= 179 n*=112 SD= 1.944

Answer choices	Frequency (%)
No more than 5 miles	57.1
No more than 25 miles	17
No more than 50 miles	4.5
No more than 100 miles	1.8
No more than 200 miles	0
Don't Know/Unsure	19.6

3.5. Components of Wetland Protection and Decision-making

TABLE 23 WETLAND PROTECTION AND DECISION-MAKING

"In this section, we ask you to think generally about aspects of natural resource management you feel are most important to wetland protection. Please indicate the level of importance for each of the following items:"

n*= indicates number of respondents that provided answers to the question

Statement	N	Not Important (1)	Slightly Important (2)	Moderately Important (3)	Important (4)	Very Important	n*	Mean (sd)
		Frequency (%)						
Wetland decision-makers' understanding of provisioning and regulating benefits of wetlands	179	0	0	5.4	34.2	60.4	111	4.5 (.599)
Good communication between local/regional planners, federal regulators, and state agencies	179	0	0.9	5.4	35.1	58.6	111	4.5 (.645)
Existing State policies on wetland protection	179	0	2.7	7.3	36.4	53.6	110	4.4 (.746)
Existing Federal policies on wetland protection	179	0	2.8	7.3	39.4	50.5	109	4.3 (.743)
Existing local land-use regulations that have an impact on wetland ecosystem services	179	0.9	1.8	9.2	36.7	51.4	109	4.3 (.800)
Developers/property owners recognizing the potential of wetlands as project amenities through implementing wetland protection requirements	179	0	1.8	8.2	45.5	44.5	110	4.3 (.705)
Public understanding of the ecosystem services provided by wetlands	179	1.8	5.4	11.7	29.7	51.4	111	4.2 (.981)
Changes to policies to make wetland protection more stringent	179	1.8	2.7	12.7	43.6	39.1	110	4.1 (.880)
Wetland decision-makers' understanding of the cultural benefits of wetlands	179	1.8	4.5	16.4	36.4	40.9	110	4.1 (.957)
Using collaborative processes, with applicable stakeholder groups, in wetland mitigation decision-making	179	1.8	9.9	15.3	39.6	33.3	111	3.9 (1.024)
Local governments allowing regulatory trade-offs to incentivize developers/property owners to preserve ecosystem services	179	4.6	4.6	20.2	45.9	24.8	109	3.8 (1.011)
Local governments providing monetary incentives to motivate developers/property owners to preserve ecosystem services	179	3.6	14.5	22.7	33.6	25.5	110	3.6 (1.124)
Including the public in wetland mitigation decision-making	179	5.4	18	36	30.6	9.9	111	3.2 (1.030)
Public access to wetlands	179	6.3	16.2	37.8	34.2	5.4	111	3.1 (.977)

3.6. Wetland Assessment Tools by State

Respondents who indicated that they worked in Idaho, Montana, North Dakota, Washington, or Wyoming most often, were shown a list of ecosystem assessment tools relevant to their state and asked which ones they use. Respondents were then shown a list of those tools and asked which one they use the most often and then answered a series of questions about that specific tool. Each of

these questions are displayed in the tables below, broken down by state. Respondents were asked to write in the name(s) of any other tools they use did not appear on the initial list. Where applicable, these write-in tools are listed below. Respondents were not asked additional evaluation questions about the write-in tools.

3.7.1. Idaho

The following questions were answered by respondents who indicated that they primarily work in the state of Idaho.

TABLE 24 IDAHO AQUATIC SYSTEM ASSESSMENT TOOLS

"You specified that you primarily work in Idaho. Please indicate whether or not you use the following aquatic system assessment tools in that state:"		
Tool	**Yes**	**No**
MWAM	3	2
Washington State Wetland Function Assessment Method	2	3
HGM Northern Rockies Riverine Floodplain	1	3
Floristic Quality Assessment	0	4
Idaho Interim Functional Assessment for Low-gradient Slope Wetlands	0	4
Idaho Interim Functional Assessment for Riverine Wetlands on 2nd or 3rd Order Streams	0	4
Idaho's Landscape Wetland Assessment Tool	0	4
ID-RAM	0	3
NWCA	0	4
Oregon Rapid Wetland Assessment Method	0	4
PFC	0	4
Wetland Ecosystem Services Protocol for the United States	0	4

TABLE 25 IDAHO TOOL USED MOST

"You specified that you use the aquatic system assessment tools listed below. Please select the tool you used the most in the last 12 months."	
Tool	**Frequency**
MWAM	2
Washington State Wetland Function Assessment Method	2

TABLE 26 IDAHO AQUATIC SYSTEM ASSESSMENT TOOL EVALUATION

Respondents' level of level of disagreement or agreement statements with the following statements regarding the aquatic assessment tool they use most often for aquatic system assessment. (strongly disagree=1 to strongly agree=5)		
	Tool	
	MWAM	Washington State Wetland Function Assessment Method
Statement	Mean (n)	Mean (n)
Produces replicable results	4.0 (1)	4.0 (1)
Outputs are clear and easy to understand	4.0 (1)	4.0 (1)
Can be applied across multiple spatial scales	4.0 (1)	4.0 (1)
Tool methods are well documented in user manuals	4.0 (1)	4.0 (1)
I trust the data produced by the tool	4.0 (1)	4.0 (1)
I use the data produced by the tool	4.0 (1)	4.0 (1)
The stakeholders I work with trust the outputs of the tool	4.0 (2)	4.0 (1)
User interface is easy to navigate	3.5 (2)	4.0 (1)
Software is easy to access	3.0 (1)	4.0 (1)
Use is rapid (less than 4 hours in the field with 2 people)	3.0 (2)	4.0 (1)
Applicable for mitigation monitoring	3.0 (2)	4.0 (1)
Adequately distinguishes across a range of conditions	2.5 (2)	4.0 (1)
Sensitive enough to detect impacts from various stressors	2.5 (2)	4.0 (1)
Adequately captures importance of various functions at assessment locations	2.0 (2)	4.0 (1)
Applicable for wetland mitigation design	2.0 (2)	4.0 (1)

3.7.2. Montana

The following questions were answered by respondents who indicated that they primarily work in the state of Montana.

TABLE 27 MONTANA AQUATIC SYSTEM ASSESSMENT TOOLS

"You specified that you primarily work in Montana. Please indicate whether or not you use the following aquatic system assessment tools in that state:"		
Tool	Yes	No
Bureau of Land Management Properly functioning conditions for lentic and lotic systems (PFC)	23	10
Montana Department of Environmental Quality (DEQ)	21	19
Montana Wetland Assessment Method (MWAM)	20	17
Montana Natural Heritage Program Montana Ecological Integrity Assessment protocol (EIA)	16	23
Natural Resource Conservation Service Riparian Assessment (NRCS)	17	22
HGM Northern Rockies Riverine Floodplain	12	25
National Wetland Condition Assessment (NWCA)	9	22
Floristic Quality Assessment	8	24
HGM Intermontane Prairie Pothole	3	28
HGM Prairie Pothole	3	25
USGS Prairie Pothole Wetland Condition Assessment	2	26

TABLE 28 MONTANA TOOL USED MOST

"You specified that you use the aquatic system assessment tools listed below. Please select the tool you used the most in the last 12 months."	
Tool	Frequency
Montana Department of Environmental Quality	11
Montana Wetland Assessment Method (MWAM)	11
Bureau of Land Management Properly functioning conditions for lentic and lotic systems (PFC)	7
Montana Natural Heritage Program Montana Ecological Integrity Assessment protocol (EIA)	6
Natural Resource Conservation Service Riparian Assessment (NRCS)	3
HGM Northern Rockies Riverine Floodplain	1
National Wetland Condition Assessment (NWCA)	1

TABLE 29 OTHER TOOLS USED

Do you use any other aquatic system assessment tools that we did not mention?"
Applied River Morphology - Rosgen
Montana Riparian Classification - Hansen
Hankin and Reeves - USFS
BEHI
Greenline
HydroLab HL7
I have used a variety of tools over the years -- they come and go. I recall using one supplied by the NRCS
MNHP reports; more focused on extent than condition of wetlands
MT stream mitigation procedure
National wetland inventory
Montana Natural Heritage Riparian/Wetland mapping
National Hydrologic Database
PIBO
PM2 (Currently under development by DEQ Watershed Protection Section)
REM (recently developed by DEQ Watershed Protection Section)
Rosgen Level II geomorphology
Routine wetland delineation
USDA Forest Service Minimum Inventory Monitoring
We rely on our partners, so whatever they use.

TABLE 30 MONTANA AQUATIC SYSTEM ASSESSMENT TOOL EVALUATION

Respondents' level of level of disagreement or agreement statements with the following statements regarding the aquatic assessment tool they use most often for aquatic system assessment.

(strongly disagree=1 to strongly agree=5)

	Tool					
Statement	(MT-DEQ) Mean (n)	(MWAM) Mean (n)	(PFC) Mean (n)	(MTNH-EIA) Mean (n)	(NRCS) Mean (n)	(HGM) Mean (n)
Tool methods are well documented in user manuals	4.67 (6)	4.10 (10)	4.00 (5)	4.00 (1)	4.50 (2)	4.00 (1)
The stakeholders I work with trust the outputs of the tool	4.29 (7)	4.33 (9)	3.60 (5)	4.00 (1)	4.00 (1)	4.00 (1)
I trust the data produced by the tool	4.25 (8)	3.90 (10)	3.80 (5)	4.00 (2)	4.00 (2)	5.00 (1)
I use the data produced by the tool	4.13 (8)	4.60 (10)	3.80 (5)	3.50 (2)	4.00 (2)	5.00 (1)
Produces replicable results	4.00 (7)	4.00 (10)	2.80 (5)	4.50 (2)	4.00 (2)	5.00 (1)
Sensitive enough to detect impacts from various stressors	4.00 (7)	3.20 (10)	2.80 (5)	4.00 (2)	4.00 (2)	4.00 (1)
Adequately captures importance of various functions at assessment locations	4.00 (7)	3.60 (10)	3.40 (5)	4.00 (2)	3.50 (2)	4.00 (1)
Adequately distinguishes across a range of conditions	3.86 (7)	3.50 (10)	3.20 (5)	4.00 (2)	4.00 (2)	5.00 (1)
Outputs are clear and easy to understand	3.71 (7)	4.30 (10)	4.00 (5)	4.50 (2)	4.00 (2)	4.00 (1)
Can be applied across multiple spatial scales	3.71 (7)	4.11 (9)	3.60 (5)	4.50 (2)	2.00 (2)	4.00 (1)
User interface is easy to navigate	3.50 (6)	4.11 (9)	3.00 (3)	4.00 (2)	4.00 (1)	4.00 (1)
Use is rapid (less than 4 hours in the field with 2 people)	3.20 (5)	4.30 (10)	4.00 (5)	4.50 (2)	3.50 (2)	5.00 (1)
Applicable for mitigation monitoring	3.20 (5)	3.70 (10)	2.60 (5)	3.50 (2)	2.00 (1)	5.00 (1)
Applicable for wetland mitigation design	3.00 (6)	3.33 (9)	2.60 (5)	No response (0)	1.00 (1)	5.00 (1)
Software is easy to access	3.00 (5)	4.13 (8)	1.00 (1)	4.00 (1)	4.00 (1)	5.00 (1)

3.7.3. North Dakota

The following questions were answered by respondents who indicated that they primarily work in the state of North Dakota. Because there were no "yes" answers to the below question, the North Dakota respondents were not offered the "which tool do you use the most" and "please rate your level of agreement/disagreement with the following statements about the tool" questions.

TABLE 31 NORTH DAKOTA AQUATIC SYSTEM ASSESSMENT TOOLS

"You specified that you primarily work in North Dakota. Please indicate whether or not you use the following aquatic system assessment tools in that state:"		
Tool	**Yes**	**No**
HGM Prairie Pothole	0	1
Index of Plant Community Integrity (IPCI)	0	1
Landscape Wetland Condition Analysis Model (LWCAM)	0	1
North Dakota Rapid Assessment Method (NDRAM)	0	1
NWCA	0	1
PFC	0	1
USGS Prairie Pothole Wetland Condition Assessment	0	1

3.7.4. Washington

The following questions were asked of and answered by respondents who indicated that they primarily work in the state of Washington.

TABLE 32 WASHINGTON AQUATIC SYSTEM ASSESSMENT TOOLS

"You specified that you primarily work in Washington. Please indicate whether or not you use the following aquatic system assessment tools in that state:"		
Tool	**Yes**	**No**
Washington State Wetland Rating System for Western Washington	21	2
Washington State Wetland Rating System for Eastern Washington	12	5
Methods for Assessing Wetland Functions - Riverine and Depressional Wetlands in the Lowlands of Western Washington	10	7
Methods for Assessing Wetland Functions -Depressional Wetlands in the Columbia Basin of Eastern Washington	2	11
Properly Functioning Conditions for Lentic Systems	0	13
Properly Functioning Conditions for Lotic Systems	0	13

TABLE 33 WASHINGTON TOOL USED MOST

"You specified that you use the aquatic system assessment tools listed below. Please select the tool you used the most in the last 12 months."	
Tool	**Frequency**
Washington State Wetland Rating System for Western Washington	21

TABLE 34 OTHER TOOLS USED

"Do you use any other aquatic system assessment tools that we did not mention?"
Calculating credits and debits for compensatory mitigation in wetlands of western Washington, Dept. of Ecology 2012
Cowardin classification system, HGM Classification system; USACE manual and regional supplements; Hydric Soil Indicators manual; various Dept. of Ecology guidance reports and manuals...
Ecological Integrity Assessment
I have used to HGM Assessment for Wetlands and Riparian sites in Oregon. And have also used the Wetlands Function Characterization Tool for Linear Projects (WSDOT)
ORWAP
ORWAP (Oregon), SFAM (Oregon)
SVAP
USACE wetland data sheets
WSDOT BPJ Tool

TABLE 35 WASHINGTON AQUATIC SYSTEM ASSESSMENT TOOL EVALUATION

"You specified that you use Washington State Wetland Rating System for Western Washington the most often for aquatic system assessment. Please indicate your level of disagreement or agreement with the following statements regarding that aquatic assessment tool."							
	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)	Don't know (6)	
Statement	Frequency (n=21)						Mean
I use the data produced by the tool	0	1	0	5	9	3	4.7
Software is easy to access	1	1	4	4	0	7	4.3
Use is rapid (less than 4 hours in the field with 2 people)	0	1	2	7	8	0	4.2
User interface is easy to navigate	0	0	2	12	3	0	4.1
Outputs are clear and easy to understand	1	1	0	9	7	0	4.1
Tool methods are well documented in user manuals	1	2	0	6	9	0	4.1
The stakeholders I work with trust the outputs of the tool	1	0	1	10	6	0	4.1
Produces replicable results	0	3	0	10	5	0	3.9
I trust the data produced by the tool	0	3	1	9	5	0	3.9
Can be applied across multiple spatial scales	1	1	2	9	3	1	3.9
Adequately distinguishes across a range of conditions	0	3	3	8	2	2	3.8
Adequately captures importance of various functions at assessment locations	0	4	1	10	3	0	3.7
Applicable for wetland mitigation design	2	0	3	13	0	0	3.5
Sensitive enough to detect impacts from various stressors	2	2	8	5	0	1	3.1
Applicable for mitigation monitoring	3	3	4	7	1	0	3.0

3.7.5. Wyoming

The following questions were answered by respondents who indicated that they primarily work in the state of Wyoming.

TABLE 36 WYOMING AQUATIC SYSTEM ASSESSMENT TOOLS

"You specified that you primarily work in Wyoming. Please indicate whether or not you use the following aquatic system assessment tools in that state:"		
Tool	Yes	No
PFC	4	1
MWAM	3	2
HGM Northern Rockies Riverine Floodplain	2	2
NWCA	1	3
Wyoming Rapid Wetland Assessment Method	1	3
The Colorado Ecological Integrity Assessment	0	4

TABLE 37 OTHER TOOLS USED

"Do you use any other aquatic system assessment tools that we did not mention?"
FAC Wet (Colorado) Wyoming Stream Quantification Tool
Wadable Streams Evaluation Field Data Form
Wyoming RIVPACS and WSII; Rosgen Predictive Level Assessment
Wyoming Stream Quantification Tool

TABLE 38 WYOMING TOOL USED MOST

"You specified that you use the aquatic system assessment tools listed below. Please select the tool you used the most in the last 12 months."	
Tool	**Frequency**
MWAM	2
PFC	2
NWCA	1

TABLE 39 WYOMING AQUATIC SYSTEM ASSESSMENT TOOL EVALUATION

Respondents' level of level of disagreement or agreement statements with the following statements regarding the aquatic assessment tool they use most often for aquatic system assessment.

(strongly disagree=1 to strongly agree=5)

	Tool		
	MWAM	**NWCA**	**PFC**
Statement	**Mean (n)**	**Mean (n)**	**Mean (n)**
Software is easy to access	No response (0)	No response (0)	No response (0)
Can be applied across multiple spatial scales	5.0 (2)	No response (0)	3.0 (2)
Adequately captures importance of various functions at assessment locations	5.0 (2)	4.0 (1)	3.5 (2)
Outputs are clear and easy to understand	4.5 (2)	No response (0)	2.5 (2)
Applicable for wetland mitigation design	4.5 (2)	No response (0)	2.0 (2)
Tool methods are well documented in user manuals	4.5 (2)	5.0 (1)	3.5 (2)
User interface is easy to navigate	4.0 (2)	No response (0)	5.0 (1)
Use is rapid (less than 4 hours in the field with 2 people)	4.0 (2)	No response (0)	4.5 (2)
Produces replicable results	4.0 (2)	No response (0)	3.0 (2)
Adequately distinguishes across a range of conditions	4.0 (2)	No response (0)	3.5 (2)
Applicable for mitigation monitoring	4.0 (2)	No response (0)	3.0 (2)
I trust the data produced by the tool	4.0 (2)	5.0 (1)	3.5 (2)
I use the data produced by the tool	4.0 (2)	4.0 (1)	3.0 (2)
Sensitive enough to detect impacts from various stressors	3.5 (2)	4.0 (1)	3.5 (2)
The stakeholders I work with trust the outputs of the tool	3.5 (2)	5.0 (1)	3.0 (2)