2008 Small Dam Matrix
A Tool to Prioritization of Work

Introduction

Most state-owned dams were constructed in the 1930's and show signs of age. All require preventative maintenance and many need extensive repairs. An objective process is needed to accomplish prioritization of maintenance and repair projects.

Approximately 190 state-owned dams exist in South Dakota. Many of the dams are not owned in fee title but have easements for access to the dam and associated land around them. When the ownership (responsibility) was officially determined in the 1970's, it was based on how easements were legally recorded. Game, Fish and Parks (GFP) was assigned 84 dams and School and Public Lands (SPL) was assigned ownership of 96 dams that had easements granted to "the State of South Dakota". Department of Transportation (DOT) owns eight (not included in this analysis) small dams. This list of dams and ownership should be considered dynamic as status may change over time. By definition, low head structures across river systems are not considered dams in this state.

The matrix was developed to be used as a tool in identifying where the highest need and most efficient use of available funds should be directed concerning small dams of the State of South Dakota. The best use of this tool is to consider the scores and rankings as a measure of value to the state for that particular dam. A high score on the matrix represents a high value to the state. It does not mean that maintenance or significant repair is not necessary. The inspections by DENR, GFP and SPL personnel verify repair needs. What it does mean is that high valued sites should be high priority sites to allocate funds for preventative maintenance.

Funding mechanisms are not addressed in this matrix as many outside issues influence the way small dam repair budgets are prepared. Past sources have come from Department of Game, Fish and Parks DJ funds (revenue from fishermen) CDBG grant funds, FEMA disaster funds, local drainage district funds and local sponsorships.

Process

Staff from the Department of Environment and Natural Resources (DENR), GFP and SPL have joined together to develop the matrix process to address maintenance of small dams owned by the State of South Dakota. There are three components of the matrix: structural integrity, fisheries potential and public use and investment values.

Structural Integrity

Three “subcategories” with which to determine structural integrity were used. They are General, Spillway and Embankment. Data within each subcategory was formulized to provide the most important aspects of a dam in relation to its integrity.

Items included in the General subcategory included size, age, hazard status and category (which also relates to size), past renovation cost investments, future renovation estimates, available access, current design capacity of the structure and watershed modification potential with relation to runoff.

Criteria under the Spillway subcategory involved the type of primary spillway in use, components of conveyance: primary, secondary, low-level outlet structures, the alignment of spillways to the reservoir and embankment, and the overall condition of the elements.

The third subcategory encompasses the embankment. Data includes geometry: mild slopes, wide crest, secondary berm, good abutments; the seepage around the toe of the dam, protection on the face of the dam, overall condition of the embankment: good grass cover, minimal tree growth; and whether or not a known core material is present in the embankment.

Fisheries Component

Information regarding lake surface area, surface acres within 50 miles, universal soil loss, lake basin morphometry, human population within a 50-mile radius of the dam and shoreline development index was determined. All data was stored in an Excel database linked to GIS coverage.

A ranking system was developed for the six criteria in an effort to weight certain factors as deemed appropriate to the fisheries potential of the lake or pond behind each dam. Fisheries potential was used instead of existing fisheries, as a small dam could have an out-of-balance fish population but good physical potential for fish management. If existing fisheries would have been used as the main evaluator, many small dams in excellent physical settings close to large numbers of South Dakota residents may have ranked low due to an existing out-of-balance fish population. The objective of the fisheries potential evaluation matrix is to determine physical settings near likely users where a good opportunity exists for development of recreational fisheries regardless of the current fish population.

Use and Investment Component

Development of the area surrounding a dam varies greatly. Certain dams have intensively developed shorelines with permanent homes or summer cabins. Other dams may have campgrounds or developed public access areas and some support agriculture activities. Public use of each dam has a value and should be considered. Criteria within the use and investment component include investment in land ownership, investment in recreation facilities, and investment in shoreline development, amount of recreational use and type of agricultural use.

General Discussion

Each of the three components contained a unique numerical ranking system. A total score for each dam within each component was calculated. Scores were normalized to account for the diversity in which scores were determined. The TMB report divides the ranked list into thirds based on total score. Dams were assigned to 'T' if the score fell in the top third of the range of scores for each component. 'M' was assigned to the middle third and 'B' for the bottom third accordingly. A table of information was assembled that displayed the ranking for each dam for the three components. Dams were assembled into groups that displayed similar ranking among the three components.

The power of the matrix allows technical data from each of the three components to be queried to understand the relative grouping of an individual dam. This will aid in discussion of the priority that should be given concerning potential repair of a given dam. For example: dams that were grouped in the 'T' group for structural integrity should not require major repair, however, if a high hazard or significant hazard dam did not group in the 'T' range it would receive a high priority for repair. A dam that was grouped in the 'M' group structurally but in the top group from a fisheries potential perspective would receive a high priority for repair. Conversely, a dam that was grouped in the 'B' group in all three categories would receive a relatively low priority for repair. Nine combinations of the T, M and B grouping exist. Interpretation of each grouping is required before assignment of a priority to fix a given dam is made.