APPENDIX TO SYSTEM-SCALE GEOMORPHOLOGY AND VEGETATION MONITORING REPORT: 2017-2020

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# Appendix A1. Hydrodynamic Modeling Protocol

1. Utilize SRH – 2D software to create models at 12 flows (500, 750, 1000, 1200, 1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000) at 5 bridge segments (Lexington to Overton, Overton to Kearney, Kearney to Shelton, Shelton to Grand Island, Grand Island to Chapman) with each year’s topobathymetric LiDAR elevations. SR-2D output is stored as a .dat text file which can be 1 GB or more in size for one model run. Each text file is stored with that reach’s model node numbers, the XYZ coordinates of the model nodes, and an array of outputs for each node, including depth and velocity.
2. Compile stock shapefiles used in analysis
   1. Bank Hull—shapefile representing all channels in the AHR extending 50-100 ft overbank. Excludes bridges and powerline footprints
   2. Geomorphic reaches – the Bank Hull clipped at bridges dividing the reaches
   3. Main Channel and Side Channel, stored as separate shapefiles – the Bank Hull clipped to channel type
   4. Cross-station lines, labeled with Cross Station ID value in Attribute Table. Oriented approximately perpendicular to the main channel
   5. Polygons representing managed and unmanaged areas of the main channel. managed areas are under any ownership
3. Prepare bridge segment node database for processing results. An important component of processing model results is relating the output text files to a node database. Each bridge segment model result output file includes information on all nodes in that bridge segment, whether or not they are inundated at that flow. Each node in the model results output is stored with its Node ID and that node’s X, Y, and Z coordinate. A stock node database for each bridge segment is joined to the model output text files in order to make area measurements and analyze results at various spatial scales. In order to spatially manipulate the node data, the XYZ coordinates can be opened in ArcGIS as points. The node database should include a field for the node area in square feet
   1. The node databases should already include a binary field representing the main channel. To edit this field, select the nodes by location within the main channel polygon. Create an MC field, and populate selected nodes with 1.
   2. The node databases should already include representing geomorphic reach. To edit this field, select the nodes by location within the geomorphic reach masks and calculate field for each geomorphic reach
   3. Each year, the node database should be updated with results from the Land Cover Classification in order to estimate suitable whooping crane roosting area.
      1. Open the model nodes as points and create a new field like WC\_XXXX, such as WC\_2017, which denotes suitable unobstructed width for whooping crane roosting habitat for that year
      2. Open unobstructed width lines from the Land Cover Classification
      3. Select unobstructed width lines that are greater than or equal to 650 ft
      4. Use the Graphic Buffer tool to buffer the selected with lines with Butt cap type to create regions of the channel with suitable width for whooping crane roosting
      5. Select by Location for the model nodes within the areas with suitable width
      6. Populate the WC\_XXXX field for selected nodes with 1
   4. Export the attribute table of the node database as a .csv for use in processing model results
4. Process SRH-2D output to analyze results. Note: This workflow is best implemented with R. A script that accomplishes this workflow will be stored on the Headwaters server to be utilized for future analyses
   1. For each model run, subset the results to reduce data size and processing time. Subset rows to those with depth greater than 0. Cut off all columns besides Node ID, water depth, and X velocity
   2. Join the node database to the model run results, using Node ID as the key. Now the data should include Node ID, water depth, X velocity, Node area, the geomorphic reach, a binary main channel field, and a binary field representing suitable unobstructed width for whooping crane roosting habitat for each year
   3. Subset the bridge segment model results into geomorphic reaches. This is a messy process and it is different for each bridge segment. Each geomorphic reach is extracted from the bridge segments in Table A1. Most geomorphic reaches are subsetted from one bridge segment run. For two geomorphic reaches – Odessa to Minden and Gibbon to Wood River – two bridge segments must be joined together first and then subsequently subsetted to the geomorphic reach.

**Table A1.** Relationships between geomorphic reaches and bridge segments

|  |  |
| --- | --- |
| **Geomorphic Reach** | **Bridge Segments** |
| N-lexington\_overton | lexington\_overton |
| J2\_overton | lexington\_overton |
| overton\_elmcreek | overton\_odessa |
| elmcreek\_odessa | overton\_odessa |
| odessa\_minden | odessa\_kearney, kearney\_shelton |
| minden\_gibbon | kearney\_shelton |
| gibbon\_woodriver | kearney\_shelton, shelton\_gi |
| woodriver\_gi | shelton\_gi |
| gi\_chapman | gi\_chapman |

* 1. Subset the geomorphic reach data to the main channel by selecting the rows where MC is equal to 1
  2. Subset the geomorphic reach data to the side channels by selecting the rows where MC is not equal to 1
  3. Populate separate dataframes with the following metrics for each spatial scale – all channels, main channel, and side channels
     1. Average depth: the average of water depth
     2. Inundated area: the sum of node areas
     3. Inundated volume: the sum of node areas multiplied by water depth
     4. Area with depth < 1 ft: The sum of node areas with depth less than 1 ft
     5. Suitable whooping crane roosting area: The sum of node areas with depth less than 1ft which also have suitable unobstructed width (WC\_XXXX=1) for a given year
     6. Volumetric flow: approximate volumetric flow for each node by multiplying node area, water depth, and X velocity together. The sum volumetric flow in the main and side channels can then be compared to estimate the main:side channel flow splits for each reach

1. Analyze wetted width. Note: This workflow is best implemented with an ArcPy Python script. A script that accomplishes this workflow will be stored on the Headwaters server to be utilized for future analyses
   1. Use R to create and export text files of each model run representing only XY coordinates and water depth
   2. Use XY table to point to create a point shapefile for every model run
   3. Create water depth TINs for each model run from the point shapefile using the Mass Points option
   4. Use the Delineate TIN Data Area tool with Max Edge Length set to 36 ft and Method as “All”
   5. Use the TIN Triangle tool to convert the water depth TINs to polygon shapefiles
   6. Add a field called “Dissolve,” populate it with 1, and attempt to use the Dissolve tool to dissolve the TIN polygon by the Dissolve field. The tool will fail for some of the larger-extent flows
   7. Clip cross-station lines to the TIN triangle polygons. These lines represent wetted width
   8. For all reaches besides the two from Lexington to Overton, clip the wetted width lines to the main channel
   9. For both all channels and main channels wetted width shapefiles, add a field called Length\_ft and calculate the length of each clipped cross-station line
   10. Use the Table to Table tool to export the attribute table as a text file
   11. Summarize the mean and standard deviation of each flow, re

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# Appendix A2. Land Cover Classification Protocol

1. Compile stock shapefiles used in analysis
   1. Bank Hull—shapefile representing all channels in the AHR extending 50-100 ft overbank. Excludes bridges and powerline footprints
   2. Geomorphic reaches – the Bank Hull clipped at bridges dividing the reaches
   3. Main Channel and Side Channel, stored as separate shapefiles – the Bank Hull clipped to channel type
   4. Cross-station lines, labeled with Cross Station ID value in Attribute Table. Oriented approximately perpendicular to the main channel
   5. Polygon representing 5,000 cfs extent from 2D modeling results. Attempt to dissolve the triangular polygons into one polygon. This has failed for me every time, but give it a shot—maybe an update to ArcGIS Pro will improve tool performance in the future
   6. Polygons representing managed and unmanaged areas of the main channel. managed areas are under any ownership
2. Collect field validation data within a week of the data collection flight

Note: A variety of methods have been used in the past to collect this data. This represents the methods implemented in 2021 and which should be followed in future years

* 1. Identify 5-8 areas throughout the AHR which represent diversity in the following areas: geomorphic reach, management type, and channel type. Each area should be located in a unique geomorphic reach. Approximately ½ of the sites should be located on private or unmanaged areas that are not managed to reduce in-channel vegetation, and at least one should be located on a side channel. The database of landowners who allowed access for the RWM field surveys prior to 2016 can be utilized to request access on private lands. Additionally, access to state Wildlife Management Areas (WMAs) can be requested.
  2. At each area, walk or wade approximately 1-2 miles throughout the channel and overbank areas within the Bank Hull analysis mask. Identify points within patches of vegetation which have consistent plant composition and density within a radius of 3 ft. Collect point with the Trimble RTK GPS, with the class labeled.
  3. Collect approximately equal number of points of the following categories:
     1. Water and sand
     2. Vegetation < 2ft in height
     3. Vegetation 2-6 ft in height
     4. Vegetation > 6 ft in height
  4. Collect approximately 500 points in total

1. Prepare imagery and LiDAR rasters for classification
   1. Mosaic together the fall topobathymetric and highest-hit LiDAR rasters
   2. Subtract the topobathymetric rasters from the highest-hit rasters to yield rasters representing vegetation height
   3. Clip vegetation height raster to geomorphic reach masks, without maintaining extent
   4. Mosaic together the fall 4-band imagery tiles that intersect with the analysis mask, while resampling from 6 inch to 3 ft resolution
   5. Clip imagery raster to geomorphic reach masks, without maintaining extent
2. Run classification in E-Cognition
   1. Load in imagery and vegetation height rasters (as DSM) and assign numbers to R,G,B,NIR bands
   2. Load the project configuration which will autopopulate the steps with schema
   3. Segment objects at the scale of 10 pixels
   4. Classify water based on NDWI. Cut-off values may range 0-0.1 between years. For each year of data, visually calibrate the cut-off value by iteratively testing values and comparing the classified area of water to the extent evident in RGB, CIR, and NDWI displays
   5. Classify vegetation greater than 15 ft in height (Veg >15ft) from the vegetation height raster
   6. Classify vegetation 6 to 15 ft in height (Veg 6-15ft) from the vegetation height raster
   7. Classify vegetation 2 to 6 ft in height (Veg 2-6ft) from the vegetation height raster
   8. Separate sand and vegetation less than 2 ft in height based on the NDVI. Cut-off values from 2017-2020 ranged from 0.03 to 0.09 and values in future years may be higher or lower. For each year of data, calibrate the NDVI cut-off value visually by iteratively testing values and comparing the classified area of vegetation to the extent evident in RGB, CIR, and NDVI displays
   9. Export the classified area as a shapefile
3. Compare classified results to field validation data in order to assess accuracy with ArcGIS
   1. Add the classified polygon class attribute to the field points with the Spatial Join tool
   2. Export the shapefile into Excel and create confusion matrices comparing the field-measured and Ecognition-assigned classes for all points
   3. Check the agreement rate between sand and vegetation < 2 ft in height. If there appears to be a systematic bias towards one class or another, rerun Ecognition with adjusted values. This may be an iterative process with multiple repetitions
4. Process E-Cognition output and calculate statistics with ArcGIS

Note: Due to the large number of steps in the following workflow, and their repetition at 20+ spatial scales for each year of data, this workflow must be automated to a degree. Individually implementing each step for each spatial scale is time-consuming and lends itself to mistakes. An Arcpy script will be stored on the Headwaters Drive to implement the following steps. The steps could also be implemented with ModelBuilder or with batch processing.

* 1. Reclip the output to the geomorphic reach bank hull polygon. This represents the All Channels shapefile
  2. For each year, merge the shapefiles for geomorphic reaches from Overton to Chapman into an All Reaches shapefile. Note: the All Reaches shapefile excludes the two geomorphic reaches from Lexington to Overton
  3. Clip the All Channels shapefile to both the main channel and side channel polygons
  4. For each reach and channel type, use the Summary Statistics tool to sum the area of each class, exporting each table as a .csv file
  5. For every shapefile representing every geomorphic reach and channel type, select by attributes for the unobstructed classes—Water, Sand, and Veg <2ft
  6. Clip cross-station lines to the classified shapefiles with the unobstructed areas selected. These represent unobstructed width lines
  7. Double-check that the “Length” field in the line Attribute Table is in feet. If it is not, add a Length\_ft field and use Calculate Geometry to calculate the length in feet of each cross-section
  8. For each reach and channel type, use the Summarize Statistics tool to sum the length of line segments by Cross Station ID, exporting each table as .csv file. These represent TUCW
  9. Use the Multipart to Singlepart tool to separate the unobstructed width lines into individual line segments
  10. Again, double-check that the Length field is populated with the correct length in ft. If it is not, recalculate a Length\_ft field
  11. For each reach and channel type, use the Summarize Statistics tool to find the maximum line segment for each Cross-Station ID, exporting each table as a .csv file. This represents MUCW.
  12. Using R or with (a lot of) copying and pasting from individual spreadsheets, summarize the MUCW and TUCW values for each year, reach, and spatial scale by mean and standard deviation
  13. To complete the managed vs nonmanaged analysis, clip the main channel classified polygon to the managed and other shapefile
  14. Re-run steps d-l with the managed and nonmanaged classified shapefiles to calculate comparative metrics

# Appendix A4. Volume Change Analysis Protocol

1. Prepare topobathymetric rasters
   1. In ArcGIS, clip each topobathymetric raster to the geomorphic reach masks
2. Prepare uncertainty rasters
   1. Locate the bathymetric coverage polygon shapefile provided by Quantum and load into ArcGIS
   2. Locate the uncertainty values provided by Quantum, which are estimated with ground control check points. Identify the values that represent 95% confidence for wet and dry areas. These will be used as accuracy values in error estimation
   3. Use the union tool with batch processing to join the bathymetric coverage polygon to each geomorphic reach mask. Create a field called “Uncertainty.” Select the areas with bathymetric coverage and calculate the field with the 95% confidence “wet” accuracy value. For unmanaged areas, calculate the field with the “dry” accuracy value.
   4. Use the Polygon to Raster tool to convert the shapefiles into accuracy rasters for each geomorphic reach, with grid values representing uncertainty in wet and dry areas
   5. Clip the uncertainty rasters to the main channel
3. Run volume differencing analysis with Geomorphic Change Detection software (GCD)
   1. Download the GCD standalone or ArcMap plug-in toolbar from <http://gcd.riverscapes.xyz/>. This website has a variety of useful background information on volume differencing methods and tutorials for using the software. The standalone software runs faster, but the ArcMap plug-in has the advantage of displaying analysis outputs in real-time. When using the standalone software, periodically open outputs in ArcGIS to double-check processing
   2. Create a new project
   3. Right-click on DEM Surveys and load in the topobathymetric surfaces for each reach for two of the years—for example 2017 and 2018. Loading in each raster may take up to 30 minutes.
   4. Expand the drop-down for each DEM, right-click on Error Surfaces, and upload both the All Channels and Main Channel (if applicable) uncertainty surface for each raster. This will also involve lengthy wait times.
   5. Right click on Change Detection under Analyses and select Batch Change Detection. Select the New and Old DEM for each reach. Select Probabilistic thresholding with a Confidence level of 0.95. Select the appropriate uncertainty surface with the Error drop-down under the Surface. For reaches that are included in the Main Channel analysis, run one analysis with the All Channels Error surface, and another with the Main Channel Error surface. Click Run Batch, and after lengthy processing, the results are visible under Change Detection. Each analysis includes helpful pie-charts and histograms for preliminary interpretation of results
4. Classify areas of significant elevation change
   1. Locate thresholded difference rasters under the project directory > Analyses > CD > DoDXXXX. The analyses are assigned a number XXXX in the directory in the order that they are run. It is helpful to create a table to keep track of the analysis name and number. In order to find the analysis number, right click on each analysis under the Change Detection folder in GCD, view Change Detection Results, click on the Analysis Details tab, and find the number next to DoD Analysis Folder
   2. Copy and paste the thresh.tif raster under each DoDXXXX folder into a new folder, taking care to rename the raster to include its reach and difference years.
   3. Open the thresholded difference rasters with ArcGIS. Use the Band Math tool to multiply the raster values by 100. The raster values are now in the units of hundredths of a foot
   4. Export the transformed rasters into a new folder in 32 bit signed format, which transforms them from float to integer format
   5. Use the Raster to Polygon tool to convert the integer rasters into polygon shapefiles
   6. Create a new field in the shapefiles called DiffType with text data type
   7. Select by Attributes to select all polygons with raster value greater than 0. Calculate field as “Agg”
   8. Select by Attributes to select all polygons with raster value less than 0. Calculate field as “DegPrelim.”
   9. Use to Dissolve tool to dissolve the Agg and DegPrelim polygons together. Do not create multipart features.
   10. In order to separate bed degradation from lateral erosion, a bank buffer is needed to select degradational areas near the bank. These are created with the 5000 cfs polygons from each year. Load in 5000 cfs polygons for each reach for each year from the 2D modeling output. To reduce processing time, dissolve the polygons into one multipart polygon. Create a field called “Dissolve,” populate all rows with the number 1, and use the Dissolve tool to make one multipart feature for each reach
   11. Use the Buffer tool to create a bank buffer polygon. Use -20 ft for distance so that the buffer extends internally into the polygon rather than externally. Check the option that dissolves all features into one output polygon
   12. Select the “DegPrelim” thresholded difference polygons, and subset the selection with Select by Location for the polygons that intersect the 20 ft internal bank buffer. Use the bank buffer that corresponds to that reach and the most recent year of the difference analysis. For example, when analyzing the 2018-2017 difference rasters, use the 2018 bank buffer. When these polygons are select, use Calculate Field to classify them in Diff Type as “Lat.”
   13. Select the polygons that remain labeled as “DegPrelim” and Calculate Field to label them “Deg.”
   14. For each analysis year, merge the reach classified shapefiles together into one classified shapefile representing All Reaches
   15. In GCD, right-click on Masks and select Add Existing Regular Mask. Load in the classified shapefile for that difference year
   16. For each analysis under Change Detection, right-click and select Add Budget Segregation. Select the classified shapefile from the drop-down and click Save
5. Extract results from GCD
   1. Results for net volume change and associated error are easiest to extract from the project directory > Analyses > IC. Folders within this directory store intercomparisons of all budget analyses run within the software
   2. Results for the classified areas must be extracted from each DoD folder under Analyses > CD > DoDXXXX > BS > BS0001 > Intercompare
   3. Copy and paste relevant results from the locations in a and b into a separate spreadsheet

# Appendix B. Mechanical Management Results

## **Table B1**. Area of in-channel management actions implemented throughout the AHR.

Years of remote monitoring are highlighted in green

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Spraying (ac)** | **Disking (ac)** | **Tree Clearing (ac)** |
| 2005 | - | - | - |
| 2006 | - | 2,721 | - |
| 2007 | 335.2 | 3,125 | - |
| 2008 | 2,763.3 | 1,283 | - |
| 2009 | 3,369.3 | 199 | 60 |
| 2010 | 1,085.4 | 137 | 53 |
| 2011 | 1,269.7 | - | 81 |
| 2012 | 824.6 | 509 | 279 |
| 2013 | 922.6 | 944 | 41 |
| 2014 | 1,204.6 | 1,601 | 32 |
| 2015 | 977.0 | - | 1 |
| 2016 | 519.5 | 6 | 53 |
| 2017 | 803.1 | 67 | 50 |
| 2018 | 592.9 | 351 | 1 |
| 2019 | 593.1 | - | 1 |
| 2020 | 594.9 | 539 | 47 |

# Appendix C. Hydrologic Results

**Table C1**. Table of hydrologic parameters collected the Overton USGS Gage (06768000) data. Years of remote monitoring are highlighted in green. Parameters are: QAVG - Mean Annual Discharge (cfs), Vaf - Annual Flow Volume (AFY), QP - Annual Mean Daily Peak Discharge (cfs), QPy - Annual Peak Flow Return Interval (years), QMax 40 - Annual 40-Day Maximum Flow (cfs)  , QJune - Mean June Flow (cfs)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Year** | **QAVG** | **Vaf** | **QP** | **QPy** | **QMax 40** | **QJune** |
| 2007 | 800 | 579340 | 3,500 | 1.4 | 1,273 | 1,362 |
| 2008 | 791 | 572578 | 10,700 | 6.8 | 1,586 | 701 |
| 2009 | 942 | 681929 | 3,600 | 1.5 | 1,811 | 1,282 |
| 2010 | 2,157 | 1561636 | 7,370 | 3.4 | 4,108 | 4,536 |
| 2011 | 3,877 | 2807021 | 8,720 | 4.6 | 7,503 | 7,675 |
| 2012 | 1,114 | 806776 | 3,430 | 1.4 | 2,796 | 319 |
| 2013 | 1,140 | 824993 | 12,400 | 9.9 | 4,129 | 303 |
| 2014 | 1,249 | 904099 | 7,360 | 3.4 | 3,150 | 3,822 |
| 2015 | 3,506 | 2538110 | 15,300 | 16.6 | 12,708 | 12,920 |
| 2016 | 2,950 | 2137701 | 8,600 | 4.5 | 7,364 | 6,433 |
| 2017 | 1,550 | 1122462 | 4,440 | 1.8 | 2,768 | 2,069 |
| 2018 | 1,415 | 1024113 | 2,960 | 1.3 | 1,834 | 1,343 |
| 2019 | 2,274 | 1646137 | 9,750 | 5.6 | 3,089 | 2,822 |
| 2020 | 1,802 | 1305700 | 3,820 | 1.5 | 2,977 | 1,966 |

## **Table C2.** Table of hydrologic parameters collected the Grand Island USGS Gage (06770500) data. Years of remote monitoring are highlighted in green. Parameters are: QAVG - Mean Annual Discharge (cfs), Vaf - Annual Flow Volume (AFY), QP - Annual Mean Daily Peak Discharge (cfs), QPy - Annual Peak Flow Return Interval (years), QMax 40 - Annual 40-Day Maximum Flow (cfs)  , QJune - Mean June Flow (cfs)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Year** | **QAVG** | **Vaf** | **QP** | **QPy** | **QMax 40** | **QJune** |
| 2007 | 800 | 579340 | 3,500 | 1.4 | 1,273 | 1,362 |
| 2008 | 791 | 572578 | 10,700 | 6.8 | 1,586 | 701 |
| 2009 | 942 | 681929 | 3,600 | 1.5 | 1,811 | 1,282 |
| 2010 | 2,157 | 1561636 | 7,370 | 3.4 | 4,108 | 4,536 |
| 2011 | 3,877 | 2807021 | 8,720 | 4.6 | 7,503 | 7,675 |
| 2012 | 1,114 | 806776 | 3,430 | 1.4 | 2,796 | 319 |
| 2013 | 1,140 | 824993 | 12,400 | 9.9 | 4,129 | 303 |
| 2014 | 1,249 | 904099 | 7,360 | 3.4 | 3,150 | 3,822 |
| 2015 | 3,506 | 2538110 | 15,300 | 16.6 | 12,708 | 12,920 |
| 2016 | 2,950 | 2137701 | 8,600 | 4.5 | 7,364 | 6,433 |
| 2017 | 1,550 | 1122462 | 4,440 | 1.8 | 2,768 | 2,069 |
| 2018 | 1,415 | 1024113 | 2,960 | 1.3 | 1,834 | 1,343 |
| 2019 | 2,274 | 1646137 | 9,750 | 5.6 | 3,089 | 2,822 |
| 2020 | 1,802 | 1305700 | 3,820 | 1.5 | 2,977 | 1,966 |

Chart, line chart

Description automatically generated

**Fig. C1**. Flow Exceedance curves for each water year from 2017-2020, as well as the period from 1998-2020, developed from the mean daily data from the USGS Overton gage (06768000)

Chart, line chart

Description automatically generated

**Fig. C2**. Flow Exceedance curves for the germination season of each water year from 2017-2020, as well as the period from 1998-2020, developed from the mean daily data from the USGS Overton gage (06768000)

Chart, line chart

Description automatically generated

**Fig. C3**. Flow Exceedance curves for the spring whooping crane migration season of each water year from 2017-2020, as well as the period from 1998-2020, developed from the mean daily data from the USGS Overton gage (06768000)

Chart, line chart

Description automatically generated

**Fig. C4**. Flow Exceedance curves for the fall whooping crane migration season of each water year from 2017-2020, as well as the period from 1998-2020, developed from the mean daily data from the USGS Overton gage (06768000)

Chart, line chart

Description automatically generated

**Fig. C5**. Flow Exceedance curves for each water year from 2017-2020, as well as the period from 1998-2020, developed from the mean daily data from the USGS Grand Island gage (06770500)

Chart, line chart

Description automatically generated

**Fig. C6**. Flow Exceedance curves for the germination season of each water year from 2017-2020, as well as the period from 1998-2020, developed from the mean daily data from the USGS Grand Island gage (06770500)

Chart, line chart

Description automatically generated

**Fig. C7**. Flow Exceedance curves for the spring whooping crane season of each water year from 2017-2020, as well as the period from 1998-2020, developed from the mean daily data from the USGS Grand Island gage (06770500)

Chart, line chart

Description automatically generated

**Fig. C8**. Flow Exceedance curves for the fall whooping crane season of each water year from 2017-2020, as well as the period from 1998-2020, developed from the mean daily data from the USGS Grand Island gage (06770500)

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# Appendix D. Hydrodynamic Modeling Results

**Table D1a**. Modeled inundated volume and area for all channels of All Reaches (Overton to Chapman), Overton to Elm Creek, and Elm Creek to Odessa

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Inundated area (ac)** | | | | **Inundated volume (acft)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| All-Reaches | 500 | 9713 | 10278 | 9987 | 10484 | 5205 | 5287 | 5909 | 5323 |
| All-Reaches | 750 | 10544 | 11095 | 10935 | 11441 | 6672 | 6966 | 7325 | 6863 |
| All-Reaches | 1000 | 11026 | 11513 | 11308 | 11610 | 7949 | 8130 | 8512 | 8100 |
| All-Reaches | 1200 | 10891 | 11340 | 11326 | 11735 | 8571 | 8730 | 9148 | 8780 |
| All-Reaches | 1500 | 11473 | 11735 | 11637 | 12092 | 10215 | 10336 | 10655 | 10389 |
| All-Reaches | 2000 | 11822 | 12000 | 11832 | 12311 | 12253 | 12347 | 12618 | 12413 |
| All-Reaches | 2500 | 12172 | 12240 | 12088 | 12533 | 14135 | 14238 | 14473 | 14351 |
| All-Reaches | 3000 | 12618 | 12688 | 12381 | 12824 | 16068 | 16161 | 16327 | 16223 |
| All-Reaches | 3500 | 12993 | 13061 | 12664 | 13126 | 17876 | 17933 | 18049 | 18032 |
| All-Reaches | 4000 | 13373 | 13481 | 12994 | 13426 | 19595 | 19694 | 19750 | 19736 |
| All-Reaches | 4500 | 13627 | 13733 | 13240 | 13635 | 21063 | 21138 | 21199 | 21193 |
| All-Reaches | 5000 | 13930 | 14068 | 13541 | 13879 | 22819 | 22888 | 22908 | 22924 |
| N-lexington-overton | 500 | 379 | 511 | 436 | 484 | 235 | 425 | 400 | 420 |
| N-lexington-overton | 750 | 380 | 511 | 462 | 536 | 235 | 425 | 418 | 430 |
| N-lexington-overton | 1000 | 383 | 549 | 460 | 537 | 236 | 432 | 413 | 431 |
| N-lexington-overton | 1200 | 380 | 547 | 463 | 534 | 236 | 432 | 418 | 430 |
| N-lexington-overton | 1500 | 381 | 550 | 453 | 538 | 236 | 432 | 403 | 431 |
| N-lexington-overton | 2000 | 384 | 548 | 437 | 539 | 238 | 432 | 403 | 432 |
| N-lexington-overton | 2500 | 382 | 511 | 451 | 536 | 239 | 426 | 402 | 432 |
| N-lexington-overton | 3000 | 510 | 618 | 532 | 611 | 452 | 697 | 645 | 678 |
| N-lexington-overton | 3500 | 589 | 687 | 622 | 705 | 645 | 888 | 868 | 912 |
| N-lexington-overton | 4000 | 646 | 747 | 713 | 785 | 816 | 1051 | 1083 | 1110 |
| N-lexington-overton | 4500 | 703 | 802 | 776 | 830 | 979 | 1232 | 1258 | 1272 |
| N-lexington-overton | 5000 | 814 | 882 | 853 | 863 | 1154 | 1377 | 1422 | 1424 |
| J2-overton | 500 | 290 | 273 | 272 | 301 | 388 | 298 | 316 | 310 |
| J2-overton | 750 | 308 | 299 | 284 | 332 | 462 | 380 | 388 | 393 |
| J2-overton | 1000 | 335 | 357 | 303 | 350 | 534 | 462 | 461 | 465 |
| J2-overton | 1200 | 336 | 373 | 307 | 367 | 583 | 518 | 508 | 530 |
| J2-overton | 1500 | 354 | 387 | 337 | 384 | 662 | 599 | 586 | 598 |
| J2-overton | 2000 | 386 | 410 | 360 | 406 | 785 | 726 | 706 | 726 |
| J2-overton | 2500 | 427 | 400 | 381 | 432 | 906 | 842 | 824 | 847 |
| J2-overton | 3000 | 447 | 400 | 381 | 431 | 965 | 850 | 832 | 854 |
| J2-overton | 3500 | 460 | 408 | 382 | 431 | 1015 | 884 | 840 | 864 |
| J2-overton | 4000 | 473 | 421 | 382 | 431 | 1060 | 927 | 849 | 880 |
| J2-overton | 4500 | 484 | 427 | 386 | 416 | 1101 | 951 | 874 | 906 |
| J2-overton | 5000 | 500 | 457 | 401 | 421 | 1141 | 1003 | 904 | 934 |

**Table D1b.** Modeled inundated volume and area for all channels of Overton to Elm Creek, Elm Creek to Odessa, and Odessa to Minden

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Inundated area (ac)** | | | | **Inundated volume (acft)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| overton\_elmcreek | 500 | 640 | 629 | 685 | 685 | 397 | 392 | 464 | 412 |
| overton\_elmcreek | 750 | 670 | 694 | 731 | 732 | 521 | 519 | 574 | 545 |
| overton\_elmcreek | 1000 | 702 | 727 | 758 | 765 | 624 | 634 | 673 | 650 |
| overton\_elmcreek | 1200 | 728 | 746 | 776 | 782 | 711 | 718 | 752 | 734 |
| overton\_elmcreek | 1500 | 770 | 773 | 799 | 799 | 830 | 826 | 865 | 847 |
| overton\_elmcreek | 2000 | 802 | 813 | 820 | 822 | 1029 | 1009 | 1037 | 1012 |
| overton\_elmcreek | 2500 | 835 | 848 | 844 | 855 | 1195 | 1212 | 1223 | 1228 |
| overton\_elmcreek | 3000 | 859 | 867 | 860 | 869 | 1352 | 1361 | 1376 | 1363 |
| overton\_elmcreek | 3500 | 887 | 889 | 881 | 895 | 1503 | 1506 | 1504 | 1515 |
| overton\_elmcreek | 4000 | 931 | 940 | 924 | 940 | 1653 | 1685 | 1657 | 1662 |
| overton\_elmcreek | 4500 | 976 | 983 | 967 | 983 | 1801 | 1820 | 1812 | 1811 |
| overton\_elmcreek | 5000 | 998 | 1003 | 985 | 1003 | 1932 | 1949 | 1942 | 1938 |
| elmcreek\_odessa | 500 | 532 | 575 | 597 | 594 | 318 | 332 | 377 | 326 |
| elmcreek\_odessa | 750 | 582 | 616 | 637 | 643 | 424 | 436 | 464 | 435 |
| elmcreek\_odessa | 1000 | 608 | 635 | 657 | 664 | 507 | 525 | 544 | 518 |
| elmcreek\_odessa | 1200 | 627 | 644 | 667 | 674 | 576 | 590 | 607 | 585 |
| elmcreek\_odessa | 1500 | 649 | 654 | 673 | 684 | 664 | 670 | 693 | 673 |
| elmcreek\_odessa | 2000 | 668 | 667 | 682 | 694 | 794 | 807 | 823 | 802 |
| elmcreek\_odessa | 2500 | 689 | 686 | 697 | 707 | 921 | 932 | 942 | 936 |
| elmcreek\_odessa | 3000 | 699 | 696 | 703 | 711 | 1039 | 1043 | 1058 | 1038 |
| elmcreek\_odessa | 3500 | 715 | 713 | 711 | 722 | 1152 | 1152 | 1153 | 1149 |
| elmcreek\_odessa | 4000 | 730 | 729 | 722 | 735 | 1256 | 1275 | 1257 | 1248 |
| elmcreek\_odessa | 4500 | 745 | 745 | 742 | 753 | 1359 | 1369 | 1365 | 1352 |
| elmcreek\_odessa | 5000 | 754 | 754 | 754 | 763 | 1456 | 1464 | 1461 | 1447 |
| odessa\_minden | 500 | 2576 | 2598 | 2327 | 2495 | 1326 | 1305 | 1421 | 1287 |
| odessa\_minden | 750 | 2692 | 2791 | 2643 | 2847 | 1691 | 1704 | 1807 | 1709 |
| odessa\_minden | 1000 | 2834 | 2882 | 2714 | 2834 | 2035 | 2046 | 2115 | 2034 |
| odessa\_minden | 1200 | 2710 | 2745 | 2698 | 2843 | 2240 | 2259 | 2336 | 2277 |
| odessa\_minden | 1500 | 2929 | 2901 | 2793 | 2963 | 2624 | 2632 | 2677 | 2643 |
| odessa\_minden | 2000 | 3038 | 2970 | 2864 | 3022 | 3165 | 3159 | 3195 | 3188 |
| odessa\_minden | 2500 | 3114 | 3061 | 2926 | 3064 | 3666 | 3657 | 3678 | 3680 |
| odessa\_minden | 3000 | 3211 | 3178 | 3006 | 3148 | 4143 | 4132 | 4132 | 4153 |
| odessa\_minden | 3500 | 3310 | 3272 | 3069 | 3208 | 4594 | 4574 | 4563 | 4595 |
| odessa\_minden | 4000 | 3431 | 3393 | 3148 | 3283 | 5033 | 5011 | 4987 | 5025 |
| odessa\_minden | 4500 | 3427 | 3439 | 3202 | 3338 | 5425 | 5411 | 5378 | 5429 |
| odessa\_minden | 5000 | 3471 | 3486 | 3277 | 3408 | 5826 | 5814 | 5777 | 5837 |

**Table D1c.** Modeled inundated volume and area for all channels of Minden to Gibbon, Gibbon to Wood River, and Wood River to Grand Island

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Inundated area (ac)** | | | | **Inundated volume (acft)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| minden\_gibbon | 500 | 687 | 683 | 667 | 684 | 318 | 297 | 336 | 296 |
| minden\_gibbon | 750 | 749 | 787 | 753 | 776 | 406 | 403 | 431 | 391 |
| minden\_gibbon | 1000 | 789 | 813 | 777 | 783 | 487 | 485 | 505 | 465 |
| minden\_gibbon | 1200 | 761 | 775 | 769 | 789 | 532 | 533 | 554 | 520 |
| minden\_gibbon | 1500 | 825 | 828 | 793 | 821 | 626 | 627 | 636 | 607 |
| minden\_gibbon | 2000 | 840 | 835 | 809 | 837 | 748 | 748 | 756 | 732 |
| minden\_gibbon | 2500 | 848 | 844 | 817 | 848 | 861 | 860 | 866 | 847 |
| minden\_gibbon | 3000 | 865 | 859 | 829 | 854 | 968 | 966 | 970 | 953 |
| minden\_gibbon | 3500 | 880 | 875 | 836 | 862 | 1068 | 1065 | 1066 | 1053 |
| minden\_gibbon | 4000 | 903 | 904 | 853 | 878 | 1165 | 1164 | 1161 | 1150 |
| minden\_gibbon | 4500 | 896 | 913 | 861 | 887 | 1252 | 1255 | 1249 | 1241 |
| minden\_gibbon | 5000 | 900 | 914 | 873 | 898 | 1338 | 1341 | 1335 | 1329 |
| gibbon\_woodriver | 500 | 1665 | 1742 | 1773 | 1888 | 846 | 834 | 983 | 869 |
| gibbon\_woodriver | 750 | 1783 | 1925 | 1933 | 2030 | 1087 | 1106 | 1230 | 1129 |
| gibbon\_woodriver | 1000 | 1892 | 1986 | 2007 | 2058 | 1312 | 1329 | 1440 | 1350 |
| gibbon\_woodriver | 1200 | 1892 | 1964 | 2024 | 2077 | 1467 | 1483 | 1593 | 1514 |
| gibbon\_woodriver | 1500 | 2002 | 2025 | 2059 | 2148 | 1709 | 1717 | 1812 | 1752 |
| gibbon\_woodriver | 2000 | 2083 | 2065 | 2098 | 2167 | 2061 | 2061 | 2153 | 2101 |
| gibbon\_woodriver | 2500 | 2137 | 2107 | 2143 | 2195 | 2383 | 2378 | 2471 | 2422 |
| gibbon\_woodriver | 3000 | 2193 | 2170 | 2172 | 2226 | 2687 | 2682 | 2764 | 2724 |
| gibbon\_woodriver | 3500 | 2260 | 2236 | 2216 | 2271 | 2979 | 2969 | 3046 | 3015 |
| gibbon\_woodriver | 4000 | 2301 | 2281 | 2247 | 2297 | 3253 | 3241 | 3312 | 3288 |
| gibbon\_woodriver | 4500 | 2307 | 2320 | 2273 | 2319 | 3506 | 3500 | 3563 | 3544 |
| gibbon\_woodriver | 5000 | 2349 | 2366 | 2302 | 2344 | 3766 | 3759 | 3812 | 3799 |
| woodriver\_gi | 500 | 1808 | 1899 | 1972 | 2016 | 834 | 822 | 985 | 837 |
| woodriver\_gi | 750 | 1932 | 2065 | 2148 | 2140 | 1073 | 1091 | 1232 | 1086 |
| woodriver\_gi | 1000 | 2060 | 2156 | 2241 | 2231 | 1300 | 1316 | 1443 | 1310 |
| woodriver\_gi | 1200 | 2126 | 2199 | 2296 | 2284 | 1465 | 1478 | 1601 | 1479 |
| woodriver\_gi | 1500 | 2217 | 2268 | 2304 | 2343 | 1702 | 1712 | 1817 | 1714 |
| woodriver\_gi | 2000 | 2317 | 2312 | 2355 | 2382 | 2058 | 2061 | 2160 | 2067 |
| woodriver\_gi | 2500 | 2395 | 2366 | 2400 | 2432 | 2387 | 2383 | 2479 | 2395 |
| woodriver\_gi | 3000 | 2444 | 2422 | 2434 | 2464 | 2693 | 2685 | 2775 | 2701 |
| woodriver\_gi | 3500 | 2488 | 2472 | 2468 | 2507 | 2982 | 2970 | 3054 | 2991 |
| woodriver\_gi | 4000 | 2533 | 2524 | 2509 | 2544 | 3257 | 3244 | 3323 | 3266 |
| woodriver\_gi | 4500 | 2561 | 2563 | 2538 | 2577 | 3517 | 3505 | 3578 | 3529 |
| woodriver\_gi | 5000 | 2597 | 2608 | 2573 | 2613 | 3771 | 3759 | 3827 | 3788 |

**Table D1d.** Modeled inundated volume and area for all channels of Grand Island to Chapman

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Inundated area (ac)** | | | | **Inundated volume (acft)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| gi\_chapman | 500 | 1202 | 1358 | 1258 | 1337 | 617 | 579 | 626 | 567 |
| gi\_chapman | 750 | 1297 | 1375 | 1345 | 1404 | 771 | 758 | 779 | 744 |
| gi\_chapman | 1000 | 1344 | 1407 | 1391 | 1454 | 912 | 902 | 917 | 884 |
| gi\_chapman | 1200 | 1371 | 1412 | 1411 | 1462 | 1014 | 985 | 1039 | 989 |
| gi\_chapman | 1500 | 1381 | 1350 | 1426 | 1412 | 1156 | 1120 | 1165 | 1124 |
| gi\_chapman | 2000 | 1402 | 1380 | 1408 | 1441 | 1383 | 1343 | 1380 | 1353 |
| gi\_chapman | 2500 | 1426 | 1417 | 1430 | 1465 | 1588 | 1547 | 1588 | 1562 |
| gi\_chapman | 3000 | 1455 | 1478 | 1464 | 1511 | 1781 | 1744 | 1774 | 1758 |
| gi\_chapman | 3500 | 1470 | 1509 | 1479 | 1523 | 1956 | 1924 | 1955 | 1938 |
| gi\_chapman | 4000 | 1486 | 1542 | 1495 | 1533 | 2121 | 2095 | 2122 | 2107 |
| gi\_chapman | 4500 | 1501 | 1566 | 1509 | 1544 | 2275 | 2260 | 2282 | 2269 |
| gi\_chapman | 5000 | 1517 | 1599 | 1524 | 1566 | 2435 | 2421 | 2429 | 2428 |

**Table D2a**. Modeled mean wetted width and depth for all channels for All Reaches (Overton to Chapman), Lexington to Overton north channel, and the J2 Return to Overton

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Mean Wetted Width (ft)** | | | | **Depth (ft)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 500 | 678 | 743 | 745 | 768 | 0.5 | 0.5 | 0.6 | 0.5 |
| All\_Reaches | 750 | 750 | 805 | 819 | 832 | 0.6 | 0.6 | 0.6 | 0.6 |
| All\_Reaches | 1000 | 802 | 837 | 852 | 867 | 0.7 | 0.7 | 0.7 | 0.7 |
| All\_Reaches | 1200 | 826 | 845 | 868 | 886 | 0.8 | 0.8 | 0.8 | 0.7 |
| All\_Reaches | 1500 | 864 | 875 | 887 | 909 | 0.9 | 0.9 | 0.9 | 0.8 |
| All\_Reaches | 2000 | 900 | 901 | 908 | 932 | 1.0 | 1.0 | 1.0 | 1.0 |
| All\_Reaches | 2500 | 927 | 927 | 926 | 951 | 1.1 | 1.1 | 1.2 | 1.1 |
| All\_Reaches | 3000 | 949 | 951 | 943 | 966 | 1.3 | 1.3 | 1.3 | 1.2 |
| All\_Reaches | 3500 | 968 | 972 | 959 | 981 | 1.4 | 1.4 | 1.4 | 1.4 |
| All\_Reaches | 4000 | 988 | 995 | 976 | 998 | 1.4 | 1.4 | 1.5 | 1.5 |
| All\_Reaches | 4500 | 1003 | 1012 | 991 | 1012 | 1.5 | 1.5 | 1.6 | 1.5 |
| All\_Reaches | 5000 | 1019 | 1030 | 1006 | 1028 | 1.6 | 1.6 | 1.7 | 1.6 |
| N-lexington\_overton | 500 | 241 | 331 | 283 | 313 | 0.6 | 0.8 | 0.9 | 0.9 |
| N-lexington\_overton | 750 | 241 | 331 | 295 | 318 | 0.6 | 0.8 | 0.9 | 0.8 |
| N-lexington\_overton | 1000 | 241 | 341 | 292 | 316 | 0.6 | 0.8 | 0.9 | 0.8 |
| N-lexington\_overton | 1200 | 242 | 341 | 294 | 317 | 0.6 | 0.8 | 0.9 | 0.8 |
| N-lexington\_overton | 1500 | 242 | 341 | 294 | 318 | 0.6 | 0.8 | 0.9 | 0.8 |
| N-lexington\_overton | 2000 | 242 | 340 | 283 | 317 | 0.6 | 0.8 | 0.9 | 0.8 |
| N-lexington\_overton | 2500 | 242 | 332 | 293 | 318 | 0.6 | 0.8 | 0.9 | 0.8 |
| N-lexington\_overton | 3000 | 323 | 402 | 345 | 367 | 0.9 | 1.1 | 1.2 | 1.1 |
| N-lexington\_overton | 3500 | 378 | 445 | 402 | 431 | 1.1 | 1.3 | 1.4 | 1.3 |
| N-lexington\_overton | 4000 | 415 | 483 | 460 | 479 | 1.3 | 1.4 | 1.5 | 1.4 |
| N-lexington\_overton | 4500 | 451 | 511 | 496 | 514 | 1.4 | 1.5 | 1.6 | 1.5 |
| N-lexington\_overton | 5000 | 500 | 538 | 529 | 535 | 1.4 | 1.6 | 1.7 | 1.6 |
| J2\_overton | 500 | 295 | 275 | 273 | 280 | 1.3 | 1.1 | 1.2 | 1.0 |
| J2\_overton | 750 | 317 | 304 | 294 | 314 | 1.5 | 1.3 | 1.4 | 1.2 |
| J2\_overton | 1000 | 344 | 344 | 319 | 336 | 1.6 | 1.3 | 1.5 | 1.3 |
| J2\_overton | 1200 | 353 | 364 | 324 | 358 | 1.7 | 1.4 | 1.7 | 1.4 |
| J2\_overton | 1500 | 372 | 384 | 351 | 378 | 1.9 | 1.5 | 1.7 | 1.6 |
| J2\_overton | 2000 | 405 | 412 | 374 | 407 | 2.0 | 1.8 | 2.0 | 1.8 |
| J2\_overton | 2500 | 447 | 424 | 401 | 431 | 2.1 | 2.1 | 2.2 | 2.0 |
| J2\_overton | 3000 | 465 | 424 | 402 | 431 | 2.2 | 2.1 | 2.2 | 2.0 |
| J2\_overton | 3500 | 479 | 430 | 402 | 432 | 2.2 | 2.2 | 2.2 | 2.0 |
| J2\_overton | 4000 | 490 | 439 | 402 | 433 | 2.2 | 2.2 | 2.2 | 2.0 |
| J2\_overton | 4500 | 498 | 445 | 407 | 431 | 2.3 | 2.2 | 2.3 | 2.2 |
| J2\_overton | 5000 | 504 | 461 | 417 | 437 | 2.3 | 2.2 | 2.3 | 2.2 |

**Table D2b.** Modeled mean wetted width and depth for all channels for Overton to Elm Creek, Elm Creek to Odessa, and Odessa to Minden

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Mean Wetted Width (ft)** | | | | **Depth (ft)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| overton\_elmcreek | 500 | 558 | 569 | 624 | 612 | 0.6 | 0.6 | 0.7 | 0.6 |
| overton\_elmcreek | 750 | 611 | 638 | 673 | 668 | 0.8 | 0.7 | 0.8 | 0.7 |
| overton\_elmcreek | 1000 | 643 | 677 | 698 | 703 | 0.9 | 0.9 | 0.9 | 0.8 |
| overton\_elmcreek | 1200 | 669 | 699 | 715 | 720 | 1.0 | 1.0 | 1.0 | 0.9 |
| overton\_elmcreek | 1500 | 709 | 723 | 732 | 741 | 1.1 | 1.1 | 1.1 | 1.1 |
| overton\_elmcreek | 2000 | 736 | 754 | 749 | 760 | 1.3 | 1.2 | 1.3 | 1.2 |
| overton\_elmcreek | 2500 | 764 | 780 | 770 | 782 | 1.4 | 1.4 | 1.4 | 1.4 |
| overton\_elmcreek | 3000 | 782 | 796 | 785 | 796 | 1.6 | 1.6 | 1.6 | 1.6 |
| overton\_elmcreek | 3500 | 807 | 820 | 805 | 815 | 1.7 | 1.7 | 1.7 | 1.7 |
| overton\_elmcreek | 4000 | 829 | 841 | 825 | 836 | 1.8 | 1.8 | 1.8 | 1.8 |
| overton\_elmcreek | 4500 | 853 | 863 | 856 | 864 | 1.8 | 1.9 | 1.9 | 1.8 |
| overton\_elmcreek | 5000 | 870 | 877 | 869 | 879 | 1.9 | 1.9 | 2.0 | 1.9 |
| elmcreek\_odessa | 500 | 616 | 681 | 706 | 697 | 0.6 | 0.6 | 0.6 | 0.5 |
| elmcreek\_odessa | 750 | 687 | 734 | 760 | 757 | 0.7 | 0.7 | 0.7 | 0.7 |
| elmcreek\_odessa | 1000 | 722 | 753 | 786 | 788 | 0.8 | 0.8 | 0.8 | 0.8 |
| elmcreek\_odessa | 1200 | 748 | 768 | 796 | 799 | 0.9 | 0.9 | 0.9 | 0.9 |
| elmcreek\_odessa | 1500 | 774 | 781 | 805 | 816 | 1.0 | 1.0 | 1.0 | 1.0 |
| elmcreek\_odessa | 2000 | 794 | 798 | 814 | 827 | 1.2 | 1.2 | 1.2 | 1.2 |
| elmcreek\_odessa | 2500 | 814 | 813 | 824 | 841 | 1.3 | 1.4 | 1.4 | 1.3 |
| elmcreek\_odessa | 3000 | 827 | 825 | 832 | 844 | 1.5 | 1.5 | 1.5 | 1.5 |
| elmcreek\_odessa | 3500 | 841 | 840 | 839 | 855 | 1.6 | 1.6 | 1.6 | 1.6 |
| elmcreek\_odessa | 4000 | 856 | 855 | 849 | 865 | 1.7 | 1.7 | 1.7 | 1.7 |
| elmcreek\_odessa | 4500 | 867 | 866 | 866 | 879 | 1.8 | 1.8 | 1.8 | 1.8 |
| elmcreek\_odessa | 5000 | 875 | 874 | 875 | 885 | 1.9 | 1.9 | 1.9 | 1.9 |
| odessa\_minden | 500 | 586 | 648 | 621 | 653 | 0.5 | 0.5 | 0.6 | 0.5 |
| odessa\_minden | 750 | 654 | 693 | 691 | 720 | 0.6 | 0.6 | 0.7 | 0.6 |
| odessa\_minden | 1000 | 707 | 727 | 722 | 750 | 0.7 | 0.7 | 0.8 | 0.7 |
| odessa\_minden | 1200 | 723 | 740 | 735 | 771 | 0.8 | 0.8 | 0.9 | 0.8 |
| odessa\_minden | 1500 | 766 | 772 | 758 | 797 | 0.9 | 0.9 | 1.0 | 0.9 |
| odessa\_minden | 2000 | 809 | 808 | 792 | 830 | 1.0 | 1.1 | 1.1 | 1.1 |
| odessa\_minden | 2500 | 843 | 844 | 815 | 854 | 1.2 | 1.2 | 1.3 | 1.2 |
| odessa\_minden | 3000 | 868 | 870 | 836 | 874 | 1.3 | 1.3 | 1.4 | 1.3 |
| odessa\_minden | 3500 | 893 | 892 | 860 | 897 | 1.4 | 1.4 | 1.5 | 1.4 |
| odessa\_minden | 4000 | 925 | 925 | 886 | 921 | 1.5 | 1.5 | 1.6 | 1.5 |
| odessa\_minden | 4500 | 947 | 941 | 904 | 940 | 1.6 | 1.6 | 1.7 | 1.6 |
| odessa\_minden | 5000 | 968 | 965 | 928 | 962 | 1.7 | 1.7 | 1.8 | 1.7 |

**Table D2c.** Modeled mean wetted width and depth for all channels for Minden to Gibbon, Gibbon to Wood River, and Wood River to Grand Island

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Mean Wetted Width (ft)** | | | | **Depth (ft)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| minden\_gibbon | 500 | 857 | 940 | 924 | 942 | 0.5 | 0.4 | 0.5 | 0.4 |
| minden\_gibbon | 750 | 957 | 1033 | 1024 | 1032 | 0.5 | 0.5 | 0.6 | 0.5 |
| minden\_gibbon | 1000 | 1030 | 1075 | 1064 | 1080 | 0.6 | 0.6 | 0.6 | 0.6 |
| minden\_gibbon | 1200 | 1052 | 1080 | 1083 | 1107 | 0.7 | 0.7 | 0.7 | 0.7 |
| minden\_gibbon | 1500 | 1106 | 1120 | 1110 | 1137 | 0.8 | 0.8 | 0.8 | 0.7 |
| minden\_gibbon | 2000 | 1140 | 1145 | 1132 | 1161 | 0.9 | 0.9 | 0.9 | 0.9 |
| minden\_gibbon | 2500 | 1159 | 1164 | 1149 | 1177 | 1.0 | 1.0 | 1.1 | 1.0 |
| minden\_gibbon | 3000 | 1183 | 1185 | 1164 | 1192 | 1.1 | 1.1 | 1.2 | 1.1 |
| minden\_gibbon | 3500 | 1196 | 1206 | 1178 | 1205 | 1.2 | 1.2 | 1.3 | 1.2 |
| minden\_gibbon | 4000 | 1218 | 1235 | 1197 | 1223 | 1.3 | 1.3 | 1.4 | 1.3 |
| minden\_gibbon | 4500 | 1228 | 1246 | 1209 | 1236 | 1.4 | 1.4 | 1.5 | 1.4 |
| minden\_gibbon | 5000 | 1240 | 1258 | 1225 | 1255 | 1.5 | 1.5 | 1.5 | 1.5 |
| gibbon\_woodriver | 500 | 612 | 697 | 707 | 751 | 0.5 | 0.5 | 0.6 | 0.5 |
| gibbon\_woodriver | 750 | 677 | 757 | 778 | 809 | 0.6 | 0.6 | 0.6 | 0.6 |
| gibbon\_woodriver | 1000 | 729 | 783 | 805 | 837 | 0.7 | 0.7 | 0.7 | 0.7 |
| gibbon\_woodriver | 1200 | 750 | 783 | 813 | 849 | 0.8 | 0.8 | 0.8 | 0.7 |
| gibbon\_woodriver | 1500 | 790 | 811 | 831 | 870 | 0.9 | 0.8 | 0.9 | 0.8 |
| gibbon\_woodriver | 2000 | 825 | 832 | 850 | 883 | 1.0 | 1.0 | 1.0 | 1.0 |
| gibbon\_woodriver | 2500 | 850 | 853 | 868 | 895 | 1.1 | 1.1 | 1.2 | 1.1 |
| gibbon\_woodriver | 3000 | 871 | 876 | 884 | 906 | 1.2 | 1.2 | 1.3 | 1.2 |
| gibbon\_woodriver | 3500 | 891 | 898 | 898 | 919 | 1.3 | 1.3 | 1.4 | 1.3 |
| gibbon\_woodriver | 4000 | 906 | 917 | 910 | 932 | 1.4 | 1.4 | 1.5 | 1.4 |
| gibbon\_woodriver | 4500 | 919 | 933 | 920 | 941 | 1.5 | 1.5 | 1.6 | 1.5 |
| gibbon\_woodriver | 5000 | 936 | 956 | 933 | 954 | 1.6 | 1.6 | 1.7 | 1.6 |
| woodriver\_gi | 500 | 702 | 788 | 798 | 809 | 0.5 | 0.4 | 0.5 | 0.4 |
| woodriver\_gi | 750 | 783 | 867 | 887 | 879 | 0.6 | 0.5 | 0.6 | 0.5 |
| woodriver\_gi | 1000 | 848 | 906 | 929 | 925 | 0.6 | 0.6 | 0.6 | 0.6 |
| woodriver\_gi | 1200 | 882 | 906 | 953 | 949 | 0.7 | 0.7 | 0.7 | 0.6 |
| woodriver\_gi | 1500 | 926 | 954 | 974 | 978 | 0.8 | 0.8 | 0.8 | 0.7 |
| woodriver\_gi | 2000 | 978 | 980 | 996 | 1006 | 0.9 | 0.9 | 0.9 | 0.9 |
| woodriver\_gi | 2500 | 1012 | 1005 | 1015 | 1026 | 1.0 | 1.0 | 1.0 | 1.0 |
| woodriver\_gi | 3000 | 1035 | 1030 | 1030 | 1043 | 1.1 | 1.1 | 1.1 | 1.1 |
| woodriver\_gi | 3500 | 1054 | 1050 | 1043 | 1058 | 1.2 | 1.2 | 1.2 | 1.2 |
| woodriver\_gi | 4000 | 1071 | 1071 | 1060 | 1073 | 1.3 | 1.3 | 1.3 | 1.3 |
| woodriver\_gi | 4500 | 1083 | 1086 | 1071 | 1086 | 1.4 | 1.4 | 1.4 | 1.4 |
| woodriver\_gi | 5000 | 1098 | 1102 | 1084 | 1098 | 1.5 | 1.4 | 1.5 | 1.4 |

**Table D2d.** Modeled mean wetted width and depth for all channels for Grand Island to Chapman

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Mean Wetted Width (ft)** | | | | **Depth (ft)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| gi\_chapman | 500 | 878 | 922 | 897 | 941 | 0.5 | 0.4 | 0.5 | 0.4 |
| gi\_chapman | 750 | 956 | 963 | 967 | 994 | 0.6 | 0.6 | 0.6 | 0.5 |
| gi\_chapman | 1000 | 996 | 986 | 1007 | 1026 | 0.7 | 0.6 | 0.7 | 0.6 |
| gi\_chapman | 1200 | 1014 | 998 | 1024 | 1043 | 0.7 | 0.7 | 0.7 | 0.7 |
| gi\_chapman | 1500 | 1026 | 998 | 1037 | 1053 | 0.8 | 0.8 | 0.8 | 0.8 |
| gi\_chapman | 2000 | 1044 | 1023 | 1047 | 1075 | 1.0 | 1.0 | 1.0 | 0.9 |
| gi\_chapman | 2500 | 1063 | 1051 | 1063 | 1093 | 1.1 | 1.1 | 1.1 | 1.1 |
| gi\_chapman | 3000 | 1083 | 1083 | 1084 | 1111 | 1.2 | 1.2 | 1.2 | 1.2 |
| gi\_chapman | 3500 | 1094 | 1106 | 1095 | 1121 | 1.3 | 1.3 | 1.3 | 1.3 |
| gi\_chapman | 4000 | 1107 | 1128 | 1108 | 1130 | 1.4 | 1.4 | 1.4 | 1.4 |
| gi\_chapman | 4500 | 1117 | 1147 | 1118 | 1138 | 1.5 | 1.4 | 1.5 | 1.5 |
| gi\_chapman | 5000 | 1129 | 1169 | 1132 | 1157 | 1.6 | 1.5 | 1.6 | 1.6 |

## **Table D3a.** Modeled area with depth < 1ft and width:depth ratio for All Reaches (Overton to Chapman), Lexington to Overton north channel, and the J2 Return to Overton

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Area with Depth <1ft (ac)** | | | | **Width:Depth Ratio** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 500 | 7928 | 8593 | 7752 | 8969 | 1325 | 1546 | 1332 | 1621 |
| All\_Reaches | 750 | 7847 | 8755 | 8087 | 9128 | 1219 | 1372 | 1280 | 1457 |
| All\_Reaches | 1000 | 7688 | 8439 | 7887 | 8608 | 1143 | 1227 | 1177 | 1298 |
| All\_Reaches | 1200 | 7128 | 7760 | 7520 | 8108 | 1054 | 1102 | 1089 | 1194 |
| All\_Reaches | 1500 | 6885 | 7164 | 7047 | 7439 | 1000 | 1015 | 995 | 1084 |
| All\_Reaches | 2000 | 6010 | 5847 | 6083 | 6148 | 893 | 889 | 871 | 941 |
| All\_Reaches | 2500 | 5182 | 4703 | 5157 | 4996 | 816 | 810 | 787 | 841 |
| All\_Reaches | 3000 | 4495 | 3900 | 4314 | 4100 | 759 | 759 | 728 | 775 |
| All\_Reaches | 3500 | 3964 | 3342 | 3578 | 3374 | 716 | 720 | 684 | 724 |
| All\_Reaches | 4000 | 3576 | 3029 | 3009 | 2847 | 686 | 692 | 652 | 686 |
| All\_Reaches | 4500 | 3096 | 2758 | 2542 | 2454 | 651 | 663 | 623 | 655 |
| All\_Reaches | 5000 | 2772 | 2575 | 2220 | 2194 | 625 | 639 | 601 | 629 |
| N-lexington\_overton | 500 | 301 | 337 | 255 | 286 | 389 | 398 | 308 | 361 |
| N-lexington\_overton | 750 | 301 | 337 | 274 | 337 | 390 | 398 | 326 | 396 |
| N-lexington\_overton | 1000 | 304 | 375 | 275 | 337 | 391 | 433 | 324 | 394 |
| N-lexington\_overton | 1200 | 301 | 373 | 275 | 335 | 390 | 432 | 326 | 394 |
| N-lexington\_overton | 1500 | 302 | 375 | 271 | 338 | 390 | 433 | 330 | 396 |
| N-lexington\_overton | 2000 | 304 | 373 | 254 | 338 | 391 | 431 | 307 | 396 |
| N-lexington\_overton | 2500 | 301 | 337 | 270 | 335 | 387 | 398 | 328 | 394 |
| N-lexington\_overton | 3000 | 317 | 289 | 207 | 256 | 365 | 356 | 285 | 331 |
| N-lexington\_overton | 3500 | 287 | 255 | 217 | 269 | 345 | 344 | 288 | 333 |
| N-lexington\_overton | 4000 | 257 | 253 | 246 | 299 | 329 | 343 | 303 | 339 |
| N-lexington\_overton | 4500 | 247 | 248 | 262 | 304 | 323 | 332 | 306 | 335 |
| N-lexington\_overton | 5000 | 301 | 288 | 295 | 300 | 353 | 344 | 318 | 325 |
| J2\_overton | 500 | 125 | 143 | 145 | 168 | 220 | 251 | 234 | 272 |
| J2\_overton | 750 | 118 | 134 | 128 | 166 | 211 | 239 | 215 | 265 |
| J2\_overton | 1000 | 122 | 162 | 122 | 158 | 216 | 266 | 209 | 253 |
| J2\_overton | 1200 | 108 | 158 | 109 | 153 | 203 | 262 | 196 | 248 |
| J2\_overton | 1500 | 102 | 145 | 114 | 150 | 198 | 248 | 202 | 242 |
| J2\_overton | 2000 | 101 | 129 | 102 | 138 | 199 | 233 | 191 | 228 |
| J2\_overton | 2500 | 114 | 87 | 93 | 132 | 211 | 201 | 185 | 220 |
| J2\_overton | 3000 | 122 | 85 | 91 | 129 | 215 | 200 | 184 | 218 |
| J2\_overton | 3500 | 124 | 84 | 89 | 128 | 217 | 198 | 183 | 215 |
| J2\_overton | 4000 | 127 | 89 | 87 | 125 | 218 | 200 | 181 | 213 |
| J2\_overton | 4500 | 130 | 90 | 86 | 104 | 219 | 200 | 180 | 198 |
| J2\_overton | 5000 | 138 | 110 | 94 | 104 | 221 | 210 | 185 | 197 |

**Table D3b.** Modeled area with depth < 1ft and width:depth ratio for all channels from Overton to Elm Creek, Elm Creek to Odessa, and Odessa to Minden

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Area with Depth <1ft (ac)** | | | | **Width:Depth Ratio** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| overton\_elmcreek | 500 | 640 | 629 | 685 | 685 | 397 | 392 | 464 | 412 |
| overton\_elmcreek | 750 | 670 | 694 | 731 | 732 | 521 | 519 | 574 | 545 |
| overton\_elmcreek | 1000 | 702 | 727 | 758 | 765 | 624 | 634 | 673 | 650 |
| overton\_elmcreek | 1200 | 728 | 746 | 776 | 782 | 711 | 718 | 752 | 734 |
| overton\_elmcreek | 1500 | 770 | 773 | 799 | 799 | 830 | 826 | 865 | 847 |
| overton\_elmcreek | 2000 | 802 | 813 | 820 | 822 | 1029 | 1009 | 1037 | 1012 |
| overton\_elmcreek | 2500 | 835 | 848 | 844 | 855 | 1195 | 1212 | 1223 | 1228 |
| overton\_elmcreek | 3000 | 859 | 867 | 860 | 869 | 1352 | 1361 | 1376 | 1363 |
| overton\_elmcreek | 3500 | 887 | 889 | 881 | 895 | 1503 | 1506 | 1504 | 1515 |
| overton\_elmcreek | 4000 | 931 | 940 | 924 | 940 | 1653 | 1685 | 1657 | 1662 |
| overton\_elmcreek | 4500 | 976 | 983 | 967 | 983 | 1801 | 1820 | 1812 | 1811 |
| overton\_elmcreek | 5000 | 998 | 1003 | 985 | 1003 | 1932 | 1949 | 1942 | 1938 |
| elmcreek\_odessa | 500 | 532 | 575 | 597 | 594 | 318 | 332 | 377 | 326 |
| elmcreek\_odessa | 750 | 582 | 616 | 637 | 643 | 424 | 436 | 464 | 435 |
| elmcreek\_odessa | 1000 | 608 | 635 | 657 | 664 | 507 | 525 | 544 | 518 |
| elmcreek\_odessa | 1200 | 627 | 644 | 667 | 674 | 576 | 590 | 607 | 585 |
| elmcreek\_odessa | 1500 | 649 | 654 | 673 | 684 | 664 | 670 | 693 | 673 |
| elmcreek\_odessa | 2000 | 668 | 667 | 682 | 694 | 794 | 807 | 823 | 802 |
| elmcreek\_odessa | 2500 | 689 | 686 | 697 | 707 | 921 | 932 | 942 | 936 |
| elmcreek\_odessa | 3000 | 699 | 696 | 703 | 711 | 1039 | 1043 | 1058 | 1038 |
| elmcreek\_odessa | 3500 | 715 | 713 | 711 | 722 | 1152 | 1152 | 1153 | 1149 |
| elmcreek\_odessa | 4000 | 730 | 729 | 722 | 735 | 1256 | 1275 | 1257 | 1248 |
| elmcreek\_odessa | 4500 | 745 | 745 | 742 | 753 | 1359 | 1369 | 1365 | 1352 |
| elmcreek\_odessa | 5000 | 754 | 754 | 754 | 763 | 1456 | 1464 | 1461 | 1447 |
| odessa\_minden | 500 | 2576 | 2598 | 2327 | 2495 | 1326 | 1305 | 1421 | 1287 |
| odessa\_minden | 750 | 2692 | 2791 | 2643 | 2847 | 1691 | 1704 | 1807 | 1709 |
| odessa\_minden | 1000 | 2834 | 2882 | 2714 | 2834 | 2035 | 2046 | 2115 | 2034 |
| odessa\_minden | 1200 | 2710 | 2745 | 2698 | 2843 | 2240 | 2259 | 2336 | 2277 |
| odessa\_minden | 1500 | 2929 | 2901 | 2793 | 2963 | 2624 | 2632 | 2677 | 2643 |
| odessa\_minden | 2000 | 3038 | 2970 | 2864 | 3022 | 3165 | 3159 | 3195 | 3188 |
| odessa\_minden | 2500 | 3114 | 3061 | 2926 | 3064 | 3666 | 3657 | 3678 | 3680 |
| odessa\_minden | 3000 | 3211 | 3178 | 3006 | 3148 | 4143 | 4132 | 4132 | 4153 |
| odessa\_minden | 3500 | 3310 | 3272 | 3069 | 3208 | 4594 | 4574 | 4563 | 4595 |
| odessa\_minden | 4000 | 3431 | 3393 | 3148 | 3283 | 5033 | 5011 | 4987 | 5025 |
| odessa\_minden | 4500 | 3427 | 3439 | 3202 | 3338 | 5425 | 5411 | 5378 | 5429 |
| odessa\_minden | 5000 | 3471 | 3486 | 3277 | 3408 | 5826 | 5814 | 5777 | 5837 |

**Table D3c.** Modeled area with depth < 1ft and width:depth ratio for all channels from Minden to Gibbon, Gibbon to Wood River, and Wood River to Grand Island

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Area with Depth <1ft (ac)** | | | | **Width:Depth Ratio** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| minden\_gibbon | 500 | 687 | 683 | 667 | 684 | 318 | 297 | 336 | 296 |
| minden\_gibbon | 750 | 749 | 787 | 753 | 776 | 406 | 403 | 431 | 391 |
| minden\_gibbon | 1000 | 789 | 813 | 777 | 783 | 487 | 485 | 505 | 465 |
| minden\_gibbon | 1200 | 761 | 775 | 769 | 789 | 532 | 533 | 554 | 520 |
| minden\_gibbon | 1500 | 825 | 828 | 793 | 821 | 626 | 627 | 636 | 607 |
| minden\_gibbon | 2000 | 840 | 835 | 809 | 837 | 748 | 748 | 756 | 732 |
| minden\_gibbon | 2500 | 848 | 844 | 817 | 848 | 861 | 860 | 866 | 847 |
| minden\_gibbon | 3000 | 865 | 859 | 829 | 854 | 968 | 966 | 970 | 953 |
| minden\_gibbon | 3500 | 880 | 875 | 836 | 862 | 1068 | 1065 | 1066 | 1053 |
| minden\_gibbon | 4000 | 903 | 904 | 853 | 878 | 1165 | 1164 | 1161 | 1150 |
| minden\_gibbon | 4500 | 896 | 913 | 861 | 887 | 1252 | 1255 | 1249 | 1241 |
| minden\_gibbon | 5000 | 900 | 914 | 873 | 898 | 1338 | 1341 | 1335 | 1329 |
| gibbon\_woodriver | 500 | 1665 | 1742 | 1773 | 1888 | 846 | 834 | 983 | 869 |
| gibbon\_woodriver | 750 | 1783 | 1925 | 1933 | 2030 | 1087 | 1106 | 1230 | 1129 |
| gibbon\_woodriver | 1000 | 1892 | 1986 | 2007 | 2058 | 1312 | 1329 | 1440 | 1350 |
| gibbon\_woodriver | 1200 | 1892 | 1964 | 2024 | 2077 | 1467 | 1483 | 1593 | 1514 |
| gibbon\_woodriver | 1500 | 2002 | 2025 | 2059 | 2148 | 1709 | 1717 | 1812 | 1752 |
| gibbon\_woodriver | 2000 | 2083 | 2065 | 2098 | 2167 | 2061 | 2061 | 2153 | 2101 |
| gibbon\_woodriver | 2500 | 2137 | 2107 | 2143 | 2195 | 2383 | 2378 | 2471 | 2422 |
| gibbon\_woodriver | 3000 | 2193 | 2170 | 2172 | 2226 | 2687 | 2682 | 2764 | 2724 |
| gibbon\_woodriver | 3500 | 2260 | 2236 | 2216 | 2271 | 2979 | 2969 | 3046 | 3015 |
| gibbon\_woodriver | 4000 | 2301 | 2281 | 2247 | 2297 | 3253 | 3241 | 3312 | 3288 |
| gibbon\_woodriver | 4500 | 2307 | 2320 | 2273 | 2319 | 3506 | 3500 | 3563 | 3544 |
| gibbon\_woodriver | 5000 | 2349 | 2366 | 2302 | 2344 | 3766 | 3759 | 3812 | 3799 |
| woodriver\_gi | 500 | 1808 | 1899 | 1972 | 2016 | 834 | 822 | 985 | 837 |
| woodriver\_gi | 750 | 1932 | 2065 | 2148 | 2140 | 1073 | 1091 | 1232 | 1086 |
| woodriver\_gi | 1000 | 2060 | 2156 | 2241 | 2231 | 1300 | 1316 | 1443 | 1310 |
| woodriver\_gi | 1200 | 2126 | 2199 | 2296 | 2284 | 1465 | 1478 | 1601 | 1479 |
| woodriver\_gi | 1500 | 2217 | 2268 | 2304 | 2343 | 1702 | 1712 | 1817 | 1714 |
| woodriver\_gi | 2000 | 2317 | 2312 | 2355 | 2382 | 2058 | 2061 | 2160 | 2067 |
| woodriver\_gi | 2500 | 2395 | 2366 | 2400 | 2432 | 2387 | 2383 | 2479 | 2395 |
| woodriver\_gi | 3000 | 2444 | 2422 | 2434 | 2464 | 2693 | 2685 | 2775 | 2701 |
| woodriver\_gi | 3500 | 2488 | 2472 | 2468 | 2507 | 2982 | 2970 | 3054 | 2991 |
| woodriver\_gi | 4000 | 2533 | 2524 | 2509 | 2544 | 3257 | 3244 | 3323 | 3266 |
| woodriver\_gi | 4500 | 2561 | 2563 | 2538 | 2577 | 3517 | 3505 | 3578 | 3529 |
| woodriver\_gi | 5000 | 2597 | 2608 | 2573 | 2613 | 3771 | 3759 | 3827 | 3788 |

**Table D3d.** Modeled area with depth < 1ft and width:depth ratio for Grand Island to Chapman

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Mean Wetted Width (ft)** | | | | **Depth (ft)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| gi\_chapman | 500 | 1202 | 1358 | 1258 | 1337 | 617 | 579 | 626 | 567 |
| gi\_chapman | 750 | 1297 | 1375 | 1345 | 1404 | 771 | 758 | 779 | 744 |
| gi\_chapman | 1000 | 1344 | 1407 | 1391 | 1454 | 912 | 902 | 917 | 884 |
| gi\_chapman | 1200 | 1371 | 1412 | 1411 | 1462 | 1014 | 985 | 1039 | 989 |
| gi\_chapman | 1500 | 1381 | 1350 | 1426 | 1412 | 1156 | 1120 | 1165 | 1124 |
| gi\_chapman | 2000 | 1402 | 1380 | 1408 | 1441 | 1383 | 1343 | 1380 | 1353 |
| gi\_chapman | 2500 | 1426 | 1417 | 1430 | 1465 | 1588 | 1547 | 1588 | 1562 |
| gi\_chapman | 3000 | 1455 | 1478 | 1464 | 1511 | 1781 | 1744 | 1774 | 1758 |
| gi\_chapman | 3500 | 1470 | 1509 | 1479 | 1523 | 1956 | 1924 | 1955 | 1938 |
| gi\_chapman | 4000 | 1486 | 1542 | 1495 | 1533 | 2121 | 2095 | 2122 | 2107 |
| gi\_chapman | 4500 | 1501 | 1566 | 1509 | 1544 | 2275 | 2260 | 2282 | 2269 |
| gi\_chapman | 5000 | 1517 | 1599 | 1524 | 1566 | 2435 | 2421 | 2429 | 2428 |

**Table D4a**. Modeled inundated volume and area for the main channel of All Reaches (Overton to Chapman), Overton to Elm Creek, and Elm Creek to Odessa

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Inundated area (ac)** | | | | **Inundated volume (acft)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 500 | 6328 | 6710 | 6736 | 6935 | 3287 | 3097 | 3708 | 3149 |
| All\_Reaches | 750 | 6908 | 7312 | 7355 | 7488 | 4269 | 4159 | 4612 | 4138 |
| All\_Reaches | 1000 | 7293 | 7580 | 7633 | 7741 | 5129 | 5045 | 5387 | 4968 |
| All\_Reaches | 1200 | 7440 | 7640 | 7747 | 7869 | 5764 | 5658 | 5989 | 5606 |
| All\_Reaches | 1500 | 7771 | 7831 | 7900 | 8058 | 6683 | 6562 | 6813 | 6503 |
| All\_Reaches | 2000 | 8056 | 8005 | 8039 | 8222 | 8050 | 7938 | 8115 | 7856 |
| All\_Reaches | 2500 | 8262 | 8194 | 8166 | 8349 | 9312 | 9193 | 9327 | 9115 |
| All\_Reaches | 3000 | 8409 | 8376 | 8283 | 8458 | 10494 | 10355 | 10461 | 10242 |
| All\_Reaches | 3500 | 8560 | 8545 | 8398 | 8567 | 11608 | 11455 | 11511 | 11337 |
| All\_Reaches | 4000 | 8698 | 8717 | 8518 | 8675 | 12653 | 12542 | 12530 | 12360 |
| All\_Reaches | 4500 | 8785 | 8836 | 8612 | 8760 | 13640 | 13518 | 13508 | 13339 |
| All\_Reaches | 5000 | 8897 | 8966 | 8708 | 8862 | 14610 | 14487 | 14444 | 14290 |
| overton\_elmcreek | 500 | 482 | 464 | 509 | 519 | 316 | 240 | 325 | 311 |
| overton\_elmcreek | 750 | 518 | 520 | 544 | 555 | 414 | 338 | 399 | 408 |
| overton\_elmcreek | 1000 | 540 | 546 | 563 | 576 | 490 | 426 | 464 | 482 |
| overton\_elmcreek | 1200 | 556 | 561 | 574 | 589 | 556 | 491 | 518 | 547 |
| overton\_elmcreek | 1500 | 580 | 577 | 586 | 600 | 642 | 574 | 596 | 630 |
| overton\_elmcreek | 2000 | 596 | 594 | 597 | 611 | 765 | 710 | 720 | 755 |
| overton\_elmcreek | 2500 | 611 | 610 | 610 | 623 | 884 | 835 | 834 | 886 |
| overton\_elmcreek | 3000 | 623 | 620 | 619 | 630 | 999 | 949 | 950 | 987 |
| overton\_elmcreek | 3500 | 634 | 631 | 628 | 642 | 1108 | 1058 | 1046 | 1097 |
| overton\_elmcreek | 4000 | 648 | 648 | 642 | 656 | 1207 | 1182 | 1149 | 1195 |
| overton\_elmcreek | 4500 | 664 | 662 | 657 | 670 | 1307 | 1274 | 1256 | 1294 |
| overton\_elmcreek | 5000 | 673 | 671 | 667 | 680 | 1399 | 1368 | 1351 | 1384 |
| elmcreek\_odessa | 500 | 522 | 571 | 591 | 586 | 315 | 331 | 374 | 323 |
| elmcreek\_odessa | 750 | 575 | 611 | 631 | 632 | 421 | 433 | 462 | 431 |
| elmcreek\_odessa | 1000 | 601 | 629 | 650 | 653 | 503 | 522 | 541 | 513 |
| elmcreek\_odessa | 1200 | 620 | 639 | 659 | 663 | 573 | 586 | 604 | 580 |
| elmcreek\_odessa | 1500 | 643 | 649 | 667 | 675 | 660 | 666 | 689 | 668 |
| elmcreek\_odessa | 2000 | 661 | 661 | 675 | 684 | 788 | 802 | 818 | 796 |
| elmcreek\_odessa | 2500 | 679 | 678 | 685 | 696 | 913 | 924 | 934 | 928 |
| elmcreek\_odessa | 3000 | 689 | 687 | 690 | 700 | 1030 | 1034 | 1049 | 1028 |
| elmcreek\_odessa | 3500 | 702 | 700 | 698 | 709 | 1140 | 1140 | 1143 | 1138 |
| elmcreek\_odessa | 4000 | 712 | 713 | 708 | 719 | 1242 | 1261 | 1245 | 1235 |
| elmcreek\_odessa | 4500 | 722 | 722 | 719 | 731 | 1343 | 1351 | 1350 | 1335 |
| elmcreek\_odessa | 5000 | 729 | 729 | 726 | 738 | 1436 | 1444 | 1443 | 1427 |

**Table D4b.** Modeled inundated volume and area for the main channel of Odessa to Minden, Minden to Gibbon, and Gibbon to Wood River

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Inundated area (ac)** | | | | **Inundated volume (acft)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| odessa\_minden | 500 | 1212 | 1291 | 1274 | 1312 | 685 | 689 | 831 | 682 |
| odessa\_minden | 750 | 1331 | 1412 | 1403 | 1444 | 902 | 913 | 1026 | 893 |
| odessa\_minden | 1000 | 1409 | 1463 | 1452 | 1481 | 1091 | 1102 | 1190 | 1072 |
| odessa\_minden | 1200 | 1412 | 1453 | 1460 | 1499 | 1220 | 1235 | 1308 | 1204 |
| odessa\_minden | 1500 | 1504 | 1517 | 1499 | 1553 | 1427 | 1439 | 1485 | 1400 |
| odessa\_minden | 2000 | 1564 | 1554 | 1541 | 1599 | 1721 | 1739 | 1758 | 1700 |
| odessa\_minden | 2500 | 1610 | 1603 | 1567 | 1626 | 1992 | 2012 | 2016 | 1969 |
| odessa\_minden | 3000 | 1643 | 1643 | 1596 | 1649 | 2244 | 2265 | 2258 | 2220 |
| odessa\_minden | 3500 | 1687 | 1687 | 1627 | 1676 | 2487 | 2507 | 2489 | 2459 |
| odessa\_minden | 4000 | 1729 | 1733 | 1660 | 1705 | 2716 | 2738 | 2710 | 2684 |
| odessa\_minden | 4500 | 1743 | 1758 | 1681 | 1726 | 2928 | 2951 | 2916 | 2895 |
| odessa\_minden | 5000 | 1770 | 1779 | 1707 | 1750 | 3140 | 3164 | 3124 | 3106 |
| minden\_gibbon | 500 | 505 | 524 | 537 | 511 | 214 | 182 | 247 | 164 |
| minden\_gibbon | 750 | 552 | 582 | 586 | 567 | 276 | 248 | 304 | 212 |
| minden\_gibbon | 1000 | 585 | 603 | 601 | 589 | 329 | 301 | 349 | 257 |
| minden\_gibbon | 1200 | 595 | 602 | 603 | 600 | 367 | 339 | 382 | 293 |
| minden\_gibbon | 1500 | 623 | 621 | 615 | 621 | 423 | 397 | 431 | 346 |
| minden\_gibbon | 2000 | 639 | 633 | 624 | 632 | 505 | 482 | 507 | 427 |
| minden\_gibbon | 2500 | 645 | 641 | 628 | 638 | 579 | 557 | 578 | 498 |
| minden\_gibbon | 3000 | 653 | 650 | 635 | 643 | 649 | 625 | 644 | 564 |
| minden\_gibbon | 3500 | 659 | 658 | 640 | 648 | 714 | 688 | 706 | 626 |
| minden\_gibbon | 4000 | 667 | 668 | 649 | 654 | 775 | 748 | 765 | 684 |
| minden\_gibbon | 4500 | 668 | 673 | 653 | 657 | 831 | 804 | 819 | 739 |
| minden\_gibbon | 5000 | 673 | 681 | 658 | 664 | 886 | 858 | 871 | 793 |
| gibbon\_woodriver | 500 | 1282 | 1382 | 1394 | 1472 | 686 | 657 | 779 | 678 |
| gibbon\_woodriver | 750 | 1393 | 1513 | 1529 | 1578 | 886 | 874 | 976 | 883 |
| gibbon\_woodriver | 1000 | 1477 | 1561 | 1585 | 1617 | 1067 | 1056 | 1142 | 1061 |
| gibbon\_woodriver | 1200 | 1501 | 1563 | 1602 | 1638 | 1198 | 1185 | 1263 | 1192 |
| gibbon\_woodriver | 1500 | 1576 | 1606 | 1633 | 1686 | 1390 | 1373 | 1437 | 1380 |
| gibbon\_woodriver | 2000 | 1639 | 1636 | 1662 | 1706 | 1674 | 1651 | 1706 | 1657 |
| gibbon\_woodriver | 2500 | 1685 | 1668 | 1688 | 1726 | 1934 | 1904 | 1954 | 1909 |
| gibbon\_woodriver | 3000 | 1717 | 1705 | 1709 | 1746 | 2175 | 2141 | 2183 | 2144 |
| gibbon\_woodriver | 3500 | 1752 | 1740 | 1735 | 1768 | 2404 | 2365 | 2401 | 2366 |
| gibbon\_woodriver | 4000 | 1778 | 1772 | 1754 | 1787 | 2619 | 2578 | 2608 | 2576 |
| gibbon\_woodriver | 4500 | 1794 | 1795 | 1770 | 1800 | 2819 | 2778 | 2802 | 2774 |
| gibbon\_woodriver | 5000 | 1823 | 1827 | 1788 | 1816 | 3019 | 2978 | 2995 | 2970 |

**Table D4c.** Modeled inundated volume and area for the main channel of Wood River to Grand Island and Grand Island to Chapman

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Inundated area (ac)** | | | | **Inundated volume (acft)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| woodriver\_gi | 500 | 1133 | 1225 | 1216 | 1256 | 458 | 440 | 533 | 437 |
| woodriver\_gi | 750 | 1253 | 1368 | 1361 | 1366 | 603 | 608 | 675 | 581 |
| woodriver\_gi | 1000 | 1347 | 1440 | 1429 | 1436 | 740 | 749 | 792 | 714 |
| woodriver\_gi | 1200 | 1395 | 1473 | 1471 | 1474 | 841 | 850 | 883 | 816 |
| woodriver\_gi | 1500 | 1468 | 1518 | 1502 | 1521 | 988 | 996 | 1017 | 959 |
| woodriver\_gi | 2000 | 1558 | 1553 | 1537 | 1556 | 1216 | 1216 | 1230 | 1173 |
| woodriver\_gi | 2500 | 1609 | 1586 | 1564 | 1583 | 1428 | 1418 | 1428 | 1368 |
| woodriver\_gi | 3000 | 1639 | 1621 | 1583 | 1604 | 1623 | 1607 | 1610 | 1551 |
| woodriver\_gi | 3500 | 1665 | 1651 | 1602 | 1624 | 1807 | 1783 | 1779 | 1724 |
| woodriver\_gi | 4000 | 1687 | 1676 | 1623 | 1644 | 1982 | 1952 | 1940 | 1889 |
| woodriver\_gi | 4500 | 1703 | 1695 | 1637 | 1656 | 2147 | 2113 | 2093 | 2044 |
| woodriver\_gi | 5000 | 1722 | 1716 | 1653 | 1671 | 2306 | 2268 | 2241 | 2195 |
| gi\_chapman | 500 | 1192 | 1253 | 1215 | 1281 | 614 | 558 | 618 | 554 |
| gi\_chapman | 750 | 1286 | 1305 | 1301 | 1347 | 767 | 744 | 770 | 731 |
| gi\_chapman | 1000 | 1334 | 1338 | 1353 | 1388 | 908 | 888 | 909 | 869 |
| gi\_chapman | 1200 | 1360 | 1351 | 1379 | 1405 | 1010 | 972 | 1032 | 975 |
| gi\_chapman | 1500 | 1378 | 1343 | 1397 | 1404 | 1153 | 1117 | 1158 | 1120 |
| gi\_chapman | 2000 | 1399 | 1374 | 1404 | 1433 | 1379 | 1339 | 1376 | 1349 |
| gi\_chapman | 2500 | 1422 | 1408 | 1425 | 1457 | 1582 | 1542 | 1582 | 1556 |
| gi\_chapman | 3000 | 1446 | 1450 | 1451 | 1486 | 1774 | 1734 | 1766 | 1748 |
| gi\_chapman | 3500 | 1461 | 1478 | 1467 | 1499 | 1948 | 1913 | 1947 | 1927 |
| gi\_chapman | 4000 | 1476 | 1507 | 1481 | 1510 | 2113 | 2083 | 2113 | 2096 |
| gi\_chapman | 4500 | 1491 | 1531 | 1495 | 1520 | 2266 | 2247 | 2272 | 2258 |
| gi\_chapman | 5000 | 1506 | 1563 | 1510 | 1543 | 2425 | 2407 | 2418 | 2415 |

**Table D5a**. Modeled mean wetted width and depth for the main channel of All Reaches (Overton to Chapman), Overton to Elm Creek, and Elm Creek to Odessa

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Mean Wetted Width (ft)** | | | | **Depth (ft)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 500 | 555 | 601 | 608 | 620 | 0.5 | 0.5 | 0.6 | 0.5 |
| All\_Reaches | 750 | 615 | 655 | 666 | 672 | 0.6 | 0.6 | 0.6 | 0.6 |
| All\_Reaches | 1000 | 656 | 681 | 691 | 701 | 0.7 | 0.7 | 0.7 | 0.6 |
| All\_Reaches | 1200 | 675 | 688 | 703 | 715 | 0.8 | 0.7 | 0.8 | 0.7 |
| All\_Reaches | 1500 | 704 | 709 | 716 | 732 | 0.9 | 0.8 | 0.9 | 0.8 |
| All\_Reaches | 2000 | 730 | 727 | 730 | 748 | 1.0 | 1.0 | 1.0 | 1.0 |
| All\_Reaches | 2500 | 749 | 746 | 742 | 761 | 1.1 | 1.1 | 1.1 | 1.1 |
| All\_Reaches | 3000 | 764 | 762 | 753 | 771 | 1.2 | 1.2 | 1.3 | 1.2 |
| All\_Reaches | 3500 | 776 | 777 | 763 | 779 | 1.4 | 1.3 | 1.4 | 1.3 |
| All\_Reaches | 4000 | 788 | 792 | 774 | 789 | 1.5 | 1.4 | 1.5 | 1.4 |
| All\_Reaches | 4500 | 798 | 803 | 784 | 798 | 1.6 | 1.5 | 1.6 | 1.5 |
| All\_Reaches | 5000 | 809 | 815 | 793 | 808 | 1.6 | 1.6 | 1.7 | 1.6 |
| overton\_elmcreek | 500 | 449 | 426 | 483 | 484 | 0.7 | 0.5 | 0.6 | 0.6 |
| overton\_elmcreek | 750 | 489 | 485 | 518 | 524 | 0.8 | 0.7 | 0.7 | 0.7 |
| overton\_elmcreek | 1000 | 509 | 517 | 534 | 546 | 0.9 | 0.8 | 0.8 | 0.8 |
| overton\_elmcreek | 1200 | 528 | 533 | 547 | 558 | 1.0 | 0.9 | 0.9 | 0.9 |
| overton\_elmcreek | 1500 | 557 | 549 | 558 | 568 | 1.1 | 1.0 | 1.0 | 1.1 |
| overton\_elmcreek | 2000 | 570 | 568 | 568 | 580 | 1.3 | 1.2 | 1.2 | 1.2 |
| overton\_elmcreek | 2500 | 584 | 583 | 580 | 594 | 1.4 | 1.4 | 1.4 | 1.4 |
| overton\_elmcreek | 3000 | 595 | 593 | 587 | 601 | 1.6 | 1.5 | 1.5 | 1.6 |
| overton\_elmcreek | 3500 | 608 | 607 | 601 | 614 | 1.7 | 1.7 | 1.7 | 1.7 |
| overton\_elmcreek | 4000 | 620 | 621 | 614 | 626 | 1.9 | 1.8 | 1.8 | 1.8 |
| overton\_elmcreek | 4500 | 634 | 635 | 630 | 642 | 2.0 | 1.9 | 1.9 | 1.9 |
| overton\_elmcreek | 5000 | 645 | 643 | 638 | 650 | 2.1 | 2.0 | 2.0 | 2.0 |
| elmcreek\_odessa | 500 | 613 | 679 | 705 | 695 | 0.6 | 0.6 | 0.6 | 0.6 |
| elmcreek\_odessa | 750 | 684 | 731 | 758 | 755 | 0.7 | 0.7 | 0.7 | 0.7 |
| elmcreek\_odessa | 1000 | 719 | 750 | 784 | 785 | 0.8 | 0.8 | 0.8 | 0.8 |
| elmcreek\_odessa | 1200 | 744 | 764 | 793 | 795 | 0.9 | 0.9 | 0.9 | 0.9 |
| elmcreek\_odessa | 1500 | 770 | 777 | 801 | 812 | 1.0 | 1.0 | 1.0 | 1.0 |
| elmcreek\_odessa | 2000 | 789 | 793 | 810 | 822 | 1.2 | 1.2 | 1.2 | 1.2 |
| elmcreek\_odessa | 2500 | 808 | 809 | 820 | 836 | 1.3 | 1.4 | 1.4 | 1.3 |
| elmcreek\_odessa | 3000 | 821 | 820 | 827 | 839 | 1.5 | 1.5 | 1.5 | 1.5 |
| elmcreek\_odessa | 3500 | 835 | 835 | 834 | 849 | 1.6 | 1.6 | 1.6 | 1.6 |
| elmcreek\_odessa | 4000 | 849 | 848 | 844 | 859 | 1.7 | 1.8 | 1.8 | 1.7 |
| elmcreek\_odessa | 4500 | 859 | 859 | 860 | 873 | 1.9 | 1.9 | 1.9 | 1.8 |
| elmcreek\_odessa | 5000 | 867 | 868 | 869 | 878 | 2.0 | 2.0 | 2.0 | 1.9 |

**Table D5b.** Modeled mean wetted width and depth for the main channel of Odessa to Minden, Minden to Gibbon, and Gibbon to Wood River

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Mean Wetted Width (ft)** | | | | **Depth (ft)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| odessa\_minden | 500 | 433 | 482 | 480 | 481 | 0.6 | 0.5 | 0.7 | 0.5 |
| odessa\_minden | 750 | 485 | 518 | 528 | 530 | 0.7 | 0.6 | 0.7 | 0.6 |
| odessa\_minden | 1000 | 521 | 541 | 547 | 552 | 0.8 | 0.8 | 0.8 | 0.7 |
| odessa\_minden | 1200 | 530 | 548 | 553 | 567 | 0.9 | 0.8 | 0.9 | 0.8 |
| odessa\_minden | 1500 | 562 | 573 | 567 | 586 | 0.9 | 0.9 | 1.0 | 0.9 |
| odessa\_minden | 2000 | 587 | 591 | 584 | 607 | 1.1 | 1.1 | 1.1 | 1.1 |
| odessa\_minden | 2500 | 609 | 612 | 595 | 620 | 1.2 | 1.3 | 1.3 | 1.2 |
| odessa\_minden | 3000 | 623 | 627 | 605 | 629 | 1.4 | 1.4 | 1.4 | 1.3 |
| odessa\_minden | 3500 | 638 | 640 | 617 | 638 | 1.5 | 1.5 | 1.5 | 1.5 |
| odessa\_minden | 4000 | 654 | 659 | 630 | 651 | 1.6 | 1.6 | 1.6 | 1.6 |
| odessa\_minden | 4500 | 666 | 669 | 640 | 659 | 1.7 | 1.7 | 1.7 | 1.7 |
| odessa\_minden | 5000 | 679 | 681 | 652 | 668 | 1.8 | 1.8 | 1.8 | 1.8 |
| minden\_gibbon | 500 | 700 | 743 | 769 | 719 | 0.4 | 0.3 | 0.5 | 0.3 |
| minden\_gibbon | 750 | 767 | 826 | 834 | 810 | 0.5 | 0.4 | 0.5 | 0.4 |
| minden\_gibbon | 1000 | 841 | 862 | 860 | 851 | 0.6 | 0.5 | 0.6 | 0.4 |
| minden\_gibbon | 1200 | 850 | 869 | 871 | 873 | 0.6 | 0.6 | 0.6 | 0.5 |
| minden\_gibbon | 1500 | 900 | 897 | 889 | 899 | 0.7 | 0.6 | 0.7 | 0.6 |
| minden\_gibbon | 2000 | 908 | 916 | 887 | 915 | 0.8 | 0.8 | 0.8 | 0.7 |
| minden\_gibbon | 2500 | 935 | 932 | 913 | 927 | 0.9 | 0.9 | 0.9 | 0.8 |
| minden\_gibbon | 3000 | 951 | 943 | 924 | 934 | 1.0 | 1.0 | 1.0 | 0.9 |
| minden\_gibbon | 3500 | 957 | 958 | 931 | 942 | 1.1 | 1.0 | 1.1 | 1.0 |
| minden\_gibbon | 4000 | 952 | 974 | 944 | 951 | 1.2 | 1.1 | 1.2 | 1.0 |
| minden\_gibbon | 4500 | 957 | 962 | 950 | 956 | 1.2 | 1.2 | 1.3 | 1.1 |
| minden\_gibbon | 5000 | 963 | 970 | 958 | 968 | 1.3 | 1.3 | 1.3 | 1.2 |
| gibbon\_woodriver | 500 | 540 | 606 | 616 | 651 | 0.5 | 0.5 | 0.6 | 0.5 |
| gibbon\_woodriver | 750 | 598 | 659 | 678 | 701 | 0.6 | 0.6 | 0.6 | 0.6 |
| gibbon\_woodriver | 1000 | 641 | 681 | 701 | 724 | 0.7 | 0.7 | 0.7 | 0.7 |
| gibbon\_woodriver | 1200 | 659 | 682 | 705 | 734 | 0.8 | 0.8 | 0.8 | 0.7 |
| gibbon\_woodriver | 1500 | 693 | 705 | 720 | 751 | 0.9 | 0.9 | 0.9 | 0.8 |
| gibbon\_woodriver | 2000 | 721 | 722 | 735 | 761 | 1.0 | 1.0 | 1.0 | 1.0 |
| gibbon\_woodriver | 2500 | 741 | 738 | 746 | 769 | 1.1 | 1.1 | 1.2 | 1.1 |
| gibbon\_woodriver | 3000 | 755 | 754 | 760 | 778 | 1.3 | 1.3 | 1.3 | 1.2 |
| gibbon\_woodriver | 3500 | 769 | 769 | 771 | 786 | 1.4 | 1.4 | 1.4 | 1.3 |
| gibbon\_woodriver | 4000 | 778 | 782 | 778 | 794 | 1.5 | 1.5 | 1.5 | 1.4 |
| gibbon\_woodriver | 4500 | 787 | 792 | 785 | 801 | 1.6 | 1.5 | 1.6 | 1.5 |
| gibbon\_woodriver | 5000 | 800 | 806 | 793 | 809 | 1.7 | 1.6 | 1.7 | 1.6 |

**Table D5c.** Modeled mean wetted width and depth for the main channel of Wood River to Grand Island and Grand Island to Chapman

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Mean Wetted Width (ft)** | | | | **Depth (ft)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| woodriver\_gi | 500 | 461 | 516 | 512 | 525 | 0.4 | 0.4 | 0.4 | 0.3 |
| woodriver\_gi | 750 | 520 | 583 | 577 | 576 | 0.5 | 0.4 | 0.5 | 0.4 |
| woodriver\_gi | 1000 | 568 | 614 | 607 | 610 | 0.5 | 0.5 | 0.6 | 0.5 |
| woodriver\_gi | 1200 | 595 | 614 | 625 | 627 | 0.6 | 0.6 | 0.6 | 0.6 |
| woodriver\_gi | 1500 | 626 | 647 | 639 | 646 | 0.7 | 0.7 | 0.7 | 0.6 |
| woodriver\_gi | 2000 | 664 | 662 | 655 | 663 | 0.8 | 0.8 | 0.8 | 0.8 |
| woodriver\_gi | 2500 | 685 | 678 | 667 | 674 | 0.9 | 0.9 | 0.9 | 0.9 |
| woodriver\_gi | 3000 | 700 | 693 | 674 | 684 | 1.0 | 1.0 | 1.0 | 1.0 |
| woodriver\_gi | 3500 | 711 | 706 | 681 | 691 | 1.1 | 1.1 | 1.1 | 1.1 |
| woodriver\_gi | 4000 | 719 | 717 | 692 | 700 | 1.2 | 1.2 | 1.2 | 1.1 |
| woodriver\_gi | 4500 | 725 | 724 | 697 | 706 | 1.3 | 1.2 | 1.3 | 1.2 |
| woodriver\_gi | 5000 | 734 | 731 | 704 | 712 | 1.3 | 1.3 | 1.4 | 1.3 |
| gi\_chapman | 500 | 878 | 922 | 897 | 941 | 0.5 | 0.4 | 0.5 | 0.4 |
| gi\_chapman | 750 | 956 | 963 | 967 | 994 | 0.6 | 0.6 | 0.6 | 0.5 |
| gi\_chapman | 1000 | 996 | 986 | 1007 | 1026 | 0.7 | 0.7 | 0.7 | 0.6 |
| gi\_chapman | 1200 | 1014 | 998 | 1024 | 1043 | 0.7 | 0.7 | 0.7 | 0.7 |
| gi\_chapman | 1500 | 1026 | 998 | 1037 | 1053 | 0.8 | 0.8 | 0.8 | 0.8 |
| gi\_chapman | 2000 | 1044 | 1023 | 1047 | 1075 | 1.0 | 1.0 | 1.0 | 0.9 |
| gi\_chapman | 2500 | 1063 | 1051 | 1063 | 1093 | 1.1 | 1.1 | 1.1 | 1.1 |
| gi\_chapman | 3000 | 1083 | 1083 | 1084 | 1111 | 1.2 | 1.2 | 1.2 | 1.2 |
| gi\_chapman | 3500 | 1094 | 1106 | 1095 | 1121 | 1.3 | 1.3 | 1.3 | 1.3 |
| gi\_chapman | 4000 | 1107 | 1128 | 1108 | 1130 | 1.4 | 1.4 | 1.4 | 1.4 |
| gi\_chapman | 4500 | 1117 | 1147 | 1118 | 1138 | 1.5 | 1.5 | 1.5 | 1.5 |
| gi\_chapman | 5000 | 1129 | 1169 | 1131 | 1156 | 1.6 | 1.5 | 1.6 | 1.6 |

**Table D6a**. Modeled area with depth < 1ft and width:depth ratio for the main channel of All Reaches (Overton to Chapman), Overton to Elm Creek, and Elm Creek to Odessa

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Area with Depth <1ft (ac)** | | | | **Width:Depth Ratio** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 500 | 5501 | 6185 | 5678 | 6530 | 427 | 520 | 414 | 542 |
| All\_Reaches | 750 | 5599 | 6383 | 5919 | 6651 | 383 | 425 | 383 | 458 |
| All\_Reaches | 1000 | 5504 | 6192 | 5828 | 6411 | 348 | 365 | 351 | 399 |
| All\_Reaches | 1200 | 5259 | 5862 | 5625 | 6093 | 320 | 332 | 322 | 361 |
| All\_Reaches | 1500 | 5018 | 5393 | 5312 | 5597 | 293 | 292 | 291 | 320 |
| All\_Reaches | 2000 | 4396 | 4378 | 4623 | 4629 | 255 | 251 | 248 | 271 |
| All\_Reaches | 2500 | 3762 | 3464 | 3911 | 3725 | 226 | 226 | 221 | 239 |
| All\_Reaches | 3000 | 3176 | 2755 | 3231 | 2975 | 206 | 207 | 203 | 217 |
| All\_Reaches | 3500 | 2710 | 2263 | 2639 | 2367 | 191 | 195 | 188 | 199 |
| All\_Reaches | 4000 | 2325 | 1940 | 2145 | 1912 | 179 | 184 | 176 | 186 |
| All\_Reaches | 4500 | 1974 | 1699 | 1734 | 1564 | 169 | 175 | 166 | 175 |
| All\_Reaches | 5000 | 1715 | 1553 | 1439 | 1338 | 162 | 168 | 159 | 167 |
| overton\_elmcreek | 500 | 385 | 406 | 401 | 439 | 156 | 199 | 185 | 205 |
| overton\_elmcreek | 750 | 352 | 415 | 401 | 407 | 139 | 172 | 173 | 176 |
| overton\_elmcreek | 1000 | 317 | 388 | 387 | 370 | 131 | 154 | 158 | 164 |
| overton\_elmcreek | 1200 | 285 | 358 | 369 | 331 | 130 | 145 | 144 | 147 |
| overton\_elmcreek | 1500 | 252 | 314 | 339 | 280 | 129 | 135 | 130 | 131 |
| overton\_elmcreek | 2000 | 197 | 228 | 273 | 203 | 114 | 120 | 114 | 117 |
| overton\_elmcreek | 2500 | 158 | 159 | 209 | 142 | 104 | 108 | 102 | 105 |
| overton\_elmcreek | 3000 | 127 | 114 | 142 | 107 | 97 | 99 | 93 | 97 |
| overton\_elmcreek | 3500 | 108 | 92 | 104 | 84 | 93 | 94 | 89 | 92 |
| overton\_elmcreek | 4000 | 96 | 83 | 82 | 76 | 91 | 91 | 86 | 90 |
| overton\_elmcreek | 4500 | 90 | 81 | 77 | 75 | 92 | 92 | 87 | 92 |
| overton\_elmcreek | 5000 | 82 | 77 | 74 | 75 | 91 | 91 | 84 | 90 |
| elmcreek\_odessa | 500 | 432 | 490 | 473 | 521 | 199 | 250 | 243 | 250 |
| elmcreek\_odessa | 750 | 418 | 470 | 472 | 500 | 183 | 199 | 216 | 217 |
| elmcreek\_odessa | 1000 | 387 | 425 | 450 | 458 | 166 | 174 | 187 | 200 |
| elmcreek\_odessa | 1200 | 359 | 386 | 424 | 413 | 150 | 159 | 167 | 182 |
| elmcreek\_odessa | 1500 | 325 | 334 | 380 | 352 | 137 | 140 | 149 | 160 |
| elmcreek\_odessa | 2000 | 262 | 237 | 298 | 258 | 121 | 120 | 125 | 133 |
| elmcreek\_odessa | 2500 | 206 | 167 | 222 | 179 | 105 | 104 | 107 | 110 |
| elmcreek\_odessa | 3000 | 158 | 118 | 146 | 131 | 92 | 93 | 95 | 99 |
| elmcreek\_odessa | 3500 | 129 | 94 | 101 | 94 | 84 | 84 | 89 | 87 |
| elmcreek\_odessa | 4000 | 110 | 81 | 72 | 76 | 75 | 76 | 82 | 80 |
| elmcreek\_odessa | 4500 | 93 | 77 | 60 | 67 | 70 | 69 | 72 | 73 |
| elmcreek\_odessa | 5000 | 78 | 73 | 57 | 62 | 64 | 66 | 67 | 69 |

**Table D6b.** Modeled area with depth < 1ft and width:depth ratio for the main channel of Odessa to Minden, Minden to Gibbon, and Gibbon to Wood River

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Area with Depth <1ft (ac)** | | | | **Width:Depth Ratio** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| odessa\_minden | 500 | 1011 | 1135 | 1004 | 1190 | 262 | 272 | 210 | 279 |
| odessa\_minden | 750 | 1010 | 1143 | 1044 | 1204 | 230 | 243 | 215 | 259 |
| odessa\_minden | 1000 | 972 | 1070 | 1008 | 1110 | 218 | 224 | 201 | 231 |
| odessa\_minden | 1200 | 886 | 957 | 947 | 1022 | 197 | 201 | 183 | 215 |
| odessa\_minden | 1500 | 849 | 865 | 879 | 918 | 203 | 201 | 175 | 201 |
| odessa\_minden | 2000 | 724 | 664 | 744 | 733 | 185 | 178 | 157 | 181 |
| odessa\_minden | 2500 | 615 | 529 | 601 | 579 | 169 | 167 | 144 | 164 |
| odessa\_minden | 3000 | 522 | 435 | 483 | 461 | 157 | 156 | 135 | 151 |
| odessa\_minden | 3500 | 468 | 381 | 388 | 378 | 151 | 149 | 131 | 142 |
| odessa\_minden | 4000 | 425 | 356 | 321 | 323 | 146 | 146 | 126 | 138 |
| odessa\_minden | 4500 | 368 | 326 | 269 | 277 | 142 | 140 | 122 | 131 |
| odessa\_minden | 5000 | 335 | 305 | 243 | 249 | 139 | 137 | 119 | 127 |
| minden\_gibbon | 500 | 477 | 516 | 487 | 507 | 203 | 315 | 227 | 412 |
| minden\_gibbon | 750 | 503 | 565 | 517 | 559 | 270 | 254 | 214 | 267 |
| minden\_gibbon | 1000 | 511 | 573 | 515 | 574 | 176 | 222 | 193 | 238 |
| minden\_gibbon | 1200 | 499 | 557 | 502 | 575 | 250 | 203 | 175 | 227 |
| minden\_gibbon | 1500 | 493 | 547 | 490 | 576 | 162 | 177 | 160 | 201 |
| minden\_gibbon | 2000 | 448 | 495 | 453 | 538 | 206 | 150 | 202 | 166 |
| minden\_gibbon | 2500 | 390 | 423 | 407 | 481 | 130 | 138 | 132 | 157 |
| minden\_gibbon | 3000 | 339 | 351 | 357 | 416 | 120 | 128 | 121 | 142 |
| minden\_gibbon | 3500 | 288 | 282 | 303 | 351 | 108 | 116 | 110 | 126 |
| minden\_gibbon | 4000 | 246 | 226 | 252 | 289 | 150 | 114 | 108 | 125 |
| minden\_gibbon | 4500 | 203 | 177 | 198 | 229 | 141 | 152 | 101 | 117 |
| minden\_gibbon | 5000 | 171 | 145 | 152 | 180 | 135 | 146 | 95 | 113 |
| gibbon\_woodriver | 500 | 1106 | 1274 | 1167 | 1396 | 293 | 370 | 311 | 378 |
| gibbon\_woodriver | 750 | 1120 | 1327 | 1216 | 1417 | 263 | 320 | 294 | 341 |
| gibbon\_woodriver | 1000 | 1100 | 1279 | 1190 | 1344 | 242 | 279 | 268 | 303 |
| gibbon\_woodriver | 1200 | 1039 | 1193 | 1142 | 1265 | 227 | 253 | 250 | 278 |
| gibbon\_woodriver | 1500 | 987 | 1084 | 1075 | 1153 | 226 | 236 | 228 | 255 |
| gibbon\_woodriver | 2000 | 853 | 846 | 934 | 914 | 206 | 206 | 199 | 219 |
| gibbon\_woodriver | 2500 | 727 | 644 | 789 | 707 | 185 | 187 | 177 | 193 |
| gibbon\_woodriver | 3000 | 613 | 499 | 646 | 542 | 168 | 169 | 163 | 175 |
| gibbon\_woodriver | 3500 | 530 | 405 | 519 | 420 | 157 | 160 | 153 | 164 |
| gibbon\_woodriver | 4000 | 462 | 348 | 408 | 330 | 147 | 151 | 143 | 151 |
| gibbon\_woodriver | 4500 | 404 | 309 | 318 | 264 | 139 | 142 | 135 | 142 |
| gibbon\_woodriver | 5000 | 367 | 295 | 258 | 224 | 135 | 137 | 128 | 136 |

**Table D6b.** Modeled area with depth < 1ft and width:depth ratio for the main channel of Odessa to Minden, Minden to Gibbon, and Gibbon to Wood River

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Area with Depth <1ft (ac)** | | | | **Width:Depth Ratio** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| odessa\_minden | 500 | 1011 | 1135 | 1004 | 1190 | 262 | 272 | 210 | 279 |
| odessa\_minden | 750 | 1010 | 1143 | 1044 | 1204 | 230 | 243 | 215 | 259 |
| odessa\_minden | 1000 | 972 | 1070 | 1008 | 1110 | 218 | 224 | 201 | 231 |
| odessa\_minden | 1200 | 886 | 957 | 947 | 1022 | 197 | 201 | 183 | 215 |
| odessa\_minden | 1500 | 849 | 865 | 879 | 918 | 203 | 201 | 175 | 201 |
| odessa\_minden | 2000 | 724 | 664 | 744 | 733 | 185 | 178 | 157 | 181 |
| odessa\_minden | 2500 | 615 | 529 | 601 | 579 | 169 | 167 | 144 | 164 |
| odessa\_minden | 3000 | 522 | 435 | 483 | 461 | 157 | 156 | 135 | 151 |
| odessa\_minden | 3500 | 468 | 381 | 388 | 378 | 151 | 149 | 131 | 142 |
| odessa\_minden | 4000 | 425 | 356 | 321 | 323 | 146 | 146 | 126 | 138 |
| odessa\_minden | 4500 | 368 | 326 | 269 | 277 | 142 | 140 | 122 | 131 |
| odessa\_minden | 5000 | 335 | 305 | 243 | 249 | 139 | 137 | 119 | 127 |
| minden\_gibbon | 500 | 477 | 516 | 487 | 507 | 203 | 315 | 227 | 412 |
| minden\_gibbon | 750 | 503 | 565 | 517 | 559 | 270 | 254 | 214 | 267 |
| minden\_gibbon | 1000 | 511 | 573 | 515 | 574 | 176 | 222 | 193 | 238 |
| minden\_gibbon | 1200 | 499 | 557 | 502 | 575 | 250 | 203 | 175 | 227 |
| minden\_gibbon | 1500 | 493 | 547 | 490 | 576 | 162 | 177 | 160 | 201 |
| minden\_gibbon | 2000 | 448 | 495 | 453 | 538 | 206 | 150 | 202 | 166 |
| minden\_gibbon | 2500 | 390 | 423 | 407 | 481 | 130 | 138 | 132 | 157 |
| minden\_gibbon | 3000 | 339 | 351 | 357 | 416 | 120 | 128 | 121 | 142 |
| minden\_gibbon | 3500 | 288 | 282 | 303 | 351 | 108 | 116 | 110 | 126 |
| minden\_gibbon | 4000 | 246 | 226 | 252 | 289 | 150 | 114 | 108 | 125 |
| minden\_gibbon | 4500 | 203 | 177 | 198 | 229 | 141 | 152 | 101 | 117 |
| minden\_gibbon | 5000 | 171 | 145 | 152 | 180 | 135 | 146 | 95 | 113 |
| gibbon\_woodriver | 500 | 1106 | 1274 | 1167 | 1396 | 293 | 370 | 311 | 378 |
| gibbon\_woodriver | 750 | 1120 | 1327 | 1216 | 1417 | 263 | 320 | 294 | 341 |
| gibbon\_woodriver | 1000 | 1100 | 1279 | 1190 | 1344 | 242 | 279 | 268 | 303 |
| gibbon\_woodriver | 1200 | 1039 | 1193 | 1142 | 1265 | 227 | 253 | 250 | 278 |
| gibbon\_woodriver | 1500 | 987 | 1084 | 1075 | 1153 | 226 | 236 | 228 | 255 |
| gibbon\_woodriver | 2000 | 853 | 846 | 934 | 914 | 206 | 206 | 199 | 219 |
| gibbon\_woodriver | 2500 | 727 | 644 | 789 | 707 | 185 | 187 | 177 | 193 |
| gibbon\_woodriver | 3000 | 613 | 499 | 646 | 542 | 168 | 169 | 163 | 175 |
| gibbon\_woodriver | 3500 | 530 | 405 | 519 | 420 | 157 | 160 | 153 | 164 |
| gibbon\_woodriver | 4000 | 462 | 348 | 408 | 330 | 147 | 151 | 143 | 151 |
| gibbon\_woodriver | 4500 | 404 | 309 | 318 | 264 | 139 | 142 | 135 | 142 |
| gibbon\_woodriver | 5000 | 367 | 295 | 258 | 224 | 135 | 137 | 128 | 136 |

**Table D6c.** Modeled area with depth < 1ft and width:depth ratio for the main channel of Wood River to Grand Island and Grand Island to Chapman

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **Area with Depth <1ft (ac)** | | | | **Width:Depth Ratio** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| woodriver\_gi | 500 | 1063 | 1185 | 1097 | 1233 | 602 | 802 | 593 | 882 |
| woodriver\_gi | 750 | 1138 | 1296 | 1194 | 1317 | 548 | 641 | 546 | 725 |
| woodriver\_gi | 1000 | 1178 | 1330 | 1219 | 1345 | 499 | 542 | 507 | 612 |
| woodriver\_gi | 1200 | 1179 | 1324 | 1222 | 1340 | 455 | 489 | 468 | 542 |
| woodriver\_gi | 1500 | 1168 | 1295 | 1187 | 1307 | 413 | 422 | 414 | 469 |
| woodriver\_gi | 2000 | 1100 | 1162 | 1102 | 1181 | 361 | 356 | 349 | 385 |
| woodriver\_gi | 2500 | 985 | 988 | 1001 | 1028 | 312 | 312 | 307 | 336 |
| woodriver\_gi | 3000 | 860 | 819 | 888 | 862 | 279 | 279 | 275 | 300 |
| woodriver\_gi | 3500 | 747 | 676 | 776 | 705 | 257 | 257 | 253 | 272 |
| woodriver\_gi | 4000 | 647 | 559 | 666 | 567 | 238 | 238 | 236 | 250 |
| woodriver\_gi | 4500 | 557 | 463 | 553 | 449 | 222 | 222 | 221 | 232 |
| woodriver\_gi | 5000 | 487 | 394 | 452 | 362 | 210 | 210 | 208 | 218 |
| gi\_chapman | 500 | 1027 | 1178 | 1049 | 1245 | 287 | 328 | 301 | 358 |
| gi\_chapman | 750 | 1058 | 1167 | 1074 | 1248 | 255 | 263 | 267 | 288 |
| gi\_chapman | 1000 | 1039 | 1128 | 1059 | 1210 | 229 | 225 | 237 | 249 |
| gi\_chapman | 1200 | 1011 | 1086 | 1020 | 1147 | 209 | 214 | 207 | 223 |
| gi\_chapman | 1500 | 944 | 954 | 962 | 1011 | 180 | 183 | 186 | 197 |
| gi\_chapman | 2000 | 811 | 746 | 819 | 803 | 153 | 158 | 152 | 162 |
| gi\_chapman | 2500 | 681 | 555 | 682 | 609 | 136 | 139 | 135 | 141 |
| gi\_chapman | 3000 | 557 | 420 | 568 | 456 | 122 | 126 | 122 | 127 |
| gi\_chapman | 3500 | 439 | 331 | 446 | 334 | 114 | 118 | 111 | 117 |
| gi\_chapman | 4000 | 338 | 287 | 344 | 251 | 106 | 111 | 102 | 109 |
| gi\_chapman | 4500 | 259 | 265 | 259 | 202 | 99 | 106 | 97 | 102 |
| gi\_chapman | 5000 | 196 | 264 | 203 | 186 | 94 | 101 | 94 | 98 |

**Table D7a.** Mean modeled width (ft) for managed vs. unmanaged areas for the main channel of All Reaches (Overton to Chapman), Overton to Elm Creek, and Elm Creek to Odessa

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | | **2018** | | **2019** | | **2020** | |
| managed | un-  managed | managed | un-  managed | managed | un-  managed | managed | un-  managed |
| All\_Reaches | 500 | 563 | 550 | 614 | 596 | 636 | 595 | 629 | 617 |
| All\_Reaches | 750 | 629 | 608 | 676 | 646 | 690 | 655 | 690 | 665 |
| All\_Reaches | 1000 | 676 | 646 | 706 | 670 | 715 | 681 | 722 | 691 |
| All\_Reaches | 1200 | 700 | 664 | 715 | 675 | 725 | 693 | 738 | 706 |
| All\_Reaches | 1500 | 737 | 688 | 741 | 695 | 739 | 706 | 757 | 721 |
| All\_Reaches | 2000 | 763 | 715 | 759 | 712 | 752 | 721 | 768 | 740 |
| All\_Reaches | 2500 | 780 | 736 | 775 | 732 | 762 | 733 | 782 | 752 |
| All\_Reaches | 3000 | 791 | 752 | 786 | 752 | 772 | 745 | 789 | 763 |
| All\_Reaches | 3500 | 802 | 765 | 799 | 768 | 783 | 755 | 796 | 773 |
| All\_Reaches | 4000 | 814 | 777 | 815 | 783 | 795 | 765 | 806 | 783 |
| All\_Reaches | 4500 | 822 | 788 | 822 | 796 | 803 | 775 | 814 | 791 |
| All\_Reaches | 5000 | 832 | 799 | 831 | 809 | 811 | 786 | 822 | 802 |
| overton\_elmcreek | 500 | 473 | 437 | 420 | 458 | 499 | 494 | 507 | 501 |
| overton\_elmcreek | 750 | 516 | 468 | 493 | 493 | 538 | 523 | 550 | 534 |
| overton\_elmcreek | 1000 | 534 | 495 | 531 | 522 | 557 | 538 | 569 | 560 |
| overton\_elmcreek | 1200 | 558 | 514 | 550 | 533 | 572 | 551 | 579 | 579 |
| overton\_elmcreek | 1500 | 591 | 541 | 570 | 551 | 579 | 570 | 588 | 589 |
| overton\_elmcreek | 2000 | 599 | 566 | 590 | 575 | 589 | 581 | 598 | 607 |
| overton\_elmcreek | 2500 | 613 | 588 | 605 | 594 | 598 | 600 | 612 | 626 |
| overton\_elmcreek | 3000 | 623 | 608 | 612 | 612 | 603 | 611 | 617 | 641 |
| overton\_elmcreek | 3500 | 629 | 639 | 622 | 644 | 616 | 634 | 625 | 668 |
| overton\_elmcreek | 4000 | 638 | 666 | 633 | 675 | 627 | 654 | 636 | 686 |
| overton\_elmcreek | 4500 | 649 | 697 | 642 | 708 | 639 | 693 | 645 | 728 |
| overton\_elmcreek | 5000 | 657 | 717 | 647 | 722 | 644 | 709 | 650 | 746 |
| elmcreek\_odessa | 500 | 641 | 570 | 731 | 599 | 762 | 617 | 733 | 637 |
| elmcreek\_odessa | 750 | 725 | 621 | 785 | 649 | 817 | 666 | 807 | 675 |
| elmcreek\_odessa | 1000 | 765 | 648 | 806 | 666 | 845 | 689 | 842 | 697 |
| elmcreek\_odessa | 1200 | 792 | 671 | 820 | 678 | 854 | 699 | 857 | 701 |
| elmcreek\_odessa | 1500 | 821 | 690 | 834 | 691 | 861 | 709 | 871 | 720 |
| elmcreek\_odessa | 2000 | 843 | 706 | 850 | 707 | 868 | 722 | 879 | 734 |
| elmcreek\_odessa | 2500 | 857 | 733 | 860 | 730 | 876 | 733 | 890 | 754 |
| elmcreek\_odessa | 3000 | 866 | 753 | 867 | 748 | 881 | 745 | 891 | 760 |
| elmcreek\_odessa | 3500 | 875 | 774 | 877 | 770 | 886 | 755 | 894 | 781 |
| elmcreek\_odessa | 4000 | 886 | 794 | 886 | 791 | 892 | 770 | 900 | 795 |
| elmcreek\_odessa | 4500 | 892 | 810 | 894 | 806 | 901 | 797 | 910 | 816 |
| elmcreek\_odessa | 5000 | 897 | 821 | 900 | 819 | 908 | 809 | 913 | 826 |

**Table D7b.** Mean modeled width (ft) for managed vs. unmanaged areas for the main channel of Odessa to Minden, Minden to Gibbon, and Gibbon to Wood River

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | | **2018** | | **2019** | | **2020** | |
| managed | un-  managed | managed | un-  managed | managed | un-  managed | managed | un-  managed |
| odessa\_minden | 500 | 390 | 450 | 436 | 500 | 440 | 494 | 419 | 513 |
| odessa\_minden | 750 | 441 | 501 | 478 | 529 | 487 | 540 | 468 | 558 |
| odessa\_minden | 1000 | 480 | 534 | 500 | 553 | 503 | 561 | 496 | 576 |
| odessa\_minden | 1200 | 492 | 540 | 506 | 560 | 505 | 570 | 510 | 590 |
| odessa\_minden | 1500 | 526 | 568 | 531 | 583 | 518 | 583 | 531 | 607 |
| odessa\_minden | 2000 | 547 | 596 | 548 | 603 | 532 | 603 | 546 | 633 |
| odessa\_minden | 2500 | 571 | 615 | 566 | 625 | 542 | 615 | 562 | 642 |
| odessa\_minden | 3000 | 582 | 631 | 581 | 640 | 554 | 622 | 573 | 650 |
| odessa\_minden | 3500 | 595 | 646 | 589 | 656 | 563 | 637 | 579 | 660 |
| odessa\_minden | 4000 | 612 | 662 | 610 | 672 | 576 | 648 | 593 | 671 |
| odessa\_minden | 4500 | 618 | 678 | 617 | 683 | 586 | 658 | 602 | 679 |
| odessa\_minden | 5000 | 630 | 691 | 624 | 700 | 597 | 670 | 608 | 690 |
| minden\_gibbon | 500 | 710 | -- | 757 | 561 | -- | 603 | 746 | -- |
| minden\_gibbon | 750 | 792 | -- | 842 | 612 | -- | 659 | 828 | -- |
| minden\_gibbon | 1000 | 855 | -- | 878 | 644 | -- | 675 | 867 | -- |
| minden\_gibbon | 1200 | 879 | -- | 884 | 665 | -- | 675 | 889 | -- |
| minden\_gibbon | 1500 | 914 | -- | 911 | 703 | -- | 683 | 914 | -- |
| minden\_gibbon | 2000 | 935 | -- | 929 | 745 | -- | 566 | 929 | -- |
| minden\_gibbon | 2500 | 946 | -- | 943 | 772 | -- | 722 | 941 | -- |
| minden\_gibbon | 3000 | 963 | -- | 955 | 781 | -- | 741 | 948 | -- |
| minden\_gibbon | 3500 | 967 | -- | 969 | 818 | -- | 750 | 954 | -- |
| minden\_gibbon | 4000 | 979 | -- | 986 | 810 | -- | 761 | 965 | -- |
| minden\_gibbon | 4500 | 985 | -- | 991 | 653 | -- | 767 | 970 | -- |
| minden\_gibbon | 5000 | 991 | -- | 999 | 654 | -- | 785 | 981 | -- |
| gibbon\_woodriver | 500 | 618 | 515 | 711 | 573 | 719 | 584 | 758 | 617 |
| gibbon\_woodriver | 750 | 683 | 570 | 772 | 624 | 776 | 646 | 818 | 664 |
| gibbon\_woodriver | 1000 | 743 | 609 | 804 | 642 | 803 | 668 | 857 | 682 |
| gibbon\_woodriver | 1200 | 776 | 623 | 813 | 641 | 814 | 670 | 868 | 692 |
| gibbon\_woodriver | 1500 | 836 | 649 | 851 | 661 | 842 | 682 | 891 | 708 |
| gibbon\_woodriver | 2000 | 877 | 674 | 872 | 676 | 860 | 696 | 903 | 717 |
| gibbon\_woodriver | 2500 | 892 | 695 | 888 | 692 | 871 | 707 | 913 | 725 |
| gibbon\_woodriver | 3000 | 904 | 709 | 901 | 708 | 892 | 719 | 921 | 734 |
| gibbon\_woodriver | 3500 | 923 | 722 | 922 | 722 | 912 | 727 | 936 | 740 |
| gibbon\_woodriver | 4000 | 931 | 731 | 937 | 734 | 919 | 734 | 936 | 750 |
| gibbon\_woodriver | 4500 | 945 | 739 | 948 | 744 | 927 | 740 | 946 | 755 |
| gibbon\_woodriver | 5000 | 966 | 750 | 970 | 756 | 935 | 749 | 962 | 762 |

**Table D7c.** Mean modeled width (ft) for managed vs. unmanaged areas for Wood River to Grand Island and Grand Island to Chapman

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | | **2018** | | **2019** | | **2020** | |
| managed | un-  managed | managed | un-  managed | managed | un-  managed | managed | un-  managed |
| woodriver\_gi | 500 | 734 | 415 | 866 | 459 | 845 | 457 | 886 | 465 |
| woodriver\_gi | 750 | 820 | 470 | 933 | 525 | 913 | 522 | 950 | 514 |
| woodriver\_gi | 1000 | 903 | 513 | 972 | 554 | 966 | 547 | 994 | 546 |
| woodriver\_gi | 1200 | 944 | 537 | 972 | 554 | 982 | 565 | 1013 | 563 |
| woodriver\_gi | 1500 | 989 | 566 | 1008 | 587 | 997 | 580 | 1034 | 582 |
| woodriver\_gi | 2000 | 1057 | 599 | 1029 | 600 | 1015 | 595 | 1036 | 600 |
| woodriver\_gi | 2500 | 1070 | 622 | 1056 | 615 | 1033 | 606 | 1056 | 610 |
| woodriver\_gi | 3000 | 1081 | 636 | 1067 | 631 | 1042 | 613 | 1066 | 620 |
| woodriver\_gi | 3500 | 1098 | 646 | 1087 | 643 | 1056 | 619 | 1074 | 628 |
| woodriver\_gi | 4000 | 1110 | 654 | 1107 | 652 | 1075 | 628 | 1085 | 636 |
| woodriver\_gi | 4500 | 1118 | 660 | 1114 | 658 | 1081 | 633 | 1090 | 642 |
| woodriver\_gi | 5000 | 1129 | 668 | 1125 | 665 | 1087 | 640 | 1096 | 648 |
| gi\_chapman | 500 | -- | 878 | -- | 922 | -- | 897 | -- | 941 |
| gi\_chapman | 750 | -- | 956 | -- | 963 | -- | 967 | -- | 994 |
| gi\_chapman | 1000 | -- | 996 | -- | 986 | -- | 1007 | -- | 1026 |
| gi\_chapman | 1200 | -- | 1014 | -- | 998 | -- | 1024 | -- | 1043 |
| gi\_chapman | 1500 | -- | 1026 | -- | 998 | -- | 1037 | -- | 1053 |
| gi\_chapman | 2000 | -- | 1044 | -- | 1023 | -- | 1047 | -- | 1075 |
| gi\_chapman | 2500 | -- | 1063 | -- | 1051 | -- | 1063 | -- | 1093 |
| gi\_chapman | 3000 | -- | 1083 | -- | 1083 | -- | 1084 | -- | 1111 |
| gi\_chapman | 3500 | -- | 1094 | -- | 1106 | -- | 1095 | -- | 1121 |
| gi\_chapman | 4000 | -- | 1107 | -- | 1128 | -- | 1108 | -- | 1130 |
| gi\_chapman | 4500 | -- | 1117 | -- | 1147 | -- | 1118 | -- | 1138 |
| gi\_chapman | 5000 | -- | 1129 | -- | 1169 | -- | 1131 | -- | 1156 |

**Table D8a**. Mean modeled depth (ft) for managed vs. unmanaged areas for the main channel of All Reaches (Overton to Chapman), Overton to Elm Creek, and Elm Creek to Odessa

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | | **2018** | | **2019** | | **2020** | |
| managed | un-  managed | managed | un-  managed | managed | un-  managed | managed | un-  managed |
| All\_Reaches | 500 | 0.5 | 0.5 | 0.4 | 0.5 | 0.5 | 0.6 | 0.4 | 0.5 |
| All\_Reaches | 750 | 0.6 | 0.6 | 0.5 | 0.6 | 0.6 | 0.6 | 0.5 | 0.6 |
| All\_Reaches | 1000 | 0.7 | 0.7 | 0.6 | 0.7 | 0.7 | 0.7 | 0.6 | 0.7 |
| All\_Reaches | 1200 | 0.8 | 0.8 | 0.7 | 0.8 | 0.8 | 0.8 | 0.7 | 0.7 |
| All\_Reaches | 1500 | 0.8 | 0.9 | 0.8 | 0.9 | 0.8 | 0.9 | 0.8 | 0.8 |
| All\_Reaches | 2000 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.9 | 1.0 |
| All\_Reaches | 2500 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.2 | 1.1 | 1.1 |
| All\_Reaches | 3000 | 1.2 | 1.3 | 1.2 | 1.3 | 1.2 | 1.3 | 1.2 | 1.2 |
| All\_Reaches | 3500 | 1.3 | 1.4 | 1.3 | 1.4 | 1.3 | 1.4 | 1.3 | 1.3 |
| All\_Reaches | 4000 | 1.4 | 1.5 | 1.4 | 1.5 | 1.4 | 1.5 | 1.4 | 1.4 |
| All\_Reaches | 4500 | 1.5 | 1.6 | 1.5 | 1.5 | 1.5 | 1.6 | 1.5 | 1.5 |
| All\_Reaches | 5000 | 1.6 | 1.7 | 1.6 | 1.6 | 1.6 | 1.7 | 1.6 | 1.6 |
| overton\_elmcreek | 500 | 0.6 | 0.7 | 0.4 | 0.6 | 0.6 | 0.7 | 0.6 | 0.6 |
| overton\_elmcreek | 750 | 0.7 | 0.9 | 0.6 | 0.7 | 0.7 | 0.8 | 0.7 | 0.8 |
| overton\_elmcreek | 1000 | 0.8 | 1.0 | 0.7 | 0.9 | 0.7 | 0.9 | 0.8 | 0.9 |
| overton\_elmcreek | 1200 | 0.9 | 1.1 | 0.8 | 1.0 | 0.8 | 1.0 | 0.9 | 1.0 |
| overton\_elmcreek | 1500 | 1.0 | 1.2 | 0.9 | 1.1 | 0.9 | 1.1 | 1.0 | 1.1 |
| overton\_elmcreek | 2000 | 1.2 | 1.4 | 1.1 | 1.3 | 1.1 | 1.3 | 1.2 | 1.3 |
| overton\_elmcreek | 2500 | 1.3 | 1.6 | 1.2 | 1.5 | 1.3 | 1.5 | 1.3 | 1.5 |
| overton\_elmcreek | 3000 | 1.5 | 1.7 | 1.4 | 1.7 | 1.4 | 1.6 | 1.5 | 1.6 |
| overton\_elmcreek | 3500 | 1.6 | 1.9 | 1.5 | 1.8 | 1.5 | 1.8 | 1.6 | 1.8 |
| overton\_elmcreek | 4000 | 1.7 | 2.0 | 1.7 | 2.0 | 1.7 | 1.9 | 1.7 | 1.9 |
| overton\_elmcreek | 4500 | 1.8 | 2.1 | 1.8 | 2.1 | 1.8 | 2.0 | 1.8 | 2.0 |
| overton\_elmcreek | 5000 | 2.0 | 2.2 | 1.9 | 2.2 | 1.9 | 2.1 | 1.9 | 2.1 |
| elmcreek\_odessa | 500 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.7 | 0.5 | 0.6 |
| elmcreek\_odessa | 750 | 0.7 | 0.8 | 0.7 | 0.7 | 0.7 | 0.8 | 0.7 | 0.7 |
| elmcreek\_odessa | 1000 | 0.8 | 0.9 | 0.8 | 0.9 | 0.8 | 0.9 | 0.8 | 0.8 |
| elmcreek\_odessa | 1200 | 0.9 | 1.0 | 0.9 | 1.0 | 0.9 | 1.0 | 0.8 | 0.9 |
| elmcreek\_odessa | 1500 | 1.0 | 1.1 | 1.0 | 1.1 | 1.0 | 1.1 | 1.0 | 1.1 |
| elmcreek\_odessa | 2000 | 1.2 | 1.3 | 1.2 | 1.3 | 1.2 | 1.3 | 1.1 | 1.2 |
| elmcreek\_odessa | 2500 | 1.3 | 1.4 | 1.3 | 1.4 | 1.3 | 1.4 | 1.3 | 1.4 |
| elmcreek\_odessa | 3000 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.6 | 1.4 | 1.5 |
| elmcreek\_odessa | 3500 | 1.6 | 1.7 | 1.6 | 1.7 | 1.6 | 1.7 | 1.6 | 1.7 |
| elmcreek\_odessa | 4000 | 1.7 | 1.8 | 1.8 | 1.8 | 1.7 | 1.8 | 1.7 | 1.8 |
| elmcreek\_odessa | 4500 | 1.8 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.8 | 1.9 |
| elmcreek\_odessa | 5000 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 1.9 | 2.0 |

**Table D8b.** Mean modeled depth (ft) for managed vs. unmanaged areas for the main channel of Odessa to Minden, Minden to Gibbon, and Gibbon to Wood River

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | | **2018** | | **2019** | | **2020** | |
| managed | un-  managed | managed | un-  managed | managed | un-  managed | managed | un-  managed |
| odessa\_minden | 500 | 0.5 | 0.6 | 0.5 | 0.6 | 0.6 | 0.7 | 0.5 | 0.5 |
| odessa\_minden | 750 | 0.6 | 0.7 | 0.6 | 0.7 | 0.7 | 0.7 | 0.6 | 0.7 |
| odessa\_minden | 1000 | 0.7 | 0.8 | 0.7 | 0.8 | 0.8 | 0.8 | 0.6 | 0.8 |
| odessa\_minden | 1200 | 0.8 | 0.9 | 0.8 | 0.9 | 0.9 | 0.9 | 0.7 | 0.9 |
| odessa\_minden | 1500 | 0.9 | 1.0 | 0.9 | 1.0 | 0.9 | 1.0 | 0.8 | 1.0 |
| odessa\_minden | 2000 | 1.0 | 1.1 | 1.0 | 1.2 | 1.1 | 1.2 | 1.0 | 1.1 |
| odessa\_minden | 2500 | 1.2 | 1.3 | 1.2 | 1.3 | 1.2 | 1.3 | 1.1 | 1.3 |
| odessa\_minden | 3000 | 1.3 | 1.4 | 1.3 | 1.4 | 1.4 | 1.5 | 1.2 | 1.4 |
| odessa\_minden | 3500 | 1.4 | 1.5 | 1.4 | 1.5 | 1.5 | 1.6 | 1.4 | 1.5 |
| odessa\_minden | 4000 | 1.5 | 1.6 | 1.5 | 1.6 | 1.6 | 1.7 | 1.5 | 1.6 |
| odessa\_minden | 4500 | 1.6 | 1.7 | 1.6 | 1.7 | 1.7 | 1.8 | 1.6 | 1.7 |
| odessa\_minden | 5000 | 1.7 | 1.8 | 1.7 | 1.8 | 1.7 | 1.9 | 1.7 | 1.8 |
| minden\_gibbon | 500 | 0.4 | -- | 0.3 | -- | 0.5 | -- | 0.3 | -- |
| minden\_gibbon | 750 | 0.5 | -- | 0.4 | -- | 0.5 | -- | 0.4 | -- |
| minden\_gibbon | 1000 | 0.6 | -- | 0.5 | -- | 0.6 | -- | 0.4 | -- |
| minden\_gibbon | 1200 | 0.6 | -- | 0.6 | -- | 0.6 | -- | 0.5 | -- |
| minden\_gibbon | 1500 | 0.7 | -- | 0.6 | -- | 0.7 | -- | 0.6 | -- |
| minden\_gibbon | 2000 | 0.8 | -- | 0.8 | -- | 0.8 | -- | 0.7 | -- |
| minden\_gibbon | 2500 | 0.9 | -- | 0.9 | -- | 0.9 | -- | 0.8 | -- |
| minden\_gibbon | 3000 | 1.0 | -- | 0.9 | -- | 1.0 | -- | 0.9 | -- |
| minden\_gibbon | 3500 | 1.1 | -- | 1.0 | -- | 1.1 | -- | 1.0 | -- |
| minden\_gibbon | 4000 | 1.1 | -- | 1.1 | -- | 1.2 | -- | 1.0 | -- |
| minden\_gibbon | 4500 | 1.2 | -- | 1.2 | -- | 1.2 | -- | 1.1 | -- |
| minden\_gibbon | 5000 | 1.3 | -- | 1.2 | -- | 1.3 | -- | 1.2 | -- |
| gibbon\_woodriver | 500 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.6 | 0.5 | 0.5 |
| gibbon\_woodriver | 750 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| gibbon\_woodriver | 1000 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.6 | 0.7 |
| gibbon\_woodriver | 1200 | 0.7 | 0.8 | 0.7 | 0.8 | 0.8 | 0.8 | 0.7 | 0.7 |
| gibbon\_woodriver | 1500 | 0.8 | 0.9 | 0.8 | 0.9 | 0.8 | 0.9 | 0.8 | 0.8 |
| gibbon\_woodriver | 2000 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.9 | 1.0 |
| gibbon\_woodriver | 2500 | 1.1 | 1.2 | 1.1 | 1.2 | 1.1 | 1.2 | 1.1 | 1.1 |
| gibbon\_woodriver | 3000 | 1.2 | 1.3 | 1.2 | 1.3 | 1.2 | 1.3 | 1.2 | 1.2 |
| gibbon\_woodriver | 3500 | 1.3 | 1.4 | 1.3 | 1.4 | 1.3 | 1.4 | 1.3 | 1.4 |
| gibbon\_woodriver | 4000 | 1.4 | 1.5 | 1.4 | 1.5 | 1.4 | 1.5 | 1.4 | 1.5 |
| gibbon\_woodriver | 4500 | 1.5 | 1.6 | 1.5 | 1.6 | 1.5 | 1.6 | 1.5 | 1.6 |
| gibbon\_woodriver | 5000 | 1.6 | 1.7 | 1.6 | 1.7 | 1.6 | 1.7 | 1.6 | 1.7 |

**Table D8c.** Mean modeled depth (ft) for managed vs. unmanaged areas for Wood River to Grand Island and Grand Island to Chapman

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | | **2018** | | **2019** | | **2020** | |
| managed | un-  managed | managed | un-  managed | managed | un-  managed | managed | un-  managed |
| woodriver\_gi | 500 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.3 |
| woodriver\_gi | 750 | 0.5 | 0.5 | 0.5 | 0.4 | 0.5 | 0.5 | 0.5 | 0.4 |
| woodriver\_gi | 1000 | 0.6 | 0.5 | 0.5 | 0.5 | 0.6 | 0.6 | 0.5 | 0.5 |
| woodriver\_gi | 1200 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.5 |
| woodriver\_gi | 1500 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.6 |
| woodriver\_gi | 2000 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.7 |
| woodriver\_gi | 2500 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 |
| woodriver\_gi | 3000 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| woodriver\_gi | 3500 | 1.0 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 |
| woodriver\_gi | 4000 | 1.1 | 1.2 | 1.1 | 1.2 | 1.2 | 1.2 | 1.1 | 1.1 |
| woodriver\_gi | 4500 | 1.2 | 1.3 | 1.2 | 1.3 | 1.2 | 1.3 | 1.2 | 1.2 |
| woodriver\_gi | 5000 | 1.3 | 1.4 | 1.3 | 1.3 | 1.3 | 1.4 | 1.3 | 1.3 |
| gi\_chapman | 500 | -- | 0.5 | -- | 0.4 | -- | 0.5 | -- | 0.4 |
| gi\_chapman | 750 | -- | 0.6 | -- | 0.6 | -- | 0.6 | -- | 0.5 |
| gi\_chapman | 1000 | -- | 0.7 | -- | 0.7 | -- | 0.7 | -- | 0.6 |
| gi\_chapman | 1200 | -- | 0.7 | -- | 0.7 | -- | 0.7 | -- | 0.7 |
| gi\_chapman | 1500 | -- | 0.8 | -- | 0.8 | -- | 0.8 | -- | 0.8 |
| gi\_chapman | 2000 | -- | 1.0 | -- | 1.0 | -- | 1.0 | -- | 0.9 |
| gi\_chapman | 2500 | -- | 1.1 | -- | 1.1 | -- | 1.1 | -- | 1.1 |
| gi\_chapman | 3000 | -- | 1.2 | -- | 1.2 | -- | 1.2 | -- | 1.2 |
| gi\_chapman | 3500 | -- | 1.3 | -- | 1.3 | -- | 1.3 | -- | 1.3 |
| gi\_chapman | 4000 | -- | 1.4 | -- | 1.4 | -- | 1.4 | -- | 1.4 |
| gi\_chapman | 4500 | -- | 1.5 | -- | 1.5 | -- | 1.5 | -- | 1.5 |
| gi\_chapman | 5000 | -- | 1.6 | -- | 1.5 | -- | 1.6 | -- | 1.6 |

**Table D9a**. Mean modeled percent area with depth < 1ft for managed vs. unmanaged areas for the main channel of All Reaches (Overton to Chapman), Overton to Elm Creek, and Elm Creek to Odessa

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | | **2018** | | **2019** | | **2020** | |
| managed | un-  managed | managed | un-  managed | managed | un-  managed | managed | un-  managed |
| All\_Reaches | 500 | 88 | 86 | 93 | 92 | 85 | 84 | 94 | 94 |
| All\_Reaches | 750 | 82 | 81 | 89 | 87 | 81 | 80 | 90 | 88 |
| All\_Reaches | 1000 | 76 | 75 | 83 | 81 | 78 | 76 | 84 | 82 |
| All\_Reaches | 1200 | 71 | 70 | 78 | 76 | 74 | 72 | 79 | 77 |
| All\_Reaches | 1500 | 65 | 64 | 71 | 68 | 69 | 66 | 71 | 69 |
| All\_Reaches | 2000 | 56 | 54 | 58 | 53 | 59 | 57 | 59 | 55 |
| All\_Reaches | 2500 | 47 | 45 | 45 | 41 | 50 | 47 | 48 | 43 |
| All\_Reaches | 3000 | 39 | 37 | 36 | 31 | 40 | 38 | 39 | 33 |
| All\_Reaches | 3500 | 33 | 31 | 29 | 25 | 32 | 31 | 31 | 26 |
| All\_Reaches | 4000 | 28 | 26 | 24 | 21 | 26 | 25 | 25 | 20 |
| All\_Reaches | 4500 | 24 | 22 | 20 | 19 | 21 | 20 | 20 | 17 |
| All\_Reaches | 5000 | 20 | 19 | 17 | 17 | 17 | 16 | 17 | 14 |
| overton\_elmcreek | 500 | 84 | 76 | 94 | 82 | 82 | 75 | 88 | 81 |
| overton\_elmcreek | 750 | 73 | 63 | 87 | 73 | 79 | 69 | 79 | 68 |
| overton\_elmcreek | 1000 | 65 | 52 | 80 | 63 | 75 | 63 | 70 | 59 |
| overton\_elmcreek | 1200 | 58 | 45 | 73 | 55 | 71 | 58 | 61 | 51 |
| overton\_elmcreek | 1500 | 50 | 37 | 63 | 46 | 65 | 51 | 51 | 42 |
| overton\_elmcreek | 2000 | 39 | 27 | 47 | 30 | 53 | 39 | 37 | 30 |
| overton\_elmcreek | 2500 | 31 | 21 | 33 | 19 | 40 | 28 | 25 | 20 |
| overton\_elmcreek | 3000 | 24 | 17 | 23 | 14 | 27 | 19 | 19 | 15 |
| overton\_elmcreek | 3500 | 19 | 15 | 17 | 12 | 19 | 14 | 14 | 12 |
| overton\_elmcreek | 4000 | 16 | 13 | 14 | 12 | 14 | 11 | 12 | 11 |
| overton\_elmcreek | 4500 | 14 | 13 | 12 | 12 | 12 | 12 | 11 | 12 |
| overton\_elmcreek | 5000 | 11 | 13 | 11 | 12 | 10 | 12 | 10 | 12 |
| elmcreek\_odessa | 500 | 83 | 82 | 86 | 85 | 81 | 78 | 89 | 89 |
| elmcreek\_odessa | 750 | 74 | 70 | 78 | 75 | 76 | 73 | 80 | 77 |
| elmcreek\_odessa | 1000 | 66 | 61 | 70 | 64 | 71 | 66 | 72 | 66 |
| elmcreek\_odessa | 1200 | 60 | 54 | 63 | 56 | 66 | 61 | 65 | 57 |
| elmcreek\_odessa | 1500 | 53 | 46 | 55 | 46 | 59 | 53 | 56 | 45 |
| elmcreek\_odessa | 2000 | 43 | 34 | 39 | 30 | 46 | 40 | 42 | 30 |
| elmcreek\_odessa | 2500 | 33 | 26 | 26 | 22 | 34 | 29 | 29 | 20 |
| elmcreek\_odessa | 3000 | 24 | 21 | 17 | 17 | 22 | 19 | 21 | 15 |
| elmcreek\_odessa | 3500 | 18 | 18 | 12 | 15 | 15 | 14 | 14 | 13 |
| elmcreek\_odessa | 4000 | 15 | 17 | 9 | 15 | 9 | 12 | 10 | 12 |
| elmcreek\_odessa | 4500 | 11 | 16 | 8 | 15 | 6 | 12 | 7 | 13 |
| elmcreek\_odessa | 5000 | 8 | 15 | 7 | 14 | 5 | 12 | 6 | 12 |

**Table D9b.** Mean modeled percent area with depth < 1ft for managed vs. unmanaged areas for the main channel of Odessa to Minden, Minden to Gibbon, and Gibbon to Wood River

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | | **2018** | | **2019** | | **2020** | |
| managed | un-  managed | managed | un-  managed | managed | un-  managed | managed | un-  managed |
| odessa\_minden | 500 | 86 | 82 | 92 | 85 | 80 | 78 | 95 | 88 |
| odessa\_minden | 750 | 79 | 74 | 86 | 78 | 76 | 74 | 89 | 80 |
| odessa\_minden | 1000 | 72 | 67 | 78 | 70 | 71 | 69 | 82 | 71 |
| odessa\_minden | 1200 | 66 | 61 | 71 | 63 | 67 | 64 | 75 | 64 |
| odessa\_minden | 1500 | 60 | 54 | 61 | 54 | 61 | 57 | 66 | 55 |
| odessa\_minden | 2000 | 49 | 44 | 46 | 41 | 50 | 47 | 52 | 42 |
| odessa\_minden | 2500 | 41 | 36 | 35 | 32 | 40 | 37 | 40 | 33 |
| odessa\_minden | 3000 | 34 | 30 | 27 | 26 | 31 | 30 | 31 | 26 |
| odessa\_minden | 3500 | 29 | 27 | 23 | 23 | 24 | 24 | 24 | 21 |
| odessa\_minden | 4000 | 26 | 24 | 21 | 21 | 19 | 19 | 20 | 18 |
| odessa\_minden | 4500 | 22 | 21 | 19 | 18 | 16 | 16 | 17 | 16 |
| odessa\_minden | 5000 | 19 | 19 | 17 | 17 | 14 | 14 | 15 | 14 |
| minden\_gibbon | 500 | 95 | -- | 99 | -- | 91 | -- | 99 | -- |
| minden\_gibbon | 750 | 92 | -- | 97 | -- | 89 | -- | 99 | -- |
| minden\_gibbon | 1000 | 88 | -- | 95 | -- | 86 | -- | 98 | -- |
| minden\_gibbon | 1200 | 85 | -- | 93 | -- | 84 | -- | 96 | -- |
| minden\_gibbon | 1500 | 80 | -- | 89 | -- | 80 | -- | 94 | -- |
| minden\_gibbon | 2000 | 71 | -- | 79 | -- | 74 | -- | 86 | -- |
| minden\_gibbon | 2500 | 62 | -- | 67 | -- | 66 | -- | 77 | -- |
| minden\_gibbon | 3000 | 53 | -- | 55 | -- | 58 | -- | 66 | -- |
| minden\_gibbon | 3500 | 45 | -- | 44 | -- | 49 | -- | 56 | -- |
| minden\_gibbon | 4000 | 38 | -- | 35 | -- | 40 | -- | 46 | -- |
| minden\_gibbon | 4500 | 31 | -- | 27 | -- | 31 | -- | 36 | -- |
| minden\_gibbon | 5000 | 26 | -- | 22 | -- | 24 | -- | 28 | -- |
| gibbon\_woodriver | 500 | 86 | 82 | 92 | 85 | 80 | 78 | 95 | 88 |
| gibbon\_woodriver | 750 | 79 | 74 | 86 | 78 | 76 | 74 | 89 | 80 |
| gibbon\_woodriver | 1000 | 72 | 67 | 78 | 70 | 71 | 69 | 82 | 71 |
| gibbon\_woodriver | 1200 | 66 | 61 | 71 | 63 | 67 | 64 | 75 | 64 |
| gibbon\_woodriver | 1500 | 60 | 54 | 61 | 54 | 61 | 57 | 66 | 55 |
| gibbon\_woodriver | 2000 | 49 | 44 | 46 | 41 | 50 | 47 | 52 | 42 |
| gibbon\_woodriver | 2500 | 41 | 36 | 35 | 32 | 40 | 37 | 40 | 33 |
| gibbon\_woodriver | 3000 | 34 | 30 | 27 | 26 | 31 | 30 | 31 | 26 |
| gibbon\_woodriver | 3500 | 29 | 27 | 23 | 23 | 24 | 24 | 24 | 21 |
| gibbon\_woodriver | 4000 | 26 | 24 | 21 | 21 | 19 | 19 | 20 | 18 |
| gibbon\_woodriver | 4500 | 22 | 21 | 19 | 18 | 16 | 16 | 17 | 16 |
| gibbon\_woodriver | 5000 | 19 | 19 | 17 | 17 | 14 | 14 | 15 | 14 |

**Table D9c.** Mean modeled percent area with depth < 1ft for managed vs. unmanaged areas for Wood River to Grand Island and Grand Island to Chapman

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | | **2018** | | **2019** | | **2020** | |
| managed | un-  managed | managed | un-  managed | managed | un-  managed | managed | un-  managed |
| woodriver\_gi | 500 | 88 | 86 | 93 | 92 | 86 | 83 | 95 | 95 |
| woodriver\_gi | 750 | 82 | 80 | 89 | 87 | 82 | 79 | 90 | 90 |
| woodriver\_gi | 1000 | 77 | 74 | 83 | 81 | 78 | 74 | 83 | 83 |
| woodriver\_gi | 1200 | 72 | 68 | 78 | 76 | 74 | 70 | 77 | 77 |
| woodriver\_gi | 1500 | 67 | 61 | 70 | 67 | 69 | 65 | 69 | 68 |
| woodriver\_gi | 2000 | 57 | 50 | 56 | 50 | 60 | 55 | 56 | 53 |
| woodriver\_gi | 2500 | 48 | 41 | 43 | 37 | 51 | 45 | 45 | 40 |
| woodriver\_gi | 3000 | 41 | 34 | 34 | 28 | 42 | 36 | 35 | 30 |
| woodriver\_gi | 3500 | 35 | 29 | 28 | 22 | 34 | 29 | 28 | 22 |
| woodriver\_gi | 4000 | 30 | 25 | 23 | 18 | 27 | 22 | 22 | 17 |
| woodriver\_gi | 4500 | 25 | 21 | 20 | 16 | 21 | 17 | 18 | 14 |
| woodriver\_gi | 5000 | 22 | 19 | 18 | 15 | 17 | 13 | 15 | 11 |
| gi\_chapman | 500 | -- | 86 | -- | 94 | -- | 86 | -- | 97 |
| gi\_chapman | 750 | -- | 82 | -- | 89 | -- | 83 | -- | 93 |
| gi\_chapman | 1000 | -- | 78 | -- | 84 | -- | 78 | -- | 87 |
| gi\_chapman | 1200 | -- | 74 | -- | 80 | -- | 74 | -- | 82 |
| gi\_chapman | 1500 | -- | 69 | -- | 71 | -- | 69 | -- | 72 |
| gi\_chapman | 2000 | -- | 58 | -- | 54 | -- | 58 | -- | 56 |
| gi\_chapman | 2500 | -- | 48 | -- | 39 | -- | 48 | -- | 42 |
| gi\_chapman | 3000 | -- | 39 | -- | 29 | -- | 39 | -- | 31 |
| gi\_chapman | 3500 | -- | 30 | -- | 22 | -- | 30 | -- | 22 |
| gi\_chapman | 4000 | -- | 23 | -- | 19 | -- | 23 | -- | 17 |
| gi\_chapman | 4500 | -- | 17 | -- | 17 | -- | 17 | -- | 13 |
| gi\_chapman | 5000 | -- | 13 | -- | 17 | -- | 13 | -- | 12 |

## **Table D10.** Modeled percent flow in the main channel at 2000 cfs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Reach** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 71 | 70 | 69 | 68 |
| overton\_elmcreek | 79 | 69 | 68 | 75 |
| elmcreek\_odessa | 100 | 100 | 100 | 100 |
| odessa\_minden | 55 | 56 | 56 | 53 |
| minden\_gibbon | 62 | 58 | 62 | 47 |
| gibbon\_woodriver | 83 | 81 | 80 | 79 |
| woodriver\_gi | 54 | 54 | 53 | 52 |
| gi\_chapman | 100 | 100 | 100 | 100 |

# Appendix E. Full Land Cover Classification Results

## **Table E1.** Parameters used in E-Cognition classification

|  |  |  |
| --- | --- | --- |
| **Year** | **NDVI** | **NDWI** |
| 2017 | 0.09 | 0 |
| 2018 | 0.05 | 0 |
| 2019 | 0.06 | 0 |
| 2020 | 0.03 | 0.05 |

## **Table E2.** Confusion matrix comparing 2018 E-Cognition classification results to field-sampled data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Class** | | **Field Observations** | | | | | |
| **Water/Sand** | **Veg <2ft** | **Veg 2-6ft** | **Veg 6-15ft** | **Veg >15ft** | **Total** |
| **E-Cognition Classification** | **Water/Sand** | 130 | 0 | 0 | 0 | 0 | 130 |
| **Veg <2ft** | 0 | 167 | 35 | 4 | 1 | 207 |
| **Veg 2-6ft** | 0 | 1 | 57 | 15 | 1 | 74 |
| **Veg 6-15ft** | 0 | 0 | 0 | 13 | 4 | 17 |
| **Veg >15ft** | 0 | 0 | 0 | 0 | 12 | 12 |
| **Total** | 130 | 168 | 92 | 32 | 18 | 440 |

## **Table E3.** Confusion matrix comparing 2019 E-Cognition classification results to field-sampled data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Class** | | **Field Observations** | | | | | |
| **Water/Sand** | **Veg <2ft** | **Veg 2-6ft** | **Veg 6-15ft** | **Veg >15ft** | **Total** |
| **E-Cognition Classification** | **Water/Sand** | 22 | 0 | 0 | 0 | 0 | 22 |
| **Veg <2ft** | 0 | 97 | 26 | 1 | 0 | 124 |
| **Veg 2-6ft** | 0 | 1 | 9 | 0 | 0 | 10 |
| **Veg 6-15ft** | 0 | 0 | 1 | 0 | 0 | 1 |
| **Veg >15ft** | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | 22 | 98 | 36 | 1 | 0 | 157 |

## **Table E4.** Confusion matrix comparing 2020 E-Cognition classification results to field-sampled data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Class** | | **Field Observations** | | | | | |
| **Water/Sand** | **Veg <2ft** | **Veg 2-6ft** | **Veg 6-15ft** | **Veg >15ft** | **Total** |
| **E-Cognition Classification** | **Water/Sand** | 58 | 0 | 0 | 0 | 0 | 58 |
| **Veg <2ft** | 0 | 26 | 1 | 0 | 0 | 27 |
| **Veg 2-6ft** | 0 | 2 | 32 | 3 | 0 | 37 |
| **Veg 6-15ft** | 0 | 0 | 0 | 1 | 0 | 1 |
| **Veg >15ft** | 0 | 0 | 0 | 1 | 0 | 1 |
| **Total** | 58 | 28 | 33 | 5 | 0 | 124 |

## **Table E5a.** Classified area of water and sand (summed together) and vegetation less than 2 ft in height (Veg <2ft) for all channels

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Water/Sand (ac)** | | | | **Veg <2ft (ac)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 7760 | 8846 | 10007 | 9022 | 3408 | 2626 | 2579 | 2084 |
| N-lexington\_overton | 489 | 486 | 610 | 511 | 404 | 335 | 316 | 220 |
| J2\_overton | 367 | 459 | 397 | 506 | 297 | 198 | 294 | 139 |
| overton\_elmcreek | 680 | 855 | 913 | 834 | 492 | 295 | 354 | 266 |
| elmcreek\_odessa | 543 | 711 | 701 | 679 | 237 | 72 | 135 | 90 |
| odessa\_minden | 1317 | 1582 | 1796 | 1682 | 843 | 636 | 686 | 503 |
| minden\_gibbon | 655 | 763 | 837 | 734 | 259 | 177 | 164 | 174 |
| gibbon\_woodriver | 1365 | 1511 | 1755 | 1622 | 558 | 506 | 490 | 330 |
| woodriver\_gi | 1974 | 2135 | 2544 | 2153 | 670 | 599 | 454 | 477 |
| gi\_chapman | 1195 | 1290 | 1461 | 1317 | 349 | 340 | 296 | 244 |

**Table E5b.** Classified area of vegetation from 2-6 ft in height (Veg 2-6ft) and vegetation 6-15 ft in height (Veg 6-15ft) for all channels

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Veg 2-6ft (ac)** | | | | **Veg 6-15ft (ac)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 2037 | 1871 | 831 | 2281 | 2281 | 533 | 402 | 348 |
| N-lexington\_overton | 107 | 189 | 76 | 261 | 261 | 35 | 28 | 38 |
| J2\_overton | 49 | 60 | 25 | 72 | 72 | 16 | 12 | 13 |
| overton\_elmcreek | 123 | 170 | 55 | 218 | 218 | 57 | 38 | 37 |
| elmcreek\_odessa | 87 | 89 | 39 | 106 | 106 | 19 | 14 | 12 |
| odessa\_minden | 447 | 424 | 177 | 464 | 464 | 123 | 99 | 87 |
| minden\_gibbon | 167 | 152 | 93 | 182 | 182 | 36 | 28 | 27 |
| gibbon\_woodriver | 466 | 407 | 188 | 481 | 481 | 109 | 79 | 71 |
| woodriver\_gi | 461 | 406 | 168 | 523 | 523 | 109 | 83 | 66 |
| gi\_chapman | 286 | 221 | 111 | 308 | 308 | 80 | 60 | 47 |

**Table E5c.** Classified area of vegetation greater than 15 ft in height (Veg>15ft) for all channels

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Reach** | **Veg >15ft (ac)** | | | |
| **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 563 | 527 | 507 | 540 |
| N-lexington\_overton | 65 | 62 | 61 | 64 |
| J2\_overton | 13 | 13 | 12 | 12 |
| overton\_elmcreek | 76 | 71 | 71 | 74 |
| elmcreek\_odessa | 28 | 27 | 26 | 27 |
| odessa\_minden | 186 | 175 | 171 | 181 |
| minden\_gibbon | 28 | 26 | 25 | 28 |
| gibbon\_woodriver | 96 | 91 | 90 | 93 |
| woodriver\_gi | 98 | 89 | 78 | 90 |
| gi\_chapman | 51 | 48 | 46 | 48 |

## **Table E6a.** Classified percent area of water and sand (summed together) and vegetation less than 2 ft in height (Veg <2ft) for all channels

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Water/Sand (%)** | | | | **Veg <2ft (%)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 54 | 62 | 70 | 63 | 24 | 18 | 18 | 15 |
| N-lexington\_overton | 44 | 44 | 55 | 46 | 37 | 30 | 29 | 20 |
| J2\_overton | 50 | 62 | 54 | 68 | 40 | 27 | 40 | 19 |
| overton\_elmcreek | 48 | 60 | 64 | 58 | 34 | 21 | 25 | 19 |
| elmcreek\_odessa | 59 | 78 | 77 | 74 | 26 | 8 | 15 | 10 |
| odessa\_minden | 45 | 54 | 62 | 58 | 29 | 22 | 24 | 17 |
| minden\_gibbon | 57 | 67 | 73 | 64 | 23 | 15 | 14 | 15 |
| gibbon\_woodriver | 53 | 58 | 68 | 63 | 22 | 20 | 19 | 13 |
| woodriver\_gi | 60 | 64 | 77 | 65 | 20 | 18 | 14 | 14 |
| gi\_chapman | 61 | 66 | 75 | 67 | 18 | 17 | 15 | 12 |

**Table E6b.** Classified percent area of vegetation from 2-6 ft in height (Veg 2-6ft) and vegetation 6-15 ft in height (Veg 6-15ft) for all channels

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Veg 2-6ft (%)** | | | | **Veg 6-15ft (%)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 14 | 13 | 6 | 16 | 4 | 3 | 2 | 2 |
| N-lexington\_overton | 10 | 17 | 7 | 24 | 3 | 3 | 3 | 4 |
| J2\_overton | 7 | 8 | 3 | 10 | 2 | 2 | 2 | 2 |
| overton\_elmcreek | 9 | 12 | 4 | 15 | 4 | 3 | 3 | 2 |
| elmcreek\_odessa | 10 | 10 | 4 | 12 | 2 | 2 | 1 | 1 |
| odessa\_minden | 15 | 15 | 6 | 16 | 4 | 3 | 3 | 3 |
| minden\_gibbon | 15 | 13 | 8 | 16 | 3 | 2 | 2 | 3 |
| gibbon\_woodriver | 18 | 16 | 7 | 19 | 4 | 3 | 3 | 3 |
| woodriver\_gi | 14 | 12 | 5 | 16 | 3 | 3 | 2 | 2 |
| gi\_chapman | 15 | 11 | 6 | 16 | 4 | 3 | 2 | 2 |

**Table E6c.** Classified percent area of vegetation greater than 15 ft in height (Veg>15ft) for all channels

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Reach** | **Veg >15ft (%)** | | | |
| **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 4 | 4 | 4 | 4 |
| N-lexington\_overton | 6 | 6 | 6 | 6 |
| J2\_overton | 2 | 2 | 2 | 2 |
| overton\_elmcreek | 5 | 5 | 5 | 5 |
| elmcreek\_odessa | 3 | 3 | 3 | 3 |
| odessa\_minden | 6 | 6 | 6 | 6 |
| minden\_gibbon | 2 | 2 | 2 | 2 |
| gibbon\_woodriver | 4 | 3 | 3 | 4 |
| woodriver\_gi | 3 | 3 | 2 | 3 |
| gi\_chapman | 3 | 2 | 2 | 2 |

## **Table E7.** Classified total unobstructed area (ac) for all channels

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Reach** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 11168 | 11472 | 12586 | 11106 |
| N-lexington\_overton | 893 | 821 | 926 | 731 |
| J2\_overton | 664 | 657 | 691 | 645 |
| overton\_elmcreek | 1172 | 1150 | 1267 | 1100 |
| elmcreek\_odessa | 780 | 783 | 836 | 770 |
| odessa\_minden | 2160 | 2218 | 2482 | 2185 |
| minden\_gibbon | 914 | 939 | 1001 | 907 |
| gibbon\_woodriver | 1923 | 2017 | 2245 | 1952 |
| woodriver\_gi | 2644 | 2734 | 2999 | 2631 |
| gi\_chapman | 1544 | 1631 | 1757 | 1561 |

## **Table E8.** Classified total percent unobstructed area for all channels

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Reach** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 78 | 80 | 88 | 78 |
| N-lexington\_overton | 81 | 75 | 84 | 66 |
| J2\_overton | 90 | 89 | 93 | 87 |
| overton\_elmcreek | 82 | 80 | 89 | 77 |
| elmcreek\_odessa | 85 | 86 | 91 | 84 |
| odessa\_minden | 74 | 76 | 85 | 75 |
| minden\_gibbon | 80 | 82 | 87 | 79 |
| gibbon\_woodriver | 74 | 78 | 87 | 75 |
| woodriver\_gi | 80 | 83 | 91 | 79 |
| gi\_chapman | 79 | 83 | 90 | 80 |

## **Table E9a.** Classified area of water and sand (summed together) and vegetation less than 2 ft in height (Veg <2ft) for the main channel

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Water/Sand (ac)** | | | | **Veg <2ft (ac)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 6231 | 7060 | 7784 | 7122 | 2373 | 1768 | 1779 | 1426 |
| overton\_elmcreek | 506 | 623 | 641 | 604 | 237 | 108 | 157 | 107 |
| elmcreek\_odessa | 540 | 703 | 696 | 675 | 226 | 66 | 125 | 83 |
| odessa\_minden | 980 | 1153 | 1282 | 1210 | 494 | 361 | 385 | 278 |
| minden\_gibbon | 494 | 586 | 631 | 546 | 209 | 138 | 117 | 146 |
| gibbon\_woodriver | 1176 | 1290 | 1450 | 1377 | 414 | 367 | 377 | 240 |
| woodriver\_gi | 1314 | 1414 | 1623 | 1393 | 444 | 388 | 324 | 328 |
| gi\_chapman | 1195 | 1290 | 1460 | 1317 | 348 | 339 | 295 | 243 |

**Table E9b.** Classified area of vegetation from 2-6 ft in height (Veg 2-6ft) and vegetation 6-15 ft in height (Veg 6-15ft) for the main channel

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Veg 2-6ft (ac)** | | | | **Veg 6-15ft (ac)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 1441 | 1300 | 608 | 1617 | 321 | 232 | 200 | 192 |
| overton\_elmcreek | 71 | 97 | 33 | 118 | 27 | 15 | 14 | 14 |
| elmcreek\_odessa | 83 | 85 | 37 | 100 | 17 | 13 | 11 | 10 |
| odessa\_minden | 270 | 252 | 107 | 283 | 58 | 44 | 38 | 37 |
| minden\_gibbon | 122 | 106 | 80 | 136 | 18 | 13 | 15 | 15 |
| gibbon\_woodriver | 340 | 294 | 130 | 340 | 65 | 48 | 43 | 41 |
| woodriver\_gi | 270 | 245 | 110 | 334 | 55 | 40 | 32 | 32 |
| gi\_chapman | 284 | 220 | 110 | 307 | 79 | 60 | 47 | 43 |

**Table E9c.** Classified area of vegetation greater than 15 ft in height (Veg>15ft) for the main channel

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Reach** | **Veg >15ft (ac)** | | | |
| **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 275 | 255 | 245 | 258 |
| overton\_elmcreek | 28 | 25 | 24 | 26 |
| elmcreek\_odessa | 22 | 21 | 21 | 21 |
| odessa\_minden | 86 | 80 | 77 | 81 |
| minden\_gibbon | 4 | 3 | 3 | 4 |
| gibbon\_woodriver | 54 | 50 | 49 | 51 |
| woodriver\_gi | 30 | 27 | 25 | 28 |
| gi\_chapman | 51 | 48 | 46 | 48 |

## **Table E10a.** Classified percent area of water and sand (summed together) and vegetation less than 2 ft in height (Veg <2ft) for the main channel

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Water/Sand (%)** | | | | **Veg <2ft (%)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 59 | 67 | 73 | 67 | 22 | 17 | 17 | 13 |
| overton\_elmcreek | 58 | 72 | 74 | 70 | 27 | 12 | 18 | 12 |
| elmcreek\_odessa | 61 | 79 | 78 | 76 | 25 | 7 | 14 | 9 |
| odessa\_minden | 52 | 61 | 68 | 64 | 26 | 19 | 20 | 15 |
| minden\_gibbon | 58 | 69 | 75 | 64 | 25 | 16 | 14 | 17 |
| gibbon\_woodriver | 57 | 63 | 71 | 67 | 20 | 18 | 18 | 12 |
| woodriver\_gi | 62 | 67 | 77 | 66 | 21 | 18 | 15 | 16 |
| gi\_chapman | 61 | 66 | 75 | 67 | 18 | 17 | 15 | 12 |

**Table E10b.** Classified percent area of vegetation from 2-6 ft in height (Veg 2-6ft) and vegetation 6-15 ft in height (Veg 6-15ft) for the main channel

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Veg 2-6ft (%)** | | | | **Veg 6-15ft (%)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 14 | 12 | 6 | 15 | 3 | 2 | 2 | 2 |
| overton\_elmcreek | 8 | 11 | 4 | 14 | 3 | 2 | 2 | 2 |
| elmcreek\_odessa | 9 | 10 | 4 | 11 | 2 | 1 | 1 | 1 |
| odessa\_minden | 14 | 13 | 6 | 15 | 3 | 2 | 2 | 2 |
| minden\_gibbon | 14 | 13 | 9 | 16 | 2 | 2 | 2 | 2 |
| gibbon\_woodriver | 17 | 14 | 6 | 17 | 3 | 2 | 2 | 2 |
| woodriver\_gi | 13 | 12 | 5 | 16 | 3 | 2 | 2 | 2 |
| gi\_chapman | 15 | 11 | 6 | 16 | 4 | 3 | 2 | 2 |

**Table E10c.** Classified percent area of vegetation greater than 15 ft in height (Veg>15ft) for the main channel

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Reach** | **Veg >15ft (%)** | | | |
| **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 3 | 2 | 2 | 2 |
| overton\_elmcreek | 3 | 3 | 3 | 3 |
| elmcreek\_odessa | 2 | 2 | 2 | 2 |
| odessa\_minden | 5 | 4 | 4 | 4 |
| minden\_gibbon | 0 | 0 | 0 | 0 |
| gibbon\_woodriver | 3 | 2 | 2 | 3 |
| woodriver\_gi | 1 | 1 | 1 | 1 |
| gi\_chapman | 3 | 2 | 2 | 2 |

## **Table E11.** Classified total unobstructed area (ac) for the main channel

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Reach** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 8604 | 8828 | 9563 | 8548 |
| overton\_elmcreek | 743 | 732 | 798 | 711 |
| elmcreek\_odessa | 767 | 769 | 820 | 758 |
| odessa\_minden | 1474 | 1514 | 1667 | 1488 |
| minden\_gibbon | 703 | 724 | 748 | 692 |
| gibbon\_woodriver | 1590 | 1657 | 1827 | 1617 |
| woodriver\_gi | 1758 | 1802 | 1947 | 1720 |
| gi\_chapman | 1543 | 1629 | 1755 | 1560 |

## **Table E12.** Classified total percent unobstructed area for the main channel

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Reach** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 81 | 83 | 90 | 81 |
| overton\_elmcreek | 85 | 84 | 92 | 82 |
| elmcreek\_odessa | 86 | 87 | 92 | 85 |
| odessa\_minden | 78 | 80 | 88 | 79 |
| minden\_gibbon | 83 | 86 | 88 | 82 |
| gibbon\_woodriver | 78 | 81 | 89 | 79 |
| woodriver\_gi | 83 | 85 | 92 | 81 |
| gi\_chapman | 79 | 83 | 90 | 80 |

## **Table E13a.** Classified percent area of water and sand (summed together) for managed channel areas and unmanaged areas of the main channel

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **2017** | | **2018** | | | **2019** | | | | **2020** | | | |
| managed | un-  managed | managed | un-  managed | | managed | | un-  managed | | managed | | un-  managed | |
| All\_Reaches | 58 | 58 | 70 | | 64 | | 75 | | 72 | | 70 | | 65 | |
| overton\_elmcreek | 57 | 50 | 77 | | 56 | | 78 | | 62 | | 73 | | 57 | |
| elmcreek\_odessa | 66 | 54 | 89 | | 66 | | 86 | | 67 | | 84 | | 65 | |
| odessa\_minden | 49 | 54 | 60 | | 62 | | 66 | | 69 | | 63 | | 65 | |
| minden\_gibbon | 58 | -- | 70 | | -- | | 75 | | -- | | 65 | | -- | |
| gibbon\_woodriver | 57 | 57 | 61 | | 64 | | 68 | | 72 | | 71 | | 66 | |
| woodriver\_gi | 66 | 61 | 74 | | 65 | | 84 | | 75 | | 74 | | 64 | |
| gi\_chapman | -- | 61 | -- | | 66 | | -- | | 75 | | -- | | 67 | |

**Table E13b.** Classified percent area of vegetation less than 2 ft in height (Veg <2ft) for managed channel areas and unmanaged areas of the main channel

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **2017** | | **2018** | | | | **2019** | | | | **2020** | | | |
| managed | un-  managed | managed | | un-  managed | | managed | | un-  managed | | managed | | un-  managed | |
| All\_Reaches | 26 | 20 | | 16 | | 17 | | 17 | | 17 | | 15 | | 13 |
| overton\_elmcreek | 34 | 22 | | 13 | | 13 | | 18 | | 21 | | 14 | | 9 |
| elmcreek\_odessa | 26 | 25 | | 5 | | 11 | | 11 | | 19 | | 8 | | 11 |
| odessa\_minden | 28 | 24 | | 22 | | 17 | | 23 | | 19 | | 17 | | 13 |
| minden\_gibbon | 25 | -- | | 16 | | -- | | 14 | | -- | | 17 | | -- |
| gibbon\_woodriver | 21 | 20 | | 19 | | 18 | | 20 | | 18 | | 12 | | 12 |
| woodriver\_gi | 26 | 20 | | 18 | | 19 | | 11 | | 16 | | 17 | | 15 |
| gi\_chapman | -- | 18 | | -- | | 17 | | -- | | 15 | | -- | | 12 |

**Table E13c.** Classified percent area of vegetation 2-6 ft in height (Veg 2-6ft) for managed channel areas and unmanaged areas of the main channel

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **2017** | | **2018** | | | **2019** | | | | **2020** | | | |
| managed | un-  managed | managed | un-  managed | | managed | | un-  managed | | managed | | un-  managed | |
| All\_Reaches | 12 | 15 | 11 | | 13 | | 6 | | 6 | | 12 | | 17 | |
| overton\_elmcreek | 6 | 14 | 8 | | 20 | | 3 | | 7 | | 11 | | 23 | |
| elmcreek\_odessa | 7 | 13 | 6 | | 15 | | 2 | | 7 | | 7 | | 17 | |
| odessa\_minden | 16 | 13 | 14 | | 13 | | 7 | | 5 | | 15 | | 15 | |
| minden\_gibbon | 14 | -- | 12 | | -- | | 10 | | -- | | 16 | | -- | |
| gibbon\_woodriver | 15 | 17 | 14 | | 14 | | 7 | | 6 | | 13 | | 18 | |
| woodriver\_gi | 6 | 14 | 6 | | 13 | | 4 | | 6 | | 7 | | 18 | |
| gi\_chapman | -- | 15 | -- | | 11 | | -- | | 6 | | -- | | 16 | |

**Table E13d.** Classified percent area of vegetation 6-15 ft in height (Veg 6-15ft) for managed channel areas and unmanaged areas of the main channel

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **2017** | | **2018** | | | **2019** | | | | **2020** | | | |
| managed | un-  managed | managed | un-  managed | | managed | | un-  managed | | managed | | un-  managed | |
| All\_Reaches | 14 | 18 | 12 | | 16 | | 7 | | 8 | | 14 | | 19 | |
| overton\_elmcreek | 7 | 21 | 8 | | 24 | | 3 | | 11 | | 12 | | 27 | |
| elmcreek\_odessa | 8 | 17 | 6 | | 18 | | 2 | | 10 | | 7 | | 20 | |
| odessa\_minden | 19 | 16 | 15 | | 16 | | 8 | | 7 | | 17 | | 17 | |
| minden\_gibbon | 16 | -- | 14 | | -- | | 11 | | -- | | 18 | | -- | |
| gibbon\_woodriver | 19 | 20 | 17 | | 17 | | 9 | | 8 | | 14 | | 20 | |
| woodriver\_gi | 8 | 17 | 7 | | 15 | | 4 | | 7 | | 8 | | 20 | |
| gi\_chapman | -- | 4 | -- | | 3 | | -- | | 2 | | -- | | 2 | |

**Table E13e.** Classified percent area of vegetation greater than 15 ft in height (Veg >15ft) for managed channel areas and unmanaged areas of the main channel

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **2017** | | **2018** | | **2019** | | **2020** | | |
| managed | un-  managed | managed | un-  managed | managed | un-  managed | managed | un-  managed | |
| All\_Reaches | 2 | 3 | 1 | 3 | 1 | 3 | 1 | | 3 |
| overton\_elmcreek | 1 | 7 | 1 | 7 | 1 | 6 | 1 | | 7 |
| elmcreek\_odessa | 1 | 5 | 1 | 5 | 1 | 5 | 1 | | 5 |
| odessa\_minden | 3 | 6 | 3 | 5 | 3 | 5 | 3 | | 5 |
| minden\_gibbon | 0 | -- | 0 | -- | 0 | -- | 0 | | -- |
| gibbon\_woodriver | 3 | 2 | 3 | 2 | 3 | 2 | 3 | | 2 |
| woodriver\_gi | 1 | 2 | 1 | 1 | 0 | 1 | 1 | | 1 |
| gi\_chapman | -- | 3 | -- | 2 | -- | 2 | -- | | 2 |

## **Table E14.** Mean MUCW and TUCW values, as measured in the field, with visual remote sensing (RS – visual), and object-based classification (RS—object-based)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Mean MUCW- All Channels** | | | **Mean TUCW- Main Channel** | | |
| **Field** | **RS – visual** | **RS –**  **object-based** | **Field** | **RS – visual** | **RS –**  **object-based** |
| 2007 | -- | 303 | -- | -- | 474 | -- |
| 2008 | -- | 447 | -- | -- | 599 | -- |
| 2009 | 597 | 377 | -- | 411 | 529 | -- |
| 2010 | 699 | 412 | -- | 540 | 551 | -- |
| 2011 | 755 | 482 | -- | 697 | 686 | -- |
| 2012 | 716 | 457 | -- | 476 | 587 | -- |
| 2013 | 497 | 486 | -- | 293 | 606 | -- |
| 2014 | 608 | 435 | -- | 604 | 592 | -- |
| 2015 | 644 | 628 | -- | 792 | 824 | -- |
| 2016 | 610 | 644 | -- | 843 | 814 | -- |
| 2017 | -- | 630 | 588 | -- | 804 | 771 |
| 2018 | -- | 608 | 601 | -- | 790 | 780 |
| 2019 | -- | 644 | 682 | -- | 822 | 781 |
| 2020 | -- | 635 | 625 | -- | 815 | 774 |

## **Table E15.** Classified percent unobstructed area for managed channel areas and unmanaged areas of the main channel

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **2017** | | **2018** | | **2019** | | **2020** | |
| managed | un-  managed | managed | un-  managed | managed | un-  managed | managed | un-  managed |
| All\_Reaches | 84 | 79 | 86 | 81 | 91 | 89 | 85 | 78 |
| overton\_elmcreek | 91 | 72 | 90 | 69 | 95 | 83 | 87 | 67 |
| elmcreek\_odessa | 92 | 78 | 93 | 77 | 97 | 86 | 92 | 76 |
| odessa\_minden | 78 | 78 | 82 | 79 | 89 | 88 | 80 | 78 |
| minden\_gibbon | 83 | -- | 86 | -- | 88 | -- | 82 | -- |
| gibbon\_woodriver | 78 | 77 | 80 | 81 | 88 | 90 | 83 | 78 |
| woodriver\_gi | 92 | 81 | 92 | 84 | 95 | 91 | 92 | 79 |
| gi\_chapman | -- | 79 | -- | 83 | -- | 90 | -- | 80 |

## **Table E16.** Mean and standard deviation of MUCW for all channels. Note: this is the standard spatial scale of MUCW

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **MUCW Mean (ft)** | | | | **MUCW Standard Deviation (ft)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 588 | 601 | 682 | 625 | 244 | 253 | 262 | 272 |
| N-lexington\_overton | 352 | 290 | 347 | 248 | 146 | 126 | 129 | 95 |
| J2\_overton | 472 | 472 | 529 | 458 | 180 | 182 | 195 | 213 |
| overton\_elmcreek | 508 | 514 | 563 | 488 | 206 | 211 | 225 | 171 |
| elmcreek\_odessa | 713 | 742 | 797 | 748 | 215 | 236 | 225 | 219 |
| odessa\_minden | 438 | 464 | 547 | 476 | 144 | 154 | 191 | 154 |
| minden\_gibbon | 896 | 876 | 888 | 913 | 184 | 224 | 181 | 244 |
| gibbon\_woodriver | 540 | 581 | 693 | 642 | 198 | 220 | 249 | 270 |
| woodriver\_gi | 585 | 574 | 651 | 595 | 251 | 257 | 256 | 288 |
| gi\_chapman | 689 | 704 | 816 | 750 | 274 | 287 | 314 | 290 |

## **Table E17.** Mean and standard deviation of MUCW for the main channel. Note: this is the not standard spatial scale of MUCW

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **MUCW Mean (ft)** | | | | **MUCW Standard Deviation (ft)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 584 | 594 | 675 | 618 | 247 | 256 | 264 | 276 |
| overton\_elmcreek | 507 | 508 | 562 | 487 | 205 | 204 | 224 | 170 |
| elmcreek\_odessa | 713 | 739 | 795 | 748 | 215 | 231 | 222 | 219 |
| odessa\_minden | 432 | 450 | 533 | 463 | 144 | 150 | 190 | 154 |
| minden\_gibbon | 892 | 872 | 884 | 910 | 199 | 236 | 197 | 254 |
| gibbon\_woodriver | 539 | 577 | 685 | 634 | 197 | 215 | 243 | 264 |
| woodriver\_gi | 581 | 565 | 648 | 584 | 254 | 265 | 259 | 298 |
| gi\_chapman | 689 | 704 | 816 | 750 | 274 | 287 | 314 | 290 |

## **Table E18.** Mean and standard deviation of TUCW for all channels. Note: this is the not standard spatial scale of TUCW and is not referenced in the report text.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **TUCW Mean (ft)** | | | | **TUCW Standard Deviation (ft)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 963 | 976 | 988 | 974 | 209 | 211 | 205 | 210 |
| N-lexington\_overton | 469 | 469 | 489 | 411 | 147 | 142 | 149 | 115 |
| J2\_overton | 473 | 442 | 408 | 410 | 180 | 172 | 160 | 164 |
| overton\_elmcreek | 828 | 839 | 847 | 814 | 163 | 161 | 150 | 148 |
| elmcreek\_odessa | 841 | 845 | 864 | 850 | 140 | 143 | 138 | 146 |
| odessa\_minden | 893 | 895 | 905 | 889 | 179 | 178 | 168 | 163 |
| minden\_gibbon | 1195 | 1204 | 1207 | 1205 | 199 | 205 | 204 | 216 |
| gibbon\_woodriver | 885 | 908 | 921 | 913 | 199 | 197 | 197 | 197 |
| woodriver\_gi | 1051 | 1053 | 1070 | 1054 | 214 | 209 | 201 | 204 |
| gi\_chapman | 1061 | 1117 | 1120 | 1116 | 154 | 148 | 151 | 152 |

## **Table E19.** Mean and standard deviation of TUCW for the main channel. Note: this is the standard spatial scale of TUCW

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **TUCW Mean (ft)** | | | | **TUCW Standard Deviation (ft)** | | | |
| **2017** | **2018** | **2019** | **2020** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 771 | 780 | 781 | 774 | 256 | 265 | 264 | 266 |
| overton\_elmcreek | 618 | 617 | 627 | 612 | 174 | 170 | 166 | 160 |
| elmcreek\_odessa | 835 | 839 | 858 | 845 | 142 | 146 | 140 | 148 |
| odessa\_minden | 640 | 644 | 641 | 634 | 225 | 224 | 211 | 204 |
| minden\_gibbon | 941 | 944 | 947 | 945 | 173 | 178 | 123 | 135 |
| gibbon\_woodriver | 760 | 771 | 785 | 779 | 214 | 216 | 215 | 219 |
| woodriver\_gi | 712 | 706 | 696 | 690 | 281 | 278 | 282 | 287 |
| gi\_chapman | 1061 | 1117 | 1120 | 1116 | 154 | 148 | 151 | 152 |

## **Table E20a.** Mean main channel MUCW in managed areas and unmanaged areas

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **2017** | | **2018** | | **2019** | | **2020** | |
| managed | un-  managed | managed | un-  managed | managed | un-  managed | managed | un-  managed |
| All\_Reaches | 663 | 545 | 681 | 551 | 742 | 643 | 714 | 571 |
| overton\_elmcreek | 606 | 331 | 622 | 330 | 670 | 386 | 568 | 337 |
| elmcreek\_odessa | 837 | 523 | 870 | 538 | 912 | 616 | 864 | 571 |
| odessa\_minden | 393 | 458 | 420 | 467 | 504 | 550 | 443 | 470 |
| minden\_gibbon | 928 | -- | 915 | -- | 919 | -- | 958 | -- |
| gibbon\_woodriver | 575 | 525 | 653 | 553 | 736 | 666 | 787 | 588 |
| woodriver\_gi | 852 | 535 | 807 | 524 | 943 | 599 | 934 | 526 |
| gi\_chapman | -- | 274 | -- | 287 | -- | 314 | -- | 290 |

**Table E20b.** Main channel MUCW standard deviation in managed areas and unmanaged areas

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **2017** | | **2018** | | **2019** | | **2020** | |
| managed | un-  managed | managed | un-  managed | managed | un-  managed | managed | un-  managed |
| All\_Reaches | 283 | 222 | 279 | 239 | 274 | 258 | 313 | 248 |
| overton\_elmcreek | 224 | 94 | 217 | 90 | 246 | 113 | 177 | 97 |
| elmcreek\_odessa | 158 | 139 | 163 | 165 | 156 | 186 | 155 | 180 |
| odessa\_minden | 148 | 136 | 149 | 151 | 193 | 186 | 163 | 149 |
| minden\_gibbon | 140 | -- | 182 | -- | 138 | -- | 194 | -- |
| gibbon\_woodriver | 214 | 194 | 262 | 200 | 283 | 235 | 370 | 214 |
| woodriver\_gi | 326 | 215 | 298 | 241 | 287 | 224 | 403 | 238 |
| gi\_chapman | -- | 689 | -- | 704 | -- | 816 | -- | 750 |

## **Table E21a.** Mean main channel TUCW in managed areas and unmanaged areas

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **2017** | | **2018** | | **2019** | | **2020** | |
| managed | un-  managed | managed | un-  managed | managed | un-  managed | managed | un-  managed |
| All\_Reaches | 805 | 756 | 806 | 768 | 768 | 772 | 798 | 764 |
| overton\_elmcreek | 645 | 646 | 639 | 648 | 648 | 676 | 628 | 645 |
| elmcreek\_odessa | 878 | 770 | 886 | 768 | 768 | 794 | 894 | 771 |
| odessa\_minden | 594 | 652 | 594 | 659 | 659 | 659 | 580 | 652 |
| minden\_gibbon | 969 | -- | 974 | -- | 617 | -- | 961 | -- |
| gibbon\_woodriver | 917 | 712 | 925 | 724 | 724 | 741 | 928 | 733 |
| woodriver\_gi | 1110 | 646 | 1095 | 641 | 641 | 632 | 1078 | 626 |
| gi\_chapman | -- | 1061 | -- | 1117 | -- | 1120 | -- | 1116 |

**Table E21b.** Main channel TUCW standard deviation in managed areas and unmanaged areas

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **2017** | | **2018** | | **2019** | | **2020** | |
| managed | un-  managed | managed | un-  managed | managed | un-  managed | managed | un-  managed |
| All\_Reaches | 278 | 246 | 274 | 263 | 268 | 265 | 270 | 267 |
| overton\_elmcreek | 204 | 136 | 195 | 138 | 186 | 127 | 181 | 120 |
| elmcreek\_odessa | 131 | 137 | 129 | 145 | 132 | 131 | 137 | 135 |
| odessa\_minden | 231 | 207 | 218 | 210 | 204 | 197 | 198 | 191 |
| minden\_gibbon | 118 | -- | 121 | -- | 116 | -- | 125 | -- |
| gibbon\_woodriver | 265 | 184 | 267 | 188 | 267 | 191 | 268 | 193 |
| woodriver\_gi | 322 | 220 | 315 | 219 | 310 | 228 | 316 | 232 |
| gi\_chapman | -- | 154 | -- | 148 | -- | 151 | -- | 152 |

# 

# Appendix F. Full Volume Change Results

**Table F1**. LiDAR accuracy (ft) in wet and dry, unvegetated areas, as measured by Quantum Spatial Inc (Quantum, 2017-2020) with ground control check points. Reported accuracy measurements represent 95% confidence

|  |  |  |
| --- | --- | --- |
| **Year** | **Dry** | **Wet** |
| 2016 | 0.14 | 0.26 |
| 2017 | 0.18 | 0.38 |
| 2018 | 0.10 | 0.35 |
| 2019 | 0.10 | 0.75 |
| 2020 | 0.18 | 0.26 |

**Table F2**. Net volume change from Overton to Grand Island in thousand cubic yards (KCY), as estimated with transects collected in the field (Field) and by differencing LiDAR-derived DEMs (RS – Remote Sensing). Error for field-based values was estimated with an asymmetrical confidence limit with upper and lower bounds, while remote sensing error was estimated with a symmetrical confidence interval (+/-). Due to fundamental differences between the field and remote sensing methods and error quantification, the values across methods are not comparable.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year** | **Volume Change (KCY)** | | **Error (KCY)** | | |
| **Field** | **RS** | **Field –**  **Lower CI** | **Field –**  **Upper CI** | **RS –**  **CI (+/-)** |
| 2010-2009 | -1010 | -- | 1027 | 514 | -- |
| 2011-2010 | -986 | -- | 1226 | 613 | -- |
| 2012-2011 | 2841 | -- | 1226 | 613 | -- |
| 2013-2012 | 447 | -- | 1158 | 579 | -- |
| 2014-2013 | 32 | -- | 1158 | 579 | -- |
| 2015-2014 | -1644 | -- | 1158 | 579 | -- |
| 2016-2015 | 338 | -- | 1158 | 579 | -- |
| 2017-2016 | -- | -841 | -- | -- | 1052 |
| 2018-2017 | -- | -270 | -- | -- | 729 |
| 2019-2018 | -- | -286 | -- | -- | 556 |
| 2020-2019 | -- | -38 | -- | -- | 364 |

**Table F3**. Estimated net channel bed volume change and estimated error, in thousand cubic yards (KCY) for all channels

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Net Bed Volume Change (KCY)** | | | | **Error (KCY)** | | | |
| **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** | **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** |
| All\_Reaches | -640 | -333 | 627 | 74 | 1385 | 935 | 624 | 471 |
| N-lexington\_overton | 69 | 3 | 76 | -55 | 96 | 28 | 55 | 30 |
| J2\_overton | 68 | -5 | 33 | 14 | 76 | 57 | 47 | 35 |
| overton\_elmcreek | 37 | -97 | -8 | 14 | 130 | 90 | 61 | 49 |
| elmcreek\_odessa | -5 | -87 | -31 | 43 | 110 | 81 | 44 | 40 |
| odessa\_minden | 25 | -33 | 185 | -7 | 278 | 182 | 137 | 98 |
| minden\_gibbon | -62 | -81 | 54 | -28 | 118 | 84 | 45 | 34 |
| gibbon\_woodriver | -303 | 72 | 144 | 50 | 270 | 174 | 118 | 91 |
| woodriver\_gi | -151 | 11 | 158 | 15 | 297 | 201 | 137 | 105 |
| gi\_chapman | -182 | -118 | 125 | -12 | 188 | 130 | 85 | 56 |

**Table F4**. Estimated aggradation volume and error, in thousand cubic yards (KCY) for all channels

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Aggradation Volume (KCY)** | | | | **Error (KCY)** | | | |
| **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** | **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** |
| All\_Reaches | 2930 | 1873 | 1883 | 1021 | 887 | 632 | 456 | 394 |
| N-lexington\_overton | 276 | 62 | 181 | 47 | 78 | 21 | 44 | 17 |
| J2\_overton | 260 | 159 | 125 | 85 | 59 | 41 | 33 | 28 |
| overton\_elmcreek | 335 | 158 | 139 | 110 | 97 | 53 | 39 | 40 |
| elmcreek\_odessa | 270 | 136 | 76 | 99 | 76 | 46 | 23 | 37 |
| odessa\_minden | 698 | 397 | 455 | 209 | 201 | 128 | 103 | 79 |
| minden\_gibbon | 236 | 135 | 138 | 60 | 75 | 47 | 34 | 24 |
| gibbon\_woodriver | 466 | 408 | 371 | 208 | 143 | 136 | 89 | 81 |
| woodriver\_gi | 592 | 425 | 427 | 222 | 189 | 148 | 102 | 87 |
| gi\_chapman | 333 | 214 | 278 | 114 | 106 | 73 | 66 | 46 |

**Table F5**. Estimated bed degradation volume and error, in thousand cubic yards (KCY) for all channels

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Bed Degradation Volume (KCY)** | | | | **Error (KCY)** | | | |
| **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** | **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** |
| All\_Reaches | 3570 | 2207 | 1256 | 947 | 1064 | 690 | 425 | 258 |
| N-lexington\_overton | 207 | 59 | 105 | 102 | 56 | 18 | 33 | 25 |
| J2\_overton | 192 | 164 | 92 | 71 | 48 | 40 | 33 | 22 |
| overton\_elmcreek | 298 | 255 | 147 | 96 | 87 | 73 | 47 | 28 |
| elmcreek\_odessa | 275 | 223 | 107 | 56 | 80 | 66 | 38 | 16 |
| odessa\_minden | 673 | 430 | 270 | 216 | 193 | 128 | 90 | 58 |
| minden\_gibbon | 297 | 216 | 84 | 88 | 91 | 70 | 28 | 25 |
| gibbon\_woodriver | 768 | 336 | 227 | 157 | 228 | 108 | 78 | 42 |
| woodriver\_gi | 743 | 415 | 269 | 207 | 229 | 136 | 91 | 58 |
| gi\_chapman | 515 | 333 | 153 | 127 | 156 | 107 | 53 | 32 |

## **Table F6.** Estimated lateral erosion volume and error, in thousand cubic yards (KCY) for all channels

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Lateral Erosion Volume (KCY)** | | | | **Error (KCY)** | | | |
| **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** | **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** |
| All\_Reaches | 549 | 247 | 1104 | 387 | 57 | 28 | 235 | 48 |
| N-lexington\_overton | 35 | 2 | 38 | 21 | 4 | 0 | 8 | 2 |
| J2\_overton | 168 | 112 | 196 | 70 | 14 | 10 | 35 | 10 |
| overton\_elmcreek | 49 | 35 | 114 | 30 | 4 | 4 | 23 | 4 |
| elmcreek\_odessa | 50 | 19 | 89 | 40 | 5 | 2 | 18 | 5 |
| odessa\_minden | 139 | 63 | 270 | 73 | 13 | 6 | 54 | 10 |
| minden\_gibbon | 31 | 12 | 59 | 18 | 3 | 2 | 12 | 3 |
| gibbon\_woodriver | 125 | 49 | 234 | 80 | 13 | 6 | 50 | 10 |
| woodriver\_gi | 104 | 34 | 190 | 69 | 11 | 4 | 43 | 9 |
| gi\_chapman | 50 | 36 | 149 | 78 | 6 | 4 | 35 | 8 |

## **Table F7.** Estimated net channel bed volume change and estimated error, in thousand cubic yards (KCY) for the main channel

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Net Bed Volume Change (KCY)** | | | | **Error (KCY)** | | | |
| **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** | **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** |
| All\_Reaches | -550 | -403 | 380 | 91 | 1096 | 765 | 452 | 372 |
| overton\_elmcreek | 24 | 59 | -6 | 14 | 96 | 150 | 37 | 35 |
| elmcreek\_odessa | -5 | -62 | -31 | 43 | 110 | 134 | 44 | 40 |
| odessa\_minden | 1 | -76 | 73 | 8 | 195 | 72 | 89 | 71 |
| minden\_gibbon | -49 | -18 | 33 | -31 | 88 | 139 | 29 | 24 |
| gibbon\_woodriver | -244 | -102 | 85 | 53 | 226 | 66 | 88 | 76 |
| woodriver\_gi | -96 | -87 | 101 | 18 | 198 | 81 | 82 | 72 |
| gi\_chapman | -182 | -118 | 125 | -12 | 188 | 130 | 85 | 56 |

## **Table F8.** Estimated aggradation volume and error, in thousand cubic yards (KCY) for the main channel

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Aggradation Volume (KCY)** | | | | **Error (KCY)** | | | |
| **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** | **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** |
| All\_Reaches | 2275 | 1463 | 1294 | 814 | 696 | 494 | 318 | 316 |
| overton\_elmcreek | 242 | 352 | 80 | 81 | 70 | 117 | 22 | 30 |
| elmcreek\_odessa | 270 | 270 | 76 | 99 | 76 | 89 | 23 | 37 |
| odessa\_minden | 475 | 127 | 263 | 154 | 139 | 43 | 60 | 59 |
| minden\_gibbon | 171 | 282 | 84 | 37 | 56 | 99 | 23 | 15 |
| gibbon\_woodriver | 395 | 81 | 259 | 174 | 121 | 28 | 64 | 68 |
| woodriver\_gi | 390 | 136 | 254 | 155 | 127 | 46 | 60 | 61 |
| gi\_chapman | 333 | 214 | 278 | 114 | 106 | 73 | 66 | 46 |

## **Table F9.** Estimated bed degradation volume and error, in thousand cubic yards (KCY) for the main channel

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Bed Degradation Volume (KCY)** | | | | **Error (KCY)** | | | |
| **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** | **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** |
| All\_Reaches | 2825 | 1866 | 914 | 723 | 847 | 584 | 322 | 196 |
| overton\_elmcreek | 218 | 292 | 86 | 67 | 66 | 94 | 30 | 19 |
| elmcreek\_odessa | 275 | 332 | 107 | 56 | 80 | 100 | 38 | 16 |
| odessa\_minden | 474 | 203 | 190 | 146 | 136 | 58 | 65 | 39 |
| minden\_gibbon | 220 | 300 | 52 | 68 | 68 | 98 | 18 | 20 |
| gibbon\_woodriver | 638 | 183 | 173 | 121 | 190 | 60 | 62 | 33 |
| woodriver\_gi | 485 | 223 | 153 | 137 | 151 | 66 | 56 | 38 |
| gi\_chapman | 515 | 333 | 153 | 127 | 156 | 107 | 53 | 32 |

## **Table F10.** Estimated lateral erosion volume and error, in thousand cubic yards (KCY) for the main channel

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Lateral Erosion Volume (KCY)** | | | | **Error (KCY)** | | | |
| **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** | **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** |
| All\_Reaches | 377 | 181 | 763 | 303 | 39 | 20 | 165 | 36 |
| overton\_elmcreek | 36 | 40 | 69 | 23 | 3 | 4 | 14 | 3 |
| elmcreek\_odessa | 50 | 40 | 89 | 40 | 5 | 4 | 18 | 5 |
| odessa\_minden | 83 | 26 | 180 | 51 | 8 | 3 | 37 | 7 |
| minden\_gibbon | 10 | 15 | 22 | 7 | 1 | 2 | 5 | 1 |
| gibbon\_woodriver | 106 | 5 | 176 | 66 | 11 | 1 | 38 | 8 |
| woodriver\_gi | 41 | 19 | 78 | 39 | 5 | 2 | 18 | 5 |
| gi\_chapman | 50 | 36 | 149 | 78 | 6 | 4 | 35 | 8 |

## **Table F11a.** Estimated areas of significant aggradation and bed degradation for all channels

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Aggradation Area (ac)** | | | | **Bed Degradation Area (ac)** | | | |
| **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** | **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** |
| All\_Reaches | 1841 | 1219 | 1563 | 426 | 2198 | 1563 | 671 | 640 |
| N-lexington\_overton | 170 | 48 | 172 | 35 | 126 | 36 | 67 | 65 |
| J2\_overton | 125 | 82 | 76 | 25 | 98 | 91 | 41 | 34 |
| overton\_elmcreek | 201 | 108 | 126 | 42 | 184 | 172 | 81 | 63 |
| elmcreek\_odessa | 155 | 92 | 57 | 33 | 165 | 154 | 47 | 32 |
| odessa\_minden | 437 | 274 | 363 | 81 | 426 | 313 | 149 | 146 |
| minden\_gibbon | 157 | 87 | 116 | 25 | 189 | 166 | 48 | 65 |
| gibbon\_woodriver | 291 | 243 | 310 | 87 | 465 | 229 | 125 | 105 |
| woodriver\_gi | 384 | 280 | 363 | 102 | 460 | 305 | 142 | 144 |
| gi\_chapman | 215 | 135 | 227 | 55 | 310 | 224 | 79 | 84 |

**Table F11b.** Estimated area of lateral erosion for all channels

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Reach** | **Lateral Erosion Area (ac)** | | | |
| **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** |
| All\_Reaches | 115 | 51 | 220 | 82 |
| N-lexington\_overton | 8 | 1 | 7 | 4 |
| J2\_overton | 27 | 23 | 33 | 15 |
| overton\_elmcreek | 10 | 7 | 22 | 6 |
| elmcreek\_odessa | 10 | 4 | 17 | 7 |
| odessa\_minden | 28 | 13 | 51 | 15 |
| minden\_gibbon | 7 | 3 | 12 | 4 |
| gibbon\_woodriver | 25 | 10 | 46 | 17 |
| woodriver\_gi | 23 | 8 | 40 | 16 |
| gi\_chapman | 11 | 8 | 31 | 17 |

## **Table F12a.** Estimated areas of significant aggradation and bed degradation for the main channel

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Aggradation Area (ac)** | | | | **Bed Degradation Area (ac)** | | | |
| **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** | **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** |
| All\_Reaches | 1440 | 956 | 1074 | 326 | 1732 | 1326 | 468 | 492 |
| overton\_elmcreek | 138 | 83 | 66 | 29 | 130 | 138 | 46 | 43 |
| elmcreek\_odessa | 155 | 189 | 57 | 33 | 165 | 240 | 47 | 32 |
| odessa\_minden | 303 | 59 | 211 | 56 | 296 | 144 | 99 | 98 |
| minden\_gibbon | 123 | 205 | 82 | 16 | 146 | 198 | 31 | 53 |
| gibbon\_woodriver | 244 | 194 | 213 | 69 | 379 | 227 | 89 | 81 |
| woodriver\_gi | 262 | 135 | 219 | 69 | 307 | 224 | 78 | 101 |
| gi\_chapman | 215 | 92 | 227 | 55 | 310 | 154 | 79 | 84 |

**Table F12b.** Estimated area of lateral erosion for the main channel

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Reach** | **Lateral Erosion Area (ac)** | | | |
| **2017-2016** | **2018-2017** | **2019-2018** | **2020-2019** |
| All\_Reaches | 78 | 38 | 153 | 64 |
| overton\_elmcreek | 7 | 5 | 13 | 4 |
| elmcreek\_odessa | 10 | 8 | 17 | 7 |
| odessa\_minden | 17 | 1 | 34 | 11 |
| minden\_gibbon | 2 | 8 | 5 | 2 |
| gibbon\_woodriver | 21 | 3 | 35 | 14 |
| woodriver\_gi | 9 | 8 | 17 | 9 |
| gi\_chapman | 11 | 4 | 31 | 17 |

**Appendix G. Full Suitable whooping crane Roosting Area Results**

## **Table G1a.** Suitable whooping crane roosting area (ac) for all channels of All Reaches (Overton to Chapman), the north Lexington to Overton channel, and the J2 Return to Overton

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 500 | 2068 | 2549 | 2983 | 2894 |
| All\_Reaches | 750 | 2138 | 2612 | 3115 | 2965 |
| All\_Reaches | 1000 | 2116 | 2542 | 3081 | 2889 |
| All\_Reaches | 1200 | 2054 | 2446 | 2994 | 2769 |
| All\_Reaches | 1500 | 1956 | 2267 | 2837 | 2548 |
| All\_Reaches | 2000 | 1707 | 1854 | 2482 | 2099 |
| All\_Reaches | 2500 | 1427 | 1414 | 2099 | 1647 |
| All\_Reaches | 3000 | 1161 | 1029 | 1715 | 1255 |
| All\_Reaches | 3500 | 932 | 747 | 1365 | 931 |
| All\_Reaches | 4000 | 737 | 543 | 1060 | 686 |
| All\_Reaches | 4500 | 574 | 407 | 801 | 503 |
| All\_Reaches | 5000 | 440 | 317 | 607 | 372 |
| N-lexington\_overton | 500 | 22 | 8 | 8 | 0 |
| N-lexington\_overton | 750 | 22 | 8 | 9 | 0 |
| N-lexington\_overton | 1000 | 22 | 8 | 9 | 0 |
| N-lexington\_overton | 1200 | 22 | 8 | 9 | 0 |
| N-lexington\_overton | 1500 | 22 | 8 | 10 | 0 |
| N-lexington\_overton | 2000 | 22 | 8 | 8 | 0 |
| N-lexington\_overton | 2500 | 21 | 8 | 10 | 0 |
| N-lexington\_overton | 3000 | 23 | 6 | 6 | 0 |
| N-lexington\_overton | 3500 | 21 | 5 | 7 | 0 |
| N-lexington\_overton | 4000 | 21 | 7 | 9 | 0 |
| N-lexington\_overton | 4500 | 21 | 9 | 11 | 0 |
| N-lexington\_overton | 5000 | 22 | 10 | 12 | 0 |
| J2\_overton | 500 | 62 | 36 | 46 | 38 |
| J2\_overton | 750 | 61 | 35 | 44 | 39 |
| J2\_overton | 1000 | 62 | 37 | 43 | 38 |
| J2\_overton | 1200 | 56 | 35 | 39 | 36 |
| J2\_overton | 1500 | 53 | 31 | 37 | 35 |
| J2\_overton | 2000 | 53 | 24 | 32 | 30 |
| J2\_overton | 2500 | 57 | 17 | 29 | 25 |
| J2\_overton | 3000 | 58 | 15 | 28 | 24 |
| J2\_overton | 3500 | 57 | 13 | 27 | 23 |
| J2\_overton | 4000 | 55 | 12 | 25 | 22 |
| J2\_overton | 4500 | 55 | 11 | 25 | 20 |
| J2\_overton | 5000 | 53 | 11 | 26 | 19 |

**Table G1b.** Suitable whooping crane roosting area (ac) for all channels of Overton to Elm Creek, Elm Creek to Odessa, and Odessa to Minden

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | **2018** | **2019** | **2020** |
| overton\_elmcreek | 500 | 103 | 124 | 148 | 103 |
| overton\_elmcreek | 750 | 101 | 134 | 152 | 101 |
| overton\_elmcreek | 1000 | 96 | 133 | 149 | 96 |
| overton\_elmcreek | 1200 | 91 | 128 | 145 | 89 |
| overton\_elmcreek | 1500 | 85 | 119 | 136 | 78 |
| overton\_elmcreek | 2000 | 72 | 96 | 116 | 60 |
| overton\_elmcreek | 2500 | 59 | 72 | 94 | 41 |
| overton\_elmcreek | 3000 | 47 | 53 | 68 | 29 |
| overton\_elmcreek | 3500 | 37 | 39 | 49 | 20 |
| overton\_elmcreek | 4000 | 29 | 28 | 35 | 14 |
| overton\_elmcreek | 4500 | 23 | 22 | 28 | 9 |
| overton\_elmcreek | 5000 | 17 | 18 | 24 | 7 |
| elmcreek\_odessa | 500 | 276 | 331 | 368 | 371 |
| elmcreek\_odessa | 750 | 271 | 320 | 367 | 360 |
| elmcreek\_odessa | 1000 | 253 | 291 | 350 | 330 |
| elmcreek\_odessa | 1200 | 235 | 264 | 330 | 299 |
| elmcreek\_odessa | 1500 | 213 | 230 | 295 | 254 |
| elmcreek\_odessa | 2000 | 171 | 163 | 230 | 185 |
| elmcreek\_odessa | 2500 | 126 | 107 | 168 | 121 |
| elmcreek\_odessa | 3000 | 90 | 68 | 107 | 82 |
| elmcreek\_odessa | 3500 | 63 | 44 | 67 | 50 |
| elmcreek\_odessa | 4000 | 45 | 30 | 38 | 31 |
| elmcreek\_odessa | 4500 | 29 | 24 | 23 | 19 |
| elmcreek\_odessa | 5000 | 17 | 19 | 18 | 12 |
| odessa\_minden | 500 | 99 | 137 | 273 | 194 |
| odessa\_minden | 750 | 100 | 136 | 282 | 195 |
| odessa\_minden | 1000 | 97 | 128 | 275 | 186 |
| odessa\_minden | 1200 | 91 | 118 | 262 | 177 |
| odessa\_minden | 1500 | 86 | 105 | 245 | 161 |
| odessa\_minden | 2000 | 74 | 80 | 206 | 127 |
| odessa\_minden | 2500 | 61 | 59 | 167 | 99 |
| odessa\_minden | 3000 | 50 | 45 | 133 | 75 |
| odessa\_minden | 3500 | 41 | 35 | 105 | 58 |
| odessa\_minden | 4000 | 33 | 29 | 84 | 46 |
| odessa\_minden | 4500 | 27 | 25 | 67 | 36 |
| odessa\_minden | 5000 | 21 | 22 | 56 | 28 |

**Table G1c.** Suitable whooping crane roosting area (ac) for all channels of Minden to Gibbon, Gibbon to Wood River, and Wood River to Grand Island

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | **2018** | **2019** | **2020** |
| minden\_gibbon | 500 | 687 | 683 | 667 | 684 |
| minden\_gibbon | 750 | 749 | 787 | 753 | 776 |
| minden\_gibbon | 1000 | 789 | 813 | 777 | 783 |
| minden\_gibbon | 1200 | 761 | 775 | 769 | 789 |
| minden\_gibbon | 1500 | 825 | 828 | 793 | 821 |
| minden\_gibbon | 2000 | 840 | 835 | 809 | 837 |
| minden\_gibbon | 2500 | 848 | 844 | 817 | 848 |
| minden\_gibbon | 3000 | 865 | 859 | 829 | 854 |
| minden\_gibbon | 3500 | 880 | 875 | 836 | 862 |
| minden\_gibbon | 4000 | 903 | 904 | 853 | 878 |
| minden\_gibbon | 4500 | 896 | 913 | 861 | 887 |
| minden\_gibbon | 5000 | 900 | 914 | 873 | 898 |
| gibbon\_woodriver | 500 | 1665 | 1742 | 1773 | 1888 |
| gibbon\_woodriver | 750 | 1783 | 1925 | 1933 | 2030 |
| gibbon\_woodriver | 1000 | 1892 | 1986 | 2007 | 2058 |
| gibbon\_woodriver | 1200 | 1892 | 1964 | 2024 | 2077 |
| gibbon\_woodriver | 1500 | 2002 | 2025 | 2059 | 2148 |
| gibbon\_woodriver | 2000 | 2083 | 2065 | 2098 | 2167 |
| gibbon\_woodriver | 2500 | 2137 | 2107 | 2143 | 2195 |
| gibbon\_woodriver | 3000 | 2193 | 2170 | 2172 | 2226 |
| gibbon\_woodriver | 3500 | 2260 | 2236 | 2216 | 2271 |
| gibbon\_woodriver | 4000 | 2301 | 2281 | 2247 | 2297 |
| gibbon\_woodriver | 4500 | 2307 | 2320 | 2273 | 2319 |
| gibbon\_woodriver | 5000 | 2349 | 2366 | 2302 | 2344 |
| woodriver\_gi | 500 | 1808 | 1899 | 1972 | 2016 |
| woodriver\_gi | 750 | 1932 | 2065 | 2148 | 2140 |
| woodriver\_gi | 1000 | 2060 | 2156 | 2241 | 2231 |
| woodriver\_gi | 1200 | 2126 | 2199 | 2296 | 2284 |
| woodriver\_gi | 1500 | 2217 | 2268 | 2304 | 2343 |
| woodriver\_gi | 2000 | 2317 | 2312 | 2355 | 2382 |
| woodriver\_gi | 2500 | 2395 | 2366 | 2400 | 2432 |
| woodriver\_gi | 3000 | 2444 | 2422 | 2434 | 2464 |
| woodriver\_gi | 3500 | 2488 | 2472 | 2468 | 2507 |
| woodriver\_gi | 4000 | 2533 | 2524 | 2509 | 2544 |
| woodriver\_gi | 4500 | 2561 | 2563 | 2538 | 2577 |
| woodriver\_gi | 5000 | 2597 | 2608 | 2573 | 2613 |

**Table G1d.** Suitable whooping crane roosting area (ac) for Grand Island to Chapman

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | **2018** | **2019** | **2020** |
| gi\_chapman | 500 | 424 | 517 | 556 | 613 |
| gi\_chapman | 750 | 438 | 513 | 574 | 618 |
| gi\_chapman | 1000 | 431 | 493 | 570 | 598 |
| gi\_chapman | 1200 | 418 | 475 | 550 | 569 |
| gi\_chapman | 1500 | 392 | 430 | 519 | 512 |
| gi\_chapman | 2000 | 334 | 333 | 447 | 398 |
| gi\_chapman | 2500 | 274 | 230 | 370 | 286 |
| gi\_chapman | 3000 | 215 | 144 | 300 | 189 |
| gi\_chapman | 3500 | 161 | 88 | 227 | 117 |
| gi\_chapman | 4000 | 113 | 57 | 165 | 71 |
| gi\_chapman | 4500 | 75 | 43 | 112 | 45 |
| gi\_chapman | 5000 | 44 | 37 | 75 | 33 |

## **Table G2a.** Suitable whooping crane roosting area (ac) for the main channel of All Reaches (Overton to Chapman), Overton to Elm Creek, and Elm Creek to Odessa

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 500 | 2064 | 2535 | 2960 | 2869 |
| All\_Reaches | 750 | 2134 | 2599 | 3090 | 2940 |
| All\_Reaches | 1000 | 2113 | 2530 | 3057 | 2866 |
| All\_Reaches | 1200 | 2051 | 2434 | 2971 | 2748 |
| All\_Reaches | 1500 | 1953 | 2255 | 2816 | 2529 |
| All\_Reaches | 2000 | 1705 | 1844 | 2464 | 2083 |
| All\_Reaches | 2500 | 1425 | 1406 | 2083 | 1633 |
| All\_Reaches | 3000 | 1160 | 1022 | 1701 | 1244 |
| All\_Reaches | 3500 | 931 | 741 | 1353 | 920 |
| All\_Reaches | 4000 | 735 | 538 | 1050 | 676 |
| All\_Reaches | 4500 | 572 | 401 | 792 | 494 |
| All\_Reaches | 5000 | 439 | 312 | 598 | 363 |
| overton\_elmcreek | 500 | 102 | 124 | 148 | 102 |
| overton\_elmcreek | 750 | 101 | 133 | 151 | 101 |
| overton\_elmcreek | 1000 | 96 | 132 | 149 | 96 |
| overton\_elmcreek | 1200 | 91 | 127 | 144 | 89 |
| overton\_elmcreek | 1500 | 85 | 118 | 136 | 78 |
| overton\_elmcreek | 2000 | 71 | 95 | 116 | 60 |
| overton\_elmcreek | 2500 | 59 | 71 | 94 | 40 |
| overton\_elmcreek | 3000 | 47 | 52 | 68 | 29 |
| overton\_elmcreek | 3500 | 37 | 38 | 49 | 19 |
| overton\_elmcreek | 4000 | 29 | 27 | 35 | 14 |
| overton\_elmcreek | 4500 | 23 | 21 | 28 | 9 |
| overton\_elmcreek | 5000 | 17 | 17 | 24 | 7 |
| elmcreek\_odessa | 500 | 276 | 331 | 368 | 371 |
| elmcreek\_odessa | 750 | 271 | 320 | 367 | 360 |
| elmcreek\_odessa | 1000 | 253 | 291 | 350 | 330 |
| elmcreek\_odessa | 1200 | 235 | 264 | 330 | 299 |
| elmcreek\_odessa | 1500 | 213 | 230 | 295 | 254 |
| elmcreek\_odessa | 2000 | 171 | 163 | 230 | 185 |
| elmcreek\_odessa | 2500 | 126 | 107 | 168 | 121 |
| elmcreek\_odessa | 3000 | 90 | 68 | 106 | 82 |
| elmcreek\_odessa | 3500 | 63 | 44 | 67 | 50 |
| elmcreek\_odessa | 4000 | 45 | 30 | 38 | 31 |
| elmcreek\_odessa | 4500 | 29 | 24 | 23 | 19 |
| elmcreek\_odessa | 5000 | 17 | 19 | 17 | 12 |

**Table G2b.** Suitable whooping crane roosting area (ac) for the main channel of Odessa to Minden, Minden to Gibbon, and Gibbon to Wood River

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | **2018** | **2019** | **2020** |
| odessa\_minden | 500 | 98 | 128 | 257 | 181 |
| odessa\_minden | 750 | 99 | 127 | 265 | 182 |
| odessa\_minden | 1000 | 97 | 119 | 259 | 174 |
| odessa\_minden | 1200 | 91 | 110 | 246 | 166 |
| odessa\_minden | 1500 | 85 | 98 | 230 | 151 |
| odessa\_minden | 2000 | 74 | 74 | 194 | 119 |
| odessa\_minden | 2500 | 61 | 55 | 157 | 91 |
| odessa\_minden | 3000 | 50 | 41 | 125 | 69 |
| odessa\_minden | 3500 | 41 | 32 | 98 | 53 |
| odessa\_minden | 4000 | 33 | 26 | 78 | 41 |
| odessa\_minden | 4500 | 27 | 22 | 62 | 31 |
| odessa\_minden | 5000 | 20 | 19 | 51 | 24 |
| minden\_gibbon | 500 | 414 | 429 | 428 | 433 |
| minden\_gibbon | 750 | 438 | 461 | 450 | 473 |
| minden\_gibbon | 1000 | 446 | 468 | 448 | 489 |
| minden\_gibbon | 1200 | 445 | 464 | 440 | 495 |
| minden\_gibbon | 1500 | 436 | 451 | 428 | 493 |
| minden\_gibbon | 2000 | 395 | 408 | 395 | 463 |
| minden\_gibbon | 2500 | 344 | 349 | 354 | 416 |
| minden\_gibbon | 3000 | 294 | 283 | 309 | 361 |
| minden\_gibbon | 3500 | 247 | 221 | 259 | 302 |
| minden\_gibbon | 4000 | 205 | 167 | 209 | 245 |
| minden\_gibbon | 4500 | 167 | 122 | 159 | 191 |
| minden\_gibbon | 5000 | 135 | 91 | 116 | 143 |
| gibbon\_woodriver | 500 | 268 | 430 | 561 | 514 |
| gibbon\_woodriver | 750 | 276 | 444 | 591 | 530 |
| gibbon\_woodriver | 1000 | 274 | 432 | 581 | 514 |
| gibbon\_woodriver | 1200 | 264 | 414 | 564 | 488 |
| gibbon\_woodriver | 1500 | 251 | 380 | 534 | 444 |
| gibbon\_woodriver | 2000 | 218 | 302 | 468 | 355 |
| gibbon\_woodriver | 2500 | 181 | 223 | 396 | 272 |
| gibbon\_woodriver | 3000 | 150 | 158 | 321 | 200 |
| gibbon\_woodriver | 3500 | 123 | 114 | 251 | 145 |
| gibbon\_woodriver | 4000 | 101 | 84 | 189 | 105 |
| gibbon\_woodriver | 4500 | 83 | 65 | 139 | 77 |
| gibbon\_woodriver | 5000 | 68 | 52 | 103 | 58 |

**Table G2c.** Suitable whooping crane roosting area (ac) for the main channel of Wood River to Grand Island and Grand Island to Chapman

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | **2018** | **2019** | **2020** |
| woodriver\_gi | 500 | 481 | 577 | 643 | 655 |
| woodriver\_gi | 750 | 510 | 601 | 693 | 676 |
| woodriver\_gi | 1000 | 516 | 595 | 701 | 665 |
| woodriver\_gi | 1200 | 507 | 580 | 696 | 643 |
| woodriver\_gi | 1500 | 491 | 548 | 674 | 597 |
| woodriver\_gi | 2000 | 442 | 470 | 614 | 504 |
| woodriver\_gi | 2500 | 379 | 371 | 545 | 407 |
| woodriver\_gi | 3000 | 314 | 278 | 472 | 313 |
| woodriver\_gi | 3500 | 259 | 204 | 402 | 233 |
| woodriver\_gi | 4000 | 209 | 147 | 335 | 170 |
| woodriver\_gi | 4500 | 169 | 106 | 269 | 122 |
| woodriver\_gi | 5000 | 137 | 77 | 212 | 86 |
| gi\_chapman | 500 | 424 | 516 | 556 | 612 |
| gi\_chapman | 750 | 438 | 513 | 574 | 617 |
| gi\_chapman | 1000 | 431 | 493 | 570 | 597 |
| gi\_chapman | 1200 | 418 | 475 | 549 | 569 |
| gi\_chapman | 1500 | 392 | 430 | 519 | 512 |
| gi\_chapman | 2000 | 334 | 332 | 447 | 398 |
| gi\_chapman | 2500 | 274 | 230 | 370 | 286 |
| gi\_chapman | 3000 | 215 | 144 | 299 | 189 |
| gi\_chapman | 3500 | 161 | 88 | 227 | 117 |
| gi\_chapman | 4000 | 113 | 57 | 165 | 71 |
| gi\_chapman | 4500 | 75 | 43 | 112 | 45 |
| gi\_chapman | 5000 | 44 | 37 | 75 | 33 |

## **Table G3a.** Percent suitable whooping crane roosting area for all channels of All Reaches (Overton to Chapman), the north Lexington to Overton channel, and the J2 Return to Overton

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 500 | 23 | 27 | 32 | 30 |
| All\_Reaches | 750 | 22 | 25 | 31 | 28 |
| All\_Reaches | 1000 | 21 | 24 | 29 | 27 |
| All\_Reaches | 1200 | 20 | 23 | 28 | 25 |
| All\_Reaches | 1500 | 18 | 21 | 26 | 23 |
| All\_Reaches | 2000 | 15 | 17 | 22 | 18 |
| All\_Reaches | 2500 | 12 | 12 | 19 | 14 |
| All\_Reaches | 3000 | 10 | 9 | 15 | 11 |
| All\_Reaches | 3500 | 8 | 6 | 12 | 8 |
| All\_Reaches | 4000 | 6 | 4 | 9 | 6 |
| All\_Reaches | 4500 | 5 | 3 | 7 | 4 |
| All\_Reaches | 5000 | 3 | 2 | 5 | 3 |
| N-lexington\_overton | 500 | 6 | 2 | 2 | 0 |
| N-lexington\_overton | 750 | 6 | 2 | 2 | 0 |
| N-lexington\_overton | 1000 | 6 | 2 | 2 | 0 |
| N-lexington\_overton | 1200 | 6 | 2 | 2 | 0 |
| N-lexington\_overton | 1500 | 6 | 1 | 2 | 0 |
| N-lexington\_overton | 2000 | 6 | 2 | 2 | 0 |
| N-lexington\_overton | 2500 | 6 | 2 | 2 | 0 |
| N-lexington\_overton | 3000 | 5 | 1 | 1 | 0 |
| N-lexington\_overton | 3500 | 4 | 1 | 1 | 0 |
| N-lexington\_overton | 4000 | 3 | 1 | 1 | 0 |
| N-lexington\_overton | 4500 | 3 | 1 | 1 | 0 |
| N-lexington\_overton | 5000 | 3 | 1 | 1 | 0 |
| J2\_overton | 500 | 21 | 13 | 17 | 13 |
| J2\_overton | 750 | 20 | 12 | 16 | 12 |
| J2\_overton | 1000 | 18 | 10 | 14 | 11 |
| J2\_overton | 1200 | 17 | 9 | 13 | 10 |
| J2\_overton | 1500 | 15 | 8 | 11 | 9 |
| J2\_overton | 2000 | 14 | 6 | 9 | 7 |
| J2\_overton | 2500 | 13 | 4 | 8 | 6 |
| J2\_overton | 3000 | 13 | 4 | 7 | 6 |
| J2\_overton | 3500 | 12 | 3 | 7 | 5 |
| J2\_overton | 4000 | 12 | 3 | 7 | 5 |
| J2\_overton | 4500 | 11 | 3 | 6 | 5 |
| J2\_overton | 5000 | 11 | 2 | 7 | 4 |

**Table G3b.** Percent suitable whooping crane roosting area for all channels of Overton to Elm Creek, Elm Creek to Odessa, and Odessa to Minden

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | **2018** | **2019** | **2020** |
| overton\_elmcreek | 500 | 16 | 20 | 22 | 15 |
| overton\_elmcreek | 750 | 15 | 19 | 21 | 14 |
| overton\_elmcreek | 1000 | 14 | 18 | 20 | 13 |
| overton\_elmcreek | 1200 | 13 | 17 | 19 | 11 |
| overton\_elmcreek | 1500 | 11 | 15 | 17 | 10 |
| overton\_elmcreek | 2000 | 9 | 12 | 14 | 7 |
| overton\_elmcreek | 2500 | 7 | 9 | 11 | 5 |
| overton\_elmcreek | 3000 | 5 | 6 | 8 | 3 |
| overton\_elmcreek | 3500 | 4 | 4 | 6 | 2 |
| overton\_elmcreek | 4000 | 3 | 3 | 4 | 1 |
| overton\_elmcreek | 4500 | 2 | 2 | 3 | 1 |
| overton\_elmcreek | 5000 | 2 | 2 | 2 | 1 |
| elmcreek\_odessa | 500 | 52 | 58 | 62 | 63 |
| elmcreek\_odessa | 750 | 47 | 52 | 58 | 56 |
| elmcreek\_odessa | 1000 | 42 | 46 | 53 | 50 |
| elmcreek\_odessa | 1200 | 37 | 41 | 50 | 44 |
| elmcreek\_odessa | 1500 | 33 | 35 | 44 | 37 |
| elmcreek\_odessa | 2000 | 26 | 24 | 34 | 27 |
| elmcreek\_odessa | 2500 | 18 | 16 | 24 | 17 |
| elmcreek\_odessa | 3000 | 13 | 10 | 15 | 12 |
| elmcreek\_odessa | 3500 | 9 | 6 | 9 | 7 |
| elmcreek\_odessa | 4000 | 6 | 4 | 5 | 4 |
| elmcreek\_odessa | 4500 | 4 | 3 | 3 | 2 |
| elmcreek\_odessa | 5000 | 2 | 3 | 2 | 2 |
| odessa\_minden | 500 | 4 | 5 | 12 | 8 |
| odessa\_minden | 750 | 4 | 5 | 11 | 7 |
| odessa\_minden | 1000 | 3 | 4 | 10 | 7 |
| odessa\_minden | 1200 | 3 | 4 | 10 | 6 |
| odessa\_minden | 1500 | 3 | 4 | 9 | 5 |
| odessa\_minden | 2000 | 2 | 3 | 7 | 4 |
| odessa\_minden | 2500 | 2 | 2 | 6 | 3 |
| odessa\_minden | 3000 | 2 | 1 | 4 | 2 |
| odessa\_minden | 3500 | 1 | 1 | 3 | 2 |
| odessa\_minden | 4000 | 1 | 1 | 3 | 1 |
| odessa\_minden | 4500 | 1 | 1 | 2 | 1 |
| odessa\_minden | 5000 | 1 | 1 | 2 | 1 |

**Table G3c.** Percent suitable whooping crane roosting area for all channels of Minden to Gibbon, Gibbon to Wood River, and Wood River to Grand Island

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | **2018** | **2019** | **2020** |
| minden\_gibbon | 500 | 60 | 63 | 64 | 63 |
| minden\_gibbon | 750 | 59 | 59 | 60 | 61 |
| minden\_gibbon | 1000 | 57 | 58 | 58 | 62 |
| minden\_gibbon | 1200 | 58 | 60 | 57 | 63 |
| minden\_gibbon | 1500 | 53 | 55 | 54 | 60 |
| minden\_gibbon | 2000 | 47 | 49 | 49 | 55 |
| minden\_gibbon | 2500 | 41 | 41 | 43 | 49 |
| minden\_gibbon | 3000 | 34 | 33 | 37 | 42 |
| minden\_gibbon | 3500 | 28 | 25 | 31 | 35 |
| minden\_gibbon | 4000 | 23 | 18 | 25 | 28 |
| minden\_gibbon | 4500 | 19 | 13 | 18 | 22 |
| minden\_gibbon | 5000 | 15 | 10 | 13 | 16 |
| gibbon\_woodriver | 500 | 16 | 25 | 32 | 28 |
| gibbon\_woodriver | 750 | 16 | 23 | 31 | 27 |
| gibbon\_woodriver | 1000 | 15 | 22 | 29 | 25 |
| gibbon\_woodriver | 1200 | 14 | 21 | 28 | 24 |
| gibbon\_woodriver | 1500 | 13 | 19 | 26 | 21 |
| gibbon\_woodriver | 2000 | 10 | 15 | 23 | 17 |
| gibbon\_woodriver | 2500 | 9 | 11 | 19 | 13 |
| gibbon\_woodriver | 3000 | 7 | 7 | 15 | 9 |
| gibbon\_woodriver | 3500 | 5 | 5 | 11 | 7 |
| gibbon\_woodriver | 4000 | 4 | 4 | 9 | 5 |
| gibbon\_woodriver | 4500 | 4 | 3 | 6 | 3 |
| gibbon\_woodriver | 5000 | 3 | 2 | 5 | 3 |
| woodriver\_gi | 500 | 27 | 30 | 33 | 33 |
| woodriver\_gi | 750 | 26 | 29 | 32 | 32 |
| woodriver\_gi | 1000 | 25 | 28 | 31 | 30 |
| woodriver\_gi | 1200 | 24 | 26 | 30 | 28 |
| woodriver\_gi | 1500 | 22 | 24 | 29 | 26 |
| woodriver\_gi | 2000 | 19 | 20 | 26 | 21 |
| woodriver\_gi | 2500 | 16 | 16 | 23 | 17 |
| woodriver\_gi | 3000 | 13 | 11 | 19 | 13 |
| woodriver\_gi | 3500 | 10 | 8 | 16 | 9 |
| woodriver\_gi | 4000 | 8 | 6 | 13 | 7 |
| woodriver\_gi | 4500 | 7 | 4 | 11 | 5 |
| woodriver\_gi | 5000 | 5 | 3 | 8 | 3 |

**Table 3d.** Percent suitable whooping crane roosting area for Grand Island to Chapman

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | **2018** | **2019** | **2020** |
| gi\_chapman | 500 | 35 | 38 | 44 | 46 |
| gi\_chapman | 750 | 34 | 37 | 43 | 44 |
| gi\_chapman | 1000 | 32 | 35 | 41 | 41 |
| gi\_chapman | 1200 | 31 | 34 | 39 | 39 |
| gi\_chapman | 1500 | 28 | 32 | 36 | 36 |
| gi\_chapman | 2000 | 24 | 24 | 32 | 28 |
| gi\_chapman | 2500 | 19 | 16 | 26 | 20 |
| gi\_chapman | 3000 | 15 | 10 | 20 | 13 |
| gi\_chapman | 3500 | 11 | 6 | 15 | 8 |
| gi\_chapman | 4000 | 8 | 4 | 11 | 5 |
| gi\_chapman | 4500 | 5 | 3 | 7 | 3 |
| gi\_chapman | 5000 | 3 | 2 | 5 | 2 |

## **Table G4a.** Percent suitable whooping crane roosting area for the main channel of All Reaches (Overton to Chapman), Overton to Elm Creek, and Elm Creek to Odessa

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | **2018** | **2019** | **2020** |
| All\_Reaches | 500 | 33 | 38 | 44 | 41 |
| All\_Reaches | 750 | 31 | 36 | 42 | 39 |
| All\_Reaches | 1000 | 29 | 33 | 40 | 37 |
| All\_Reaches | 1200 | 28 | 32 | 38 | 35 |
| All\_Reaches | 1500 | 25 | 29 | 36 | 31 |
| All\_Reaches | 2000 | 21 | 23 | 31 | 25 |
| All\_Reaches | 2500 | 17 | 17 | 26 | 20 |
| All\_Reaches | 3000 | 14 | 12 | 21 | 15 |
| All\_Reaches | 3500 | 11 | 9 | 16 | 11 |
| All\_Reaches | 4000 | 8 | 6 | 12 | 8 |
| All\_Reaches | 4500 | 7 | 5 | 9 | 6 |
| All\_Reaches | 5000 | 5 | 3 | 7 | 4 |
| overton\_elmcreek | 500 | 21 | 27 | 29 | 20 |
| overton\_elmcreek | 750 | 19 | 26 | 28 | 18 |
| overton\_elmcreek | 1000 | 18 | 24 | 26 | 17 |
| overton\_elmcreek | 1200 | 16 | 23 | 25 | 15 |
| overton\_elmcreek | 1500 | 15 | 20 | 23 | 13 |
| overton\_elmcreek | 2000 | 12 | 16 | 19 | 10 |
| overton\_elmcreek | 2500 | 10 | 12 | 15 | 6 |
| overton\_elmcreek | 3000 | 8 | 8 | 11 | 5 |
| overton\_elmcreek | 3500 | 6 | 6 | 8 | 3 |
| overton\_elmcreek | 4000 | 4 | 4 | 5 | 2 |
| overton\_elmcreek | 4500 | 3 | 3 | 4 | 1 |
| overton\_elmcreek | 5000 | 3 | 3 | 4 | 1 |
| elmcreek\_odessa | 500 | 53 | 58 | 62 | 63 |
| elmcreek\_odessa | 750 | 47 | 52 | 58 | 57 |
| elmcreek\_odessa | 1000 | 42 | 46 | 54 | 51 |
| elmcreek\_odessa | 1200 | 38 | 41 | 50 | 45 |
| elmcreek\_odessa | 1500 | 33 | 35 | 44 | 38 |
| elmcreek\_odessa | 2000 | 26 | 25 | 34 | 27 |
| elmcreek\_odessa | 2500 | 19 | 16 | 25 | 17 |
| elmcreek\_odessa | 3000 | 13 | 10 | 15 | 12 |
| elmcreek\_odessa | 3500 | 9 | 6 | 10 | 7 |
| elmcreek\_odessa | 4000 | 6 | 4 | 5 | 4 |
| elmcreek\_odessa | 4500 | 4 | 3 | 3 | 3 |
| elmcreek\_odessa | 5000 | 2 | 3 | 2 | 2 |

**Table G4b.** Percent suitable whooping crane roosting area for the main channel of Odessa to Minden, Minden to Gibbon, and Gibbon to Wood River

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | **2018** | **2019** | **2020** |
| odessa\_minden | 500 | 8 | 10 | 20 | 14 |
| odessa\_minden | 750 | 7 | 9 | 19 | 13 |
| odessa\_minden | 1000 | 7 | 8 | 18 | 12 |
| odessa\_minden | 1200 | 6 | 8 | 17 | 11 |
| odessa\_minden | 1500 | 6 | 6 | 15 | 10 |
| odessa\_minden | 2000 | 5 | 5 | 13 | 7 |
| odessa\_minden | 2500 | 4 | 3 | 10 | 6 |
| odessa\_minden | 3000 | 3 | 2 | 8 | 4 |
| odessa\_minden | 3500 | 2 | 2 | 6 | 3 |
| odessa\_minden | 4000 | 2 | 2 | 5 | 2 |
| odessa\_minden | 4500 | 2 | 1 | 4 | 2 |
| odessa\_minden | 5000 | 1 | 1 | 3 | 1 |
| minden\_gibbon | 500 | 82 | 82 | 80 | 85 |
| minden\_gibbon | 750 | 79 | 79 | 77 | 83 |
| minden\_gibbon | 1000 | 76 | 78 | 74 | 83 |
| minden\_gibbon | 1200 | 75 | 77 | 73 | 82 |
| minden\_gibbon | 1500 | 70 | 73 | 70 | 79 |
| minden\_gibbon | 2000 | 62 | 64 | 63 | 73 |
| minden\_gibbon | 2500 | 53 | 54 | 56 | 65 |
| minden\_gibbon | 3000 | 45 | 43 | 49 | 56 |
| minden\_gibbon | 3500 | 38 | 34 | 41 | 47 |
| minden\_gibbon | 4000 | 31 | 25 | 32 | 37 |
| minden\_gibbon | 4500 | 25 | 18 | 24 | 29 |
| minden\_gibbon | 5000 | 20 | 13 | 18 | 22 |
| gibbon\_woodriver | 500 | 21 | 31 | 40 | 35 |
| gibbon\_woodriver | 750 | 20 | 29 | 39 | 34 |
| gibbon\_woodriver | 1000 | 19 | 28 | 37 | 32 |
| gibbon\_woodriver | 1200 | 18 | 26 | 35 | 30 |
| gibbon\_woodriver | 1500 | 16 | 24 | 33 | 26 |
| gibbon\_woodriver | 2000 | 13 | 18 | 28 | 21 |
| gibbon\_woodriver | 2500 | 11 | 13 | 23 | 16 |
| gibbon\_woodriver | 3000 | 9 | 9 | 19 | 11 |
| gibbon\_woodriver | 3500 | 7 | 7 | 14 | 8 |
| gibbon\_woodriver | 4000 | 6 | 5 | 11 | 6 |
| gibbon\_woodriver | 4500 | 5 | 4 | 8 | 4 |
| gibbon\_woodriver | 5000 | 4 | 3 | 6 | 3 |

**Table G4c.** Percent suitable whooping crane roosting area for the main channel of Wood River to Grand Island and Grand Island to Chapman

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | **2018** | **2019** | **2020** |
| woodriver\_gi | 500 | 42 | 47 | 53 | 52 |
| woodriver\_gi | 750 | 41 | 44 | 51 | 49 |
| woodriver\_gi | 1000 | 38 | 41 | 49 | 46 |
| woodriver\_gi | 1200 | 36 | 39 | 47 | 44 |
| woodriver\_gi | 1500 | 33 | 36 | 45 | 39 |
| woodriver\_gi | 2000 | 28 | 30 | 40 | 32 |
| woodriver\_gi | 2500 | 24 | 23 | 35 | 26 |
| woodriver\_gi | 3000 | 19 | 17 | 30 | 20 |
| woodriver\_gi | 3500 | 16 | 12 | 25 | 14 |
| woodriver\_gi | 4000 | 12 | 9 | 21 | 10 |
| woodriver\_gi | 4500 | 10 | 6 | 16 | 7 |
| woodriver\_gi | 5000 | 8 | 4 | 13 | 5 |
| gi\_chapman | 500 | 36 | 41 | 46 | 48 |
| gi\_chapman | 750 | 34 | 39 | 44 | 46 |
| gi\_chapman | 1000 | 32 | 37 | 42 | 43 |
| gi\_chapman | 1200 | 31 | 35 | 40 | 40 |
| gi\_chapman | 1500 | 28 | 32 | 37 | 36 |
| gi\_chapman | 2000 | 24 | 24 | 32 | 28 |
| gi\_chapman | 2500 | 19 | 16 | 26 | 20 |
| gi\_chapman | 3000 | 15 | 10 | 21 | 13 |
| gi\_chapman | 3500 | 11 | 6 | 15 | 8 |
| gi\_chapman | 4000 | 8 | 4 | 11 | 5 |
| gi\_chapman | 4500 | 5 | 3 | 8 | 3 |
| gi\_chapman | 5000 | 3 | 2 | 5 | 2 |

## **Table G5a.** Percent suitable whooping crane roosting area on managed areas of the main channel and unmanaged areas

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | | **2018** | | **2019** | | **2020** | |
| managed | un-  managed | managed | un-  managed | managed | un-  managed | managed | un-  managed |
| All\_Reaches | 500 | 48 | 25 | 53 | 30 | 58 | 37 | 56 | 34 |
| All\_Reaches | 750 | 45 | 24 | 50 | 28 | 55 | 35 | 54 | 32 |
| All\_Reaches | 1000 | 42 | 22 | 48 | 26 | 53 | 34 | 51 | 30 |
| All\_Reaches | 1200 | 40 | 21 | 46 | 25 | 51 | 32 | 49 | 28 |
| All\_Reaches | 1500 | 37 | 19 | 42 | 22 | 47 | 30 | 45 | 25 |
| All\_Reaches | 2000 | 32 | 16 | 35 | 17 | 41 | 25 | 38 | 19 |
| All\_Reaches | 2500 | 26 | 13 | 27 | 12 | 35 | 21 | 32 | 14 |
| All\_Reaches | 3000 | 22 | 10 | 21 | 8 | 28 | 17 | 26 | 9 |
| All\_Reaches | 3500 | 18 | 8 | 16 | 5 | 23 | 13 | 20 | 6 |
| All\_Reaches | 4000 | 14 | 6 | 12 | 3 | 17 | 10 | 16 | 4 |
| All\_Reaches | 4500 | 11 | 4 | 9 | 2 | 13 | 7 | 12 | 3 |
| All\_Reaches | 5000 | 9 | 3 | 7 | 2 | 10 | 5 | 9 | 2 |
| overton\_elmcreek | 500 | 41 | 2 | 52 | 3 | 54 | 4 | 37 | 2 |
| overton\_elmcreek | 750 | 38 | 1 | 50 | 3 | 52 | 3 | 35 | 2 |
| overton\_elmcreek | 1000 | 35 | 1 | 47 | 2 | 50 | 3 | 32 | 1 |
| overton\_elmcreek | 1200 | 32 | 1 | 44 | 2 | 48 | 3 | 29 | 1 |
| overton\_elmcreek | 1500 | 28 | 1 | 40 | 2 | 45 | 2 | 26 | 1 |
| overton\_elmcreek | 2000 | 23 | 1 | 31 | 1 | 38 | 2 | 19 | 0 |
| overton\_elmcreek | 2500 | 19 | 1 | 23 | 1 | 30 | 1 | 13 | 0 |
| overton\_elmcreek | 3000 | 14 | 1 | 17 | 0 | 21 | 1 | 9 | 0 |
| overton\_elmcreek | 3500 | 11 | 1 | 12 | 0 | 15 | 1 | 6 | 0 |
| overton\_elmcreek | 4000 | 8 | 1 | 8 | 0 | 10 | 1 | 4 | 0 |
| overton\_elmcreek | 4500 | 6 | 1 | 6 | 0 | 8 | 1 | 3 | 0 |
| overton\_elmcreek | 5000 | 5 | 1 | 5 | 0 | 7 | 1 | 2 | 0 |
| elmcreek\_odessa | 500 | 74 | 18 | 78 | 22 | 77 | 35 | 81 | 32 |
| elmcreek\_odessa | 750 | 66 | 15 | 71 | 19 | 72 | 32 | 73 | 28 |
| elmcreek\_odessa | 1000 | 59 | 12 | 63 | 16 | 67 | 29 | 65 | 24 |
| elmcreek\_odessa | 1200 | 53 | 10 | 56 | 14 | 63 | 27 | 59 | 21 |
| elmcreek\_odessa | 1500 | 47 | 8 | 49 | 11 | 56 | 23 | 50 | 16 |
| elmcreek\_odessa | 2000 | 37 | 5 | 35 | 6 | 44 | 16 | 37 | 10 |
| elmcreek\_odessa | 2500 | 27 | 3 | 23 | 3 | 32 | 11 | 24 | 5 |
| elmcreek\_odessa | 3000 | 19 | 2 | 15 | 2 | 21 | 6 | 17 | 3 |
| elmcreek\_odessa | 3500 | 14 | 1 | 9 | 1 | 13 | 4 | 10 | 2 |
| elmcreek\_odessa | 4000 | 10 | 1 | 6 | 1 | 7 | 2 | 6 | 1 |
| elmcreek\_odessa | 4500 | 6 | 1 | 5 | 1 | 4 | 2 | 3 | 1 |
| elmcreek\_odessa | 5000 | 3 | 1 | 4 | 1 | 3 | 2 | 2 | 1 |

**Table G5b.** Percent suitable whooping crane roosting area on managed areas of the main channel and unmanaged areas

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | | **2018** | | **2019** | | **2020** | |
| managed | un-  managed | managed | un-  managed | managed | un-  managed | managed | un-  managed |
| odessa\_minden | 500 | 6 | 9 | 8 | 11 | 21 | 20 | 15 | 13 |
| odessa\_minden | 750 | 6 | 9 | 7 | 10 | 19 | 18 | 14 | 12 |
| odessa\_minden | 1000 | 5 | 8 | 7 | 9 | 19 | 17 | 13 | 11 |
| odessa\_minden | 1200 | 5 | 7 | 6 | 8 | 18 | 16 | 13 | 10 |
| odessa\_minden | 1500 | 5 | 6 | 6 | 7 | 16 | 15 | 11 | 9 |
| odessa\_minden | 2000 | 4 | 5 | 4 | 5 | 14 | 12 | 9 | 6 |
| odessa\_minden | 2500 | 3 | 4 | 3 | 4 | 11 | 9 | 7 | 5 |
| odessa\_minden | 3000 | 2 | 3 | 2 | 3 | 9 | 7 | 6 | 3 |
| odessa\_minden | 3500 | 2 | 3 | 2 | 2 | 7 | 6 | 4 | 3 |
| odessa\_minden | 4000 | 1 | 2 | 1 | 2 | 5 | 4 | 3 | 2 |
| odessa\_minden | 4500 | 1 | 2 | 1 | 1 | 4 | 3 | 2 | 1 |
| odessa\_minden | 5000 | 1 | 1 | 1 | 1 | 3 | 3 | 2 | 1 |
| minden\_gibbon | 500 | 84 | -- | 86 | -- | 83 | -- | 89 | -- |
| minden\_gibbon | 750 | 82 | -- | 83 | -- | 80 | -- | 88 | -- |
| minden\_gibbon | 1000 | 79 | -- | 82 | -- | 77 | -- | 88 | -- |
| minden\_gibbon | 1200 | 77 | -- | 81 | -- | 76 | -- | 87 | -- |
| minden\_gibbon | 1500 | 72 | -- | 77 | -- | 72 | -- | 84 | -- |
| minden\_gibbon | 2000 | 64 | -- | 68 | -- | 66 | -- | 77 | -- |
| minden\_gibbon | 2500 | 55 | -- | 58 | -- | 59 | -- | 69 | -- |
| minden\_gibbon | 3000 | 47 | -- | 46 | -- | 51 | -- | 59 | -- |
| minden\_gibbon | 3500 | 39 | -- | 36 | -- | 42 | -- | 49 | -- |
| minden\_gibbon | 4000 | 32 | -- | 27 | -- | 34 | -- | 40 | -- |
| minden\_gibbon | 4500 | 26 | -- | 19 | -- | 26 | -- | 31 | -- |
| minden\_gibbon | 5000 | 21 | -- | 14 | -- | 19 | -- | 23 | -- |
| gibbon\_woodriver | 500 | 21 | 21 | 40 | 28 | 43 | 39 | 49 | 30 |
| gibbon\_woodriver | 750 | 21 | 20 | 39 | 26 | 42 | 37 | 48 | 29 |
| gibbon\_woodriver | 1000 | 19 | 18 | 37 | 24 | 40 | 35 | 45 | 27 |
| gibbon\_woodriver | 1200 | 18 | 17 | 35 | 23 | 39 | 34 | 43 | 25 |
| gibbon\_woodriver | 1500 | 17 | 16 | 32 | 21 | 36 | 31 | 38 | 22 |
| gibbon\_woodriver | 2000 | 15 | 13 | 26 | 16 | 32 | 27 | 31 | 17 |
| gibbon\_woodriver | 2500 | 12 | 10 | 20 | 11 | 28 | 22 | 25 | 12 |
| gibbon\_woodriver | 3000 | 10 | 8 | 15 | 7 | 23 | 17 | 19 | 9 |
| gibbon\_woodriver | 3500 | 8 | 7 | 11 | 5 | 18 | 13 | 14 | 6 |
| gibbon\_woodriver | 4000 | 7 | 5 | 9 | 3 | 14 | 10 | 11 | 4 |
| gibbon\_woodriver | 4500 | 5 | 4 | 6 | 3 | 10 | 7 | 8 | 3 |
| gibbon\_woodriver | 5000 | 4 | 4 | 5 | 2 | 8 | 5 | 7 | 2 |

**Table G5c.** Percent suitable whooping crane roosting area on managed areas of the main channel and unmanaged areas

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reach** | **Q (cfs)** | **2017** | | **2018** | | **2019** | | **2020** | |
| managed | un-  managed | managed | un-  managed | managed | un-  managed | managed | un-  managed |
| woodriver\_gi | 500 | 60 | 37 | 56 | 45 | 72 | 47 | 65 | 48 |
| woodriver\_gi | 750 | 59 | 36 | 55 | 41 | 71 | 45 | 64 | 45 |
| woodriver\_gi | 1000 | 57 | 33 | 53 | 38 | 69 | 44 | 62 | 42 |
| woodriver\_gi | 1200 | 55 | 31 | 52 | 36 | 67 | 42 | 61 | 39 |
| woodriver\_gi | 1500 | 53 | 28 | 49 | 32 | 64 | 40 | 57 | 34 |
| woodriver\_gi | 2000 | 48 | 23 | 44 | 26 | 59 | 35 | 51 | 27 |
| woodriver\_gi | 2500 | 43 | 18 | 38 | 20 | 53 | 30 | 45 | 20 |
| woodriver\_gi | 3000 | 37 | 14 | 31 | 13 | 47 | 25 | 38 | 14 |
| woodriver\_gi | 3500 | 32 | 11 | 26 | 9 | 41 | 21 | 32 | 10 |
| woodriver\_gi | 4000 | 28 | 8 | 20 | 6 | 35 | 17 | 26 | 6 |
| woodriver\_gi | 4500 | 23 | 6 | 16 | 4 | 30 | 13 | 20 | 4 |
| woodriver\_gi | 5000 | 20 | 5 | 12 | 2 | 25 | 10 | 16 | 2 |
| gi\_chapman | 500 | -- | 36 | -- | 41 | -- | 46 | -- | 48 |
| gi\_chapman | 750 | -- | 34 | -- | 39 | -- | 44 | -- | 46 |
| gi\_chapman | 1000 | -- | 32 | -- | 37 | -- | 42 | -- | 43 |
| gi\_chapman | 1200 | -- | 31 | -- | 35 | -- | 40 | -- | 40 |
| gi\_chapman | 1500 | -- | 28 | -- | 32 | -- | 37 | -- | 36 |
| gi\_chapman | 2000 | -- | 24 | -- | 24 | -- | 32 | -- | 28 |
| gi\_chapman | 2500 | -- | 19 | -- | 16 | -- | 26 | -- | 20 |
| gi\_chapman | 3000 | -- | 15 | -- | 10 | -- | 21 | -- | 13 |
| gi\_chapman | 3500 | -- | 11 | -- | 6 | -- | 15 | -- | 8 |
| gi\_chapman | 4000 | -- | 8 | -- | 4 | -- | 11 | -- | 5 |
| gi\_chapman | 4500 | -- | 5 | -- | 3 | -- | 8 | -- | 3 |
| gi\_chapman | 5000 | -- | 3 | -- | 2 | -- | 5 | -- | 2 |