AquaTechnex

"Advancing the Science of Lake Management"

Kootenai River Eurasian Milfoil Survey

Prepared for
Boundary County Weed Department
Bonners Ferry, Idaho

Fall, 2007

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Introduction

The Kootenai River is an upstream major tributary for the Columbia River. Its origins are in the Rocky Mountains of eastern British Columbia. The Kootenai (spelled Kootenay River in Canada) runs south into the state of Montana where it is impounded by the Libby Dam forming Lake Koocanusa Reservoir which startles the border. Below the dam, the river turns west into Idaho and through the city of Bonners Ferry where it turns north and again enters Canada. From there the river flows into Kootenay Lake and on to the Columbia River. It is interesting to note that the Kootenai and Columbia River headwaters are only one mile apart in the upper reaches of the watershed. This has lead to a number of diversion schemes to develop hydro-electric power. These have been opposed by environmentalists, local residents and local units of government that depend on the river for a tourism based economy.

The Kootenai River below the Libby Dam is home to population of White Sturgeon (*Acipenser tranmontanus*) that has been listed since 1994 as endangered throughout its range in the United States and Canada. This population migrates freely in the river from Kootenai Falls to Kootenay Lake in British Columbia.

The population has been landlocked since glacial times about 10,000 years ago. There is an active management program to recover this fishery.

Ralph Bahe of the Kootenai Tribe of Idaho monitoring White Sturgeon, from US Fish and Wildlife

The Kootenai River flows entirely through Boundary County, Idaho. Local units of government and the Kootenai Tribe of Idaho have had an interest in the health of the Kootenai River. The Tribe is very concerned about protecting the environment and specifically the White Sturgeon populations within the river. Both the Tribe and the County are also partners in the economic development of the region. They have developed a join strategic plan that highlights tourism development. The river is a key asset in this regard. There is also an important agricultural economy in the region that relies on the river as an irrigation source. A major beer manufacturer has located two large hops farms along the river and these hops are a major ingredient necessary in the production of their product each year. A number of other groups farm in this valley as well.

While aquatic plants are an important part of any aquatic ecosystem, excessive amounts of aquatic vegetation can impact beneficial uses such as recreation or habitat for endangered species. Excessive amounts of invasive aquatic weeds can dramatically alter the environment of a lake or river system. Eurasian Milfoil (*Myriophyllum spicatum*) is such an invasive weed. Classified by the US Congress as a "harmful non-ingenious" species, waters infested with Eurasian Milfoil exhibit a loss of aquatic habitat and depression of water quality parameters critical to many fish species. Excessive amounts of this weed can also impact recreational activities such as boating and fishing. A number of swimmers drown each year throughout the United States tangled in the dense weed beds this plant produces. Excessive weed growth can also impact irrigation delivery systems an plug pumping systems thereby impacting crop production.

The State of Idaho has recognized the threat posed by this invasive weed to the water resources of region. The 2006 Legislature passed a bill that funded a statewide Eurasian Milfoil Control Program. The Idaho Department of Agriculture's noxious weed program was charged with the development and implementation of this program. During the summer of 2006, grant funding was provided to a number of local entities and a significant reduction in the populations of milfoil was accomplished. The second phase of this program in 2007 provided additional funding and technical assistance to local entities to expand survey and control operations.

The Boundary County Weed Department is charged with the management of noxious and invasive aquatic weeds throughout the County. The Department had determined that Eurasian Milfoil was present in the River through the County during a preliminary survey in the fall of 2006. The County prepared and submitted a grant application to the Department of Agriculture to obtain funding to map and quantify the problem and begin to focus control efforts on the plant. In the summer of 2007, Boundary County published a Request for Proposals to map the Eurasian Milfoil infestation throughout the river system. Aquatechnex, LLC was selected to perform this effort in the late summer. This report will describe the methods used and conditions present in the system at the time of this survey.

Methods

The RFP documents requested a consulting firm utilized aquatic plant survey methods developed by the Idaho State Department of Agriculture Eurasian Milfoil Control Program. This survey protocol calls for both a littoral survey and

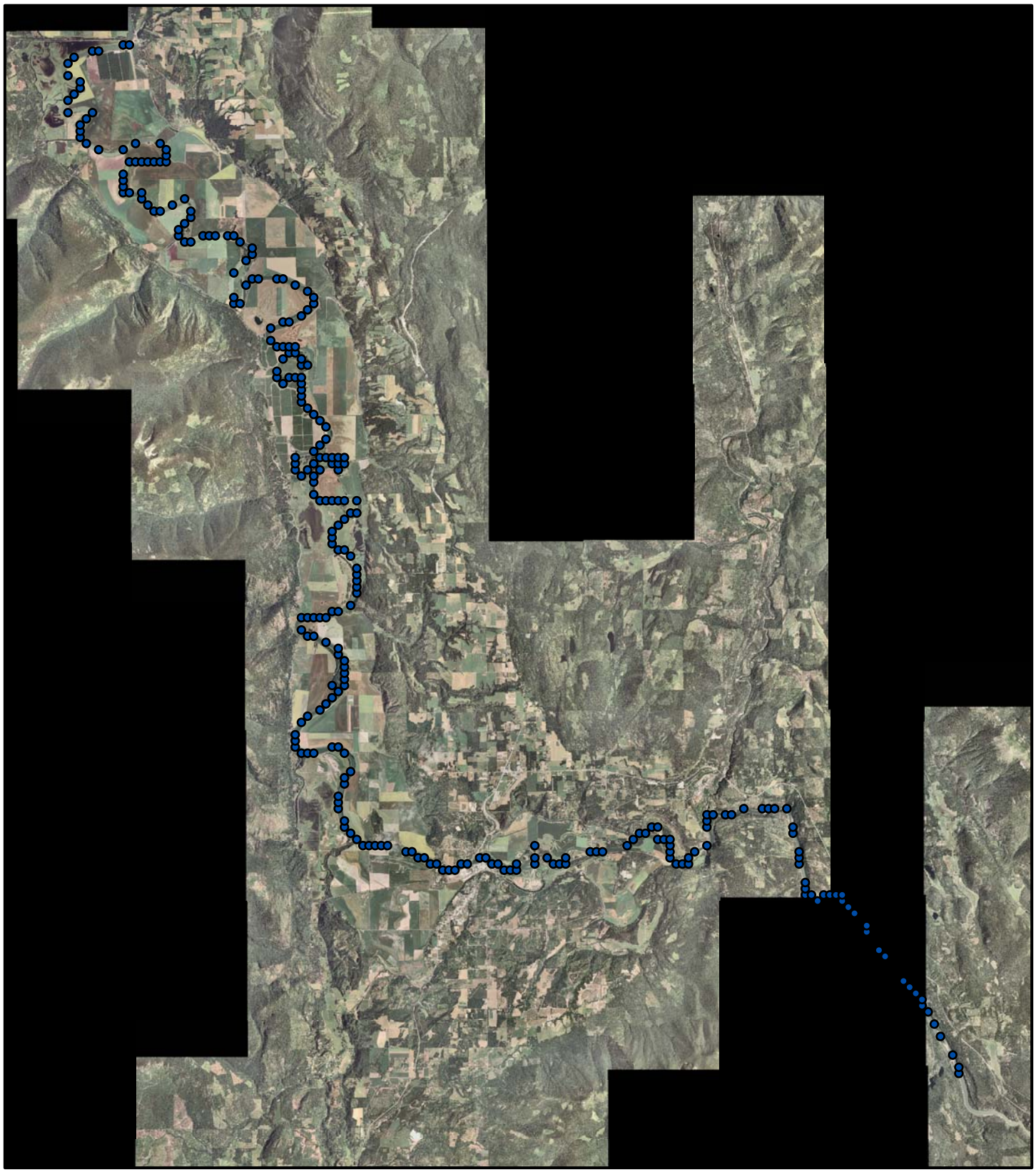
a point intercept survey. Aquatechnex biologists used these protocols and some additional tools to perform this work.

On award of this contract, Aquatechnex studied existing information on the infestation and met with County officials to tour the area. We developed ArcGIS files that documented the shoreline and a number of other attributes of the river through the County. We also obtained aerial imagery covering most of the project area from the US Department of Agriculture crop compliance program. This information was used to create an ArcGIS project file for this mission.

Aquatechnex field mapping system provides submeter accuracy and real time GIS updates.

The point intercept protocol calls for the development of sampling locations throughout the littoral zone of the lake. In order to maintain the same resolution as other mapping projects funded by the Department of Agriculture, we requested the Department provide the point sampling locations at a density they felt would meet their needs. The Department developed a grid overlay for the waters of the Kootenai River in ArcGIS format. We added this information to our project file and used it to plan the data collection mission. At each sampling location, the protocol calls for an observation and record of the plant species present and a density rating. The biologist records the presence of any species observed and then provides a overall density rating of 0, 25, 50, 75 or 100 percent.

Point Intercept Sampling Locations



Idaho Department of Agriculture provided this sampling location grid. Aquatechnex biologists navigated to each sampling station and recorded the required information.

If plants are not visible from the surface, a rake is used to collect vegetation or determine that none exists at that point. Our biologists developed a data dictionary for a Trimble GPS unit to perform this work. It provided data fields for a number of species to be recorded and a density rating. Drop down menus were used that listed the plant species known to be in the reservoir with additional place holders for new species located. At each site, the biologist placed the dominate species in the first window, with secondary species in the remaining attribute sites and lastly assigned the density rating.

The littoral survey is conducted between sampling points. As the boat crew moves to the next site, the team observes conditions present. Our biologists used a Trimble GeoXT data logger and GPS unit to record the location of the outside edge of plant beds observed. This data is later used to define the boundaries of the plant communities.

We also developed a flight plan for collection of high resolution low altitude photography to visually capture conditions present in the lake. Aquatechnex develop a process called Aerial Shoreline Analysis in the mid 1980's for the US Environmental Protection Agency to detect non point sources of pollution. This technology also is very useful in locating and visualizing aquatic plant communities. This technique uses a high resolution digital camera linked to a GPS unit that records points along the flight line at 5 second intervals. The flight protocols are designed to obtain an oblique image with approximately 30 percent overlap. This provides a complete coverage of the shoreline and littoral area of the reservoir along both banks.

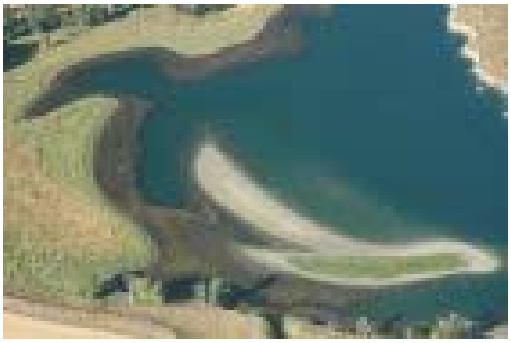
With these protocols in place, our team mobilized to the field and began to collect data. Our team consisted of two biologists operating a 17 foot Panther Airboat and a 16 foot LUND survey vessel with a 60 hp engine. The boats were equipped with a Panasonic Toughbook running ArcGIS 9.2, the Kootenai River ArcGIS project file, a Trimble ProXT submeter GPS receiver and Trimble's GPS Analyst for ArcGIS extension. This system allows us to open the ArcGIS project file, display the location of the mapping vessel, navigate to sampling locations and collect aquatic plant data directly into the ArcGIS project.

During the summer, the Boundary County Weed Department Staff evaluated river conditions and visibility. Through August, the Department reported that conditions were not ideal for survey work on the river. They recommended that the month of September would be best for this effort as historical flows are low and visibility increased dramatically. The Department advised us in early

September that conditions were now right for mobilization and field work. An airboat was used to perform survey work upstream from Bonners Ferry, Idaho. This section of the river is shallow and swift running. Conventional boats would not be able to navigate these waters. The LUND was used for the deeper water areas downstream of Bonners Ferry.

Point Intercept and Littoral Survey efforts on the approximately 45 miles of river channel downstream of Bonners Ferry were accomplished the week of September 22nd with our team spending the majority of the week on the water. The upstream areas were surveyed the following week.

On September 14th, the flight mission was performed to collect Aerial Shoreline Analysis (ASA) image data. This mission had been attempted earlier, but our aircraft (Felts Field Aviation) suffered a serious bird strike in late August and was placed out of commission. An alternate pilot and aircraft was located at Spokane Airways and as soon as their schedule and weather conditions permitted, this effort was scheduled.

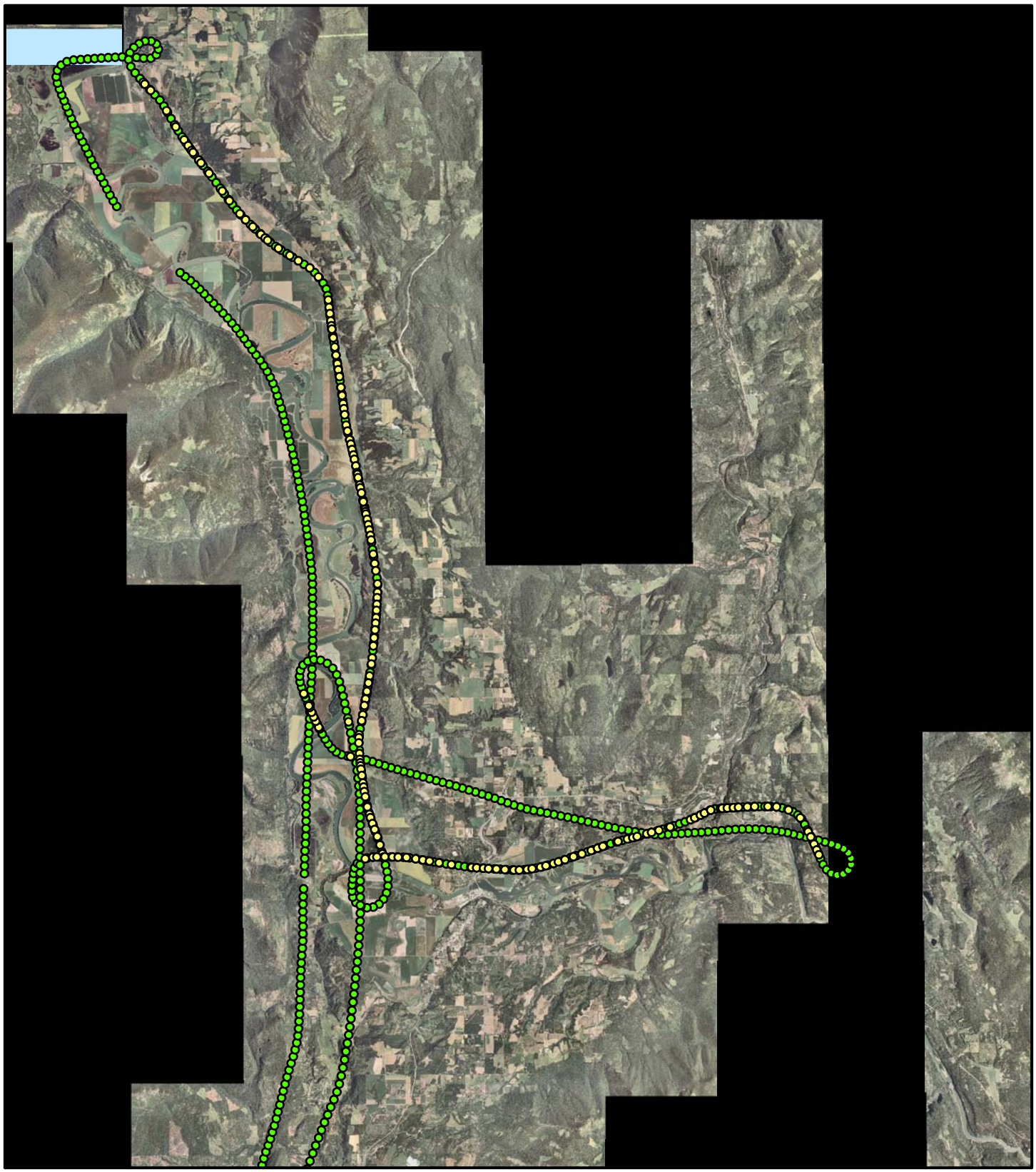


Example of ASA imagery of Eurasian Milfoil Beds

This flight mission combined the Eurasian Milfoil ASA mission on the Kootenai River in northern Idaho with the coverage of Lake Spokane for Avista Utilities. A Trimble GeoXT data logging GPS unit was mounted in the aircraft with a clear view of the sky. This unit was programmed to collect a GPS point every five seconds along the flight line. A Nikon D70s digital camera was used to collect digital image coverage of the littoral area and shoreline of the entire lake system. The flight protocol was executed and the image data collected.

On return to our facilities, the data was processes and maps created. The ASA digital imagery and Trimble GPS data was processed using GeoSpatial Experts' GPS-Photolink Software. The first step was to download the Trimble GPS flight path data, process it using Trimble Pathfinder Software and export it as a ArcGIS

Image Collection Flight Line and Image Location



Aerial Image Position

Flight Line

Aquatechnex Aerial Shoreline Analysis Flightline and Image Positions. An aerial image is "hot linked" to each image position location. This information was used to help identify aquatic plant communities.

shapefile. The GPS-Photolink software then processed the flightline GPS points and the image data to create an ArcGIS hotlink with the shoreline image accessible at the exact location it was collected. The Image Location and Flight Line layers were added to the ArcGIS project file. We then began processing this information.

In the mapping laboratory, biologists analyzed each image location, the field littoral and point intercept data, and created polygons that represented the Eurasian Milfoil beds present and located in the field. The attribute tables for the milfoil polygons were configured to include a calculation of acres at each location. The point intercept data included the other species of plants found throughout the system.

The team then developed the maps, and completed the final report for submission to Boundary County.

Results and Discussion

There were a number of aquatic plant species identified and mapped through this process.

Table 1. Common and Scientific Names of Aquatic Plant Species Observed in 2007 at Lake Spokane

Common Names	Scientific Names
Eurasian Milfoil	*Myriophyllum spicatum*
Common Waterweed	*Elodea canadensis*
Richardson Pondweed	*Potamogeton richardsonii*
Curly Leaf Pondweed	*Potamogeton crispus*
Thin Leaf (small) Pondweed	*Potamogeton pusillus*
Sago Pondweed	*Potamogeton pectinatus*
Coontail	*Ceratophyllum demersum*
Tape Grass	*Vallisneriaa americana*

*non-native plants listed on the Federal Noxious Weed List appear in bold type

While we observed Thin Leaf Pondweed, Coontail and Tape Grass during the survey work, these plants did not occur at any of the point intercept locations and should be considered a minor part of the plant populations in the system. The primary species observed were Eurasian Milfoil, Curly Leaf Pondweed (also considered invasive), Richardson's Pondweed, Sago Pondweed and Elodea.

Eurasian Milfoil was found to be present in the Kootenai River system throughout the County. Map pages 1 thought 8 provide an overview of the locations and extent of the infestations. It should also be noted that the County has been provided with the ArcGIS project files for this mission and these areas can be examined in greater detail by using that software.

From the Montana Boarder to an area approximately 3 miles upstream from Bonners Ferry, no Eurasian Milfoil plants were discovered through the littoral or point-intercept survey methods. It should be noted that this section of river is fast moving and there was very limited habitat suitable for this invasive weed. As Eurasian Milfoil spreads primarily through fragmentation, the plant fragments need to sink and root in the river bed substrate. The river current probably limits that possibility in this section of the river.

Typical Eurasian Milfoil infestation in the downstream project areas of the Kootenai River.

Traces of Eurasian Milfoil start to appear in protected backwater areas or behind sand bars approximately 3.5 miles upstream from the Bonners Ferry Bridge. In the areas downstream from the Bonners Ferry Bridge, the river flow changes

fairly dramatically. As the river proceeds west and then turns north to the Canadian Border, the river drop is more shallow and the littoral area increases. Native aquatic plant communities begin to thrive in these waters and Milfoil beds begin to be present. After the river turns north, downstream of Bonners Ferry, Eurasian Milfoil populations expand and begin to dominate the littoral areas of the river.

A total of all Eurasian Milfoil polygons developed for this project found that there are 504.51 acres of Eurasian Milfoil beds present in County Waters.

It should also be noted that much of the littoral area of the river remains milfoil free at this point. Long stretches of the system have a littoral area dominated by native aquatic plant growth. In many of these areas pioneering milfoil colonies (as noted by the milfoil points in the attached maps) are present and these will expand over time. There is considerable potential for the acres present in the system to expand over time. In addition, these milfoil beds are a threat to downstream waters. It is probable given the level of infestation present here that fragments are crossing the Canadian Border and impacting Lake Kootenay near Creston, BC.

Close up of Eurasian Milfoil and Curly Leaf Pondweed in the Kootenai River System.

There are obvious impacts on the aquatic ecosystem in the northern portions of the survey area. Eurasian Milfoil beds are present and dominate critical backwater habitat. In flowing water systems, these backwater areas provide critical refugia for small fish during this critical stage of their lives. Extensive milfoil beds are known to cause elevated water temperatures and depressed dissolved oxygen levels within the areas they infest. This removes these areas as refuge for these young fish as the water quality parameters are generally outside those required for life. Our survey team also observed a buck deer swimming the river channel and becoming entangled in the dense milfoil growth along the bank in the downstream area. This deer was almost consumed by the effort and after a long struggle was able to gain a footing, move from the water and collapse on the bank of exhaustion. Our team also observed this horse which was not so lucky.

Horse found drown in Eurasian Milfoil Bed on Kootenai River during survey.

The map pages that follow provide an overview of the plant communities throughout the river system. The GIS files accompany this report and can be viewed using ArcGIS software. The point intercept data has been entered into

the GIS project file and linked to each sampling location. It can be accessed through that system as well as queried.

In order to view the aerial image data collected by Aquatechnex the County needs to obtain a license for the GPS-Photolink Extension for ArcGIS and install that software. In addition to showing the aquatic plant communities along this river, the GPS-Photolink layers may be very useful in accessing photography for reports, presentations or evaluating the shoreline for permit compliance or encroachment to the reservoir.

It should be noted that portions of this system were not ideally suited for the ASA methodology. This system is generally used on lake systems where the aircraft is operating over the lake and there are no obstacles for flight. In some of the downstream areas of the study areas where there are dramatic oxbow features on the river the mountains were too close for safe flight at the required altitude. While the photography still provides useful information in these areas, it is not as well suited for plant identification as would be the case on a larger river or lake system.

Questions on this report should be directed to Terry McNabb, Aquatechnex, 360-527-1271 or tmcnabb@aquatechnex.com.

Kootenai River Eurasian Milfoil Survey

Aquatechnex, LLC biologists performed a Eurasian Milfoil and Aquatic Plant Survey for Boundary County Weed Department in the Fall of 2007. These maps display the location of data points, individual milfoil plants and milfoil beds detected.
This project was conducted using protocols developed by the Idaho Department of Agriculture.

Legend

- ISDA Sample Point Locations
- Point Intercept C
- E. Milfoil Plants
- Point Intercept K
- E. Milfoil Beds
- Aerial Image Position

Kootenai River

RGB

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- Green: Band_2
- Blue: Band_3

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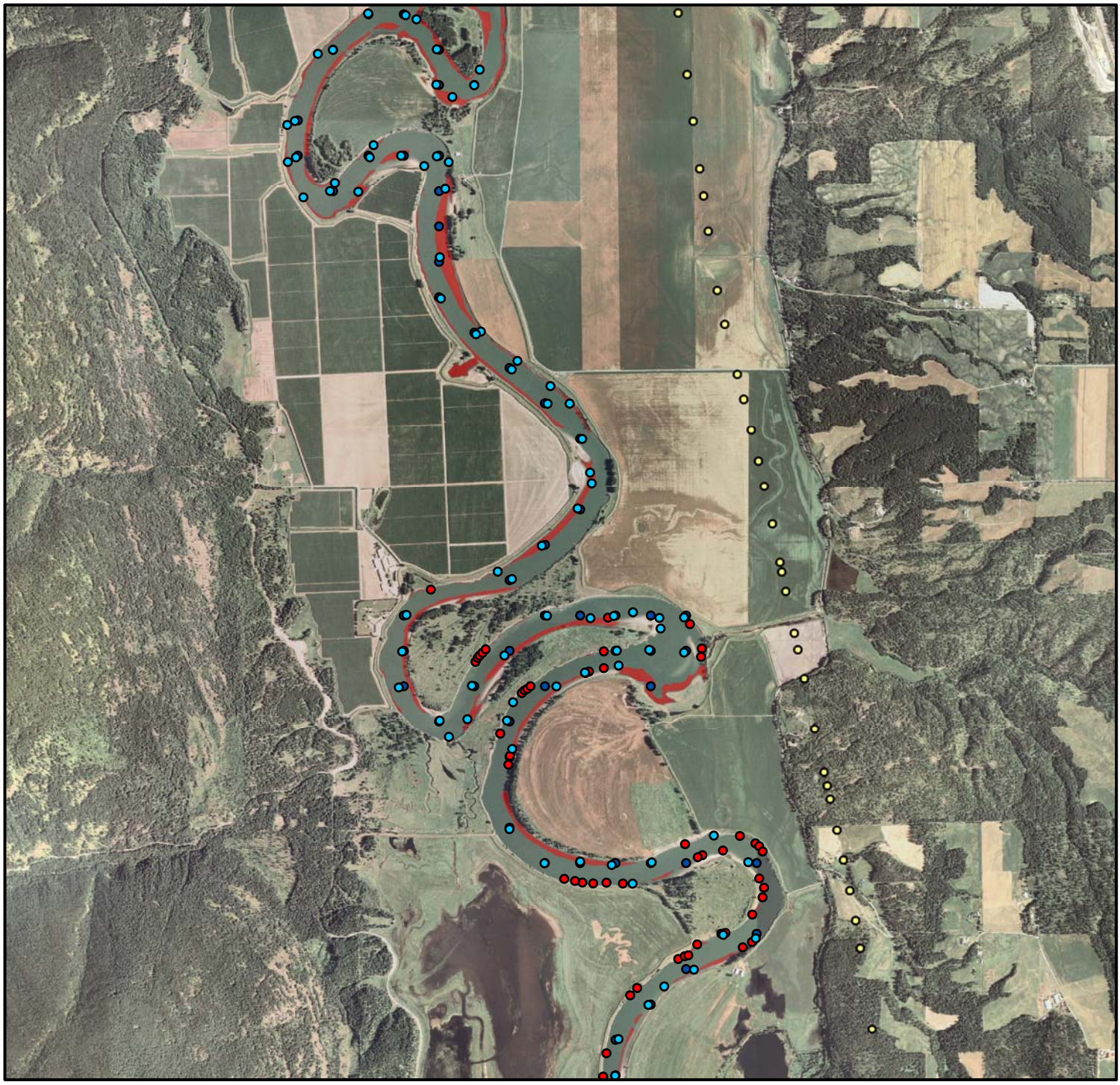

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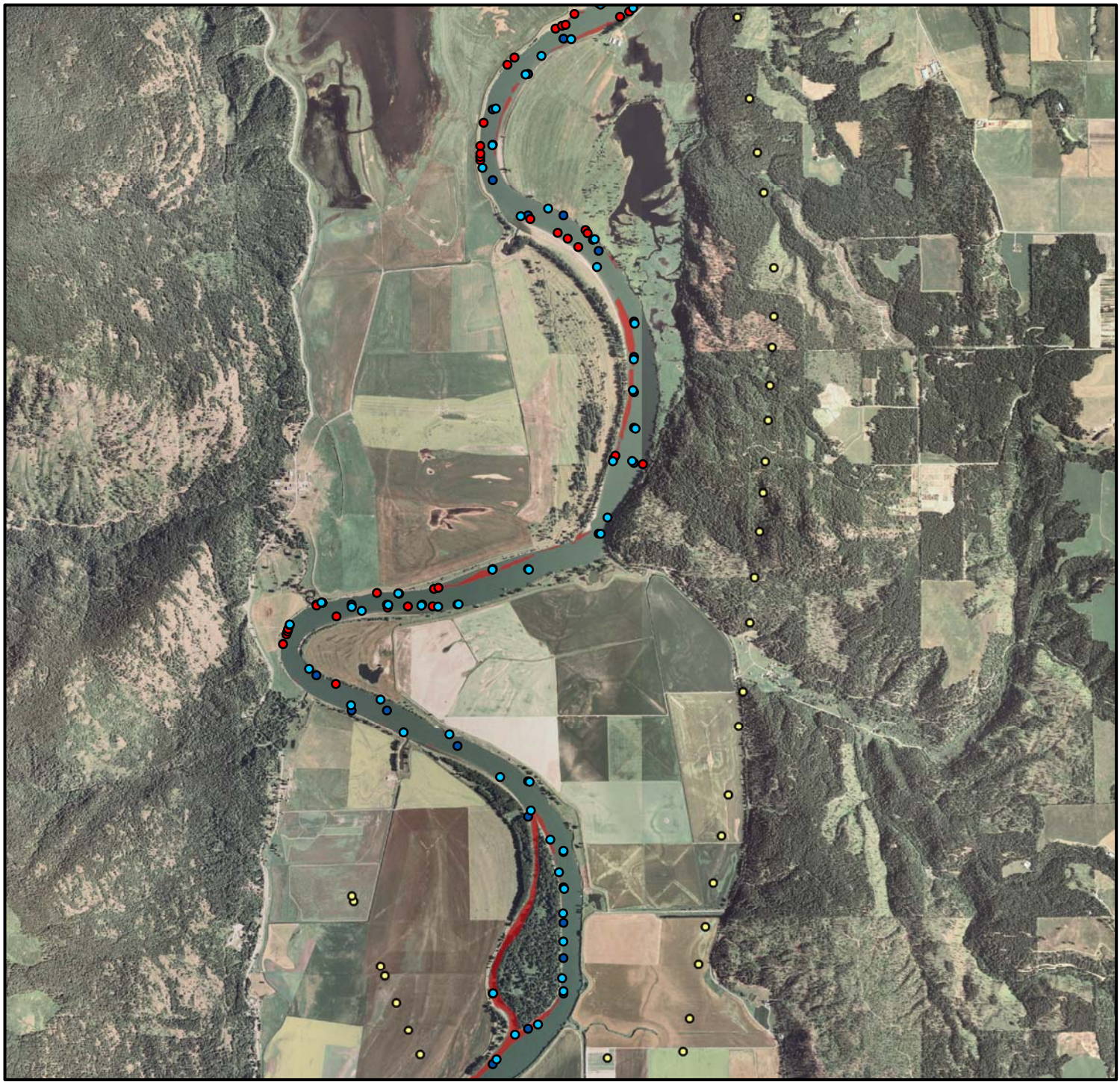

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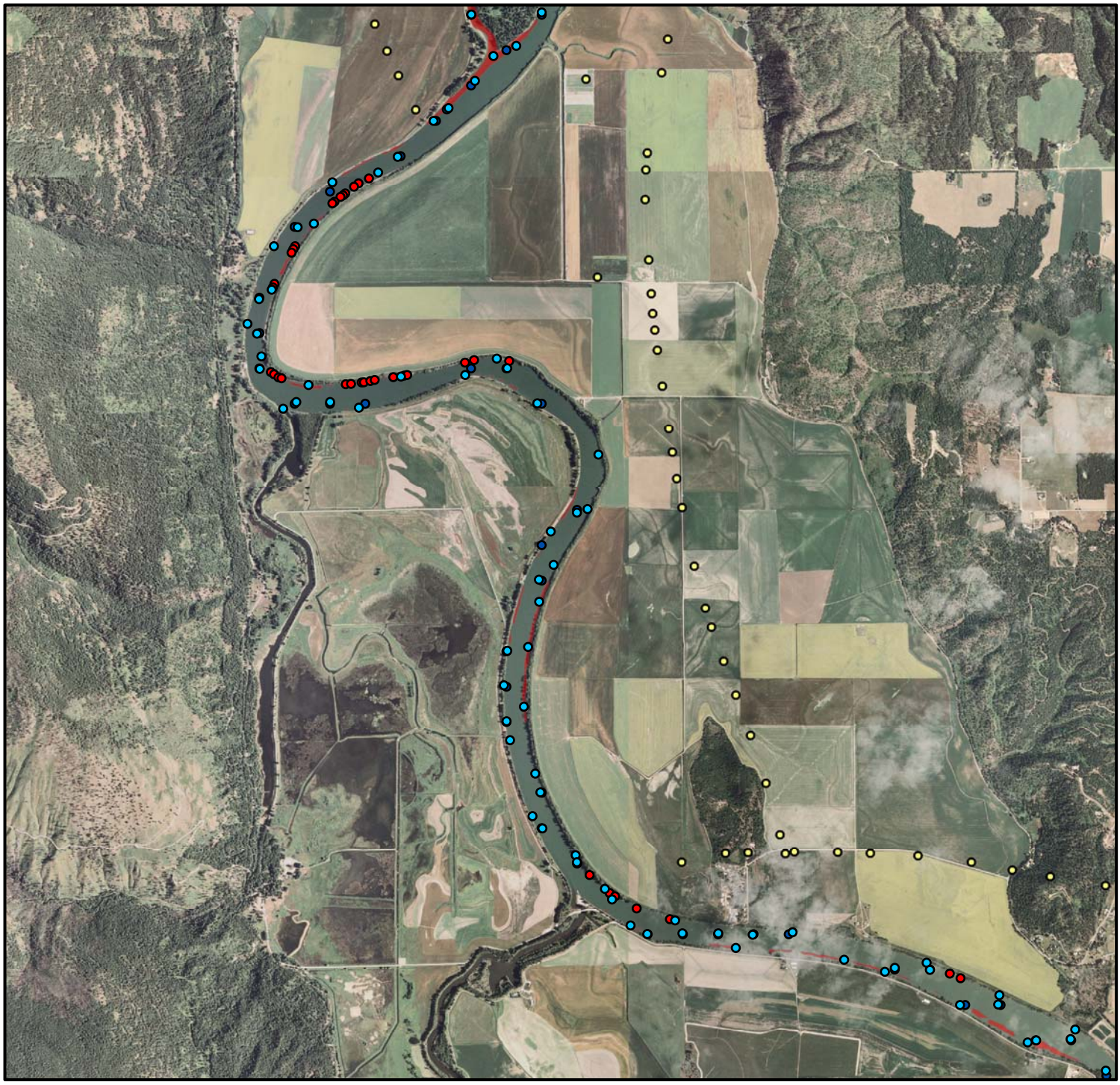

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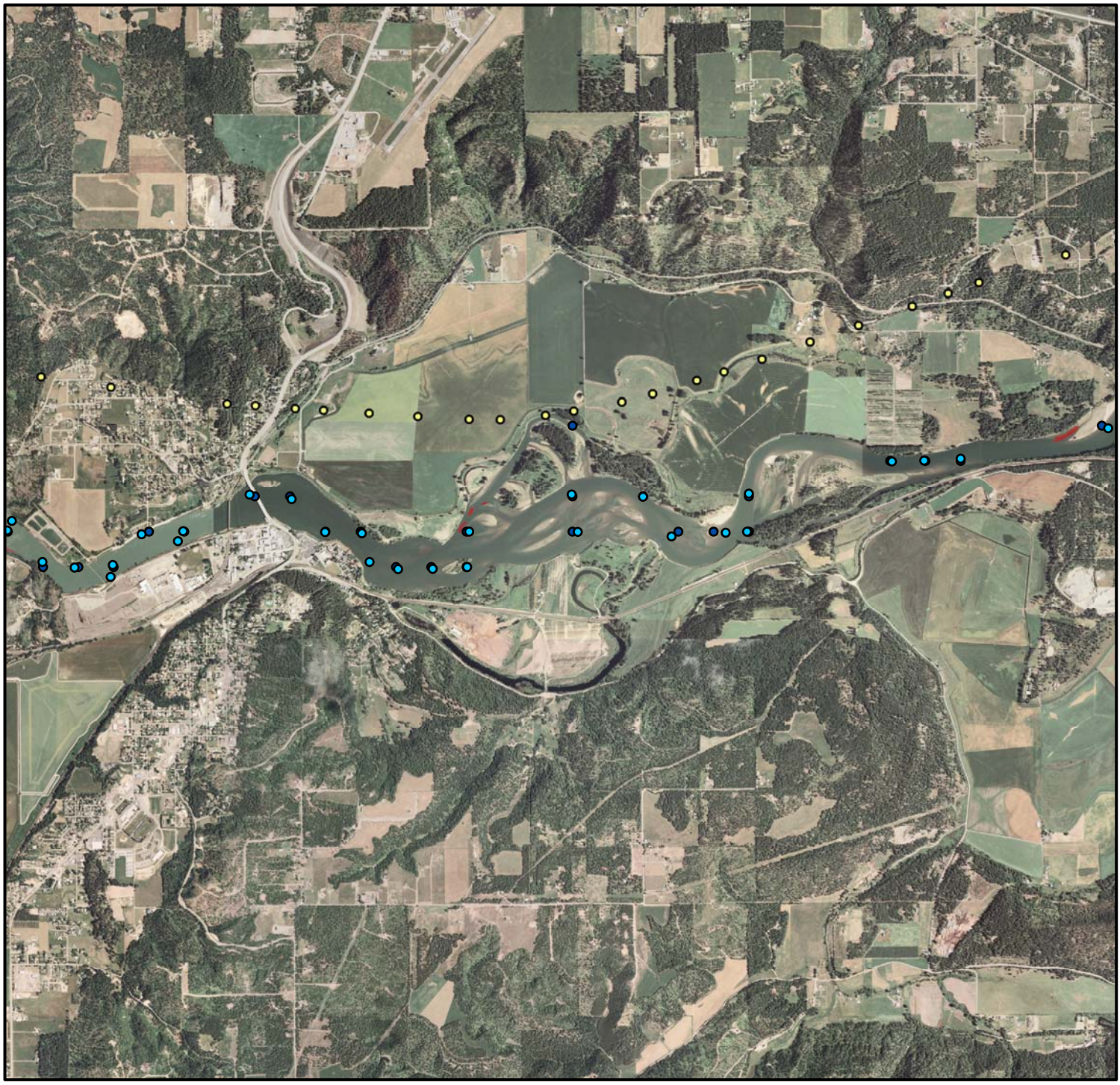

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