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Task #2: Update Spring Feature Class Based on IDWR Water Right Point of Diversion Data

COOPERATIVE AGREEMENT NO. G12AS00003

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Introduction:

Water, a scarce resource in Idaho and through the Western U.S., is important to many competing water users including the agricultural, urban, recreational, and fisheries sectors. Although Idaho has over 95,000 miles of streams and rivers, and more than 2,000 natural lakes, precipitation is low and water demand is high.[i] Annual precipitation accounts of over 75 percent of Idaho's water supply[ii] but, Idaho's average annual precipitation is 22 inches per year with the Snake River Basin averaging 18 inches per year[iii].

Springs provide and important link between surface water and ground water resources. Although groundwater comprises only 22 percent of Idaho's total water use, it accounts for nearly 95 percent of Idaho's drinking water.[iv] Springs are essential for keeping Idaho's rivers flowing. Natural discharge from the Eastern Snake Plain Aquifer (ESPA) via springs flowing into the Snake River near Hagerman, contributes 70 percent of the Snake River flow between the Milner Dam and King Hill.[v] An updated spring dataset will be useful for hydrologic analysis and modeling, correlation and verification of water right data, and environmental quality monitoring.

The Idaho Department of Water Resources (IDWR) is close to completing an extensive adjudication which includes nearly two thirds of the state. During this process, points of diversion (PODs) were identified. The source of these PODs could be streams, dams, canals, and springs. Water Right PODs can be digitized (a point was placed on the map using aerial photography as a guide), GPS-ed (a point was placed on the map using coordinates from a GPS unit) or nominal (a point was placed in the middle of a 40 acre tract [QQ] or a 10 acre tract [QQQ]).

Water rights are divided into different business processes depending on what stage of the process they are in and whether the water right is involved in water right adjudication. A Water Right is usually a Permit first or, if it is involved in water right adjudication, a Recommendation. There are other stages and processes, but only PODs in the IDWR Permit, Recommendation and Water Right process stages have been verified or at least examined.

In this project, PODs with a source of spring, springs, or a named spring in the IDWR Permit, Recommendation and Water Right process stages were analyzed.

Methods & Results:

The first step was to select named and unnamed springs from Permits, Recommendations and Water Rights process databases. This was done in a two step selection process. The first selection was with a wildcard query of "Spring". The selection of points where some type of reference was made to springs in the conditions portion of a water right.

If the source ended in the word "creek", for example "Double Spring Creek", it was deleted from the selection. These were deleted since they were actually creeks, not springs.

The spring selections of the processes Permits, Recommendations and Water Rights were exported into separate ArcGIS shapefiles.

Four fields were added to the table of each shapefile:

Comments – stores any information pertaining to the POD, NHD point or GNIS point close to the POD

Conf – a confidence level of the POD's location accuracy

To_NHD – points that could be added to the NHD

Add_name – spring names that could be added to GNIS

Each POD in each table was zoomed to and reviewed for accuracy starting with GPS'd points, then digitized points. PODs with a nominal location were not reviewed. The POD points were placed on top of base layers such as the DRG (topo maps), aerial photos from 2011, 2009, 2004 and, when available for the area, 2006. ESRI Imagery was also used. Each point was reviewed for location accuracy and given a Confidence level number from 1-3.

A point received the highest confidence level (3) if a spring could be clearly seen on any of the above base layers and/or the spring name was on the DRG. These were marked for inclusion in the NHD by a "y" (for yes) in the "to_NHD" field. If an area on one or more of the base layers looked like it might be a spring or if the POD might need to be moved it was given a confidence level of 2. Those areas where there looked to be multiple springs in the area or there was evidence water was present but the actual spring was not visible were also given a Confidence level of 1. There was many more Confidence level 1's primarily because springs were not visible under trees. Confidence level 0 was for nominal points.

Once the location of the point was established as accurately as possible, notes were placed in the Comments Field. If a point should be moved, appropriate information such as feet, direction, NHD ID and GNIS ID were recorded in the Comments field. No point was recommended to be moved outside of the QQ or QQQ that it was described in on the Water Right. The NHD Permanent Identifier and/or the GNIS ID were also added to the Comments Field if POD's were within 5 meters of an NHD or GNIS point. NHD and GNIS points were also evaluated to see if they were in the correct location. If they needed to be moved to the POD location, a note was added to the Comments field.

Table 1: Number of POD records in each confidence level

Process	Conf. 3	Conf 2	Conf. 1	Conf. 0
Permits	145	261	29	374

Recommendations	344	640	11	490
Water Rights	2652	2724	364	27293

The PODs that were identified as confidence level 3 were reviewed again. PODs that could be used to identify new springs in the NHD were identified. The number of POD records identified that could potentially provide new spring locations to the NHD is summarized in Table 2.

Table 2: Spring PODs not in the NHD		
Process	# PODs	Conf. Level
Permits	134	3
Recommendations	318	3
Water Rights	2073	3

Names of springs were also reviewed. If the spring was visible on the DRG and a name was included on the DRG or in the Water Right, the name was recorded in the Comments field and a "y" (for yes) was added to the add_name field for inclusion in GNIS. After the initial POD review, several PODs were identified as potential contributors to new spring locations and names to the NHD.

Number of POD records identified that could potentially provide new spring names to GNIS is summarized in Table 3.

Table 3: PODs with names not in GNIS	
Process	# PODs
Permits	67
Recommendations	16
Water Rights	1920

An additional 1552 Water Right, 35 recommendation, and 53 permit records were reviewed. These records had to be analyzed separately because the source information was in a comment field of the right instead of the source field. After review, the source comments were not found to contribute additional information.

Discussion and Conclusions:

Issues and Challenges

1) Tree Shadows

a. It was very difficult to distinguish between water and tree shadows. It helped a little to look at the direction of other tree shadows in the area. If the area in question did not seem to have any trees around it capable of making that particular shadow, then water was more likely the choice. Tree shadows are also "fuzzy" looking on the outside edge of the shadow whereas a water edge is smoother. If a tree was shadowing the water it was nearly impossible to tell the difference with any degree of certainty.

2) Determining Spring Location
    a. It was also difficult to tell where the actual spring was in a row of vegetation. The vegetation indicated a spring, or at least that water was present but the exact location of the spring was hidden.
3) Variation in Imagery
    a. The aerial photography should be looked at from several different scales from 1:400 to 1:2000 or more. Some springs were only visible around 1:400 and others are visible only around 1:2000. At 1:400 every black spot on the photography looks like a small spring so it was necessary to zoom out to see if other areas nearby had the same black spot. A large number of things can look like a spring at one scale but clearly are not a spring at a different scale.

Summary of Adjustments to Be Made To the NHD

After Points of Diversion (PODs) that could be used to update the NHD were identified, the process datasets were merged together then dissolved in order to remove stacked PODs. Multiple water rights at the same point of diversion have their own shape in a process. This practice results in stacked PODs at a single location. 2174 unique spring locations that could be used to update the NHD were identified. The new spring locations are spread out among 75 different SubBasins (HUC-8) with the most in the Clearwater (17060306). A summary of the number of potential new spring locations by SubBasin(HUC-8) is provided in Appendix A.

In order to identify unique names that could be added to GNIS, he PODs that were identified to have names that are not currently in GNIS were spatially joined to the SubBasin (HUC-8) each POD was in. The number of unique names per SubBasin was then calculated. Names were sorted by SubBasin because the same name may be attached to several different springs. For example, any one state may have many Antelope Springs. As a result, 1540 names were identified. A summary of the number of potential new spring names by SubBasin(HUC-8) is provided in Appendix B. The locations of the 1540 names were also reviewed. 651 unique names with a good location have been identified as most likely to gain GIS approval. Further research is

required in order to meet GNIS submission standards for each name. Once the GNIS standards are met for a name, it will be submitted to GNIS for future inclusion into the NHD.

As a SubBasin is checked out and edited by the Idaho Data Steward or staff, the new springs and names will be added to the NHD.

Appendix:

A. Summary of the number of potential new spring locations by SubBasin(HUC-8)

# Locations	HUC_8	HU_8_Name
236	17060306	Clearwater
132	17040212	Upper Snake-Rock
94	17040208	Portneuf
85	17010304	St. Joe
85	17050124	Weiser
74	17010303	Coeur d'Alene Lake
71	17060203	Middle Salmon-Panther
70	17060204	Lemhi
70	17060209	Lower Salmon
67	17040220	Camas
63	17050122	Payette
61	17010305	Upper Spokane
52	17010306	Hangman
46	17050201	Brownlee Reservoir
46	17060210	Little Salmon
43	17040204	Teton
41	17040211	Goose
40	17050103	Middle Snake-Succor
39	17060201	Upper Salmon
35	17040210	Raft
34	17040205	Willow
34	17040219	Big Wood
34	17060305	South Fork Clearwater
33	16010202	Middle Bear
33	17050123	North Fork Payette
31	16010201	Bear Lake
31	17050113	South Fork Boise

28	17040203	Lower Henrys
28	17050114	Lower Boise
26	17040209	Lake Walcott
26	17050112	Boise-Mores
26	17060202	Pahsimeroi
25	17040218	Big Lost
24	17050108	Jordan
23	17040207	Blackfoot
22	17040202	Upper Henrys
21	17040213	Salmon Falls
20	17010214	Pend Oreille Lake
13	17060304	Middle Fork Clearwater
12	17040104	Palisades
12	17040105	Salt
12	17050104	Upper Owyhee
12	17050115	Middle Snake-Payette
11	17010302	South Fork Coeur d'Alene
11	17040206	American Falls
11	17040221	Little Wood
11	17060101	Hells Canyon
10	17050101	C.J. Strike Reservoir
9	17040215	Medicine Lodge
9	17040217	Little Lost
8	17010104	Lower Kootenai
8	17060308	Lower North Fork Clearwater
7	16010204	Lower Bear-Malad
7	17040214	Beaver-Camas
7	17060208	South Fork Salmon
6	17040201	Idaho Falls
5	17050102	Bruneau
4	17010301	Upper Coeur d'Alene
4	17050107	Middle Owyhee
4	17060108	Palouse
4	17060207	Middle Salmon-Chamberlain
3	17010105	Moyie
3	17010215	Priest
3	17050120	South Fork Payette
3	17050121	Middle Fork Payette
3	17060103	Lower Snake-Asotin
3	17060206	Lower Middle Fork Salmon
2	16010102	Central Bear

2	17060205	Upper Middle Fork Salmon
1	16020309	Curlew Valley
1	17010213	Lower Clark Fork
1	17050111	North and Middle Forks Boise
1	17060301	Upper Selway
1	17060302	Lower Selway
1	17060303	Lochsa

B. Summary of Number of Potential New Spring Names By Basin

# Names	HUC_8	HU_8_Name
274	17050113	South Fork Boise
137	17060101	Hells Canyon
110	17060209	Lower Salmon
107	17050201	Brownlee Reservoir
78	17040212	Upper Snake-Rock
63	17060201	Upper Salmon
60	17060210	Little Salmon
50	17050112	Boise-Mores
43	17040208	Portneuf
39	17050122	Payette
37	17050124	Weiser
37	17060204	Lemhi
26	16010202	Middle Bear
26	17040210	Raft
26	17050103	Middle Snake-Succor
25	16010201	Bear Lake
25	17040218	Big Lost
24	17040211	Goose
23	17050102	Bruneau
21	17060203	Middle Salmon-Panther
19	17040213	Salmon Falls
17	17040215	Medicine Lodge
17	17040219	Big Wood
15	17040204	Teton
13	17040203	Lower Henrys
13	17040220	Camas
13	17050108	Jordan
13	17050114	Lower Boise

13	17060202	Pahsimeroi
10	17040104	Palisades
10	17050101	C.J. Strike Reservoir
9	17040202	Upper Henrys
8	17040209	Lake Walcott
8	17040217	Little Lost
8	17040221	Little Wood
8	17060207	Middle Salmon-Chamberlain
8	17060306	Clearwater
6	16020309	Curlew Valley
6	17010303	Coeur d'Alene Lake
6	17050123	North Fork Payette
5	17010104	Lower Kootenai
5	17040206	American Falls
5	17040207	Blackfoot
5	17050104	Upper Owyhee
5	17050107	Middle Owyhee
5	17060208	South Fork Salmon
5	17060305	South Fork Clearwater
4	16010204	Lower Bear-Malad
4	17040105	Salt
4	17040205	Willow
4	17040214	Beaver-Camas
4	17040216	Birch
4	17060301	Upper Selway
3	17010214	Pend Oreille Lake
3	17040201	Idaho Falls
3	17050120	South Fork Payette
3	17060205	Upper Middle Fork Salmon
3	17060302	Lower Selway
2	17050111	North and Middle Forks Boise
2	17050121	Middle Fork Payette
2	17060108	Palouse
2	17060307	Upper North Fork Clearwater
1	17010105	Moyie
1	17010213	Lower Clark Fork
1	17010215	Priest
1	17010216	Pend Oreille
1	17010305	Upper Spokane
1	17060206	Lower Middle Fork Salmon
1	17060308	Lower North Fork Clearwater

End Notes:

[ii] http://www.idwr.idaho.gov/waterboard/WaterPlanning/PDFs/2010_Resource-Inventory.pdf p. 8

[iii] http://www.idwr.idaho.gov/waterboard/WaterPlanning/PDFs/2010_Resource-Inventory.pdf p. 20

[iv] Mahler, R.L. & Van Steeter, M. M., *Idaho's Water Resource, Current Information Series No. 887.* University of Idaho. Retrieved January 15, 2013 from http://www.uiweb.uidaho.edu/wq/wqpubs/cis887.html

[v] http://www.idwr.idaho.gov/waterboard/WaterPlanning/PDFs/2010_Resource-Inventory.pdf p. 34