

# ANALYSIS OF HYDROLOGIC REGIMES IN THE BATTEN KILL BASIN

\*Keith H. Nislow USDAFS-NERS Amherst, MA 01003

Frank J. Magilligan Dartmouth College Department of Geography Hanover, NH



## ABSTRACT

Changes in hydrologic regime (the magnitude, timing, and duration of river flow) can negatively affect wild trout populations. We used long-term USGS stream gage data from the Batten Kill and other rivers in the region to determine whether hydrologic regimes have changed over time in the last century, and whether these changes have been coincident with brown trout decline in the Batten Kill basin. We found no evidence of long-term change in the timing, duration or magnitude of flows in the Batten Kill basin. It therefore appears unlikely that changes in hydrologic regime are a major factor in brown trout decline in the basin.

## METHODS

- Analysis of stream flow data
- Indicators of Hydrologic Alteration (IHA) (Richter et al. 1997)
- Test for changes in these indicators over time

### Categories of Hydrologic Indicators

- (1) MAGNITUDE;
- (2) MAGNITUDE AND DURATION OF ANNUAL EXTREME CONDITIONS;
- (3) TIMING OF ANNUAL EXTREME CONDITIONS;
- (4) FREQUENCY AND DURATION OF HIGH AND LOW PULSES; AND
- (5) RATE AND FREQUENCY OF CHANGES IN CONDITIONS.

## BACKGROUND

Hydrologic Regime – the magnitude, timing and duration of river flow

- Closely linked to the life cycle of river fish

Hydrologic Alteration

- Dams and flow regulation
- Land use change
- Climate change

Evidence in New England that hydrologic regimes have changed over the past century

- Earlier ice-out (Huntington et al. 2003)
- Earlier spring floods (Hodgkins et al. 2003)
- Changes in low-flow timing (Magilligan and Nislow 2001)

Batten Kill – no major flow regulation; land use and climate change effects only

## QUESTIONS

Have hydrologic regimes changed over time in the Batten Kill?

Are these changes associated with brown trout decline?

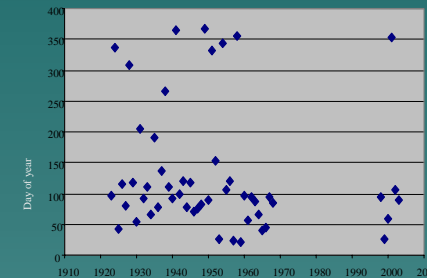
## RESULTS

No significant changes in any hydrologic indicators

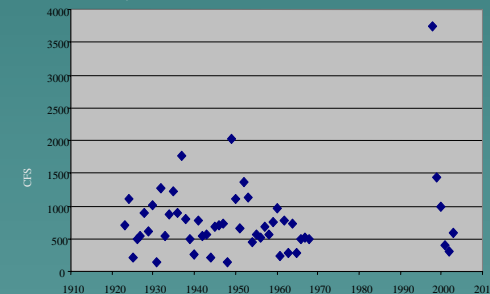
### References

- Hodgkins, G. A., R. W. Dudley, and T. G. Huntington. 2003. Changes in the timing of high river flows in New England over the 20th century. *Journal of Hydrology* 278: 244 - 252.
- Huntington, T. G., G. A. Hodgkins, R. W. Dudley, 2003, Historical trend in river ice thickness and coherence in hydroclimatological trends in Maine. *Climatic Change*, 61:217-236.
- Magilligan, F.J. and K.H. Nislow, 2001, Long-term Changes In Regional Hydrologic Regime Following Impoundment In A Humid-Climatic Watershed, *Journal of the American Water Resources Association*.
- Richter, B. D., J. V. Baumgartner, J. Powell, and D. P. Braun, 1996. A Method for Assessing Hydrologic Alteration Within Ecosystems. *Conservation Biology* 10(4):1163-1174.

Date of Maximum Flow Over Time – Batten Kill at Battenville



January Flows Over Time – Batten Kill at Battenville



## CONCLUSION

It appears unlikely that changes in hydrologic regime are a major factor in brown trout decline in the basin.

### Acknowledgements

- USDA Forest Service
- USGS Water Resources Division
- Batten Kill Technical Work Group