

PERFORMANCE MEASURE INFORMATION SHEET # 3

KINBASKET RESERVOIR: CULTURE & HERITAGE

Objective / Location	Performance Measure	Units	Description
Culture & Heritage / Kinbasket Reservoir	Archaeological sites – Wave Erosion	Weighted-Days reservoir is within sensitive elevation zones	Total number of weighted days that the reservoir is potentially eroding archaeological sites through wave action

Description

The Columbia WUP Consultative Committee recognized the significance of heritage resources, particularly to the First Nations with an interest in the area. However, they were unable to fully evaluate the potential effects of operating alternatives on archaeological sites in Kinbasket Reservoir due to a lack of information on the number and condition of actively eroding archaeological sites in the reservoir. The contents and significance of documented sites within the reservoirs had not been comprehensively reviewed, and it is likely that additional undocumented archaeological sites exist in areas that have not been previously surveyed.

As part of WUP implementation, an archaeological overview was conducted on Kinbasket Reservoir in 2008 to identify and assess archaeological resource potential or sensitivity within portions of the drawdown zone with a primary focus on those areas with potential for revegetation. As part of this work, recommendations were also developed for subsequent archaeological work and possible mitigative options for identified potential conflicts with the WUP physical works programs. A total of 12 archaeological sites were identified in Kinbasket Reservoir during a survey of 13 vegetation polygons. Prior to this study, only one stone artifact had been documented in the vicinity of the reservoir. Consequently, these newly discovered archaeological deposits are considered to be highly significant from an archaeological perspective, as well as their value in better understanding the effects of reservoir operations on archaeological sites.

Performance Measure

In developing a performance measure for the NTS analysis, an inventory of archaeological sites in the vicinity of Kinbasket Reservoir was obtained from the Remote Access to Archaeological Data (RAAD) database of the Archaeology Branch. The archaeology sites extracted from RAAD were selected based on their proximity to the Kinbasket shoreline as displayed in RAAD.

Elevations for each site were interpolated using a digital elevation model of Kinbasket Reservoir, which was collected between 2342 and 2483 ft. A 3-D terrain surface was generated from the digital elevation model, and the site polygons were draped over the terrain and the elevations were interpolated from the terrain surface heights. Some archaeology sites fell below or were beyond the DEM collection area, and were not included in the analysis. A total of 14 sites were found to exist within the lower limit of the DEM and full pool elevation of the reservoir.

The minimum and maximum site elevations were interpolated from the perimeter of the archaeology site. The results were manually inspected to ensure that significant peaks or depressions do not exist within the site boundaries that would alter the minimum or maximum value of the site.

The drawdown zone of Kinbasket Reservoir was divided into elevation bands between 2391 ft and 2476 ft. The total number of archaeological sites within each band was tallied corresponding to its minimum and maximum elevation. Each elevation band was weighted based on the number of sites inventoried in each band to provide a relative importance modifier.

Table 1. Current Archaeological Site Inventory for Kinbasket Reservoir

	Elevation Range (ft)			
	2391<band<2417	2417<band<2437	2437<band<2457	2457<band<2476
Total sites within elevation band	5	12	11	9
Proportion of sites within band	13.5%	32.4%	29.7%	24.3%
Relative day weight	0.42	1	0.92	0.75

There are multiple ways to consider the potential for operational impacts on archaeological sites. Two different approaches are presented here for consideration in evaluating the NTS scenarios.

Parameter 1

The first parameter was presented at the NTS Stakeholder Session #1 (October 2010). The method is based on concern over the potential for erosion of archaeological sites due to wave action. The number of days that the reservoir is within each elevation band over the year is weighted by the number of sites known to exist within each band. The fewer the number of wave action erosion days, the better.

Parameter 2

The second parameter emerged from discussions with First Nations. The method is based on the concept that keeping sites fully inundated can protect them from wind and wave erosion, as well as human disturbances. The number of days that the reservoir water level is at least 1 metre above each elevation band over the year is weighted by the number of sites known to exist within each band. The greater the number of inundation days, the better. A 1 metre buffer was applied to each elevation band to account for depth of erosion due to wave action.

Calculation

For each scenario:

1. Assemble the simulated results for Kinbasket Reservoir elevations over 60 years (1940-2000; Figure 1).
2. Parameter (1): Count the number of days over the year that the reservoir is within each elevation band for each of the 60 years.
Weight each day by the relative day weights listed in the Table 1 above.
3. Parameter (2): Count the number of days over the year that the reservoir is at least 1 metre above each elevation band and thus fully inundating each elevation band for each of the 60 years.
Weight each day by the relative day weights listed in the Table 1 above.
4. Summarize all statistics (Figures 2 and 3).

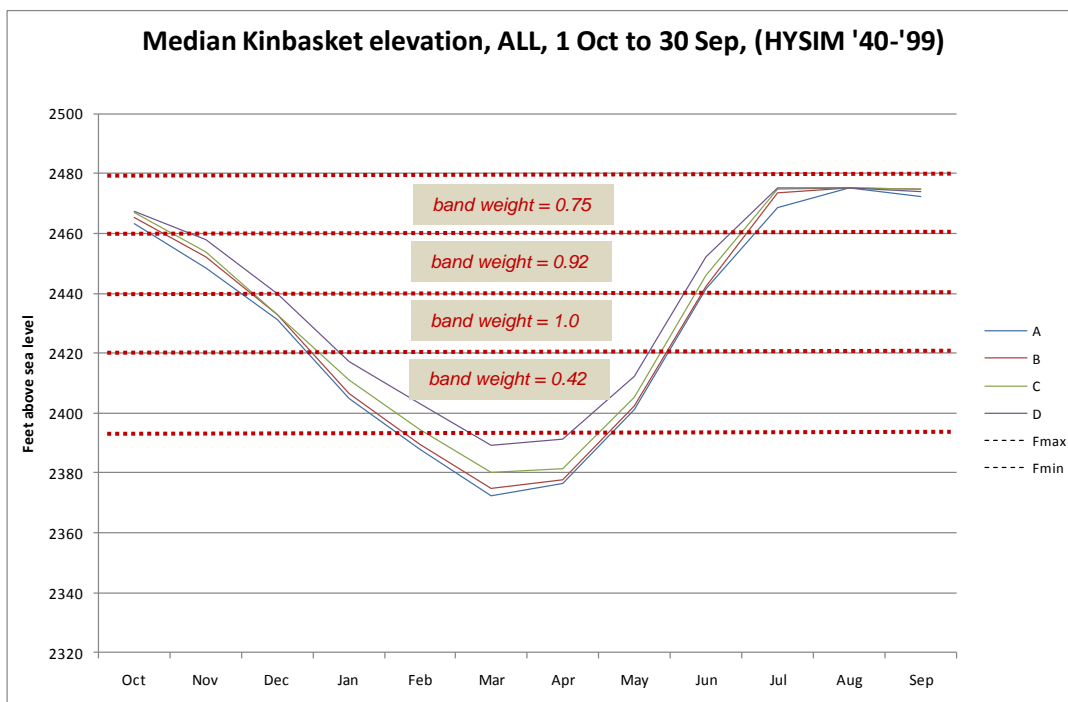


Figure 1. HYSIM Simulated Kinbasket Reservoir elevations. Median over 60 years showing the weighted elevation bands for protection of identified heritage and cultural sites.

Key Assumptions and Uncertainties

- Each scenario is simulated using the same set of system constraints, input assumptions (e.g., load forecasts) and historic basin inflows (1940 – 2000).
- Assumes that the relative importance of any given recorded site is equal.
- Assumes that the relative survey effort across elevation zones is equal.

Results

Regardless of the statistics used, the modeling suggests that Scenario D (no NTS) would cause Kinbasket Reservoir to fluctuate through sensitive elevation zones containing archaeological sites for a significantly greater number of days than the “with NTS” scenarios and therefore represent the greatest potential risk of wave erosion. However, it would also provide the best protection against wind erosion and surface disturbance due to human activity as it would keep the reservoir higher and thus inundate the archaeological sites for a greater number of days than Scenarios A, B and C.

Figure 2. Parameter (1): Erosion – Culture & Heritage – Results for all NTS scenarios

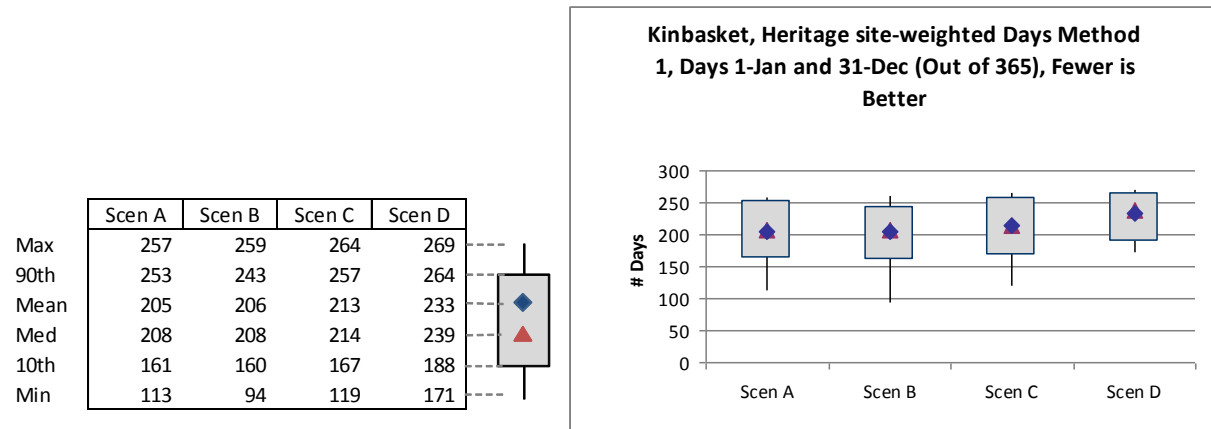


Figure 3. Parameter (2): Inundation – Culture & Heritage –Results for all NTS scenarios

