Dam Storage Methods

Data:

We inventoried dams within the study area for each of the four states in the study area (Table 1). Dam layers were merged into a single comprehensive layer for the study area and checked for duplicate data. In instances where attributes showed multiple dams at a location, aerial imagery was checked to determine how many dams were present at the location.

Table 1. Data sources used for the inventory of dams within the study area. Databases for Louisiana, Mississippi, and Texas were provided directly by contacts. Arkansas data were taken from the Natural Resources Commission Website (Arkansas Natural Resources Commission n.d .).

State	Agency/Program	Database
Louisiana	Department of Transportation	Dam Safety Data File
Arkansas	Natural Resources Commission	Statewide Inventory of Dams
Mississippi	Department of Environmental Quality, Dam Safety Division	Statewide Inventory of Dams
Texas	Commission on Environmental Quality, Dam Safety Program	Statewide Inventory of Dams

There were three instances where duplicate dams were identified based on common attributes (latitude and longitude coordinates, normal storage, max storage and drainage area). These were 1) Jonesville Lock and Dam (LA00175) and Jonesville Closure Dam (LA00176), 2) Columbia Lock and Dam (LA00177) and Columbia Closure Dam (LA00178), and 3) Oakley Lake Dam (AR00813) and Oakley Lake No 2 Dam (AR01308). In the first two cases, aerial imagery indicated that there was only one dam in each location, and LA00176 and LA00178 were removed from the layer. In the last case, aerial imagery showed no visible dam at the location, several small ponds (4 to 6 acres) were evident that could be created by multiple dams. Based on the aerial imagery and names of the dams (Oakley Lake and Oakley Lake No 2) these dams were considered to be unique and both were included in

the final layer, and the attribute duplication was determined to be a result of inadequate resolution to distinguish between small, closely packed features. Lastly, Toledo Bend Dam (LA00030) was duplicated in the layer, likely due to the fact that there are two spillways associated with the dam, one opening directly into the Sabine River and the other into a cutoff channel of the Sabine River. In this instance, the dam point with the least complete attributes was removed from the final layer to prevent double-counting the storage capacity of the reservoir. This screening process yielded a total of 944 dams within the study area that were used for further analyses.

Analysis:

For the dam storage assessment, we were interested in quantifying the hydrologic effect of individual dams on the watershed, defined as the amount of water impounded by dam-associated reservoirs. To do this we first examined a series of quantitative attributes for each dam (i.e., dam length, normal storage, max storage, drainage area) to determine their usefulness in describing the impact of a specific dam. However, most of the records from appropriate attributes were so incomplete that they were rendered useless for evaluating dam effects across the 57 watersheds. For instance, 27% of the dam inventory had no value for normal storage and 52% of the dams inventoried contained no value for drainage area. The max storage attribute provided both an appropriate measure and a complete record (98%). Max storage is defined as the volume of water (acre-feet) that a reservoir can hold before it discharges without human intervention and provides an approximation of the potential of each dam to store water or, conversely, to deprive a stream network of flow. Total max storage was calculated across each watershed, and a storage index was then calculated as,

$$\sum \text{storage}_{\text{(acre-ft)}} / \text{watershed area}_{\text{(acres)}}$$