COLUMBIA RIVER TEMPERATURE ASSESSMENT

MATHEMATICAL MODELLIING

PRELIMINARY RESULTS

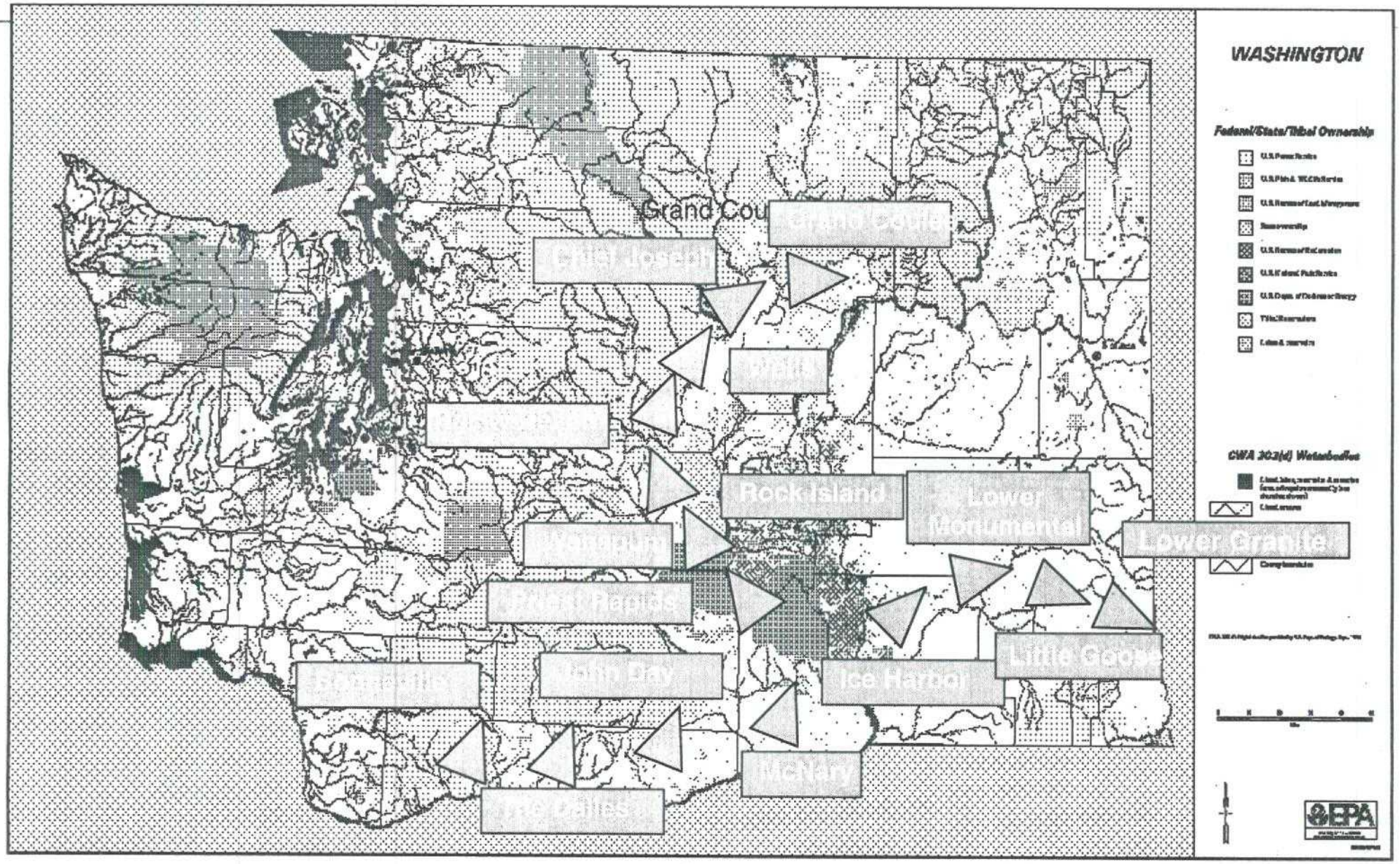
MAN AGEMENT OBJECTIVES

- DEVELOP TEMPERATURE ASSESSMENT METHOD FOR WATER QUALITY LIMITED SEGMENTS OF THE MAIN STEM COLUMBIA AND SNAKE RIVERS
- CHARACTERIZE RELATIVE IMPACT OF IMPOUNDMENTS AND WATERSHED MODIFICATION ON WATER QUALITY STANDARDS

PROJECT GOALS

- DEVELOP SIMULATION METHODS FOR TEMPERATURE ASSESSMENT
- ESTIMATE UNCERTAINTY OF WATER TEMPERATURE SIMULATIONS
- ESTIMATE TEMPERATUE IMPACTS OF DAMS ON THE SNAKE AND COLUMBIA RIVERS
- ESTIMATE TEMPERATURE IMPACTS OF TRIBUTARIES ON THE SNAKE AND COLUMBIA RIVERS

REGIONAL SCALE OF ANALYSIS



IMPOUNDMENTS

- CHIEF JOSEPH
- WELLS
- ROCKY REACH
- ROCK ISLAND
- WANAPUM
- PRIEST RAPIDS
- MCNARY
- JOHN DAY
- THE DALLES
- BONNEVILLE

IMPOUNDMENTS

- LOWER GRANITE
- LITTLE GOOSE
- LOWER MONUMENTAL
- ICE HARBOR

TRIBUTARIES

- OKANOGAN
- CHELAN
- WENATCHEE
- CRAB CREEK
- YAKIMA
- JOHN DAY
- DESCHUTES

TRIBUTARIES

- TUCANNON
- PALOUSE

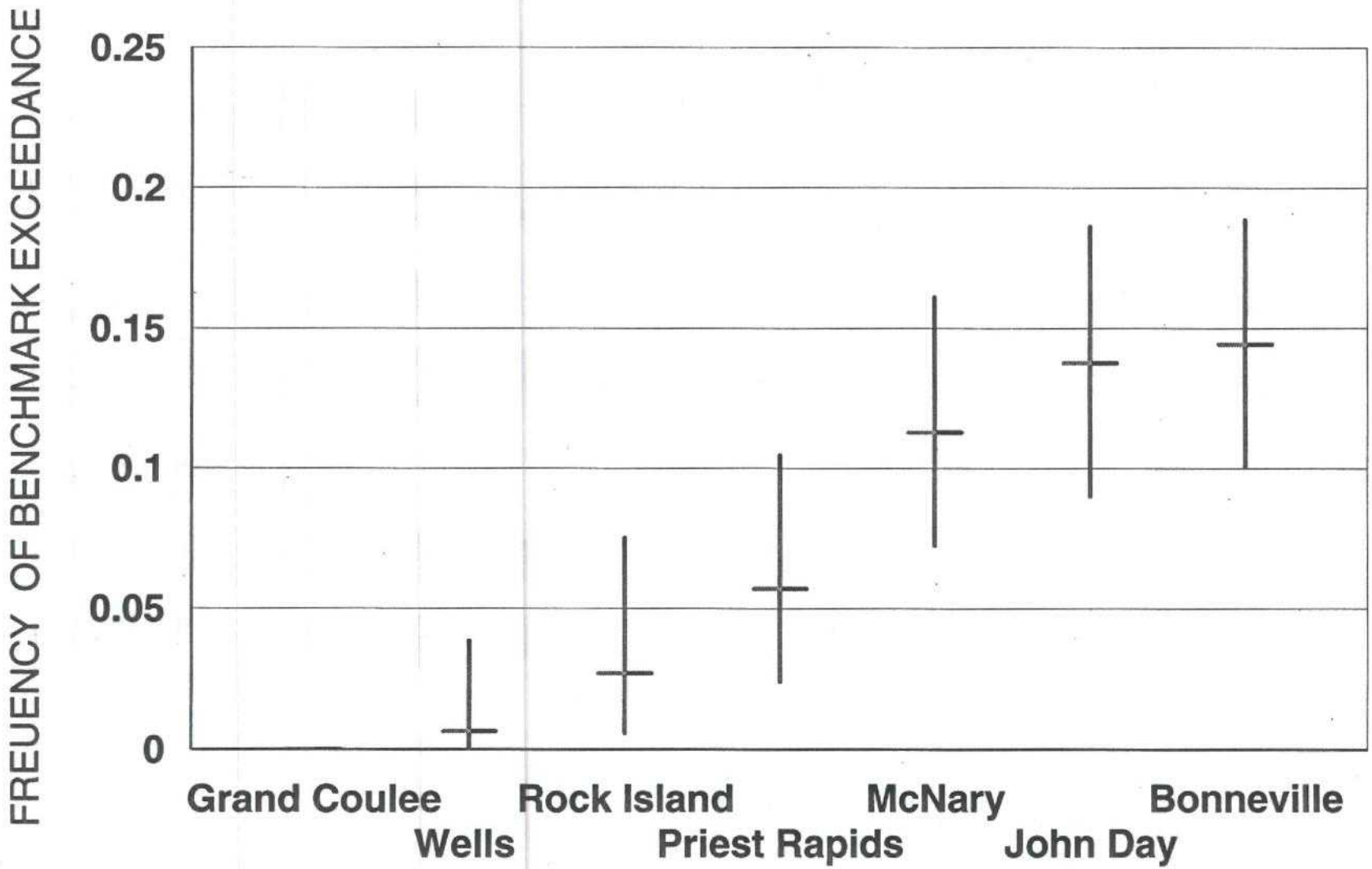
SCENARIO I

- ALL DAMS ON THE MAIN STEM COLUMBIA AND SNAKE RIVERS IN PLACE
- HYDROLOGY AND METEOROLOGY FOR THE PERIOD 1975-1995
- TRIBUTARY TEMPERATURES FROM NONLINEAR REGRESSION

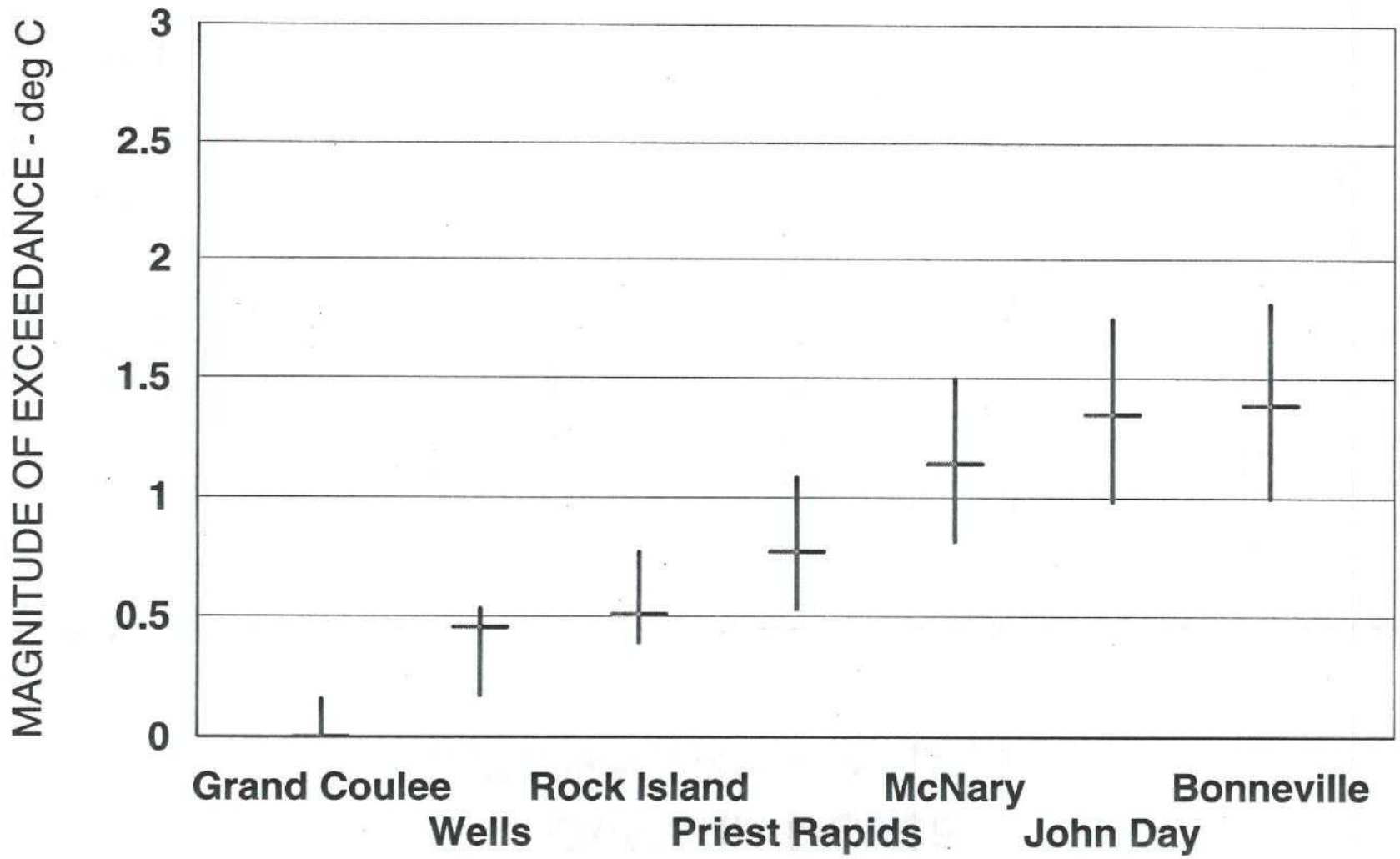
COLUMBIA RIVER

DAMS IN PLACE

BENCHMARK = 20 DEG C.



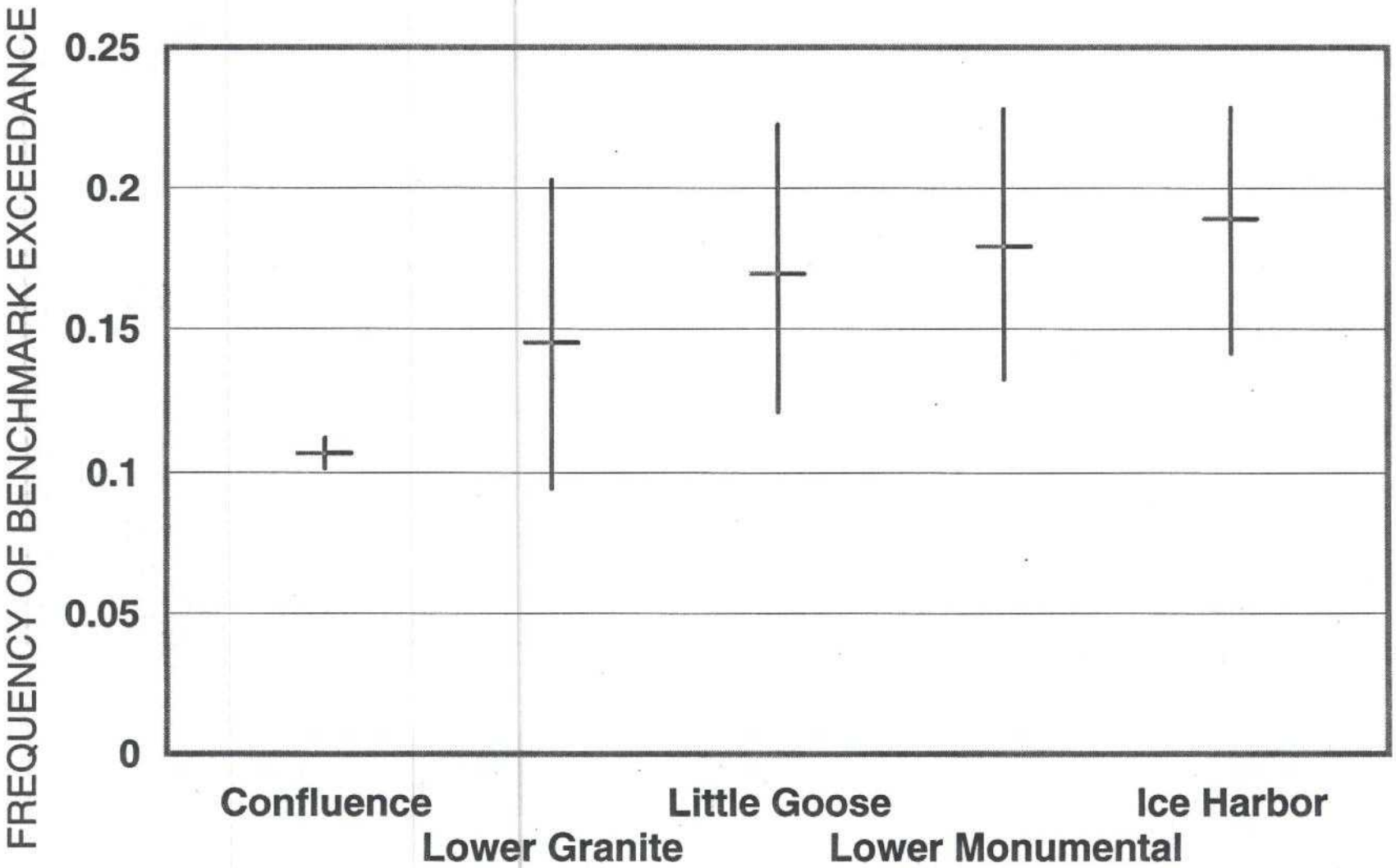
COLUMBIA RIVER
DAMS IN PLACE
BENCHMARK = 20 DEG C.



SNAKE RIVER

DAMS IN PLACE

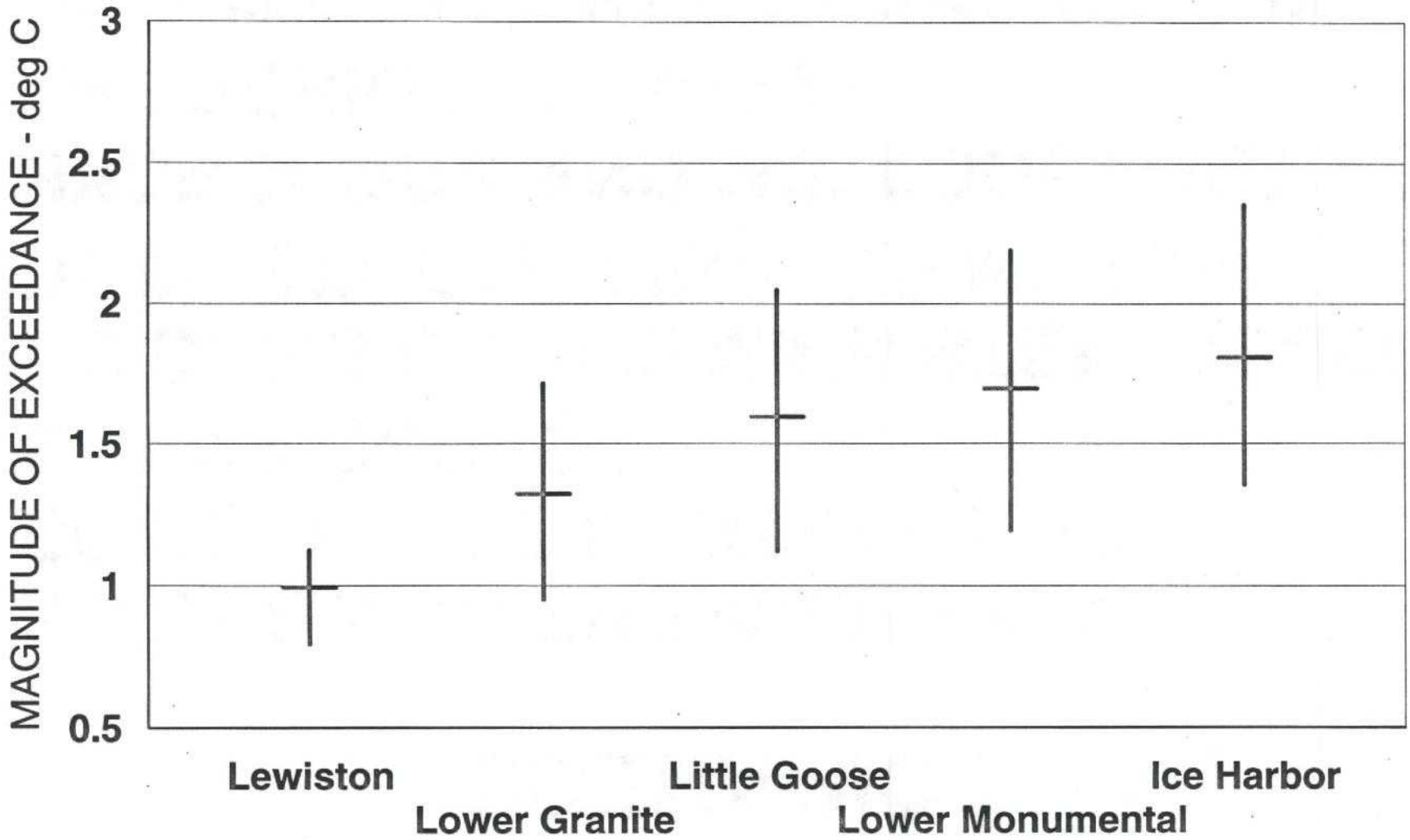
BENCHMARK = 20 DEG C.



SNAKE RIVER

DAMS IN PLACE

BENCHMARK = 20 DEG C.



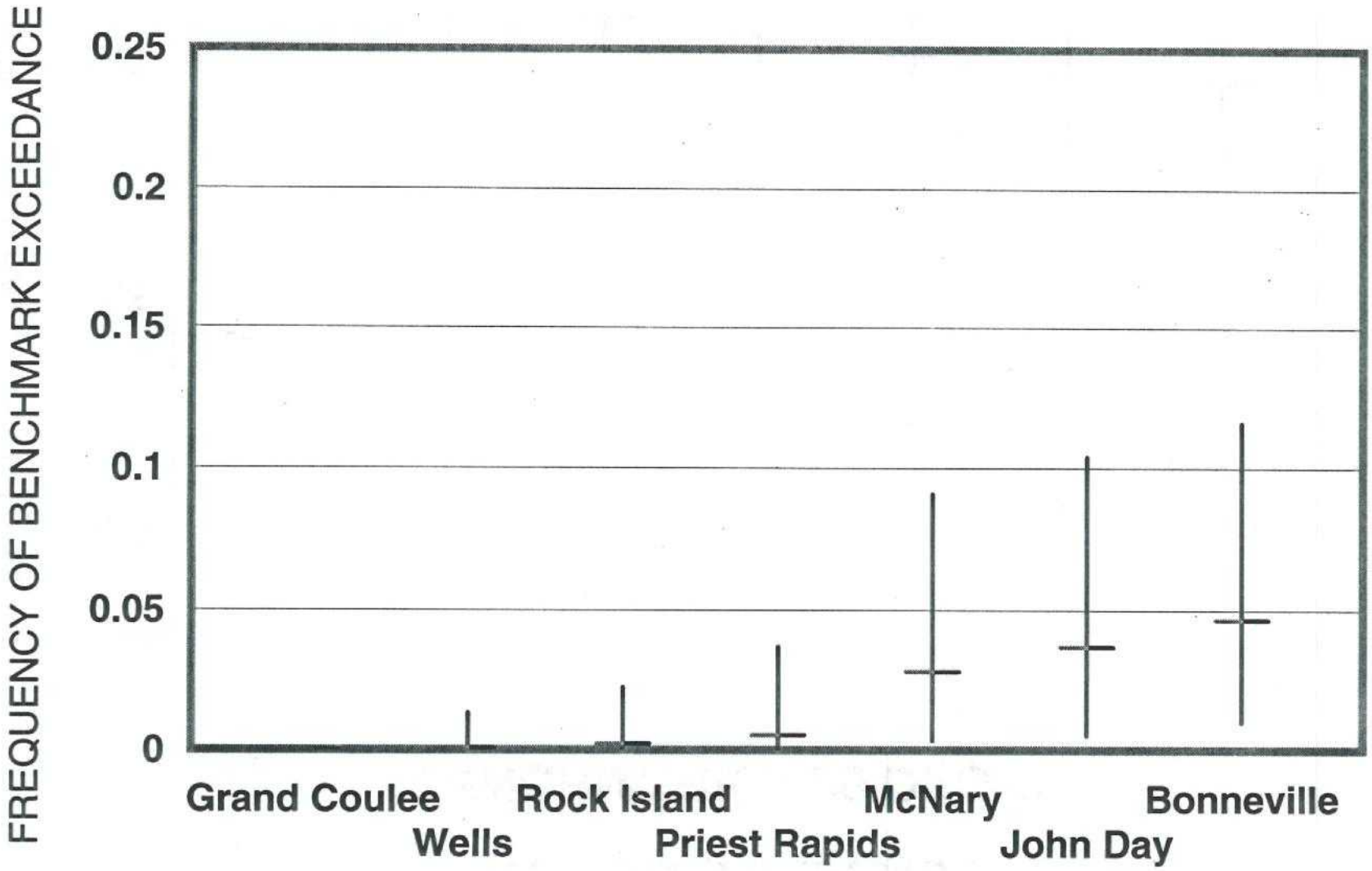
SCENARIO II

- NO DAMS ON THE MAIN STEM COLUMBIA DOWNSTREAM FROM GRAND COULEE
- NO DAMS ON THE MAIN STEM SNAKE DOWNSTREAM FROM LEWISTON
- HYDROLOGY AND METEOROLOGY FOR THE PERIOD 1975-1995
- TRIBUTARY TEMPERATURES FROM NONLINEAR REGRESSION

COLUMBIA RIVER

NO DAMS IN PLACE

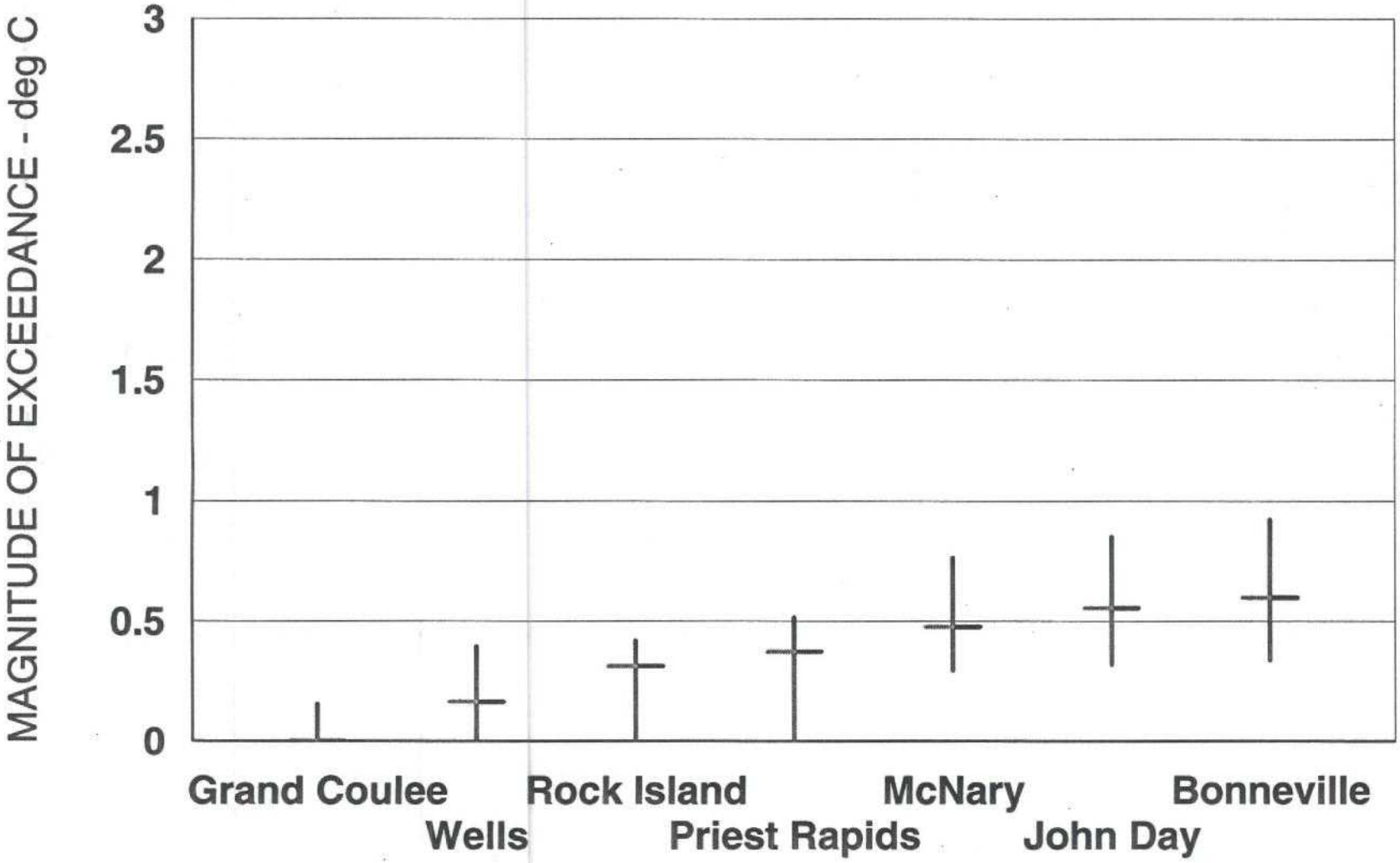
BENCHMARK = 20 DEG C.



COLUMBIA RIVER

NO DAMS IN PLACE

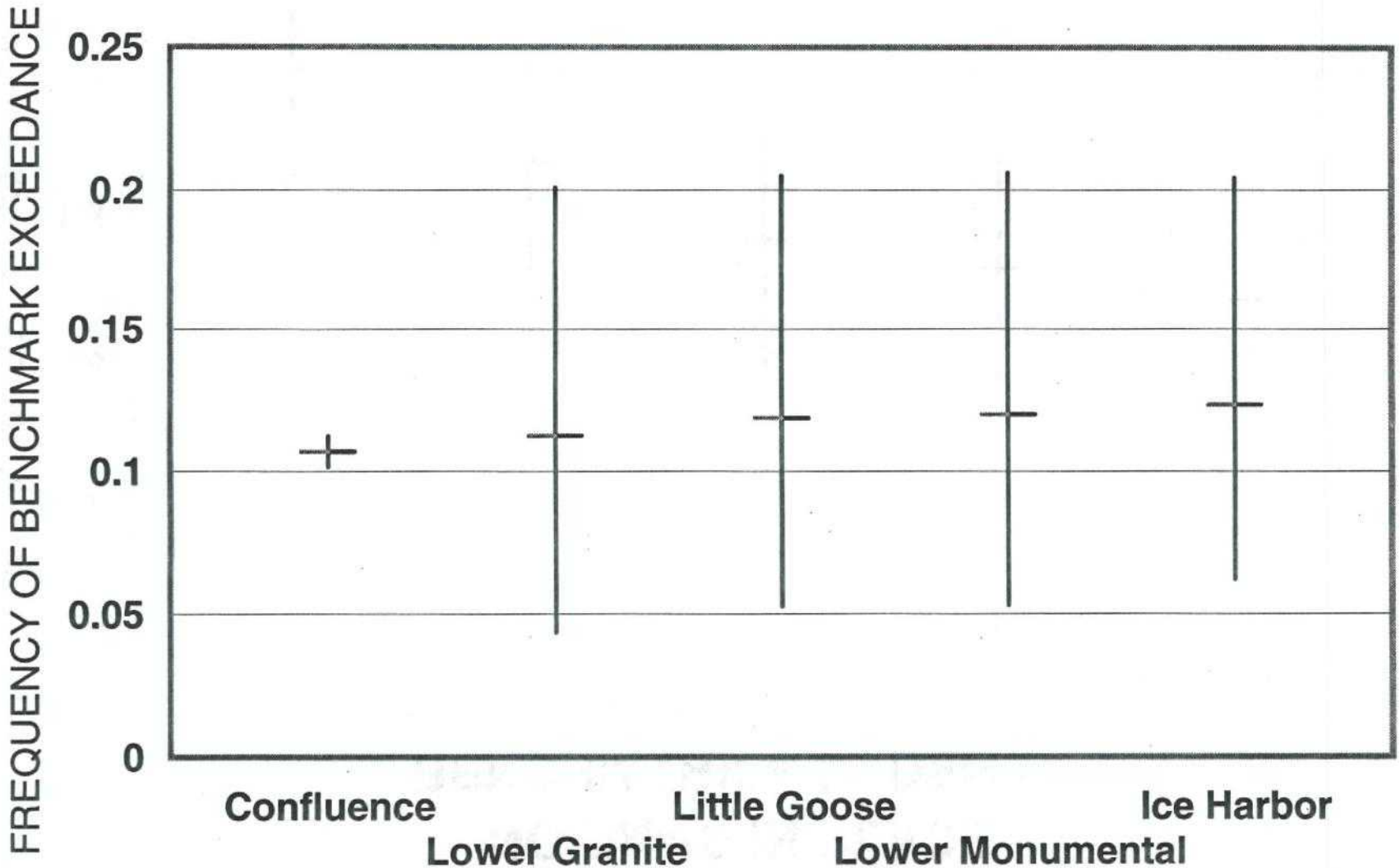
BENCHMARK = 20 DEG C.



SNAKE RIVER

NO DAMS IN PLACE

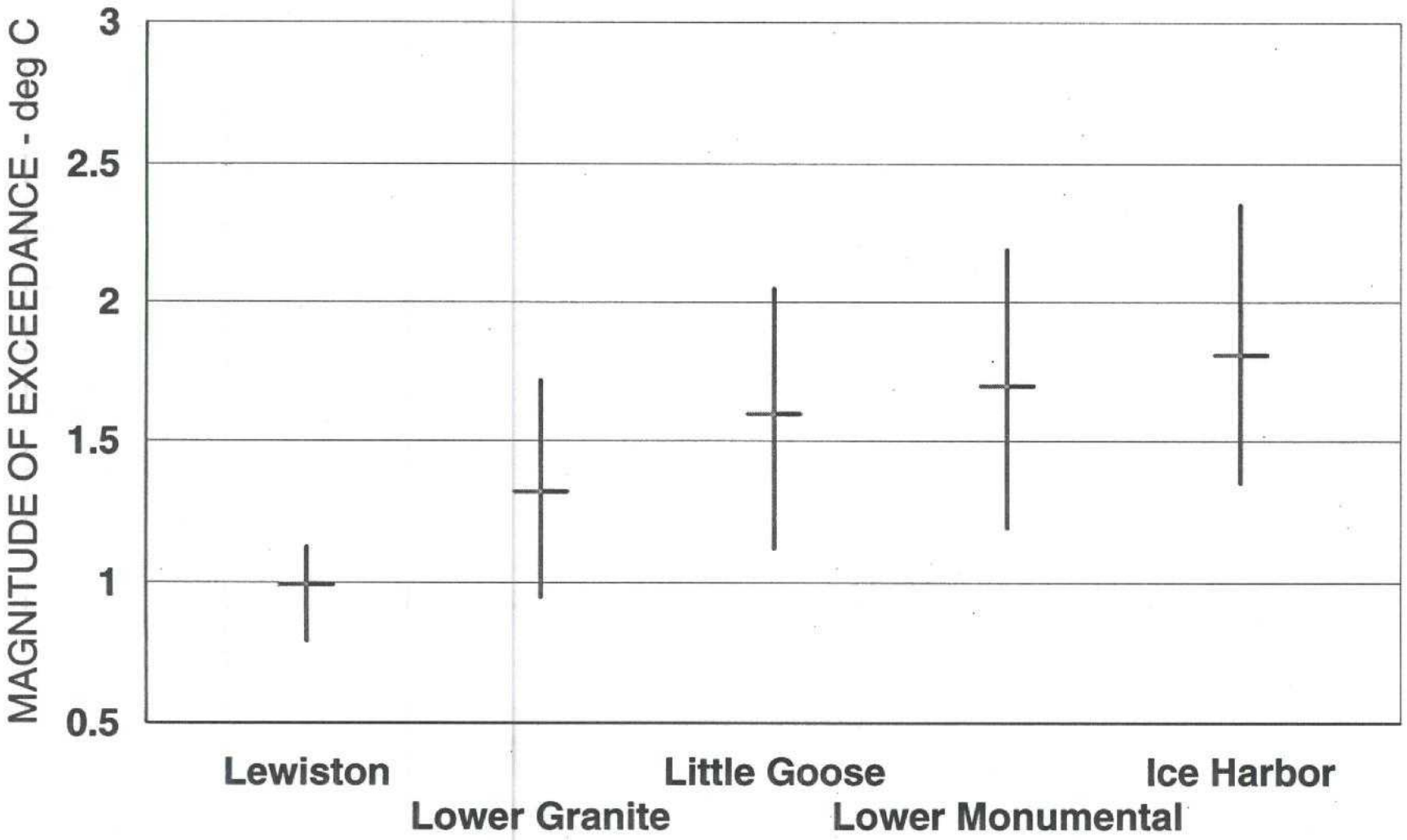
BENCHMARK = 20 DEG C.



SNAKE RIVER

NO DAMS IN PLACE

BENCHMARK = 20 DEG C.



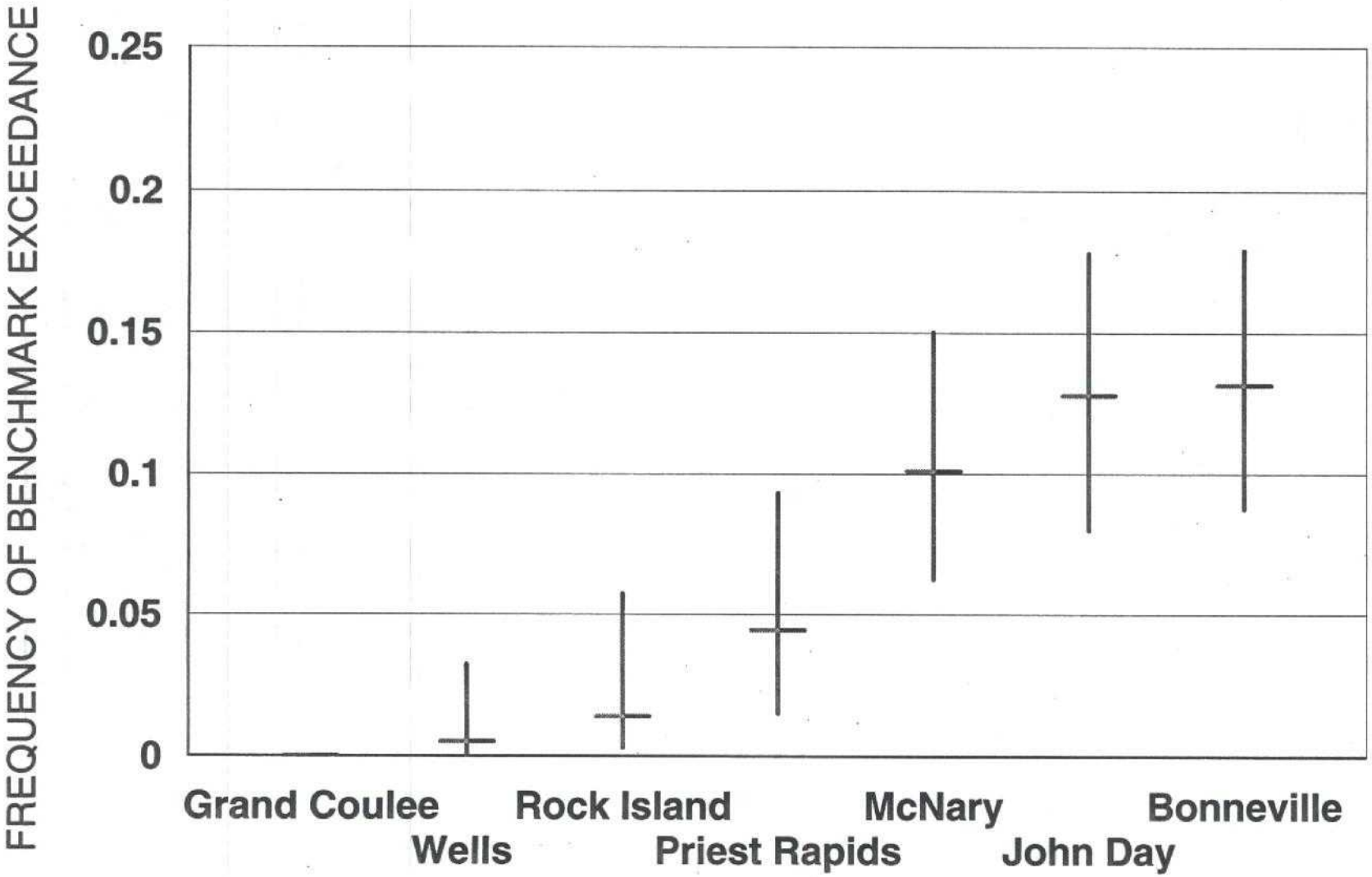
SCENARIO III

- ALL DAMS ON THE MAIN STEM COLUMBIA AND SNAKE RIVERS IN PLACE
- HYDROLOGY AND METEOROLOGY FOR THE PERIOD 1975-1995
- TRIBUTARY TEMPERATURES FROM NONLINEAR REGRESSION BUT LIMITED TO EQUAL TO OR LESS THAN 16 DEG C.

COLUMBIA RIVER

DAMS IN PLACE - TRIBUTARIES < 16 DEG C.

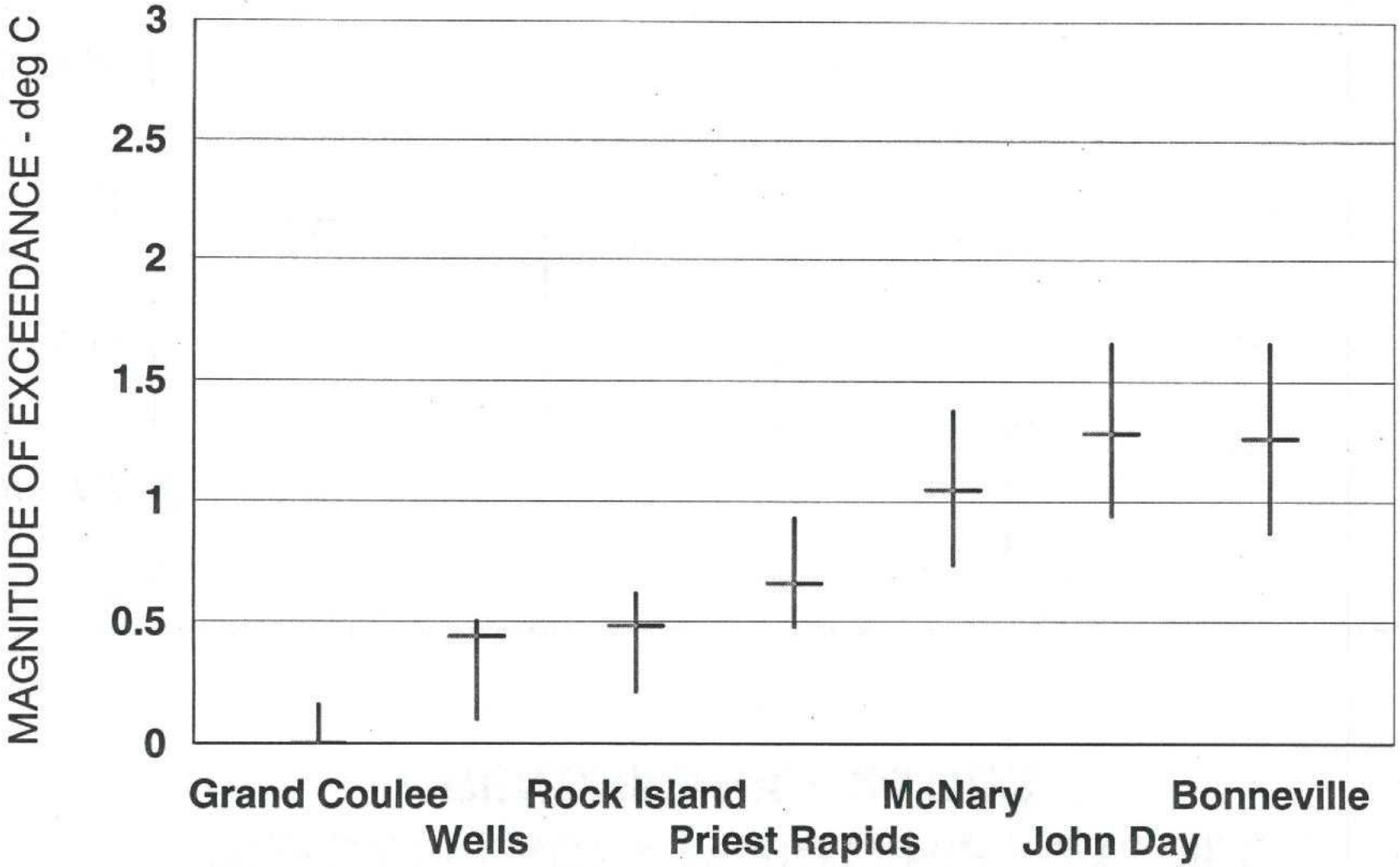
BENCHMARK = 20 DEG C.



COLUMBIA RIVER

DAMS IN PLACE - TRIBUTARIES < 16 deg C

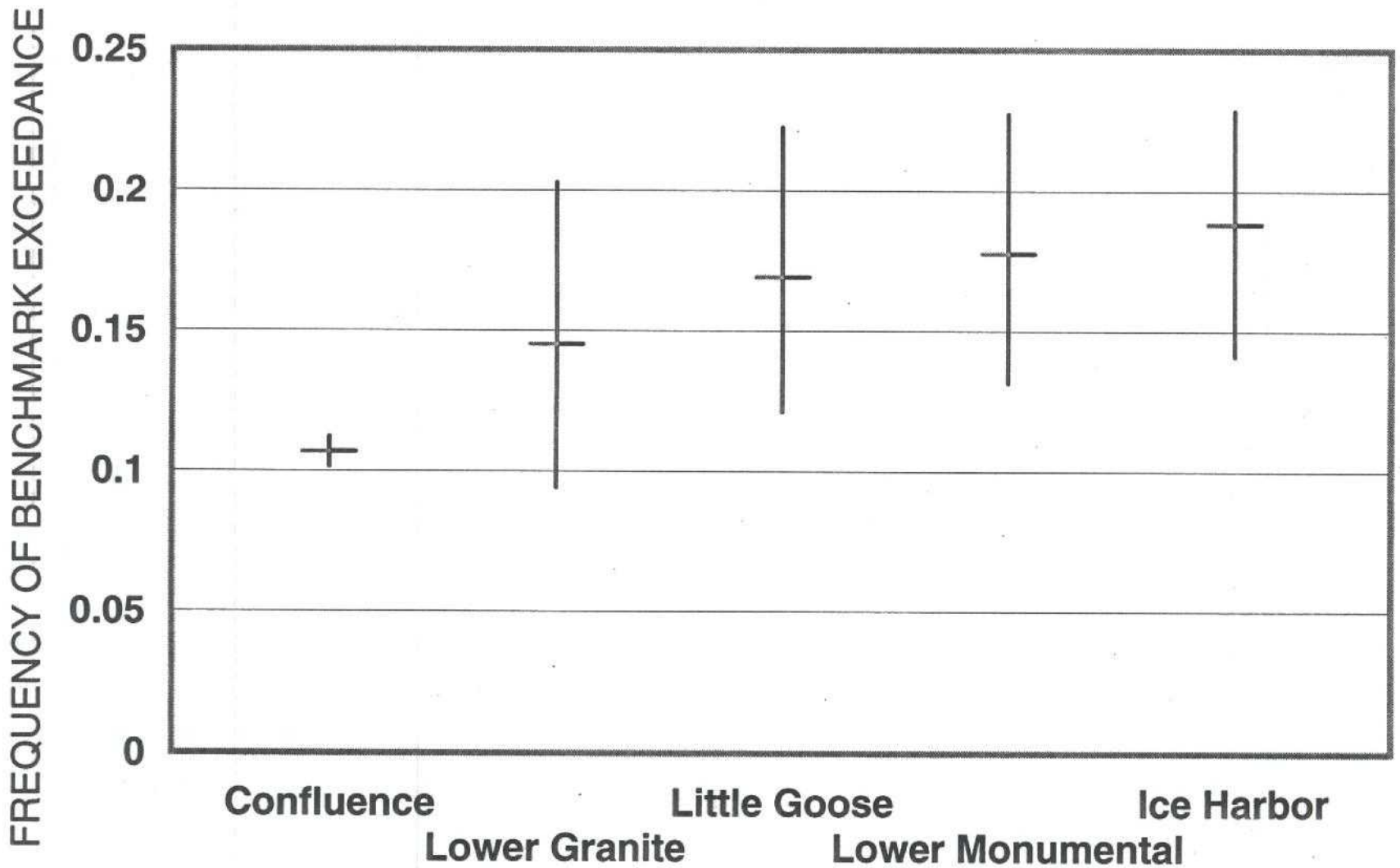
BENCHMARK = 20 DEG C.



SNAKE RIVER

DAMS IN PLACE - TRIBUTARIES < 16 DEG C.

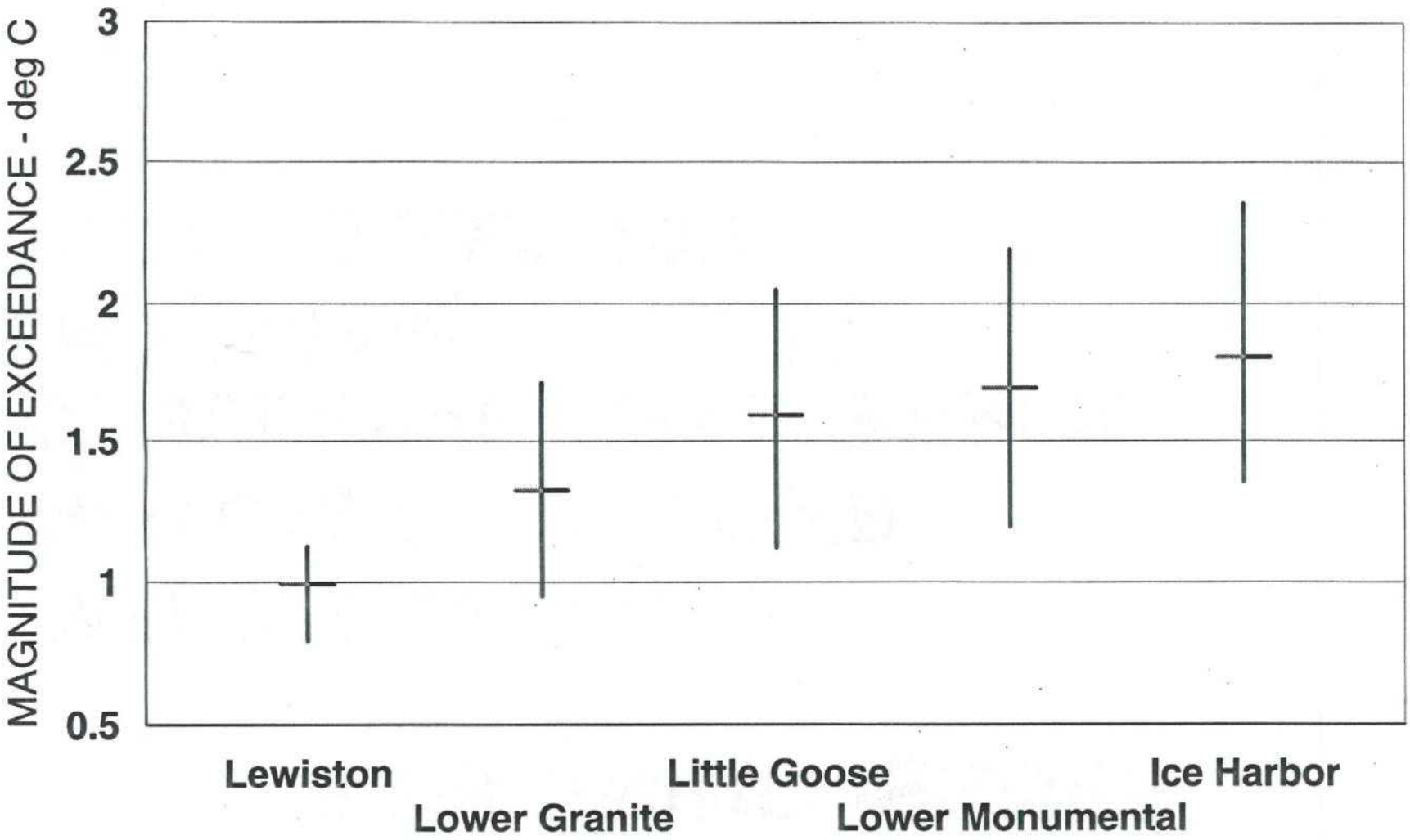
BENCHMARK = 20 DEG C.



SNAKE RIVER

DAMS IN PLACE - TRIBUTARIES < deg C

BENCHMARK = 20 DEG C.



REMAINING ISSUES

- IMPACTS OF FLOW
- IMPACTS OF WEATHER
- CUMULATIVE IMPACTS FROM UPSTREAM
- DATA COLLECTION