

## Estimation of Non-Federal Reservoir Evaporation

For a total of 643 non-federal reservoirs inventoried in the Republican River Basin within Nebraska, each reservoir has attributes of decimal longitude and latitude, storage and surface area at spillway elevation, and the digitized area, and etc.

A shapefile of five federal reservoirs with evaporation measurements was created. The nearest one of the federal reservoirs in Republican River basin to those 643 non-federal reservoirs was determined. The net evaporation rate [in inches] of the nearest reservoir was assigned to those corresponding non-federal reservoirs.

Evaporation loss [in acre-feet] of each non-federal reservoir was computed as a product of its presumed surface area and the net evaporation rate. GIS analyses were used to locate each non-federal reservoir to its corresponding RRCA sub-basin.

Finally, the calculated non-federal reservoirs' evaporations were summarized by sub-basin.

The implementation steps are as follows:

1. Start with NetEvap2.xls, and export the "Export\_to\_ArcMap" sheet into a dBase file NFEDEVAP.DBF
2. In ArcCatalog, right click on NFEDEVAP.DBF, select Create Feature Class → From XY Table. X Field = DLONG; Y Field = DLAT. In the Output field, specify output shapefile as NFRevap.shp. Right click on the NFRevap.shp file, select Export → to Coverage, and name the output coverage as **NFRevap\_cov**.
3. Create a new shapefile in ArcCatalog, Fed\_Lakes.shp
4. Open ArcMap, add the Fed-Lakes.shp into it (It is invisible before editing). Add Lakes (Major water bodies) using the Add State Data tool. Edit the Fed\_Lakes.shp and click on the top of five federal reservoirs in the Republican basin inside Nebraska. Add two fields into the attribute table: Name & NetEvap. Enter corresponding lake name and net evaporation.
5. In ArcCatalog, export it into coverage: fed\_lakes\_cov.
6. Start ArcMap, and add fed\_lakes\_cov and nfrevap\_cov coverages into the project, save it as Near\_Identity.mxd.
7. In ArcToolbox, select Coverage Tools → Analysis → Proximity → Near

Input Coverage = nfrevap\_cov

Near Coverage = fed\_lakes\_cov  
Output Coverage = NFR\_nrLake  
Feature Type = POINT  
Search Radius = 2

8. In ArcMap, right click on nfr\_nrlake and select Joins and Relates → Join

What do you want to join to this layer? Join attributes from a table.  
Table to join is fed\_lakes\_cov; the field is FED\_LAKES\_COV#.

9. Add union\_blw\_gage\_subs.shp into the Near\_Identity.mxd ArcMap document.

10. In ArcToolbox, select Analysis Tools → Overlay → Identity

Input Feature = nfr\_nrlake  
Identity Feature = union-blw\_gage\_subs  
Output Feature = **NFR\_subbasin\_Identity.shp**

11. In ArcMap, add **NFR\_subbasin\_Identity.shp**. Save the ArcMap document!!!

12. Make a copy of the *NFR\_subbasin\_Identity.dbf*, and rename it as *NFR\_sub.dbf*  
(The original file name is too long for Access importing).

13. Create a new Access Database, and name it as NFR\_evap.mdb. Import the *NFR\_sub.dbf* into the database.

14. Use *qry1ForMeaningfulFields* to query out those meaningful data fields in NFR\_sub table.

15. Use *qry2DetermineArea* to assign presumed surface area for each non-federal reservoir.

If a reservoir's normal storage is greater than 200 AF, use its surface acre at normal level;  
For a reservoir with a storage capacity less than 200 AF, the presumptive average annual surface area equals to 25% of its surface area at the principal spillway elevation. If the area at principal spillway is not available, the digitized average area is used.

16. Use *qry3CalculateEvap* to calculate each reservoir's evaporation as a product of the determined reservoir area and the net evaporation rate at the nearest federal reservoir.

17. Finally, use *qry4NFR\_evap\_bysubbasin* to summarize total non-federal reservoir evaporation for each sub-basin.