Saint Mary's University OF MINNESOTA

TNC Contract Number:
AKFO-070114a-JD

Systematic Validation and Quality Control of Digital Hydrography in the Mat-Su Basin

Status Report 06/26/14 – 08/31/14

- **Project(s) Title:** Systematic Validation and Quality Control of Digital Hydrography in the Mat-Su Basin
  - **Contract #:** AKFO-070114a-JD

- **Contractor:** Saint Mary's University of Minnesota, GeoSpatial Services
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- **Project Area (if applicable):** The Matanuska-Susitna Basin is a large, 25,500 square mile watershed area in south-central Alaska. The basin is approximately the combined size of Vermont, New Hampshire and Massachusetts (see attached map). In the fall of 2013, The Nature Conservancy initiated a hydrographic mapping and analysis program in the Mat-Su basin using newly available data to map all lakes, rivers and streams to a level of quality and technical specification suitable for ingestion into the USGS National Hydrographic Database. By meeting federal standards, this mapping program is freely available for use by government agencies, private and public organizations to support decisions which affect Mat-Su freshwater resources.
  - **Project Extent to be Mapped:** 16.3 M acres, +/- 25,500 square miles
  - **Website:**http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/alaska/placesweprotect/matanuska-susitna-basin.xml
  - **Other Project Area Comments:**

- **Websites**
  - **Contractor Website:** http://www.geospatialservices.org/

- **Agency**
  Website: http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/alaska/index.htm

- **Accomplishments Narrative**
  - **Administrative:** Administrative duties during this period of the contract were focused on: developing a comprehensive scope of work for the various aspects of the project; preparing a contract for delivery of services; interacting with project partners to secure commitments for project support and funding; and; finalizing field logistics for a week long data validation field trip to the Mat-Su Basin in mid-July, 2014. Additional activities included: assigning project responsibilities; ensuring that project activities were being completed on time and within budget; preparation of the draft interim reports; and, reconciling project expense.

    Numerous discussions and conferences calls were arranged during the period covered by this report in order to define the scope of work, validate mapping procedures, review sample hydrography data, assemble collateral spatial layers for incorporation in the mapping protocols and prepare for upcoming project milestones. Specific decisions during this period included:
    - Collateral data to be used in support of hydrography validation will include: SDMI IfSAR elevation data (DTM, DSM and ORI); SDMI SPOT5 spectral imagery; Mat-Su LiDAR based DSM and DTM; Derived Hillshade; Contours; Soils; Mat-Su LiDAR reflectance imagery; Mat-Su LiDAR mission spectral imagery; any existing Mat-Su basin stream, lake and culvert datasets; existing 2D break line data from IfSAR and LiDAR data collection processes; current AWC data from Alaska Fish and Game; PSWCD-USFWS Centerline Data; Reach possible flow; DNR Hydro; existing Mat-Su Basin wetland data (NWI, Gracz).
    - Attempts will be made classify single line streams into the following categories: perennial, intermittent and ephemeral. It was determined through the field validation exercise that most, if not all, streams in the basin are characterized by intermittent and perennial flow due to rainfall and snowmelt amounts. As a result, the ephemeral categorization will be reserved for the very limited number of streams that can truly be established to have ephemeral flow.

  - **Data and Geodatabases:** Primary and collateral data layers were provided to GSS via hard drive delivery from TNC in early July 2014. These datasets were loaded on servers at Saint Mary's University and prepped for future project activities.

- **Field Validation:** The week of July 14-18 SMU staff were in Alaska conducting fieldwork with the Palmer Soil and Water Conservation District personnel. We split our efforts to examine areas of high terrain, flat wetlands, and urbanization to get an understanding of the terrain and the validity of the flow network. Although the main focus at this point is the Goose Bay watershed, field work was conducted in a variety of locations. The team also had the opportunity to do some helicopter work. This trip originated from Talkeetna airport. Field sites were entered in the GPS to navigate from site to site. While in the field SMU used maps to document what was occurring at the field sites.

- **Goose Bay Trial:** The maps and knowledge gained in the field are being used to validate, edit and add to the linear network in the Goose Bay watershed. Many of the edits to the linears are done, approximately 90%. SMU has sent additional field points to the PSWCD to verify questions that came up while editing. At this time we are waiting for feedback on those areas. In the meantime SMU is working on the field reports.

- **Challenges, Lessons Learned, Opportunities for Improvement:** In general, the derived flowlines represent a reasonably accurate depiction of the surface hydrology. In some cases surface flow is over-represented and in others valid streams have been missed. We have seen some anomalies in the flow network as it corresponds to the elevation data. This was somewhat expected in the flat areas, however, it is being seen in elevated areas and along river corridors. In one example below (Attachment 3) the yellow arrow points to a valid flowline that was not captured. In addition, we have found numerous locations where the derived hydrography does not follow slope breaks in the contours derived from the composite digital elevation model (DEM). These specific issues will be reviewed in an upcoming conference call with TNC once edits to the Goose Bay trial watershed are complete.

- **Maps (screen capture, link, or attach graphics (jpg preferred)**
  - **Project Study Area and Field Photos:**
    - See attached graphics below

- **Outreach**
  - **Presentations:** An overview of the project was included in a webinar presentation to Association of State Wetland Managers Wetland Mapping Consortium on 06/25/14.

- **Budget**
  - **Current budget allocated for the project:** $31,475.00

- **Expenditures as of 07/31/2014**
  - **Federal Expenditures Invoiced:** $18,497.69
  - **Match Expenditures Invoiced:** $0.00
  - **Accumulated Time to Invoice:** +/- $10,000.00
- **Budget Remaining as of 01/31/2014**
  - **Federal Expenditures:** $31,030.02
  - **Match Expenditures:** $0.00
- **FTE's employed working on the project:** 3
- **Payments Received from NMED**
  - $18,497.69 **Date:** TBD
- **Other Budget Comments and Forecast**
  - Next invoice anticipated for 08/31/2014

- **Final Comments/Suggestions:** The Mat-Su hydrographic mapping program consists of two phases; a modeling phase and a validation phase. The modeling phase employs newly-available LiDAR and IfSAR elevation data to create an elevation-derived, synthetic network of hydrologic flowlines, or streams, in the Mat-Su basin. The validation phase consists of a third party, independent photogrammetric review of modeled streams coupled with field observations which ensure that modeled streams best reflect actual ground conditions. Once validated through these processes, the Mat-Su stream network will be conflated to the USGS NHD and AK Hydro data schema following USGS specifications for 1:24,000 scale mapping.

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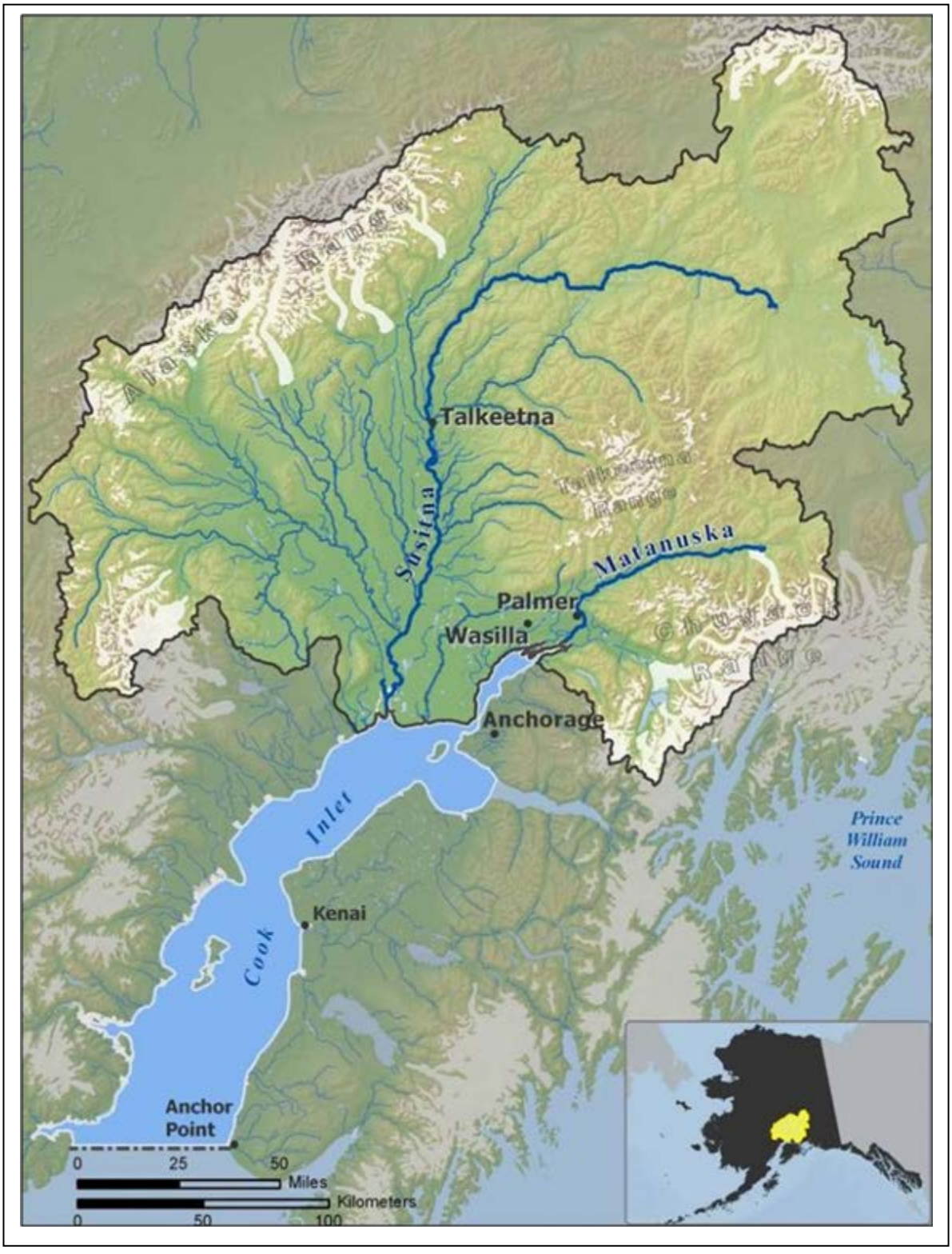
Attachment 1:
Project Study Area Map



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Attachment 2:
Field Trip Photo Samples

Attachment 3:
Challenges

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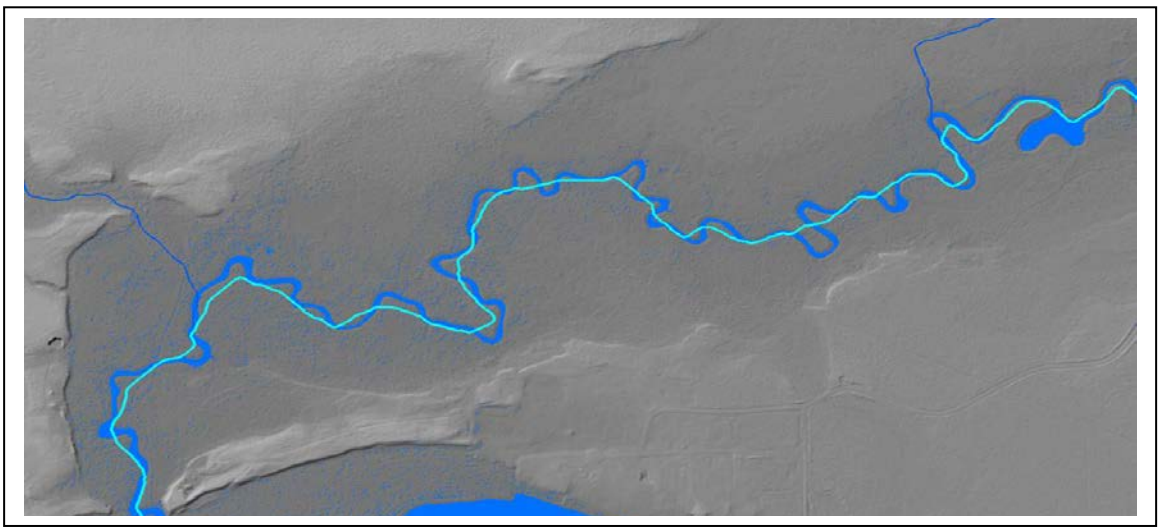

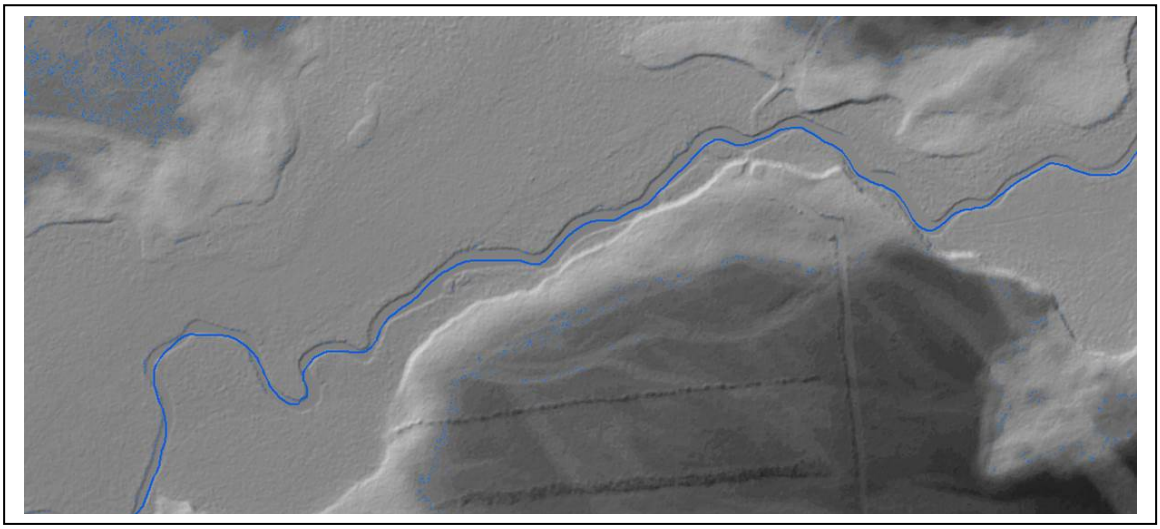

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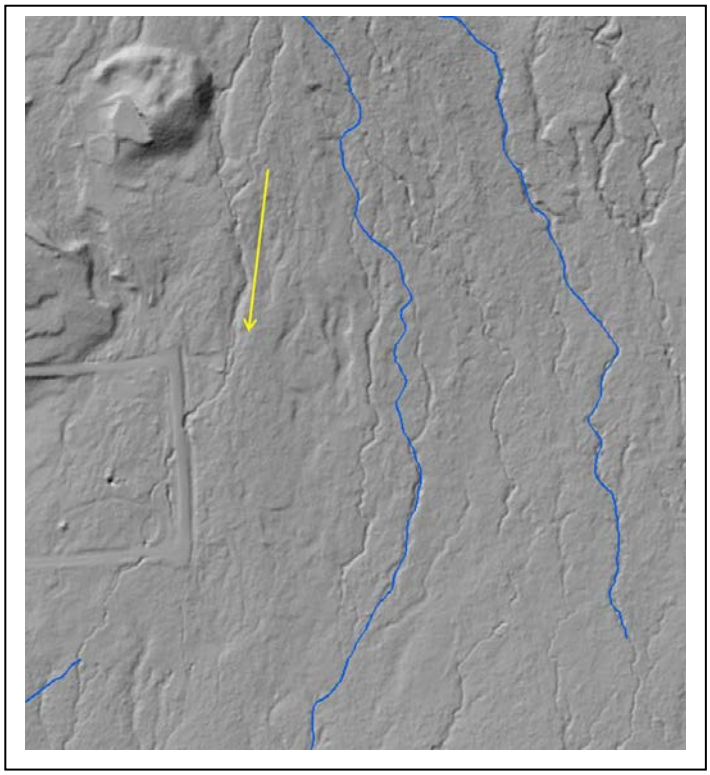

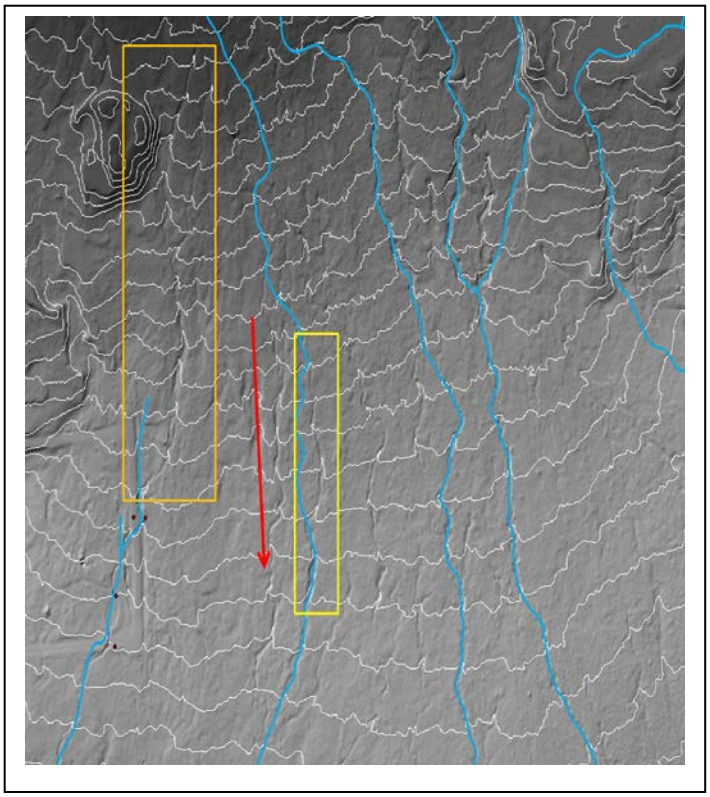

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Palmer Soil & Water Conservation District
101 W. Arctic Ave. Suite D. Palmer Alaska 99645
Phone: (907) 745-1441 • Fax: (907) 745-1443

Date: August 29th, 2014
Reporting Period: 7/1/14 – 8/29/14 Project Update
Project Title: 2014 Matanuska-Susitna Basin Hydrographic Mapping Program: Field Validation of Elevation-Derived Streams and Fish Passage Barriers

The PSWCD MAT-Su Hydro Mapping field crew (Primarily Gooseberry Peter and Rachel Bobka) has surveyed modeled streams across the valley, from Hatcher's Pass to Pt. MacKenzie and from the Chugach Range to Meadow Lakes. The total number of data points (wetted streams necessitating measurements) recorded thus far is 49 (Figure 1). In addition to the GPS data taken, the field crew has hand drawn recorded observations, notes and hydrographic data on the GIS maps where appropriate. Particularly, observations and notes have been hand recorded directly onto the aerial imagery maps to express the absence of recordable data (non-existent culverts and stream channels) and to capture/illustrate information beyond that recorded in the data forms on the GPS unit (stream direction if different than modeled, cultural impacts and anecdotal information).

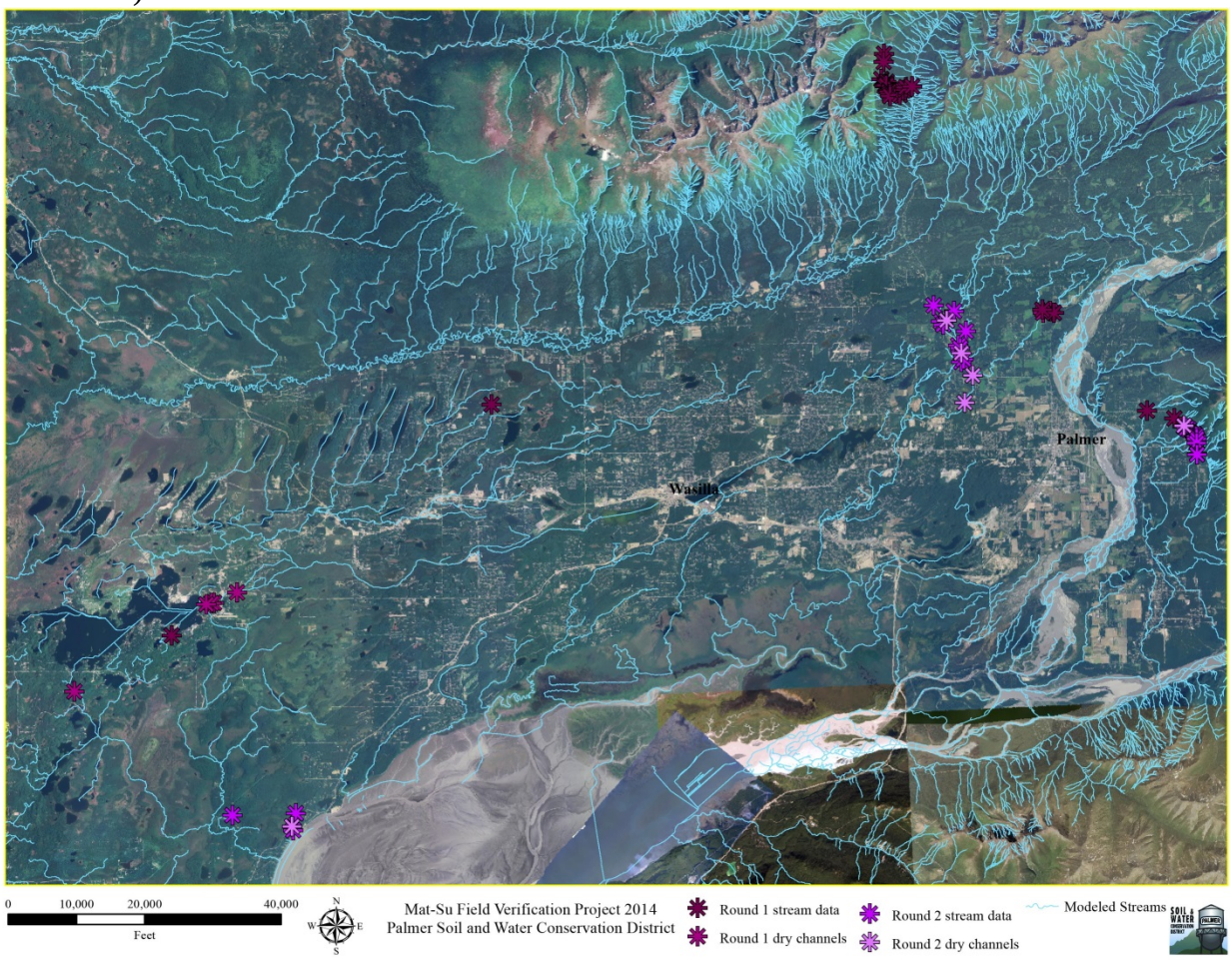

Figure 1. Overview of data points collected as of 8/29/2014

The PSWCD field crew is currently up-to-date with the survey points assigned by the St. Mary's University team. We have been prioritizing surveys that do not require landowner notification or access permission, and are nearly finished with that list. We have also been in the process of contacting landowners to secure permission for survey sites as needed. Thus far, we are only

waiting on landowner permission to access the ridge on the East side of the Little Su as the level of the river has risen too high to permit crossing to access the ridge via public lands. We have contacted the landowner at the southern base of the ridge to secure permission to cross her property and gain the ridge via a land route. As we hear from landowners (or not), we will advise regarding which surveys may be delayed or impossible pending landowner permission.

The model continues to present interesting challenges to verification! As noted by the St. Mary's team when they were out in the field earlier this summer with the PSWCD field crew, the model can place streams where there are none, and miss streams that are exist. It has also proven capable of deriving the accurate stream channel location and flow direction in spite of significant cultural impacts to an area. The nature of the Mat-Su hydrology also presents its own challenges in the form of streams that originate from and terminate in subsurface flow in low relief areas, the presence of countless relict channels, etc. We haven't found any water flowing uphill but we are still looking.

While conducting field surveys, the PSWCD crew has encountered "old timer" local property owners who have been able to provide invaluable anecdotal information regarding historic stream conditions, salmon runs and cultural impacts to the hydrography at several survey sites. This information has been recorded on the maps and shared with the Alaska Department of Fish and Game as appropriate. The PSWCD crew has also recorded invasive plant species and riparian restoration opportunities where encountered during stream mapping surveys, and hope to pursue these findings with funding organizations in the future.

Figure 2. Example of some field points given to field crew to identify

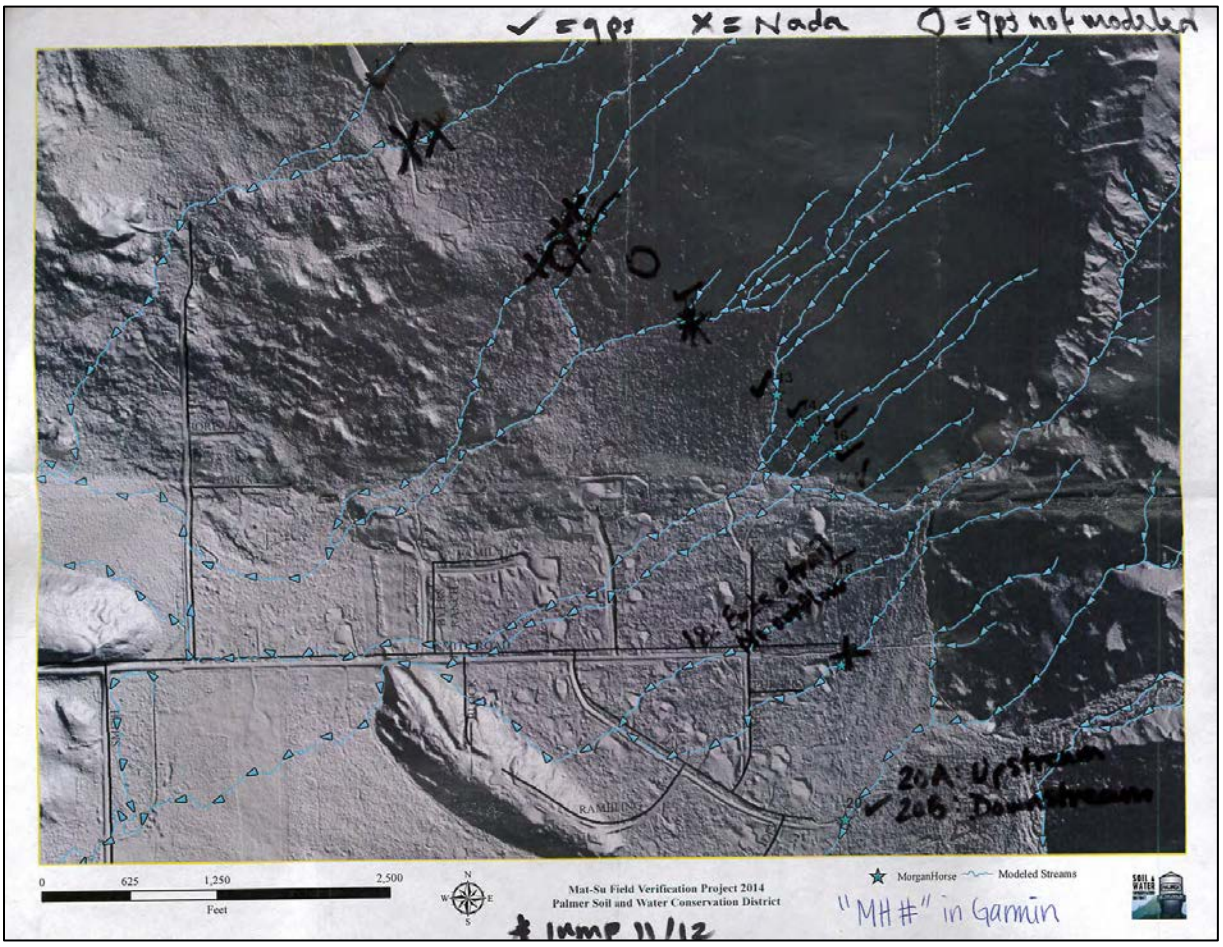

Figure 3. Example of notations from field crew on field maps