# Texas Prairie Wetlands Project (TPWP) Performance Monitoring

**Relationship to Gulf Coast Joint Venture (GCJV) Habitat Conservation:**

**Priority Species:** Wintering waterfowl species in the Texas portion of the Laguna Madre (LMIA), Texas Chenier Plain (TXCPIA) and Texas Mid-Coast Initiative Areas (TMCIA).

**Planning Objective:** To implement land use and conservation practices on private land to make substantial contributions of flooded agricultural land and moist-soil habitats to meet foraging requirements for target numbers of waterfowl during fall and winter.

**Type of Monitoring:** Habitat

**Monitoring Metric:** Acres of flooded agricultural lands and moist-soil habitats

**Monitoring Objective:** Evaluate performance (e.g., percent of project acres flooded, percent of units with water, and flooded TPWP acres as a percent of total flooded habitat) of TPWP enrolled and expired sites via yearly GCJV-generated seasonal surface water classifications of agriculture-based and moist-soil waterfowl habitat for each IA (LMIA, TXCPIA, and TMCIA; fig. 1.) and time period [i.e., early (16 Aug–31Oct), mid (1 Nov–15 Jan), late (16 Jan–31 Mar)].

**Brief Methodology:** Performance of TPWP sites is assessed using yearly GCJV-generated seasonal surface water classifications of agriculture-based and moist-soil waterfowl habitat for each IA (fig. 1) and time period [i.e., early (16 Aug–31Oct), mid (1 Nov–15 Jan), late (16 Jan–31 Mar)]. For a synopsis of the classification methodology, see the monitoring summary titled "Fall and Winter Surface Water Assessment for Waterfowl Habitat" (path noted in Data and Report Archival section of this document).

TPWP acres are evaluated in Esri ArcMap via a yearly shapefile of updated project units (as polygons) and metadata provided by Ducks Unlimited (DU). Performance of both enrolled and expired units (separately) are evaluated each year based on project metadata, with "enrolled" defined as units constructed before July 1st of the assessment period and "expired" as those whose enrollment in the program expired before March 31st of the assessment period. Both enrolled and expired polygons are then clipped to IA boundaries. Areas of polygons that fall under the GCJV coastal marsh, forested, and permanent water mask are excluded to ensure that only seasonal agriculture-based and moist-soil habitat is included in the TPWP assessment. Using Landsat satellite imagery mosaics for each IA and period (for more details, see monitoring summary titled "Fall and Winter Surface Water Assessment for Waterfowl Habitat"), polygons obscured by cloud and cloud shadow are removed. Following processing, final acres are calculated for both enrolled and expired shapefiles. Processed TPWP polygons are then intersected with the seasonal surface water classification raster for each IA and period to determine flooded acres within all polygons.

Performance results are reported separately for each IA and for enrolled and expired units. Results are reported as final TPWP acres (acreage of post-processing units), flooded acres (acres of flooded habitat within TPWP units), % of acres flooded per all acres, % of units with water per all processed units, and % of flooded TPWP acres per all flooded waterfowl habitat (Appendix 1). All performance results are also reported for maximum extent (combined maximum available habitat per unit) for both the assessment year (early, middle, late periods combined) and for middle/late periods only (Appendix 1). Annually, lists of enrolled and expired TPWP polygons with no reported habitat acres in any assessment are generated. For each list, the assessed periods (i.e., periods for which cloud-free imagery was available) are noted for each polygon on the zero-performance list. For expired polygons, units with zero consecutive performance (e.g., units with no acres of flooded habitat for all periods evaluated) are also reported (Appendix 2). For a detailed methodology synopsis, see Appendix 3 (Texas Prairie Wetland Projects Standard Operating Procedure).

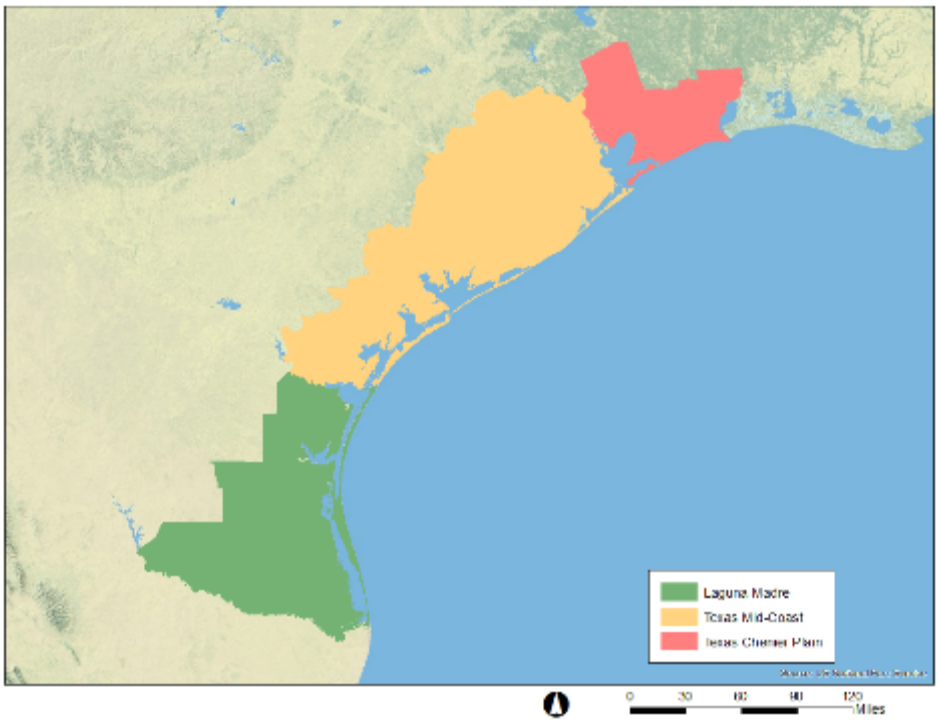


Figure 1. GCJV Laguna Madre, Texas Mid-Coast, and Texas Chenier Plain Initiative Areas.

**Monitoring Responsibilities:**

**Data Collection:** GCJV Remote Sensing and GIS Analysts acquire satellite imagery from the U.S. Geological Survey Earth Resources Observation and Science Center. DU staff at the Southern Regional and Texas Gulf Coast offices maintain and annually update the TPWP polygon dataset. Annual updates to the TPWP dataset include addition of polygons and associated attributes for projects completed since June 30 of the previous year but prior to July 1 of the current year.

**Data Compilation and Analysis:** GCJV Remote Sensing and GIS Analysts compile and classify satellite imagery and calculate TPWP performance metrics.

**Report Development:** GCJV Remote Sensing and GIS Analysts compile results into tables for distribution to the GCJV Biological Team Leader.

**Report Distribution:** The Biological Team Leader reviews results, prepares report, and distributes the report and tables to the TPWP Committee and delivery staff.

**Timing and Frequency:**

**Data Collection:** Depending upon availability of cloud-free Landsat TM satellite imagery, data are collected and processed annually for three fall and winter periods [i.e., early (16 Aug–31Oct), mid (1 Nov–15 Jan), late (16 Jan–31 Mar)]. GCJV Remote Sensing and GIS Analysts receive the updated TPWP dataset from DU staff by 28 Feb, annually.

**Data Analysis:** Classification of **s**atellite imagery for the fall and winter periods of the current year is initiated at the end of each period (e.g., scenes for early winter are compiled and classified beginning 1 Nov). Results are compiled and delivered to the GCJV Biological Team Leader by 1 August, annually.

**Report Development:** Data, tables, and graphs for GCJV use are updated by early August, annually. The summarized information is delivered to the TPWP Committee and TPWP delivery staff at their annual meeting, held in late summer.

**Detailed Methodology:** See Appendix 3 for a detailed Standard Operating Procedure.

**Data Sources and Seamless Mosaics:** An updated TPWP shapefile is obtained each year from DU with sites (project units, as polygons) and metadata (site name, owner, enrollment and expiration dates, etc.). Performance of TPWP sites is assessed using yearly GCGV-generated satellite imagery and derived seasonal surface water classifications of agriculture-based and moist-soil waterfowl habitat for each IA (fig. 1.) and time period [i.e., early (16 Aug–31Oct), mid (1 Nov–15 Jan), late (16 Jan–31 Mar)]. Satellite imagery (e.g., Landsat TM 5 and OLI 8 surface reflectance products and SPOT 4/5) is inventoried for each time period and relevant IA and used to create seamless mosaics. Classifications are derived from this imagery and GCJV surface water models. For a synopsis of the classification methodology see the monitoring summary "Fall and Winter Surface Water Assessment for Waterfowl Habitat" (path noted in Data and Report Archival section of this document).

**Preprocessing:** All TPWP processing is done in ArcMap. An initial review of the data is made to ensure that only TPWP project polygons (units) are included in the shapefile. The shapefile is then projected into WGS 84 UTMN14N and clipped to the GCJV boundary. Following initial shapefile standardization, units are coded as "enrolled" or "expired" for the assessment year based on metadata provided with the shapefile. For each year, enrolled units are those constructed before July 1st of the assessment period, which is estimated to be far enough before the start of the

given assessment period on Aug 15th to ensure a reasonable expectation of performance. Expired units are defined as those that expired before or during the end of the given assessment period on March 31st. When the expiration date is not provided, units are designated as expired if ≥10 years has elapsed since the construction date (e.g., a unit is designated as expired if it was constructed on or before March 31st 10 years prior and as enrolled if it was constructed on April 1st onward). After designation is made, enrolled and expired units are exported into separate shapefiles for further analyses.

**Classification:** For the following steps, all procedures are applied to both enrolled and expired shapefiles unless otherwise noted. Shapefiles are first clipped to individual IA boundaries (fig. 1) for classification. The following steps are then repeated for each IA for both enrolled and expired polygons. For each IA, units covered by the GCJV coastal marsh, forested, and permanent water mask are erased to ensure that only seasonal agriculture-based and moist-soil habitat is included in the TPWP assessment. Using Landsat satellite imagery mosaics for each IA and period (for more details, see "Fall and Winter Surface Water Assessment for Waterfowl Habitat"), units obscured by cloud and cloud shadow are manually edited by either removing the entire unit (if the entire polygon is obscured) or by splitting and removing only the obscured portion of the polygon. Unobscured polygons are then exported to a new, final shapefile. All polygons less than 1.5 acres are then flagged as not assessed. Following processing, final TPWP polygons are intersected with the seasonal surface water classification raster for each IA and period using the Zonal Statistics tool in ArcMap to create a table with performance (pixels of flooded habitat) summed for each polygon. This table is joined to the final shapefile for each IA for reporting. Final results are reported for each period and as maximum extent of available habitat both annually (all periods combined) and for middle/late periods only. To estimate maximum extent, relevant classification rasters are overlaid for each IA and output to a separate layer with combined maximum habitat for each pixel. The same methods are then used to intersect this classification raster with the TPWP enrolled and expired units to determine performance metrics for each polygon.

**Reporting:** Estimates of seasonal surface water availability and TPWP enrollment data are entered into pre-formatted tables depicting a series of metrics for evaluating overall performance of the TPWP as well as performance of individual TPWP sites (for examples, see Appendices 1 and 2).

The following values are reported separately for enrolled and expired sites and for individual periods and for maximum extent periods (early/middle/late and middle/late; Appendix 1). From the final (masked, clouds removed) shapefile, final acres are tallied and recorded as "TPWP Enrollment (ac)" for enrolled units and "TPWP Expired Enrollment (ac)" for expired units. From the joined zonal sum table, pixels of habitat per polygon are summed for the entire IA, converted to acres using the formula =pixel count*900*0.000247105, and reported as "TPWP Flooded Acres" on the summary sheet for both enrolled and expired units. The "% of Units With Water" value is calculated by dividing the number of units with performance (units with flooded habitat) by the total number of units and "% of Project Acres Flooded" is calculated by dividing the

number of TPWP flooded acres by the total number of project acres. "Flooded TPWP Acres of % of Total Flooded Habitat" is calculated by dividing the number of TPWP flooded acres by the total amount of flooded acres classified for each IA (obtained from the GCJV waterfowl habitat monitoring summary spreadsheet).

For both expired and enrolled sites, the number of units and acres that are masked or are outside of IA boundaries are calculated by joining final shapefiles for each IA and period for the assessment year, summing the total number of units and acres from the final shapefile, and subtracting those values from the unprocessed number of units and acres from the unaltered TPWP shapefile provided by DU. The differences are reported as affected units and acres in a footnote for each year.

For both enrolled and expired sites, zero performance is reported for units that have had no performance (e.g., no acres of flooded habitat) for the all periods of a given enrollment year (Appendix 2). Zero performance is determined by joining the shapefile for each period and selecting records where performance is 0 for all periods but not flagged for all periods (i.e. the unit was evaluated for each period and not flagged for being cloud obscured, not classified for the period, or for being <1.5 acres). Units with zero performance for each period are exported to a separate shapefile, placed in a directory with zero performance shapefiles for each assessment year, and added to a separate spreadsheet when performance is 0 for all periods assessed for the current year (see Appendix 3 for more detail).

**Data and Report Archival**

Y:\Monitor

- Contains a readme.doc file that describes directories and the files within them.

Y:\Monitor\TPWP

- Contains compiled data (Excel spreadsheets), reports, tables, and graphs relating to the performance (e.g., percent of enrolled acres flooded and percent of units containing water) of TPWP sites within the GCJV region.

**Monitoring Related Issues to Consider:**

Potential biases from the use of imagery from different satellites (Landsat vs. Spot).
Analysis excludes TPWP sites that are under the Mask or outside the initiative area.

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[a] Monitoring objective, brief methodology, and detailed methodology sections were updated in spring 2021 and minor edits to the Appendix 1 in summer 2021.

# Appendix 1. Example TPWP performance results and reporting format for 2002/03.

**Texas Prairie Wetlands Project Flooding Performance of Current Enrollment [1,2]**

| | Texas Mid-Coast | | | | | | |
|---|---|---|---|---|---|---|---|
| Year/Period[4] | Satellite Image Acquisition Date(s) | TPWP Enrollment (ac)[1,2,3] | TPWP Flooded Acres | % of Project Acres Flooded[6] | % of Units w/Water[7] | Total Flooded Acres[8] | Flooded TPWP Acres as % of Total Flooded Habitat |
| 2002/03 | | | | | | | |
| Early[9] | Sep 20 - Sep 27 | 11,518 | 3307 | 28.7% | 53.7% | 39,777 | 8.3% |
| Middle[10] | Nov 23 - Jan 1 | 11,518 | 5457 | 47.4% | 71.8% | 71,313 | 7.7% |
| Late[11] | Jan 17 - Mar 31 | 11,518 | 5209 | 45.2% | 68.2% | 49,231 | 10.6% |
| Early/Middle/Late | Sep 20 - Mar 31 | 11,518 | 6515 | 56.6% | 78.0% | 106,159 | 6.1% |
| Middle/Late | Nov 23 - Mar 31 | 11,518 | 6175 | 53.6% | 76.2% | 85,439 | 7.2% |

[1]Excludes all enrolled acres that fall under the GCJV's mask of permanent, forested and estuarine wetland classes and urbanized areas, outside of the Initiative Area boundaries, or where cloud free imagery was unavailable.

[2]Includes all units constructed before July 1st of any given year (i.e., proceeding the start of the assessment period), excluding those whose enrollment period expired prior to March 31st, (i.e., end of the assessment period) of the given year.

[3]Units for which expiration date was blank were assumed to have a 10 year life cycle from delegation date.

[4]Areas are generally defined as south of Corpus Christi Bay (Laguna Madre), Corpus Christi Bay to Galveston Bay (Tx Mid-Coast), and Galveston Bay to Louisiana state line (Tx Chenier Plain).

[5]Periods are defined as August 16-October 31 (early), November 1-January 15 (middle), and January 16-March 31 (late).

[6]Calculated by dividing total flooded acres on TPWP sites by acreage of total TPWP enrollment available for analysis.

[7]Calculated by dividing number of TPWP units with water by total number of units available for analysis.

[8]Estimated for GCJV "agricultural/moist-soil" habitats, with other habitats excluded by mask of permanent, forested, and estuarine wetland classes.

[9]Landsat 5 CDR imagery was used for classifications. For Initiative Area/periods assessed, excludes all enrolled acres that fall under the GCJV's mask of permanent, forested and estuarine wetland classes and urbanized areas, outside of the Initiative Area boundaries, or where cloud free imagery was unavailable, which affects 7,139 acres and all or portions of 455 units.

[10]Landsat 5 CDR imagery was used for classifications. For Initiative Area/periods assessed, excludes all enrolled acres that fall under the GCJV's mask of permanent, forested and estuarine wetland classes and urbanized areas, outside of the Initiative Area boundaries, or where cloud free imagery was unavailable, which affects 7,192 acres and all or portions of 455 units.

[11]Landsat 5 CDR imagery was used for classifications. For Initiative Area/periods assessed, excludes all enrolled acres that fall under the GCJV's mask of permanent, forested and estuarine wetland classes and urbanized areas, outside of the Initiative Area boundaries, or where cloud free imagery was unavailable, which affects 11,229 acres and all or portions of 502 units.

Prepared by Gulf Coast Joint Venture Office [date]

# Appendix 2. Example of reporting currently enrolled units with no detectable flooding performance.

**Texas Prairie Wetlands Project: Currently Enrolled Units with No Detectable Flooding Performance[1,2]**

| Time Period(s) Assessed This Year | Consecutive Years W/out Performance | Unit # | Project # | Landowner | Construction Completion Date |
|---|---|---|---|---|---|
| Early, Middle, & Late | 2 | 10 | TX0374 | Hall, George | Jul-99 |

[1] Excludes all or portions of XX units representing YY enrolled acres that fall under the GCJV's mask of permanent, forested, and estuarine wetland classes.
[2] Includes all units constructed before Xxdate of any given year, excluding those whose enrollment period expired prior to March 31st of t the given year.

Prepared by Gulf Coast Joint Venture Office

# Appendix 3. Standard Operating Procedure for assessing the performance of Texas Prairie Wetland Projects.

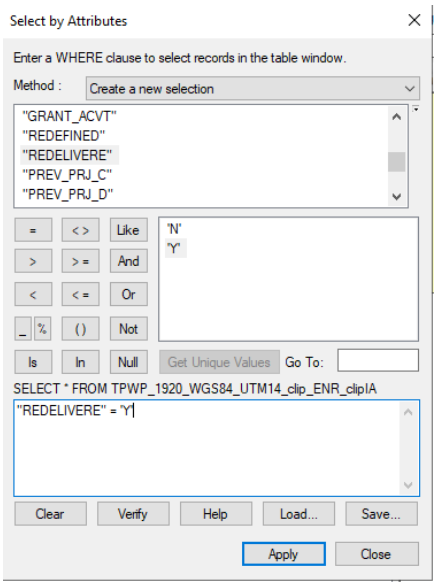
1) Create a new directory at R:\SC009NO\12\Working\GCJV\TPWP for the year assessed (i.e., 0708).
2) Within this directory create the follow directories
    a. LAG
        i. A folder for all periods assessed (e.g., “Early”, “Middle”, and “Late”)
    b. TMC
        i. A folder for all periods assessed (e.g., “Early”, “Middle”, and “Late”)
    c. TXCHEN
        i. A folder for all periods assessed (e.g., “Early”, “Middle”, and “Late”)
    d. TPWP
3) Add years assessing to the TPWP_Performance_updated_August_XXXX.xls spreadsheet and adjust footnotes accordingly.
4) Obtain Texas Prairie Wetland Projects (TPWP) polygon shapefile from Ducks Unlimited SRO.
    a. Note for historical years always use the current version of the TPWP polygon.
5) Add TPWP shapefile to a new ArcMap document.
6) Select by attributes TYPE = ‘TPWP’ and the switch selection. This selects only TPWP polygons. In 17/18 the shapefile already came with only TPWP polygons. This might be the case in the future.
    a. Export selected polygons as TPWP_YRYR.shp.
7) Project TPWP_YRYR.shp data into WGS 84 UTM14N. Check the preserve shape box.
8) Add a float field named “Acres_GIS.” Calculate geometry (Acres_US).
9) Add a float field named “AcresFinal”.
10) Add a float field named “AcresDiff”.
11) Add a short integer field “ENR”.
12) Add a short integer field “EXP”.
13) Add a short integer field “CloudOb”.
14) Add a float field for periods assessed (e.g., “EarlyP”, “MidP”, “LateP”).
15) Clip to the GCJV boundary.
16) Calculate the ENR for all polygons that are “enrolled” to be “1” using the following criteria (Based on the DEL_YR field):
    a. Includes all units constructed before July 1st of the assessment period (i.e., before the start of the assessment period), excluding those whose enrollment period expired before March 31st, (i.e., end of the assessment period). For example, if the assessment period is 2019/2020, units constructed before July 1$^{st}$ of 2019 would be enrolled, and units that expired before March 31$^{st}$ of 2020 would be expired.

b. Units for which expiration date was blank were assumed to have a 10-year life cycle from delegation date.

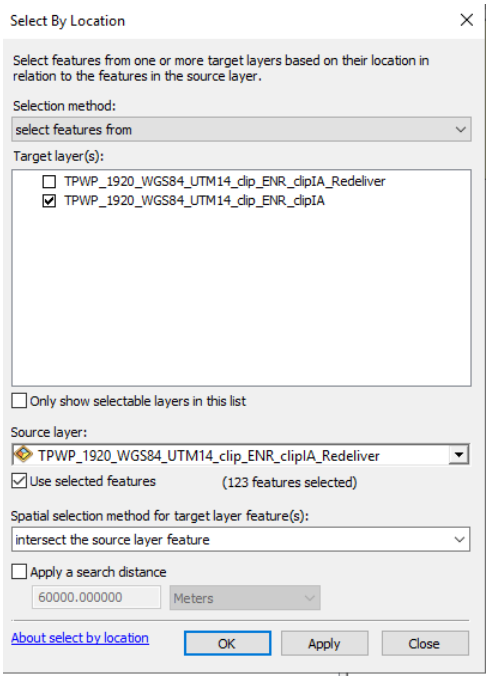
17) Calculate the EXP for all polygons that are “expired” to be “0” using the following criteria (Based on the EXP_YR field):
    a. Units whose enrollment period expired prior to March 31st, (i.e., end of the assessment period) of the given year.
18) All other units set “ENR” to “-99” using the following criteria.
    a. Includes all units constructed after July 1st of any given year (i.e., proceeding the start of the assessment period) of the given year.
19) Select polygons where “ENR” and “EXP” is equal to 1 and export to “TPWP_XXXX_sel_TPWP_utm14_ENR_EXP.shp”.
20) Check for error polygons and adjust ENR and EXP accordingly. Some errors you may find:
    a. Missing prj_del_ID filed
    b. Duplicate prj_del_ID
    c. ENR = 1 and redelivery = NO
    d. EXP = 1 and redelivery =yes. Do not do anything to change these polygons, simply dissolve them with overlapping polygons.
    e. Keep track of errors found in a spreadsheet
    f. Enrolled polygons overlapping enrolled polygons
    g. Enrolled polygons overlapping expired polygons

***Steps to solve ENR overlapping ENR***

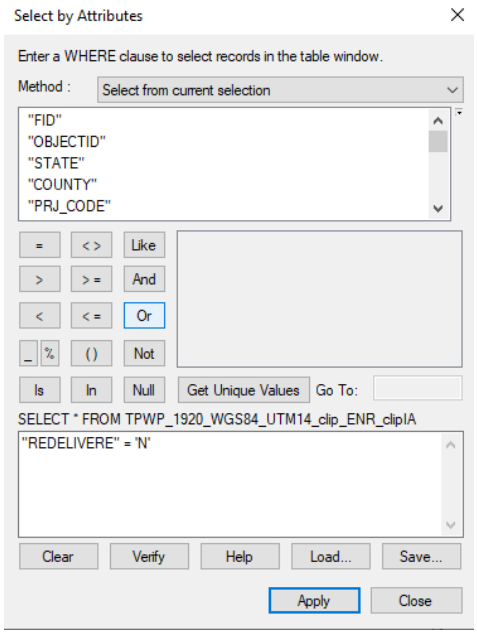
1. Add Enrolled Files to the table of contents (TOC) twice
    a. In the TOC, rename the second one differently so you can identify them
2. Select the newly named ENR File and use “select by attributes”
    a. Select where the Field “redelivere”= ‘Y’



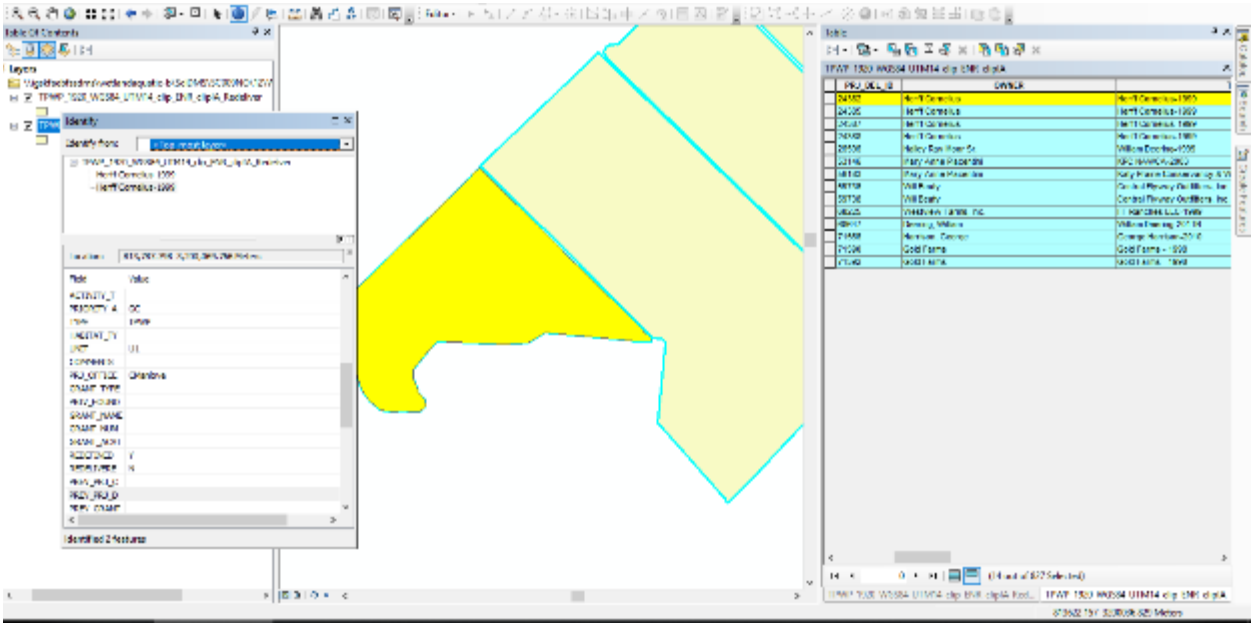
3. Then “Select by location”
   a. Target layer= the original enrolled layer
   b. Source layer=newly named enrolled layer
   c. Check the box for “Use selected features”




4. Now you can “select by attribute” on the original enrolled file where the field “redelivere”=’N’ (note, this was the file that was the target layer in the select by location)
   a. Make sure to select “select from current selection” under the method tab
      i. These will be the old polygons that have now been renewed
   b. Export this Selection as a table to use in documenting these errors in a spreadsheet for the assessment year.
      i. Provide the Project IDs along with a comment about the error.




5. Use these to look through and delete the old polygon and keep the renewed polygons, (or most updated polygon). You can use the identify tool to help aid you in finding the two overlapping polygons, along with their individual project id numbers.



***Steps to solve Enrolled over Expired***

1. Export out Enrolled and Expired polygons

2. Select by Location
    a. Target Layer=ENR file
    b. Source Layer= EXP file
3. Use this selection to identify the polygons with issues
    a. Export out this selection as a table and document the problem polygons
4. Use the Erase Tool to fix the issue.
    a. Input Feature=Export file
    b. Erase Feature=Enrolled file

21) Add an integer field NA_Flag" + P initial (e.g., E, M, L) and "ZP_" + year [e.g., 1415]) to the shapefile.
22) Clip polygons to IA boundaries using R:\SC009NO\12\Working\GCJV\TPWP\MISC\LAG_TMC_TXCHEN_utm14.shp and name output as "TPWP_XXXX_sel_TPWP_utm14_clipIA.shp".
23) Recalculate GIS_ACRES field to update the number of acres in each polygon. This will account for any changed due to clipping polygons to the boundaries. This must be done before TXCHEN is projected to UTM15.
24) Using R:\SC009NO\12\Working\GCJV\TPWP\MISC\LAG_TMC_TXCHEN_utm14.shp, select each IA and then use a select by location to select and export out the expired and enrolled units by IA. Place outputs in the TPWP directory.
25) Project the expired and enrolled units for TXCHEN to UTM15N.
26) Erase the masked area from the enrolled and expired acres shapefile using the exclusion mask for each Initiative Area. For output name add "_masked" to the end of the name.
27) Place a copy of these data in each period for the respective IA (see step 2).
28) ***If cloud and cloud shadow is present in imagery***:
    a. Using the imagery used for area classified, systematically assess each dataset for cloud coverage. If the entirety of a polygon is obscured by clouds set the "CloudOb" field to be 1. If portions of the polygon are obscured, use the edit tools to split the polygon and set "CloudOb" to be 1 for the obscured areas. This information will be useful for the zero performance assessment. *Note as you are editing and splitting polygons be sure to merge polygons portions of the same unit that are not obscured by clouds.*
    b. When finished with IA, select all polygons where CloudOb = 1 and calculate "NA_Flag" + P initial (e.g., E, M, L) field to be 1.
29) Select polys that are not obscured by clouds from the dataset (i.e., CloudOb = 0) and export to new dataset in the same directory. For output name add "_remove_clouds" to the end of the name.
30) Calculate "AcresFinal" field. Record this number in the TPWP Enrollment (ac) and Expired (ac) field of the TPWP spreadsheet.
31) From the "_remove_clouds" shapefile, select all polygons that are <=1.5 acres and calculate NA_Flag" + P initial (e.g., E, M, L) to be 1.

Repeat these steps for each IA for each period assessed.

**For each Initiative Area and each period (Do each step for ENR and EXP Separately):**

32) Open attribute table and sum AcresFinal. Enter the information into the appropriate worksheet for the appropriate Initiative Area. (TPWP enrollment acres and expired acres)
33) Use the "Zonal Statistics as Table" tool in ArcMap:
    a. Input raster: TPWP polygon (masked_remove_clouds)
    b. Zone field: PRJ_DEL_ID
    c. Input value raster: final classification for yr/IA/period
    d. Statistics type: "sum"
    e. Output: "INPUT FILE NAME" + "_zonalsum.dbf"
34) **Join** the "_remove_clouds" shapefile to the zonal statistics result using the PRJ_DEL_ID as the common field. (right click polygon→ join and relate→ join)
    a. Calculate period + "p" field to be 1 if the zonal sum is > 0.
    b. **Sum** the zonal sum column and multiply by 900 * 0.000247105 to find the performance in acres.
    c. Record this number in the "TPWP Flooded Acres" field of the TPWP spreadsheet.
35) Determine the percent of units (i.e., polygons) with water by dividing the number of units with any performance (period+"p" > 0) by the total number of units. Record this number in the "% of Units w/Water" field of the TPWP spreadsheet.
36) Re-project TX CHEN files to be WGS84 UTM14N

**Determining number of polygons and acres for which enrolled or expired acres that fall under the GCJV's mask of permanent, forested and estuarine wetland classes and urbanized areas, outside of the Initiative Area boundaries, or where cloud free imagery was unavailable for each period assessed.**

37) Create a new file geodatabase called "TPWP_YRYR"
    a. In Arc Catalog, right click the TPWP folder in the current year. Choose new file geodatabase.
38) **Import** one "remove_clouds" file from the current year by right clicking on the geodatabase. Call the file "TPWP_" + ENR_EXP + period+"_Assessed"
    a. For Field Map only preserve fields "PRJ_DEL_ID", "AcresFinal", "Acres_diff", all "NA_Flag"+ P initial and Period + "_P" fields.
39) **Load** the other "remove_clouds" files for the current year and relative period by right clicking on the appropriate "_Assessed" file in the geodatabase and choosing LOAD data.
    a. Ex: There should be a file called "TPWP_ENR_EXP_Early_Assessed" containing all of the Early ENR_EXP "_remove_clouds" files from the current year.
40) **Join** the "_Assessed" file to the original, unaltered ENR_EXP shapefile for the current year (Clipped to the GCJV boundary, yet not clipped to the Individual IA boundaries yet).
    a.

41) Calculate Acres_Diff to be Acres_Final (from the unaltered file) – Acres_GIS (from the "_Assessed" file). (Calculate this separately for Enrolled and Expired by selecting only Enrolled or Expired polygons)
42) Set "NA_Flag" + P initial to 1 for all units where final acres <= 1.5.
43) Determine number of units where AcresDiff > 0.
44) Use this data to edit the excel spreadsheet footnote for the period being assessed.
    a. Total the number of Acres_GIS for ENR and EXP separately in the original ENR_EXP file and determine the total number of units. Write this down for later use.
    b. Calculate acres affected by totaling the Acres_Final for each period. Subtract this from the total of Acres_GIS (found in step 44a). (**For ENR and EXP separately**)
    c. Calculate number of units affected by subtracting the total number of units in the "_Assessed" file from the total number of units in the original ENR or EXP file. Then add the number of units where AcresDiff > 0 (from step 43).

*Repeat steps for each period.*

**When all periods have been assessed - determining zero performance**

45) Export original unaltered ENR_EXP created in step 24 and name output …_ENR_EXP_with_performance.shp".
46) One period at a time join the other "TPWP_"+ ENR_EXP + period + "_Assessed_join_original.shp" from the other periods and calculate data from the joined table.
    a. Calculate performance and flag fields by copying the fields from the joined shapefile.
    b. Flag all periods that are null, too
    c. Remove all joins.
47) Select records where performance is zero in all periods, but not "NA_Flag" = 1 for all periods example:
48) ( "EarlyP" = 0  AND "MidP" = 0 AND "LateP" = 0) AND ("NA_Flag_E" = 0 OR "NA_Flag_M" = 0 OR "NA_Flag_L" =0)
49) Calculate ZP to be 1.
50) Select records with ZP = 1 (ENR and EXP seperately) and export data to "TPWP_ZP_ENR or EXP_" + year (e.g., 1415) + ".shp".
51) Copy data to …TPWP\ZP\years directory.

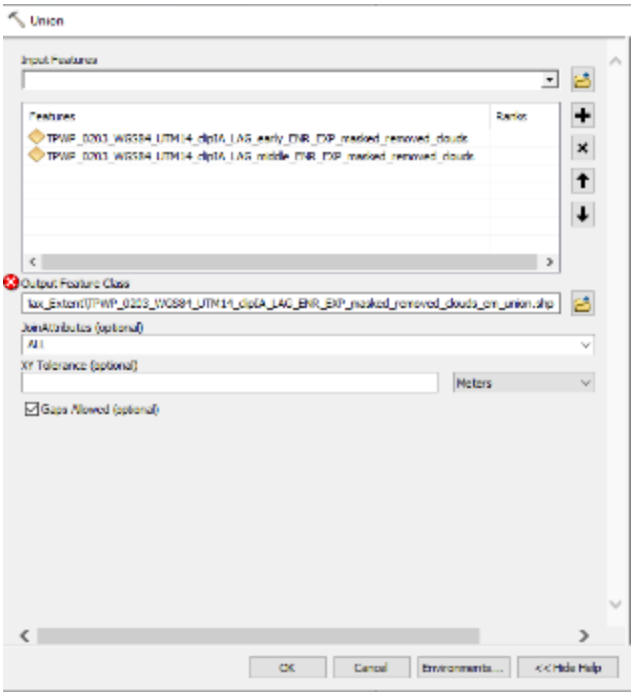
**Determining consecutive zero performance (For ENR and EXP):**

52) Merge all the years TPWP\ZP\years directory. In the Field Map, remove all fields except for "PRJ_CODE", "PRJ_DEL_ID", "OWNER", "DEL_MO", "DEL_YR", "NA_FlagP" initial fields and all "ZP_XXXX" (e.g., ZP_1415).
53) Dissolve merged data using the PRJ_DEL_ID field. For Statistic Fields set each ZP Field to MAX.
54) From Dissolved data, select records where the current year has zero performance (e.g., SUM_ZP_141 = 1).
55) Export data to a new shapefile named "ZP_" + XXXX + "_with_ConZP.shp".

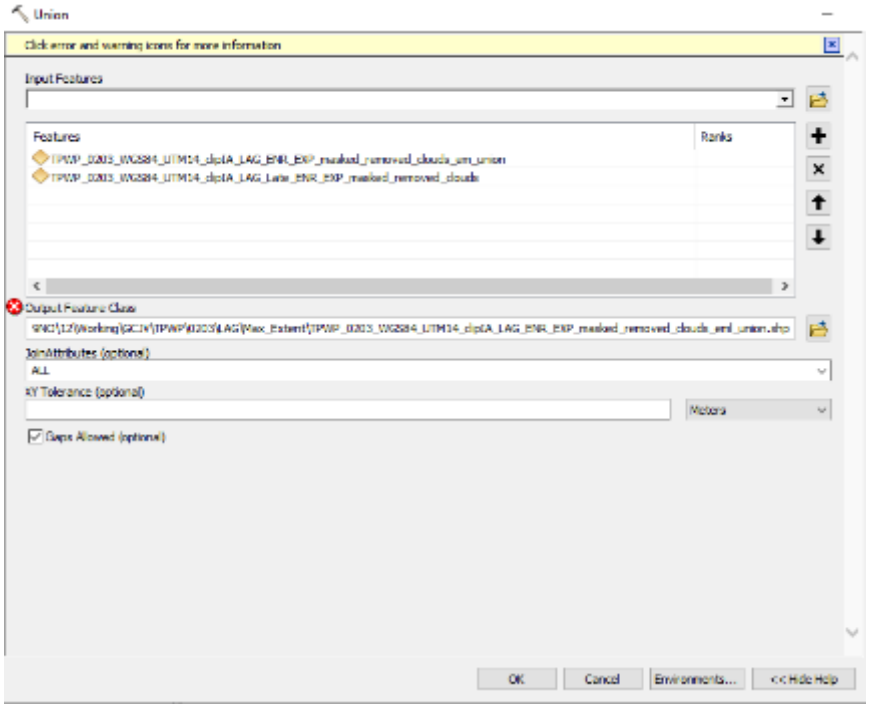
56) Open attribute table for “ZP_” + XXXX + “_with_ConZP.shp”
57) Add short integer field named “ConZP” and calculate field to 1.
58) Iteratively, working from less consecutive years towards more consecutive years, select records where all years are ZP_XXXX = 1 and calculate ZP accordingly.
    a. Example: Select by attributes where "SUM_ZP_070" = 1 AND "SUM_ZP_080" = 1 AND "SUM_ZP_091" = 1 AND "SUM_ZP_101" = 1 AND "SUM_ZP_111" = 1 AND "SUM_ZP_121" = 1 AND "SUM_ZP_131" = 1 AND "SUM_ZP_141" = 1;Calculate ZP to be 8.
59) Join this data with the original TPWP_ZP_XXXX.shp. Export data as “TPWP_ZP_” + XXXX + “_final.shp” in the …TPWP\ZP\final directory
60) Add a 100-character text field named “P_Assess”.
61) Use selection queries to attribute “P_Assess” for periods assessed (i.e., “Early, Middle”, “Early”, “Middle”, “Middle, Late”, etc.)
62) Export the attribute table of “TPWP_ZP_” + XXXX + “_final.shp” to TPWP_ZP_” + XXXX + “_final_table.dbf”
63) Transfer data to the TPWP spreadsheet.
    a. You can browse to the shapefile in windows explorer and open the .dbf file in excel
    b. Delete all but the following fields
        i. Time periods assessed
        ii. Del_month
        iii. Del_year
        iv. Years without performance
        v. Project code
        vi. Project delivery id
        vii. Landowner
        viii. Date completed
    c. Create a new column called date. Enter a formula to get the whole date
        i. DateValue(concat(Del_mo cell, “/01/” Del_year cell))
        ii. Set the format of the cell to be a date with the type month-year (For example Mar-12 is March 2012)
    d. Open the TPWP spreadsheet. Copy each column and paste individually. Choose “paste values” to paste only the text and not the formula entered in step c.
        i. You will not need to copy the delivery month and year columns
64) ***Maximum Extent in TPWP***
    a. If there is a period with no cloud obscurity use that period’s “..._remove_clouds.shp” as the maximum extent shapefile for that Initiative area.
        i. Export all data from shapefile and name it “…_remove_clouds_EML/ML_max_extent.shp” and input it into R:\SC009NO\12\Working\GCJV\TPWP\YYYY\IA\Max_Extent

    b. If there is cloud obscurity in all periods for an initiative area do the following steps:

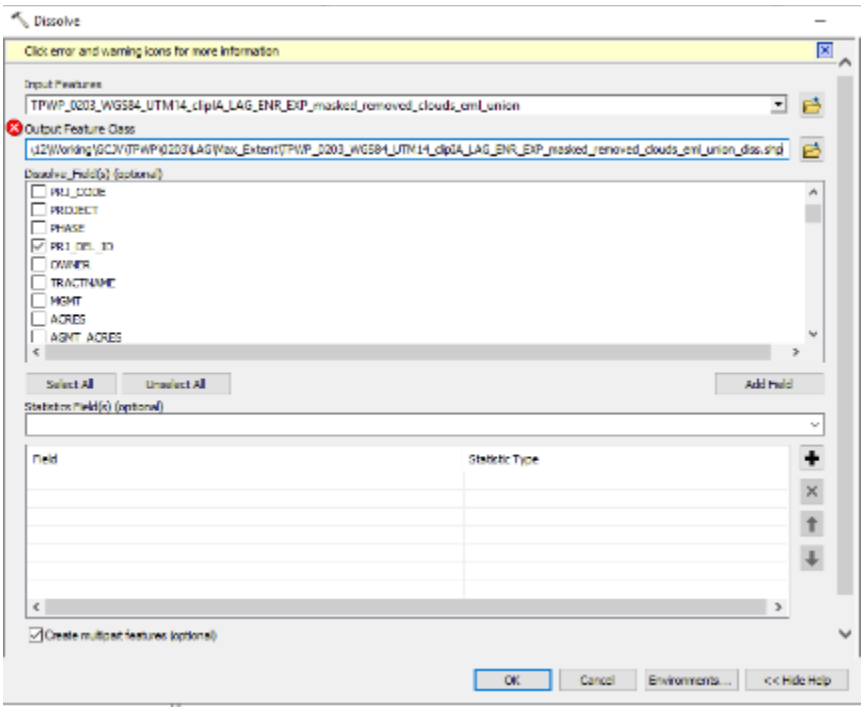
i. For EML maximum extent:
    1. Take the early and middle period "…_remove_clouds.shp" shapefiles and perform a union.
        a. Input Features: early and middle period "…_remove_clouds.shp" files
        b. Output Feartures: "…remove_clouds_em_union.shp" to R:\SC009NO\12\Working\GCJV\TPWP\YYYY\IA\Max_Extent



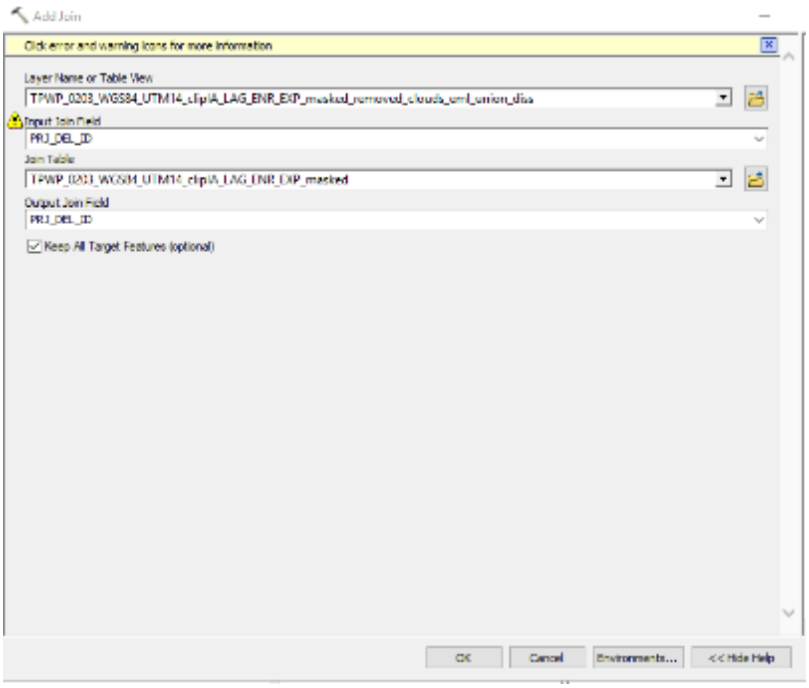

    2. Take the product of the early/middle period union and perform a union with the late period.
        a. Input Features: "…remove_clouds_em_union.shp" and "…remove_clouds.shp" for late period.
        b. Output: "…remove_clouds_eml_union.shp" into R:\SC009NO\12\Working\GCJV\TPWP\YYYY\IA\Max_Extent



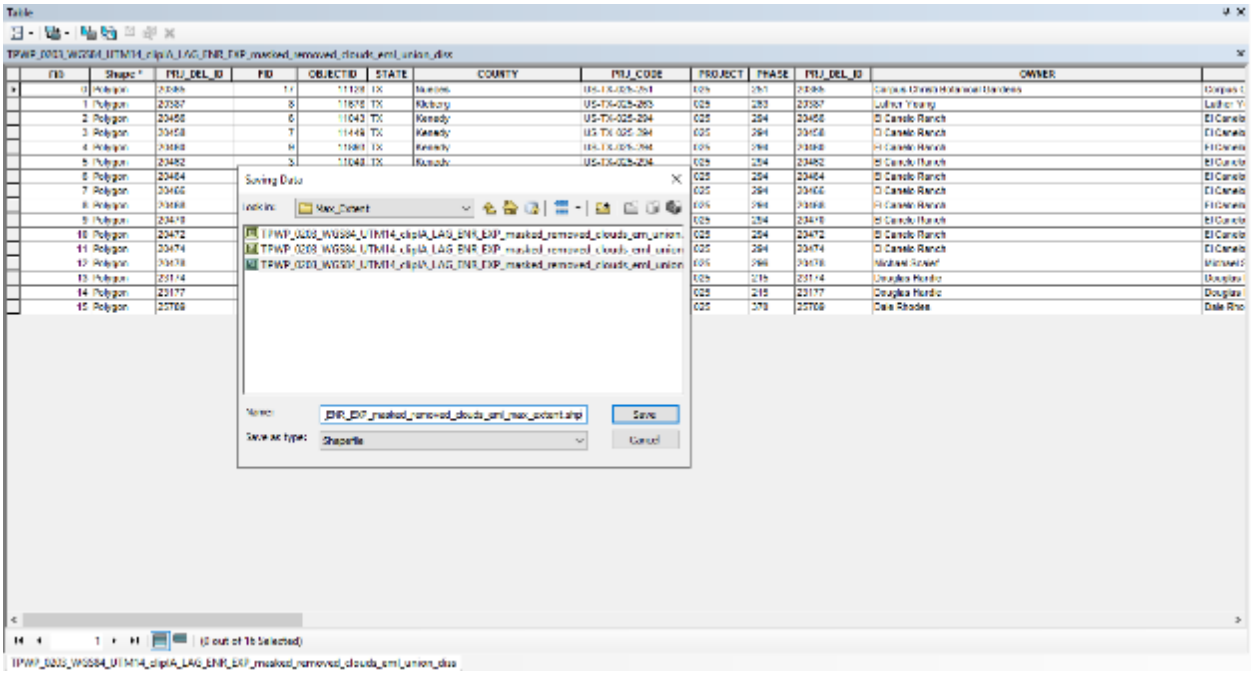

3. Take the final union product and perform a dissolve using the PRJ_DEL_ID field as the dissolve field option.
    a. Input: "…remove_clouds_eml_union.shp"
    b. Output: "…remove_clouds_eml_union_diss.shp" to R:\SC009NO\12\Working\GCJV\TPWP\YYYY\IA\Max_Extent
    c. Dissolve_Field: PRJ_DEL_ID




4. Take the dissolved product and perform a add join to the "…_masked.shp" within the specific initiative area file directory.
    a. Layer Name or Table View: "…_eml_union_diss"
    b. Input Join Field: PRJ_DEL_ID
    c. Join Table: "…ENR_EXP_masked"
    d. Output Join Field: PRJ_DEL_ID



5. Export all data from the product of the add join as a new shapefile.
    a. Select the PRJ_DEL_ID that comes from the "…clouds_eml_union_diss.shp"
    b. Select all other fields and cells that correlate to the "…clouds_eml_union_diss.shp" and export to a new shapefile.
    c. Export name: "…clouds_eml_max_extent.shp"




6. Recalculate final acres

ii. For ML maximum extent:
    1. Do the same as EML maximum extent but perform a union with middle and late periods only.

c. Once you have the maximum extent shapefiles, start the max extent assessment at step #33 using the maximum extent classifications (see Maximum Extent in the Allston_SOP_Overview_of_Waterfowl_Shorebird_Classifications.docx) for step #34 part c.