RECLAMATION

Managing Water in the West

Reservoir Exceedance Curves

Best Practices

Last Modified 6/19/2009

U.S. Department of the Interior
Bureau of Reclamation

Presentation Taken From One Developed for Reclamation Best Practices

- **This is not meant to fully represent how Reclamation would teach Best Practices for Reservoir Exceedance**
- **The presentation is to provide an introduction to important concepts that Reclamation has developed over many years**

Key Concepts

- Reservoir Elevation key loading parameter for evaluating potential failure mode
- Example: load on radial gate function of square of the water height on gate
- Consequences are function of reservoir elevation; can dramatically increase with small change in elevation
- Probability of attaining a given range in reservoir elevation an important risk analysis consideration

Risk Analysis Applications

Goal:

- Develop Reservoir Elevation Exceedance Probability Curves for Specific Potential Failure Modes

- Static - e.g. seepage/piping
- Seismic
- Flood Related – e.g. overtopping, chute walls…

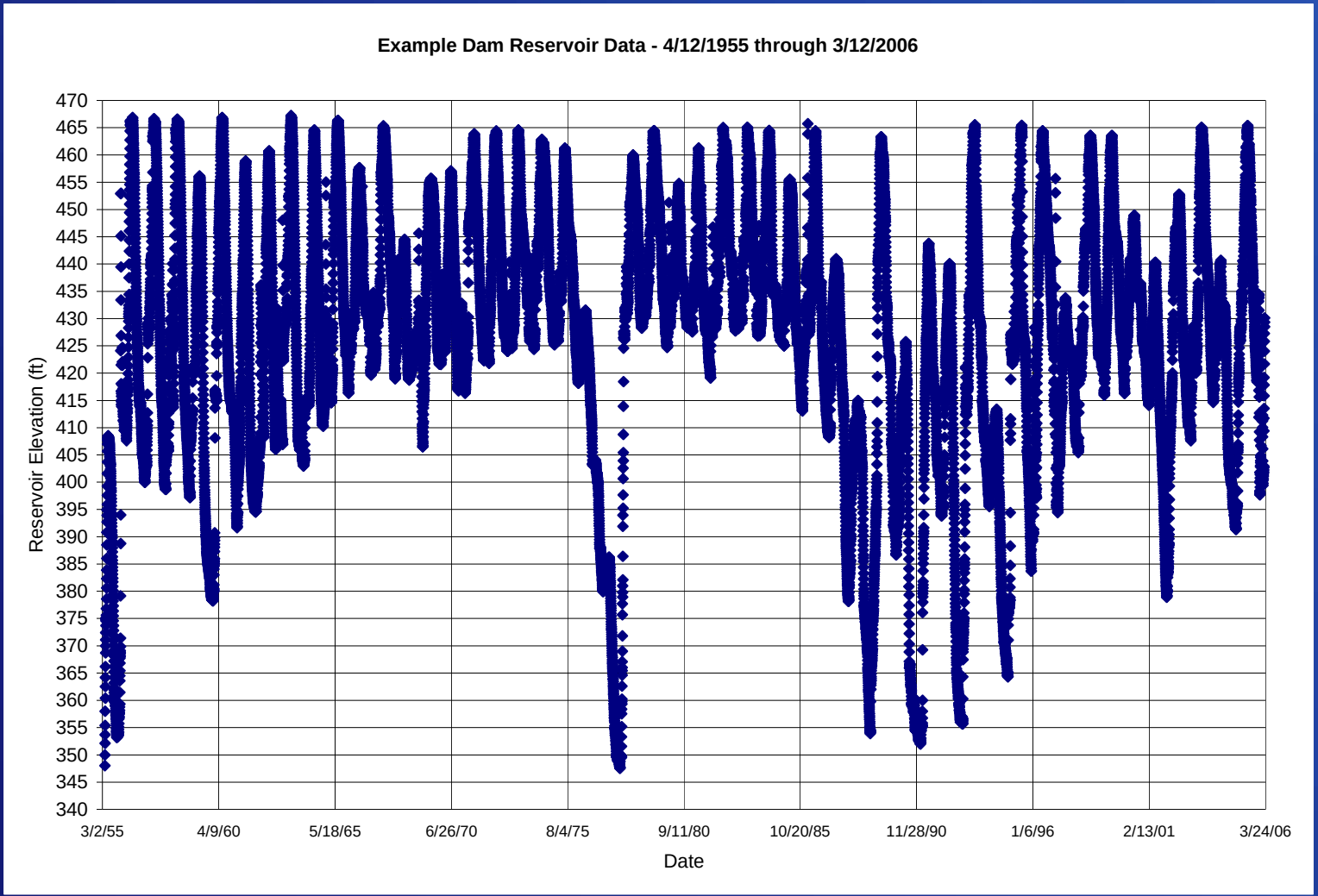
Reservoir Elevation Data

RECLAMATION

Reservoir Elevation Data Processing

- QA/QC Very Important
- Daily Data, Monthly Data (end of month), missing data
- Make a time series plot

Reservoir Elevation Data Processing



Look for bad data, sudden shifts, change in operations

RECLAMATION

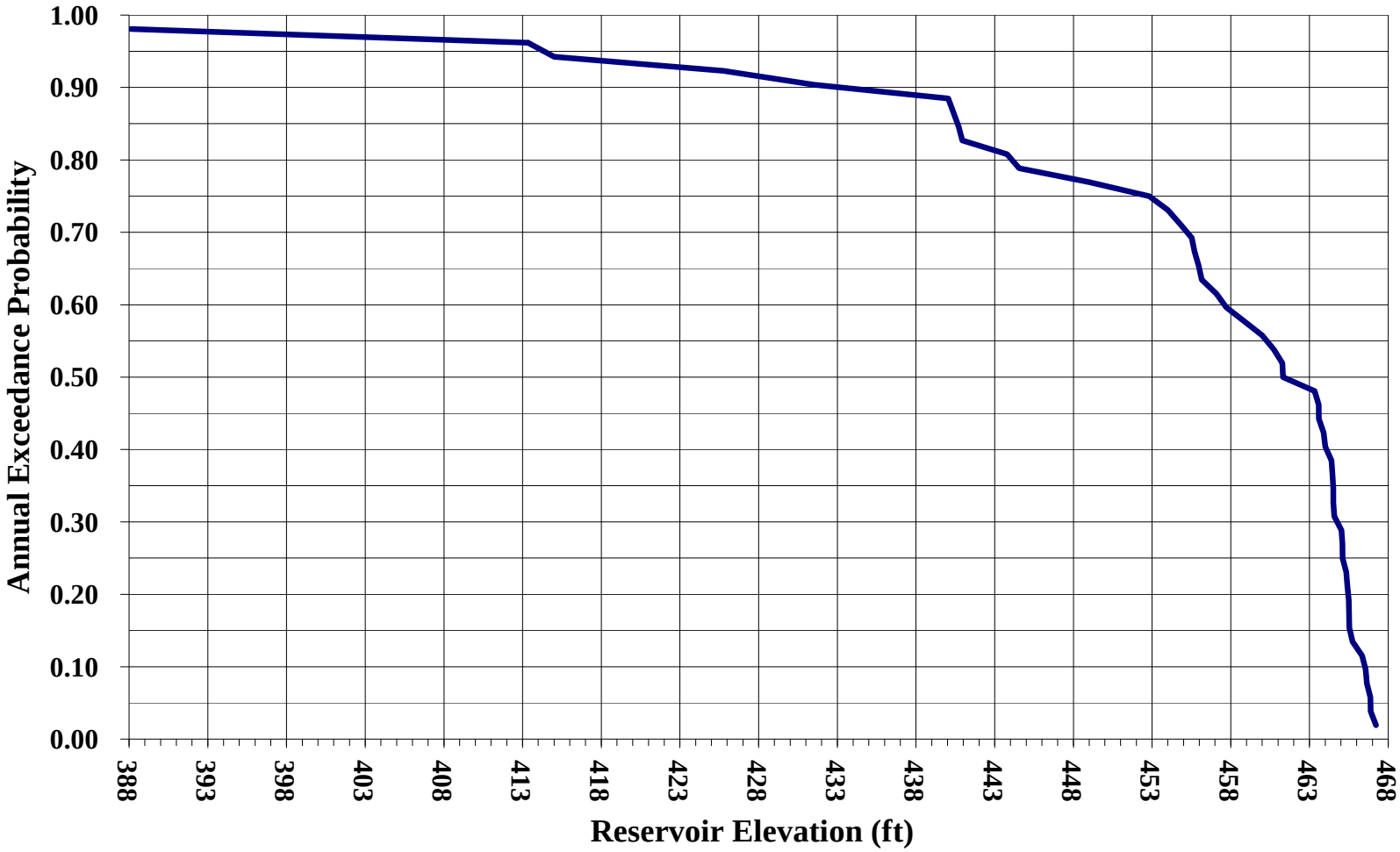
Reservoir Elevation Data Processing

- Two types of reservoir exceedance curves
- Annual Maximum – distribution of maximum observations (one per year) for static potential failure modes
- Daily (or seasonal) – distribution of daily observations for seismic and flood potential failure modes
- Rank the data from maximum to minimum
- Use a plotting position (e.g. Weibull) to estimate probability

$$p(i) = \frac{i}{n+1}$$

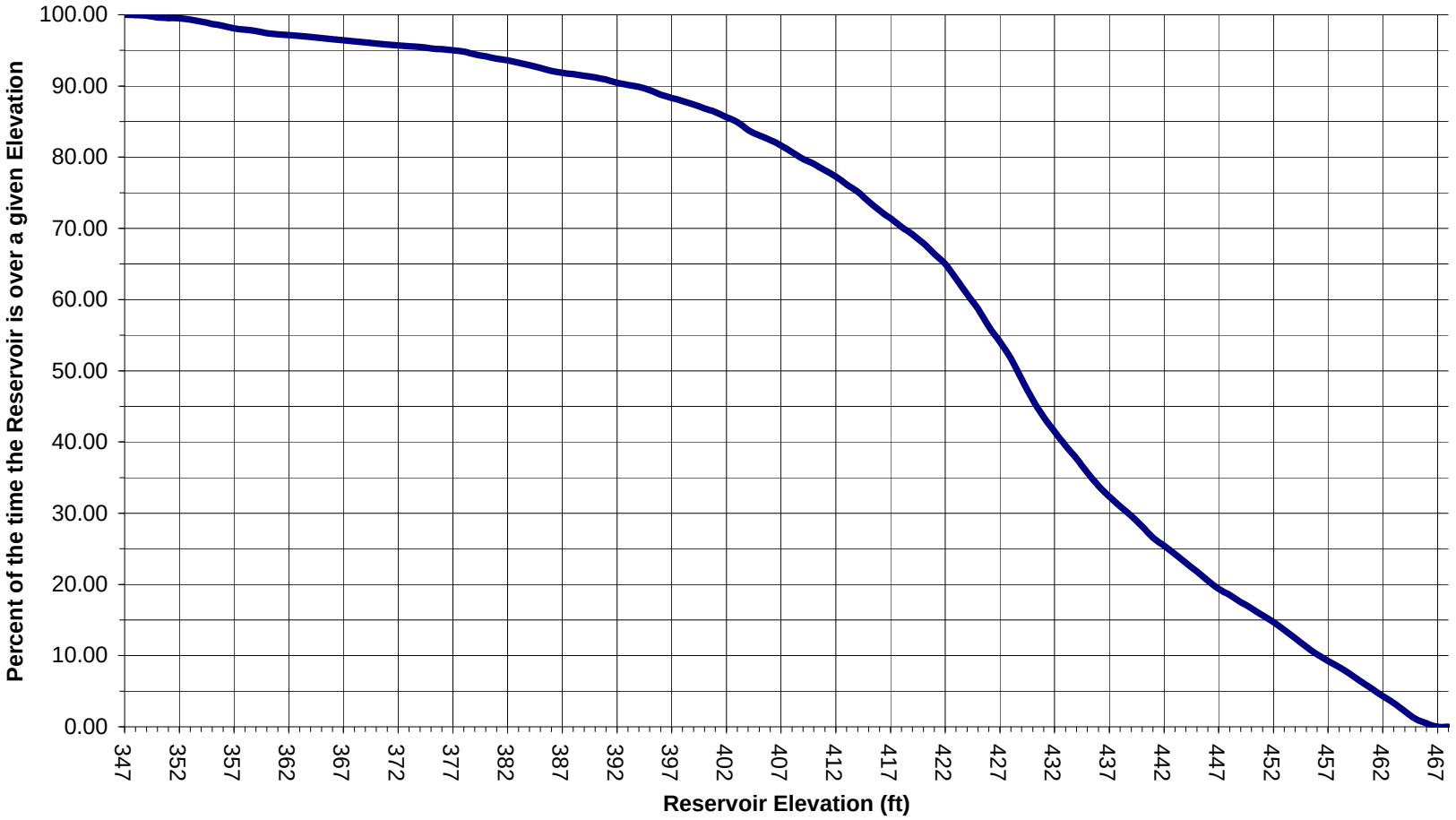
RECLAMATION

Example Dam Reservoir Data - 1955 through 2005
Annual Reservoir Elevation Exceedance Probability for use with Internal Erosion Risk Analysis



RECLAMATION

Example Dam Reservoir Data - 4/12/1955 through 3/12/2006
Percentage of Time Exceedance for Seismic and Hydrologic Risk Analysis



RECLAMATION