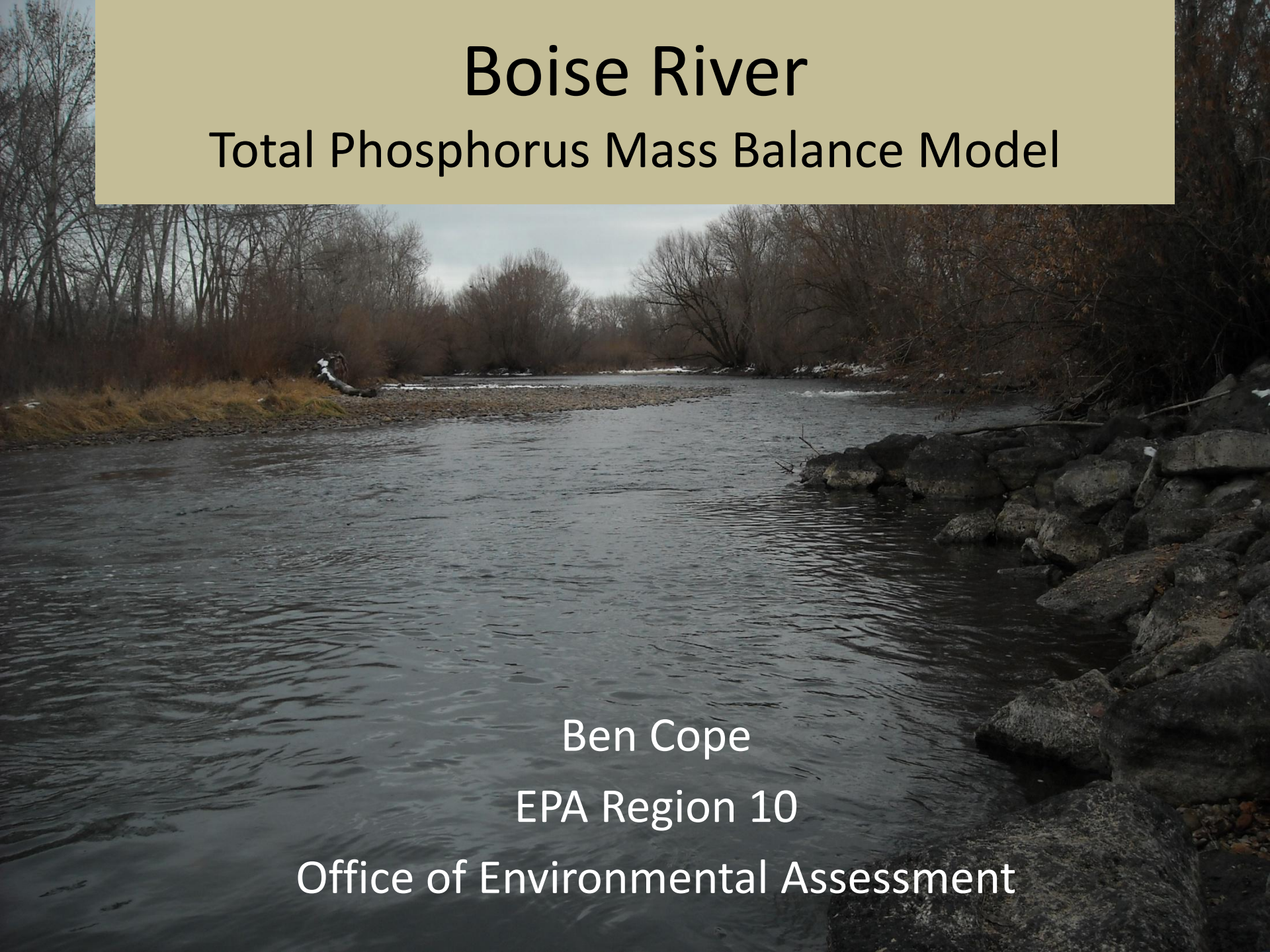
Boise River

Total Phosphorus Mass Balance Model



Ben Cope

EPA Region 10

Office of Environmental Assessment

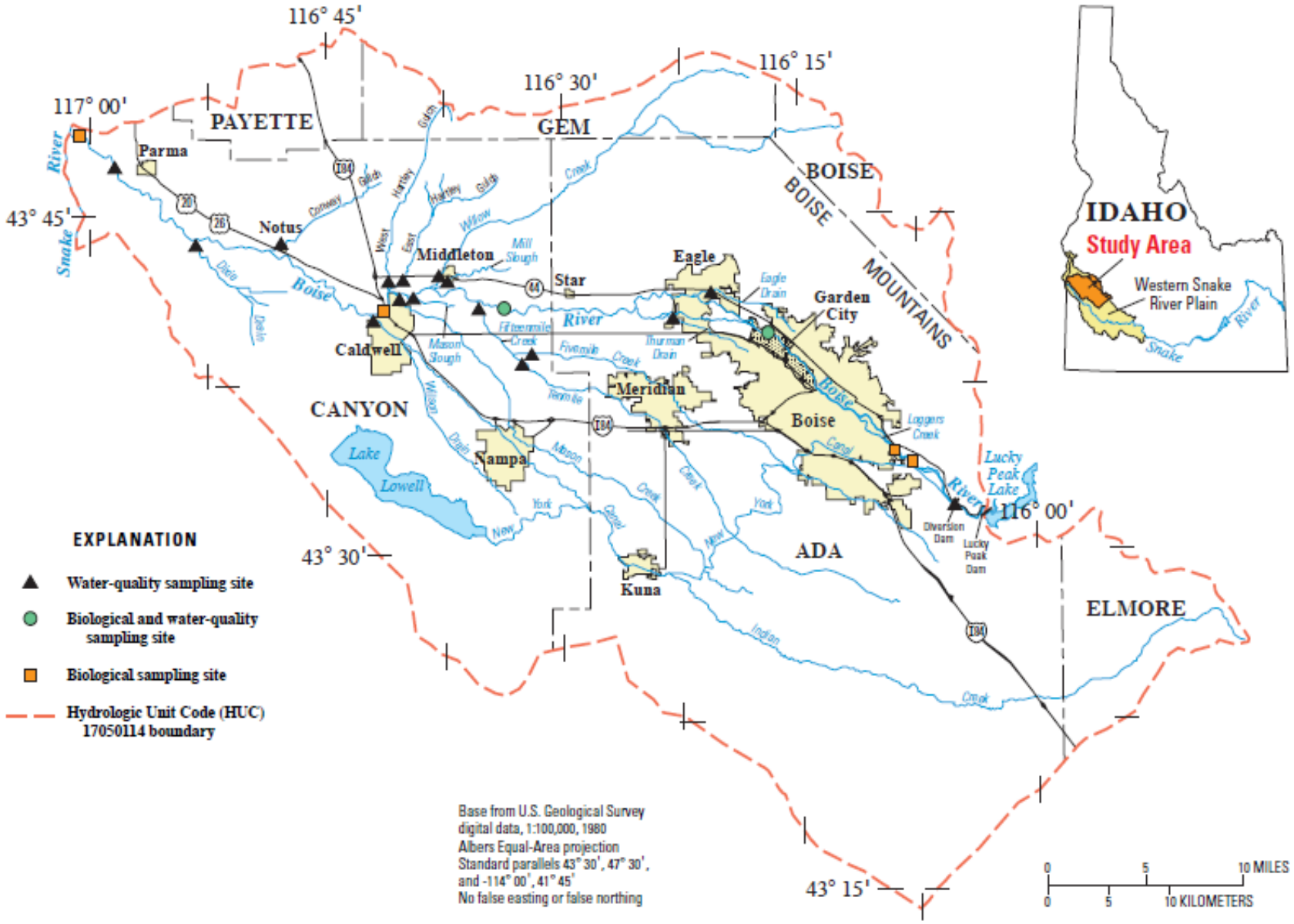
- Impetus: City of Boise Offset Project

- Adapted from earlier CH2M Hill model
  - Excel spreadsheet…simple
  - Removed TMDL allocation calculators
  - IDEQ review of data-to-model accuracy

- Mainstem Boise River only
  - Follows south channel at Eagle Island

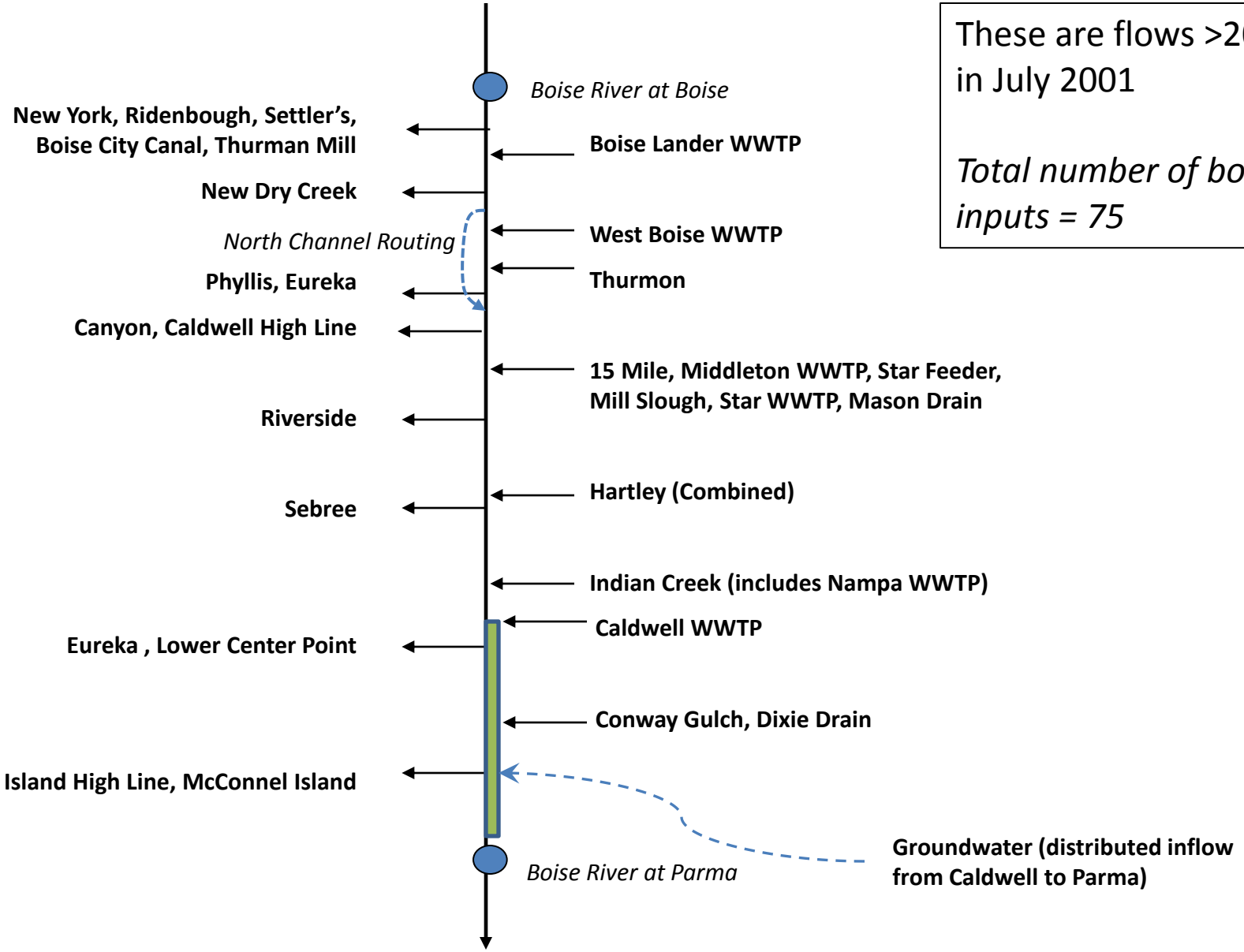
- Mass balance of total phosphorus
  - Assumes no loss due to instream processes
  - Steady state – snapshot in time

- Two periods analyzed
  - July 2001 – low flow (approx. 30Q10)
  - August 2000 – higher, more typical summer flow



116° 45'
116° 30'
116° 15'
117° 00'
43° 45'
43° 30'
43° 15'
116° 00'
PAYETTE
GEM
BOISE
BOISE MOUNTAINS
CANYON
ADA
ELMORE
Parma
Notus
Middleton
Star
Eagle
Garden City
Caldwell
Meridian
Boise
Nampa
Kuna
Snake River
Boise River
Lake Lowell
Lucky Peak Lake
Diversion Dam
Lucky Peak Dam
Mill Slough
Mason Slough
Fifteenmile Creek
Thurman Drain
Eagle Drain
Loggers Creek
Indian Creek
IDAHO
Study Area
Western Snake River Plain
EXPLANATION
Water-quality sampling site
Biological and water-quality sampling site
Biological sampling site
Hydrologic Unit Code (HUC) 17050114 boundary
Base from U.S. Geological Survey digital data, 1:100,000, 1980
Albers Equal-Area projection
Standard parallels 43° 30', 47° 30', and -114° 00', 41° 45'
No false easting or false northing
0 5 10 MILES
0 5 10 KILOMETERS

Mainstem Inflows and Diversions



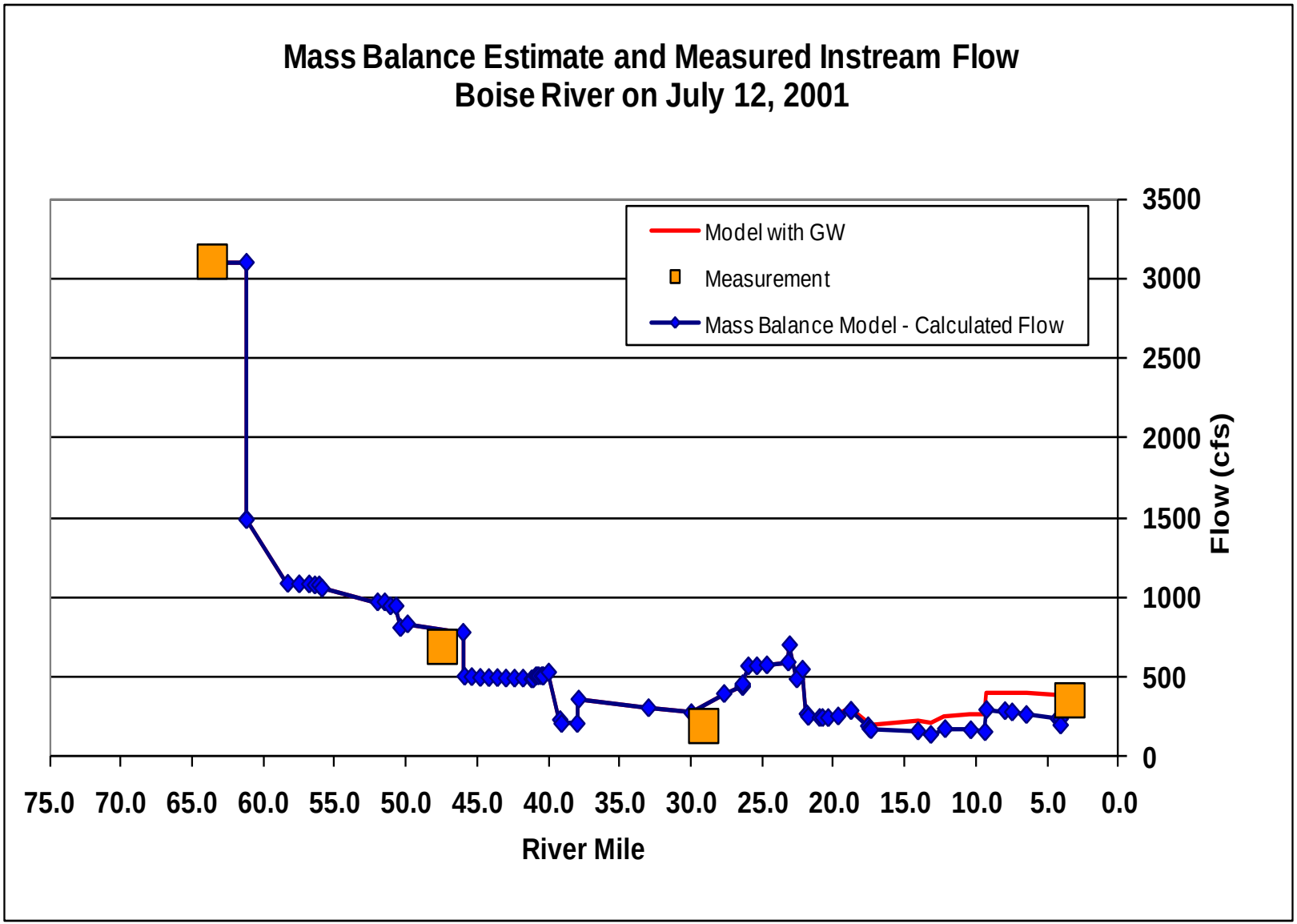
These are flows >20 cfs in July 2001

Total number of boundary inputs = 75

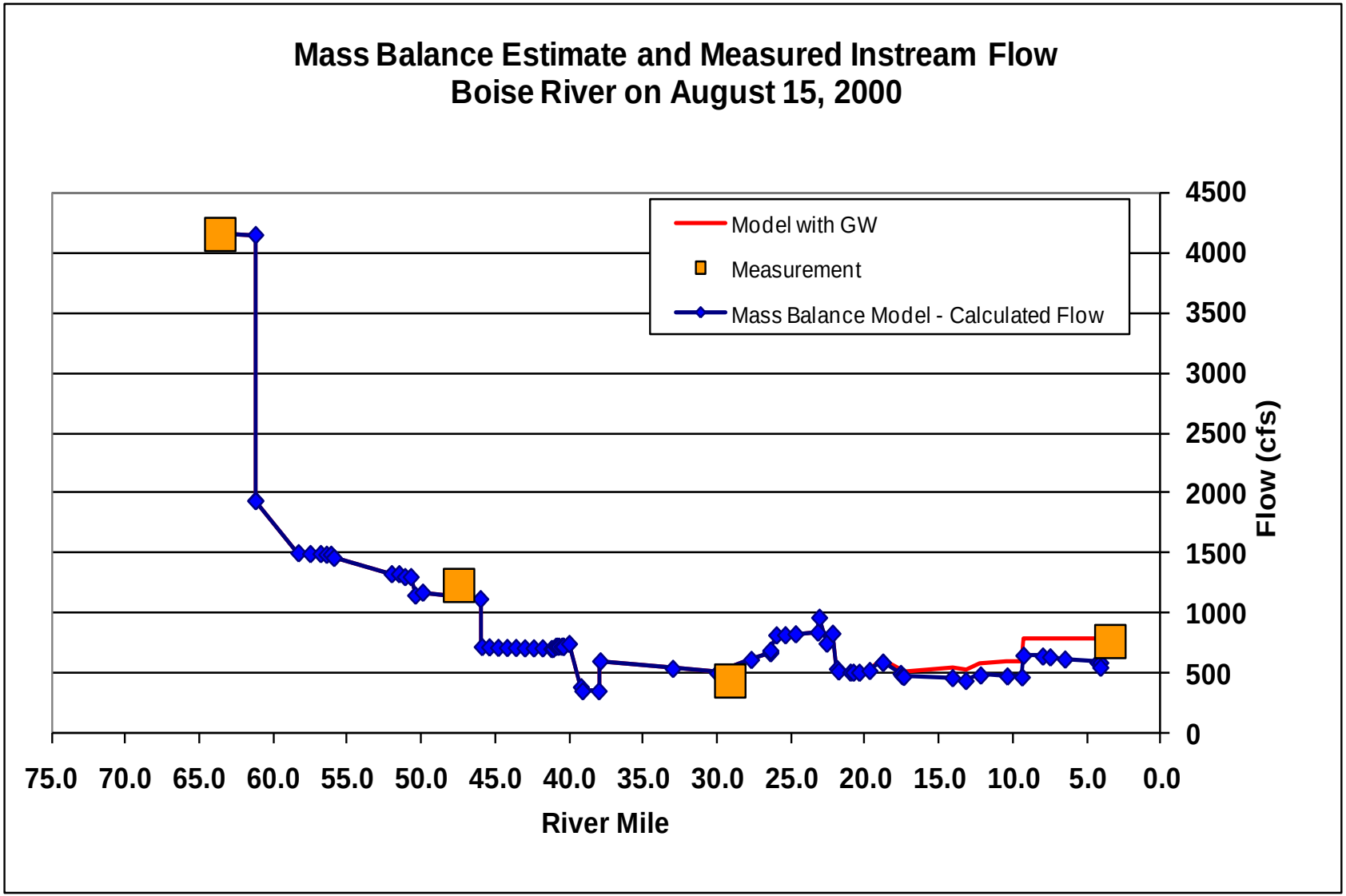
Development Process

- Selection of time frames
- Input data review (with IDEQ)
- Flow evaluation
- Total Phosphorus evaluation
- Model application/scenarios
- Documentation

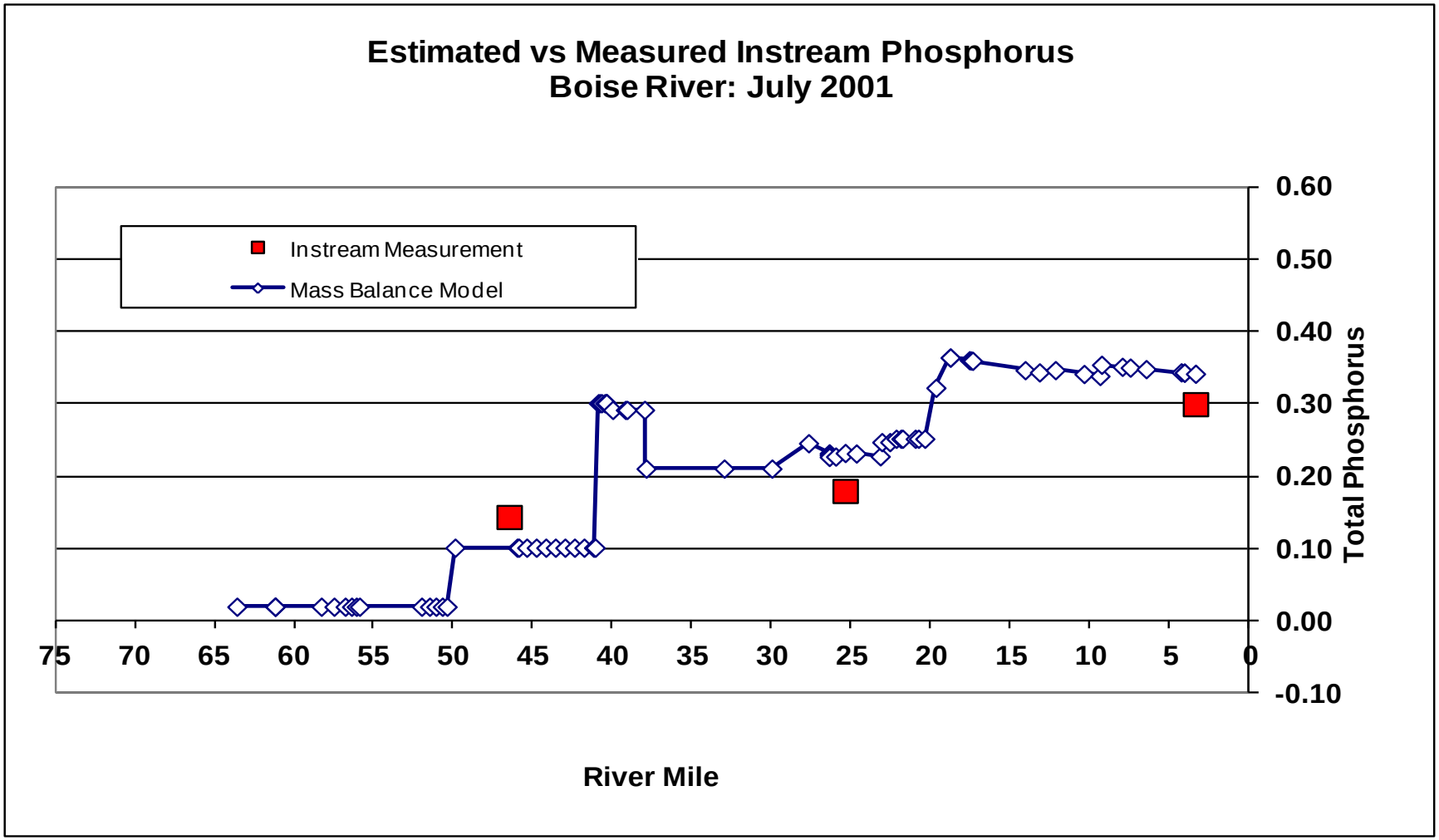
Mainstem Flow – July 2001



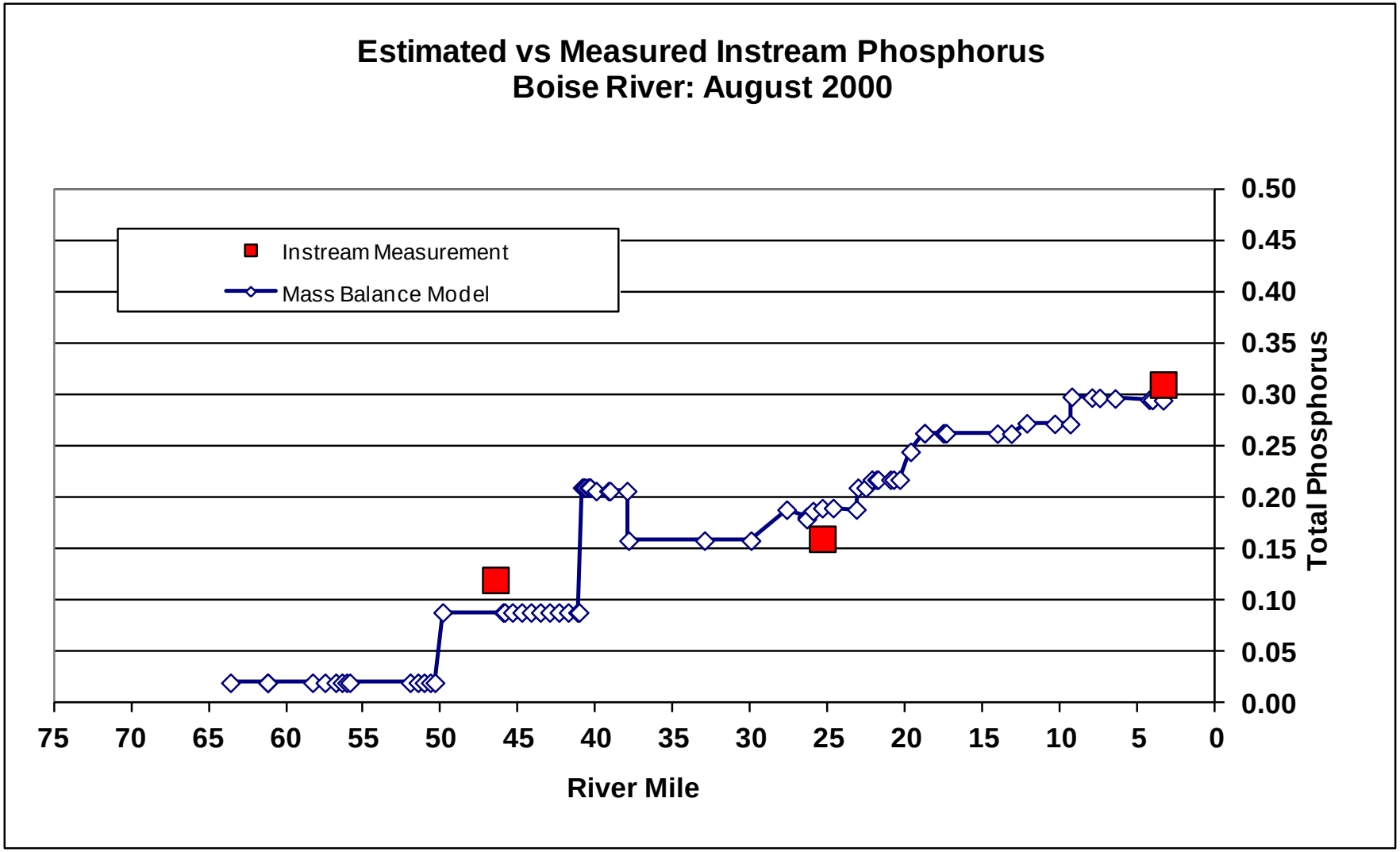
Mainstem Flow – August 2000



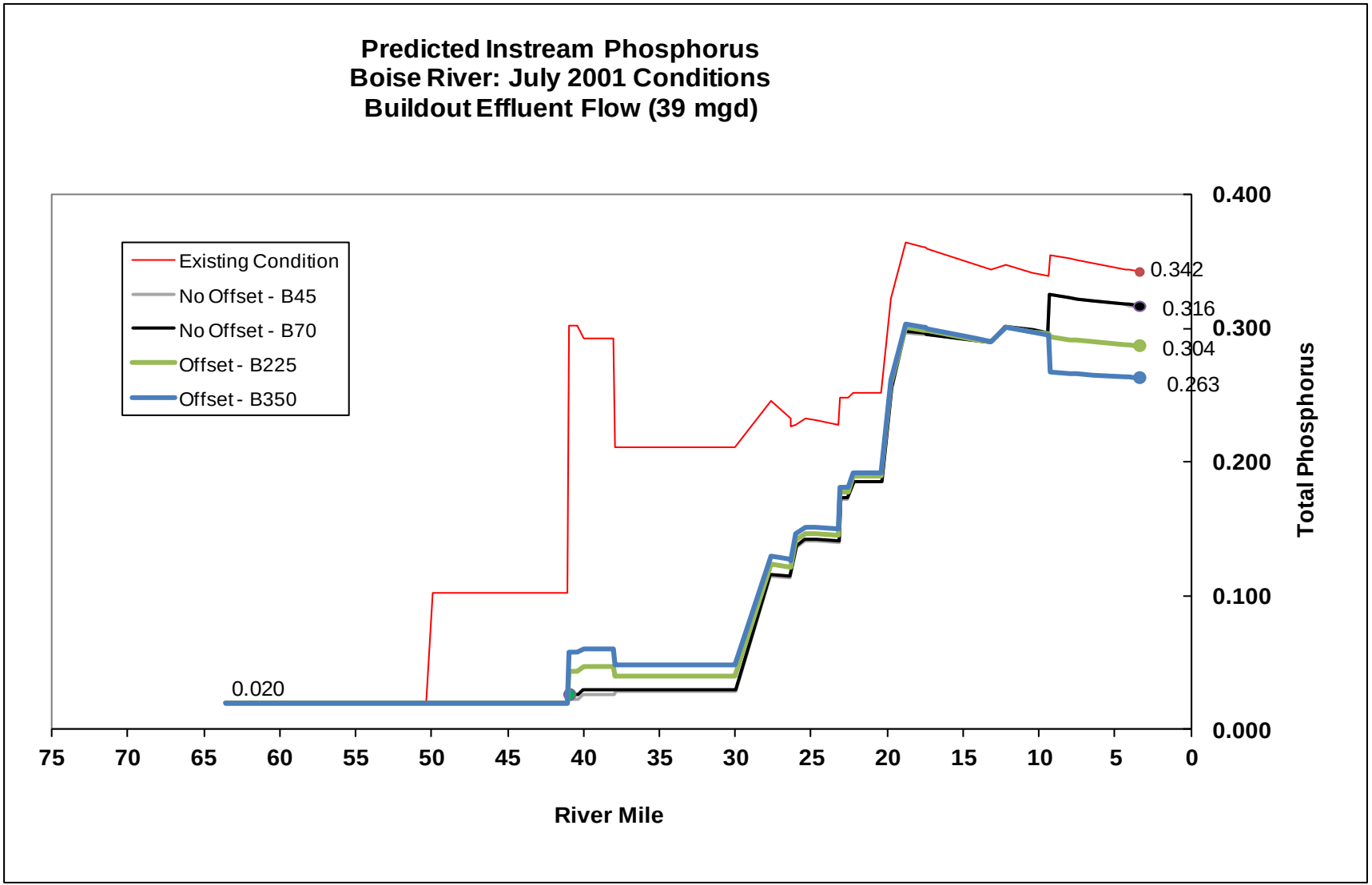
Total Phosphorus – July 2001



Total Phosphorus – August 2000



Application
City of Boise Offset Scenarios



Key Assumptions/Uncertainties

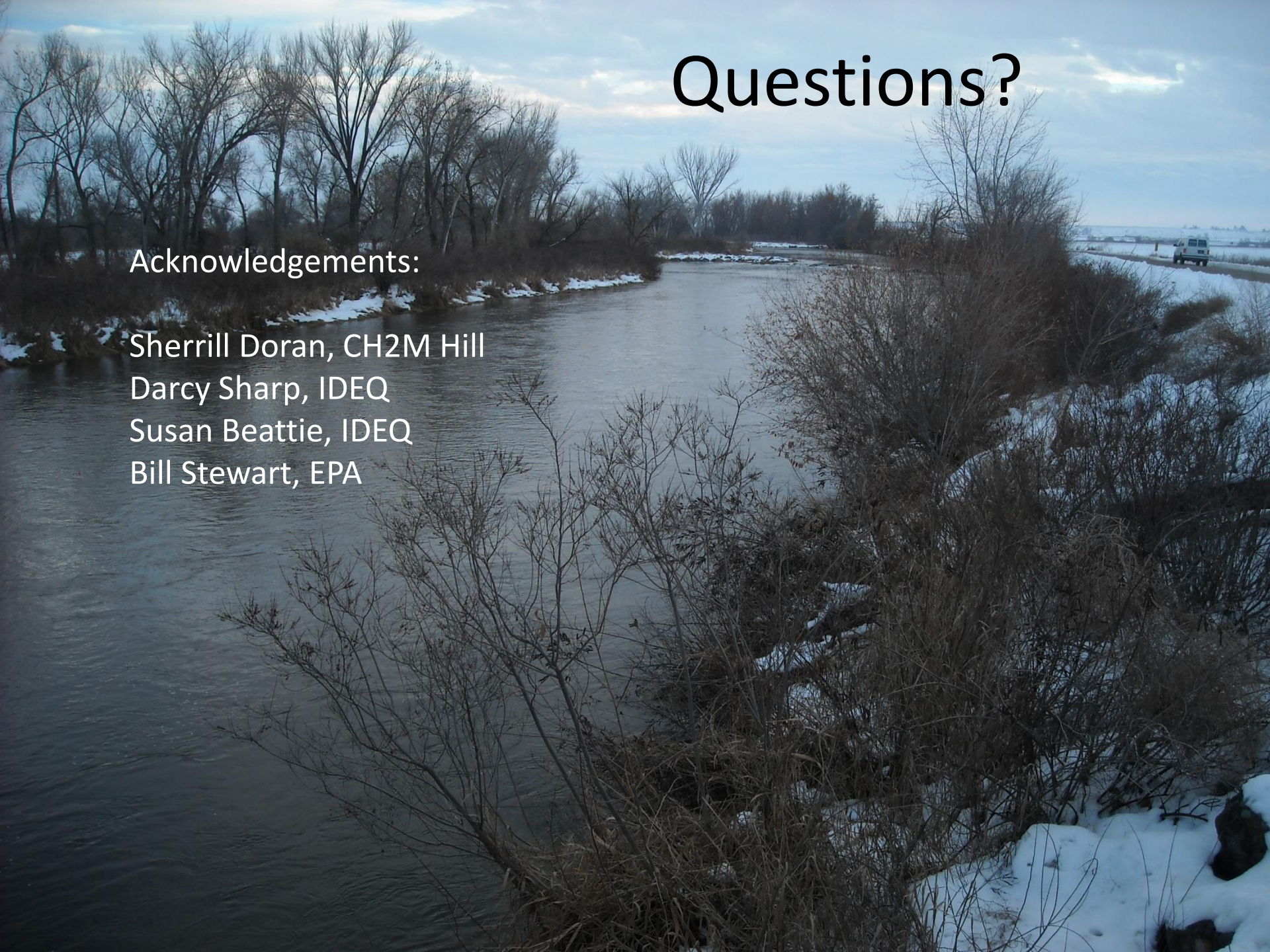
- Groundwater flow and TP concentration
  - Uniform flow in lower reach
  - Concentration set at mean drain concentration
    - Consistent with USGS sampling mean but limited samples
- Drain TP data is “patchy”
  - Synoptic sampling by USGS will help ground truth
- Offset assumption: TP removed from mainstem by diversions does not return to mainstem
  - How much comes back to mainstem: unknown
  - Thorny problem in past TMDL efforts

Documentation

Predicted Effects of Dixie Drain Project on Phosphorus Concentrations in the Boise River

Dixie Drain, December 2010

March 2012



Questions?

Acknowledgements:

Sherrill Doran, CH2M Hill
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Bill Stewart, EPA