

memorandum

date February 20, 2008

to Jeremy Freimund, P.H.

from Margaret Clancy, PWS; Lizzie Zemke, PWS; and Ilon Logan, PWS

subject Wetland Inventory Peer Review Findings and Recommendations

ESA Adolfson (ESA) prepared this memorandum to summarize our findings and recommendations concerning the wetland inventory Quality Assurance/Quality Control efforts we conducted on behalf of the Lummi Indian Business Council (LIBC). Our work was completed on Lummi Indian Reservation lands during the months of October, November, and December 2007.

The purpose of our work was to provide an independent peer review of the Lummi wetland inventory update process and results. Our tasks were to review the methods used by LIBC staff during the inventory, compare a limited sample of Lummi staff field results with field results obtained by ESA staff, and develop specific recommendations for maintaining and, if needed, improving the accuracy of the wetland inventory update effort in the future. Our original scope of work called for two field days of independent wetland delineation and two additional days of wetland delineation with the LIBC Water Resources Planner II Ginger Lee First, PWS (LIBC Planner II). Once our work began, our scope was modified to include wetland delineation training to the LIBC's recently hired Water Resources Planner I Frank Lawrence III (LIBC Planner I).

Approach/Methods

Our review of the Lummi wetland inventory process and results consisted of comparing the results of wetland boundary determinations, function assessments, and wetland ratings obtained in the field by ESA biologists with results of these same processes obtained by the LIBC Planner II.

The original list of wetlands we evaluated as part of this project included:

- Wetland 38N1E03-07
- Wetland 38N1E04-02
- Wetland 38N1E01-18
- Wetland 38N2E06-01
- Wetland 38N2E06-02

We were requested to delineate¹ two additional wetlands if time allowed. These were described as “Flood plain site: Mitigation site near former blockhouse location”, and “Forested site: wetland between Cagey Road and Smokehouse Road”.

We had planned to compare our independent ESA wetland delineations with the Lummi wetland delineations by comparing wetland boundary location maps generated using a Trimble XT GPS unit. However, the GPS unit did not work on the 2nd ESA field day so we were only able to collect limited GPS information. The maps included at the back of this memorandum are our attempt to show how our boundary determinations compared with the LIBC determinations. These comparison maps include both GPS-generated information and rough sketches for wetlands where no GPS data were available.

The independent ESA site visits were conducted in October 2007, and the joint ESA/LIBC staff site visits were conducted in November and December 2007, as shown in Table 1.

Table 1. Summary of wetland assessment dates and locations

Wetland(s) Visited	Field Date	Staff and Wetland Location
Wetland 38N1E03-07	October 10	Lizzie Zemke and Rachel Hulscher (ESA). Forested wetland located east of Lake Terrell Road.
Wetland 38N1E01-18 Wetland 38N2E06-01 Wetland 38N2E06-02	October 15	ESA staff Lizzie Zemke and Rachel Hulscher (ESA). Floodplain wetlands located south of Slater Rd and east of the Silver Reef casino.
Wetland 38N1E04-02	November 13	Lizzie Zemke (ESA) and LIBC Planner I. Forested wetland west of Lake Terrell Road and south of Slater Road.
Wetland 38N1E01-18	November 14	Lizzie Zemke (ESA) and LIBC Planner I. Located on a site known as the East Casino property.
Wetland 38N1E04-02 “Forested site: wetland between Cagey Road and Smokehouse Road”	December 10	Ilon Logan (ESA) and LIBC Planner I. Forested wetland west of Lake Terrell Road and south of Slater Road. Brief visit to “forested site: wetland between Cagey Road and Smokehouse Road”

We reviewed the function assessment results (from Ecology’s wetland function assessment method called WFAM) and the wetland ratings (from Ecology’s wetland rating system for Western Washington)

¹ For purposes of this effort, the term ‘delineate’ means to identify the approximate wetland boundary using detailed on-site reconnaissance techniques. The boundary determinations are supported by observations of soil, vegetation, and hydrology, but detailed wetland delineation data sheets were not completed as would be the case with a routine on-site delineation under the Corps 1987 Manual. Wetland boundary locations are recorded using hand-held Trimble GeoXT Global Positioning System (GPS) units.

obtained by the LIBC Planner II and compared our input data for all of the wetlands we visited in the field.

Findings

In general, with the exception of Wetland 38N1E 01-18, ESA generally agrees with the wetland boundaries determined by the LIBC Planner II. Although our initial inspection suggested that our findings concerning Wetlands 38N1E03-07 and 38N1E04-02 were not in agreement with the LIBC wetland mapping, our subsequent inspections indicated the LIBC wetland mapping was reasonably accurate. Our GPS map of the boundaries of Wetland 38N1E03-07 is very similar to the LIBC Planner II’s wetland map. Our determination for the Wetland 38N1E04-02 boundary was also similar to the LIBC determination except for the areas adjacent to an un-named stream. This particular wetland is difficult to delineate because of its "hummocky" nature, which obscures small depressions that might actually meet wetland criteria. One reason this area may not have been picked up in the LIBC delineation is that the LIBC Planner II apparently entered the wetland from Lake Terrell Road instead of Slater Road (where we entered). Another factor may be that the LIBC Planner II evidently was not focused on delineating stream boundaries, only wetland boundaries, so the wetlands next to the stream channel may have been overlooked.

Our review of the function assessments and wetland ratings suggests that the results obtained by the Planner II are reasonably accurate. Some of our scores on various score sheets differed from the LIBC results, but not more than would be expected when analyses are performed by different individuals. Our findings are summarized in Table 2 and described below. Note: the field visit to the “forested site: wetland between Cagey Road and Smokehouse Road” was generally used for wetland training purposes and did not include boundary determinations, function assessment or wetland rating and is therefore not included in the table below.

Table 2. Summary of ESA assessment findings

Wetland	Extent of ESA Agreement/ Disagreement with LIBC Results		
	Wetland Boundary	Function Assessment	Rating
Wetland 38N1E03-07	Boundary determination closely matches LIBC determination.	Function assessment scores for habitat are different.	Agreement on Category III rating.
Wetland 38N1E01-18	Substantial differences in wetland extent, potentially due vegetation changes and different interpretations of growing season.	Function assessment scores are similar.	Agreement on Category III rating.
Wetland 38N2E06-01	Minor differences, but overall boundary determination closely matches LIBC	Function assessment scores are similar. We defer to LIBC’s site-specific knowledge of	Agreement on Category II rating.

Wetland	Extent of ESA Agreement/ Disagreement with LIBC Results		
	Wetland Boundary	Function Assessment	Rating
	determination.	hydrologic functioning (flood storage).	
Wetland 38N2E06-02	Boundary determination closely matches LIBC determination.	Function assessment scores are similar.	Agreement on Category III rating.
Wetland 38N1E04-02	Some differences, but our wetland boundary determination closely matches LIBC determination (see attached comparison map). The stream and associated wetland were not identified by the Planner II. The likely reason is that the Planner II was only focused on wetlands and treated the stream as a different feature.	Function assessment scores are similar.	Agreement on Category III rating.

Wetland 38N1E03-07

During our site visit we observed a wetland dominated by skunk cabbage and American brooklime within a forested area dominated by big-leaf maple, salmonberry, and lady fern. Our GPS wetland boundary map closely matched the GPS map generated by the LIBC Planner II (see attached maps).

We rated this wetland as Class III according to the Ecology rating form as did the LIBC Planner II. We found the wetland to have a higher score for hydrologic functions, but our overall rating was the same. The LIBC Planner II's WFAM results were different from ours in terms of the habitat, partially because she included a stream as an open water component in the Assessment Unit (AU) and we did not observe an open water or perennial stream feature during our field investigation. We did observe a shallow vegetated channel that lacked a defined bed or bank (i.e., essentially a wetland with water flowing through it intermittently). It is possible that the LIBC Planner II concluded this was a perennial stream as it may have had more/ flowing water at the time of her delineation. Overall though, the WFAM results obtained by the LIBC Planner II did not differ very much from ours.

Wetland 38N1E01-18

We visited this parcel (known as the East Casino parcel) south of Slater Road on two separate occasions. On October 15, 2007 we noted the presence of wetland vegetation and hydric soil across most of the site. Later during a follow up visit with the LIBC Planner I, we established three east-west oriented transects to collect soil and vegetation data. At each data collection point, we observed soil colors

approximately 10 inches below the surface, and frequently much shallower, that contained hydric indicators including low matrix chroma and mottles (either 10YR 4/1 or 10YR 4/2 with mottles). Vegetation consisted almost entirely of hydrophytes, including reed canarygrass, Watson's willow herb, and creeping buttercup. Verbal reports by Lummi staff of standing water over much of the site during the early growing season provided further evidence of wetland hydrology, and thus we concluded that this area meets wetland criteria. Based upon our field observations, the entire area south of Slater Road, east of Schell Creek, and west of the north-south oriented ditch, is wetland. In contrast, the LIBC Planner II mapped only a small area near the center of parcel as wetland (see attached map).

To identify potential reasons for the difference in delineation results, we reviewed a December 3, 2003 report prepared by the LIBC Planner II describing the subject parcel. In the report, the Planner II noted that corn stubble and weedy agricultural plant species² dominated the site, which is not what we observed. The discrepancy in plant species observed could be due to the fact that Planner II's fieldwork occurred in late 2003 and early 2004 just a few years following the cessation of agricultural activities. Our field work, on the other hand, occurred much later (fall of 2007) and species composition could have changed in the ensuing three-year period.

The LIBC Planner II concluded that the wetland hydrology criterion was met on a relatively small area compared to what we observed. This may be due to the fact that she discounted observations of wetland hydrology in some areas because her field investigation took place in early December, which is outside the growing season³. If that were the case, she may have correctly excluded "wet" areas from the delineation based on the assumption that these areas would likely be drier in the growing season. Unfortunately, interpreting the growing season can be very complex and may have led to a 'false negative' determination in this instance.

To explain further, the growing season is typically defined as the portion of the year when soil temperatures at 19.7 inches below the soil surface are higher than biological zero (41 degrees F). This period can be approximated by the number of frost-free days; in other words from the last date in spring that the air temperature drops to 28 degrees F to the first date in the fall that it drops to 28 degrees F. Although this definition is relatively straightforward, determining the growing season requires professional judgment. In some parts of Washington some plant species are growing year-round, and each county soil survey has multiple locations for which air temperature data are tabulated, which can result in numerous "growing seasons" for each county. Generally, the rule of thumb is that if the dominant plants of the area are actively growing, it is the growing season. During our site visit in December 2007, we observed indicators of wetland hydrology across much of the area. We also observed plants actively growing in these conditions. Thus, we concluded that our field visit occurred within the growing season and as a result, our wetland area was much larger than the area previously delineated by the LIBC Planner II.

The LIBC Planner II also noted in a May 7, 2004 memo to you that her fieldwork was conducted in a dry year and recommended that the site be revisited in a different year. To further complicate the

² It is not clear if the species present are upland species. Field notes indicate "weedy pasture species and noxious weeds" and "vegetation is not abundant on the site. In some areas wetland plants (reed canarygrass, buttercup, and soft rush) are prevalent."

³ The US Army Corps of Engineers 1987 delineation manual for wetlands requires that wetland hydrology be present during the growing season in order for the hydrology criterion to be met. The growing season dates used by the LIBC Planner II were April 8 to October 30.

situation, our field work did not occur earlier in the year when the growing season interpretation would not have been an issue. An additional follow up visit(s) to this site would likely help reconcile the current discrepancy in wetland boundaries. We agree with the WFAM results and the Ecology rating of Class III as determined by the Planner II.

Wetland 38N2E06-01

Our observations of this floodplain wetland east of the casino generally agree with the LIBC Planner II's observations. The wetland is located in a shallow topographic depression dominated by reed canarygrass and Watson's willow herb. The surrounding field is dominated by a single upland species, quackgrass. Based on what we observed, the wetland might not extend as close to Slater Road as the boundary shown in green on the LIBC map, but otherwise our wetland edge is very close to that mapped by the Planner II. We also agree with the WFAM results and the Ecology rating of Class III. We might have rated the wetland higher in terms of hydrologic functioning—specifically, flood storage, but we defer to the Planner II's site-specific knowledge of the area and its flooding issues.

Wetland 38N2E06-02

Based upon our aerial photograph interpretation and our on-site observations, the wetland boundary we identified corresponds closely with the wetland boundary established by the LIBC Planner II. The distinction between herbaceous non-wetland vegetation and the shrub-dominated wetland area was clear on the ground as well as on the aerial photograph we used in the field. This scrub-shrub wetland is located immediately north of the edge of the Red River. Dominant vegetation in the wetland consisted of reed canarygrass, Pacific ninebark, and bald-hip rose. The edge of the river defined the southern edge of the wetland. Apparently due to heavy cloud cover, the Trimble GPS unit could not locate sufficient numbers of satellites to record data points, so we can not fully compare the GPS boundary to the LIBC mapped boundary.

Wetland 38N1E04-02

During our first visit to this wetland, we accessed this forested wetland located west of Lake Terrell Road from Slater Road and encountered wetland conditions immediately south of the road adjacent to an unnamed stream. The LIBC wetland inventory map shows no wetlands adjacent to this stream in the vicinity of Slater Road. The ESA biologist and LIBC Planner I placed flags along some of the edges of wetland, but due to time constraints did not locate the entire wetland boundary. We began our flagging east of the stream. The stream appears to form the west edge of the wetland at least along a portion of the wetland. Bright orange-brown soils characterize the uplands; while dark, moist to wet soils characterize the wetlands. Hydrophytes such as skunk cabbage, lady fern, some slough sedge, red alder, and salmonberry are the dominant wetland plants. During the delineation, the presence of sword fern typically indicated upland conditions.

During a second field visit, the LIBC Planner I and ESA biologist tied additional flags and closed the wetland polygon. During both of the ESA visits to this wetland, it was noted that many of the flags we tied were very close to flags that appear to have been tied by LIBC Planner II, which supports the idea that our delineation results were similar overall.

In general, we agree with the boundary established by the LIBC Planner II for most of the site. However, the stream that contributes to this wetland from the northwest has wetlands on both sides of the channel near the culvert at Slater Road that we would have delineated. This additional wetland does not appear to be connected to Wetland 38N1E04-02, but should be added to the LIBC wetland inventory

map in the future. We agree with the WFAM results and the Ecology rating of Class III as determined by the Planner II.

Conclusions and Recommendations

Based on our independent review of a small, but representative set of Lummi Reservation wetlands, we conclude that the LIBC wetland inventory process and results are generally valid and accurate. The one area where our observations differed substantially from the LIBC inventory results was the reed canarygrass-dominated wetland (Wetland 38N1E01-18) on the East Casino site. The difference in the ESA delineation and LIBC delineation is likely due to different interpretations of the growing season, as described in the above.

Notwithstanding these positive findings, we believe the inventory program could be strengthened by making some adjustments in the approach as you move forward. Our recommendations can be grouped into 2 general categories:

1. Recommendations to improve efficiency and reduce costs, and
2. Recommendations to improve technical accuracy.

Efficiency/Cost Saving Improvements

We recommend using a two- or three-tiered approach to the inventory where the areas most likely to be developed or altered in the near future receive the highest level of review/evaluation and areas less likely to be affected by near term development receive moderate or minimal review/evaluation. We believe that this is generally consistent with your current operations but feel that you could expand how this approach is applied so there is greater differentiation in how various areas are treated. For areas that are unlikely to be developed soon you could rely more heavily on aerial photography, pictometry, and LIDAR data. Areas that are likely to be developed soon (within 1-3 years) would be subject to full delineation and possibly instrument survey of the boundary.

This tiered approach would also apply to the function assessment component of the inventory. The WFAM function assessment approach that is currently used for all of the inventoried wetlands is time consuming and labor/data intensive. In our experience, this approach is somewhat rarely used especially at the reconnaissance or inventory stage. You may want to consider forgoing this approach and relying on the wetland rating information for an assessment of functions (possibly in conjunction with another more qualitative assessment) unless development is imminent. At that time, you could apply the WFAM approach if the development impacts are planned to be offset using credits from the proposed Lummi Wetland and Habitat Mitigation Bank or through other mitigation.

Technical Improvements

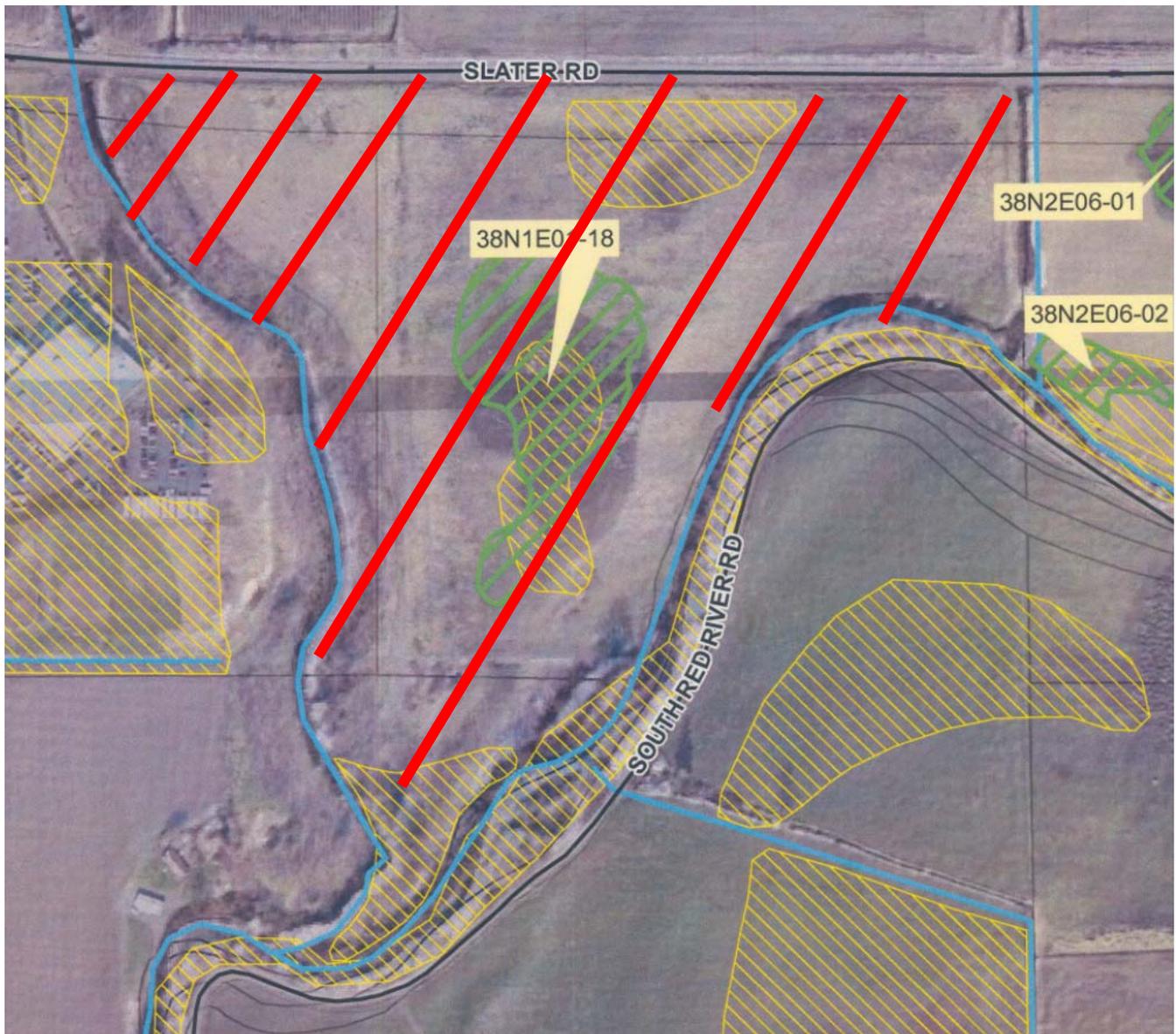
We recommend that the Planner I be outfitted with some additional standard delineation equipment including a soil auger, tile spade, write-in-the-rain notebooks, and plant field guidebooks (e.g., *Plants of the Pacific Northwest Coast* by Pojar and Mackinnon and *A Field Guide to the Common Wetland Plants of Western Washington and Northwestern Oregon* by Sarah Spear Cooke).

We also recommend additional and ongoing staff training to further develop your in-house expertise. The following websites have information on specific training programs that you may want to consider:

- <http://www.richardchinn.com/schedule.html>-Richard Chinn
- getinfo@wetlandtraining.com Wetlands Training Institute
- <http://epp.esr.pdx.edu/coursedesctfull.html> Portland State University-course EPP 716 Basic Wetland Delineation

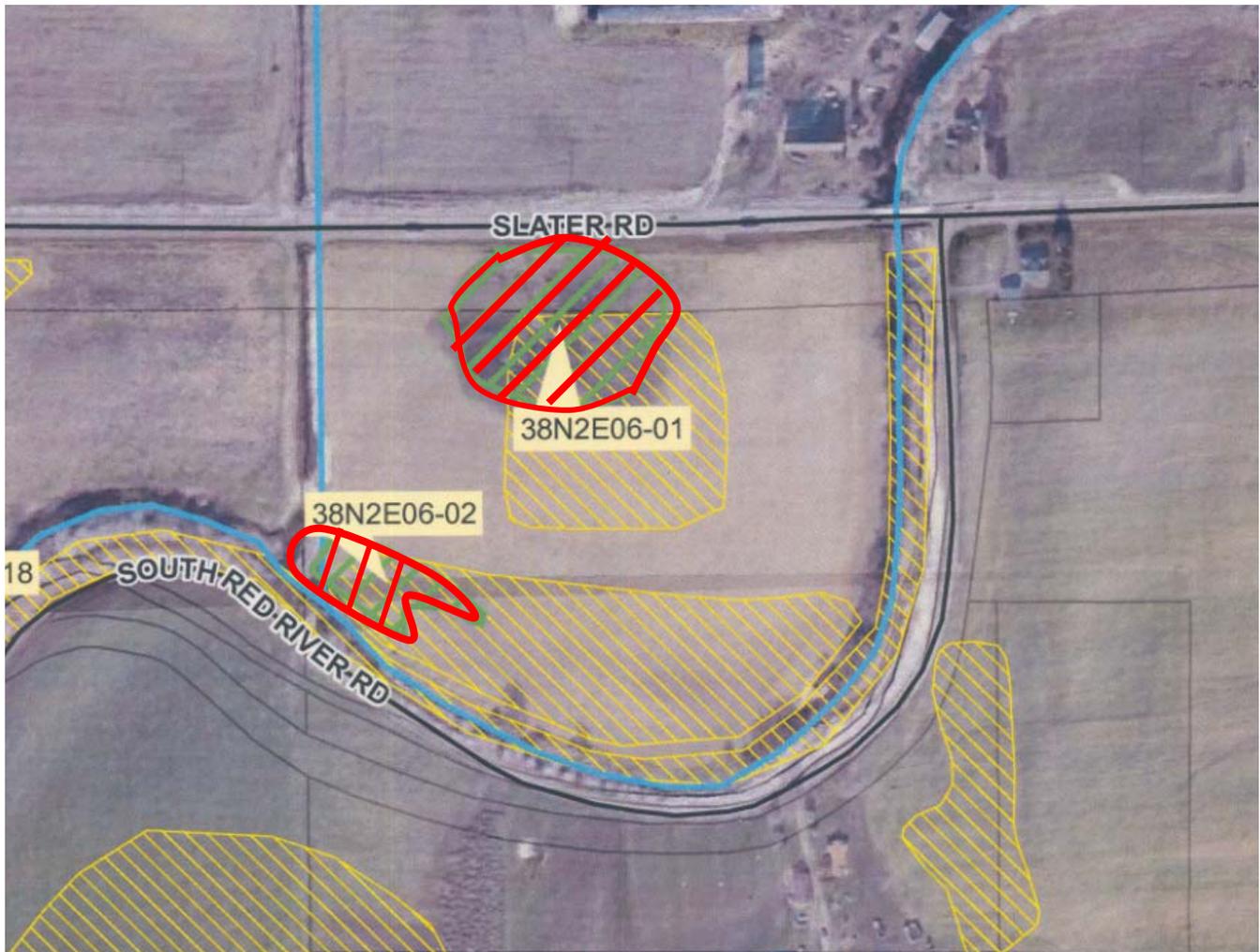
Ideally, the field work would be conducted by two qualified biologists, which is the standard operating procedure for most consulting firms including ESA. We believe that accurate delineations require two people, except in the most basic and straightforward situations. Having two scientists improves the consistency and quality of the data collected, increases the level of accuracy when making boundary determinations, and helps ensure the safety of field personnel. This is especially important when making determinations in support of development proposals that require permits from the Corps or other regulatory agencies. Alternatively, the quality of the inventory could be assured via periodic site-specific oversight and/or peer review by other qualified biologists.

Comparison map for Wetland 38N1E01-18



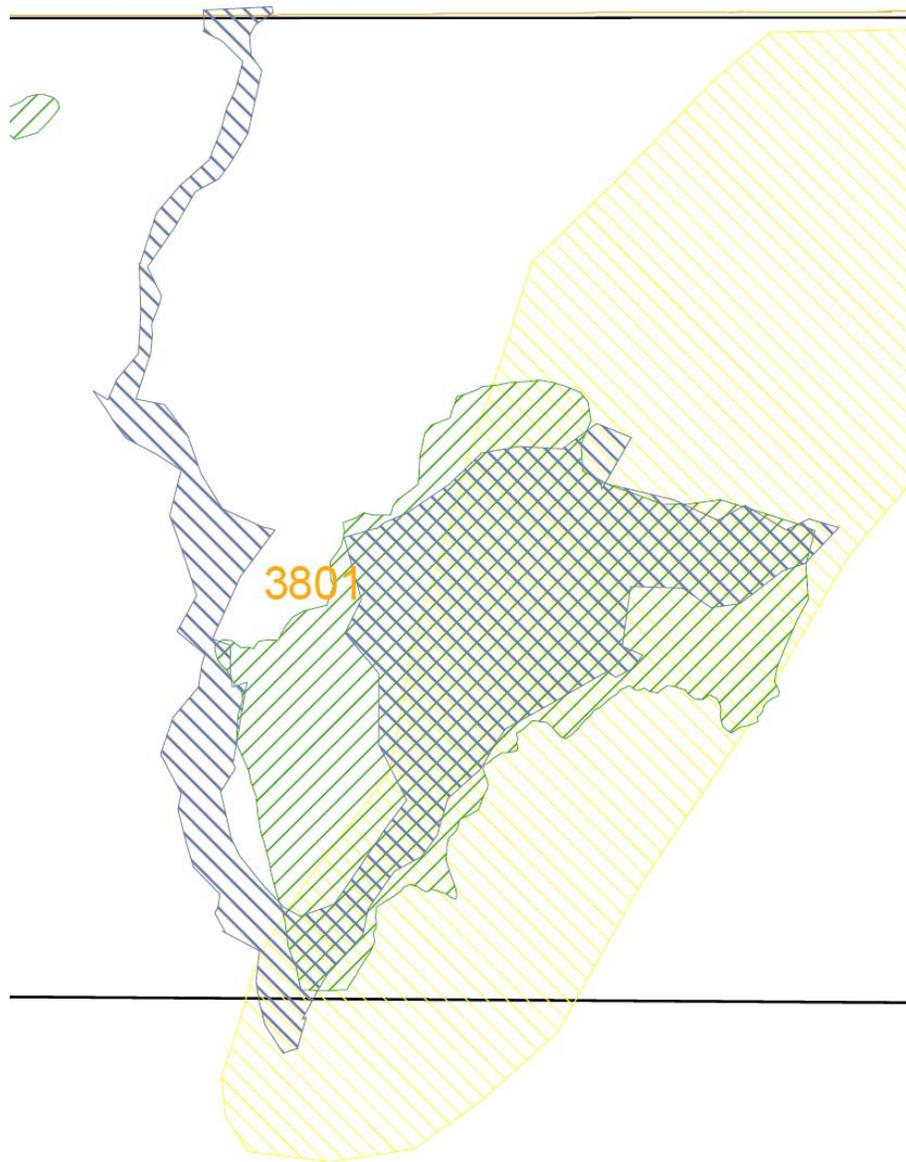
ESA Adolfson estimated wetland areas (2007)

Comparison map for Wetlands 38N2E06-01 and 06-02



ESA Adolfsen estimated wetland areas (2007)

Comparison map for Wetland 38N1E04-02

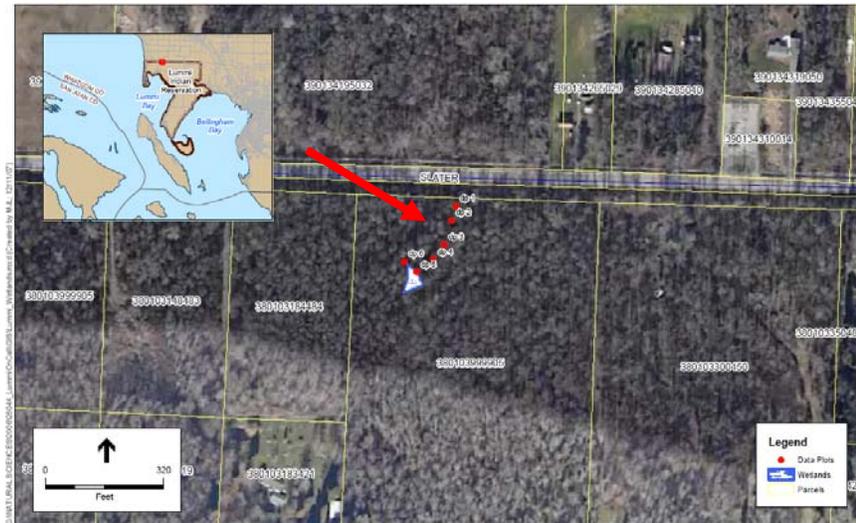


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|---|--|
|  Section Lines |  Wetland (Estimated 1999) |
| Wetlands |  Wetland Complex (Estimated 1999) |
|  Updated 2005 |  Approximate Parcel Boundary |
|  Updated 2006 |  Jan10Polygon |
|  Updated 2007 | |

ESA GPS-generated boundary is the Jan01Polygon

Comparison maps for Wetland 38N1E03-07

ESA Adolfson GPS-generated boundary



LIBC Boundary

