FISH GROWTH POTENTIAL AS AFFECTED BY WATER TEMPERATURE: LINKAGES TO ENVIRONMENTAL CONDITIONS AT MULTIPLE SPATIAL SCALES.

J.V. Mead¹,², F.N. Scatena², R.J. Horwitz¹, Y. Pan³, and R. Birdsey³

INTRODUCTION

Water temperature is a fundamental water quality parameter that influences a range of chemical and biological processes. While strong relationships between air- and water temperatures exist, the relations are complex, non-linear, and influenced by a range of climatic and riparian conditions. Nevertheless, being able to predict the spatial and temporal distribution of water temperature is needed to assess water management and climate scenarios.

This study assessed the past, present, and future influence of riparian- and watershed- scale variables, climate, and water level regulation on water temperature for all 36,306 km of stream channel in the Delaware River Basin. We then use our temperature model to examine the effects of environmental conditions on fish growth potential.

OBJECTIVES

- Relate watershed- and reach- scale factors to water temperature
- Predict water temperature under different land-use/management scenarios (Climate change with low quantity of greenhouse gases over 65 years (Climate); Reforest riparian zones in non-urban land (BMP); Reforest all riparian zones (Reforest))
- Determine the effect of scenarios on fish growth potential

METHODS

Models of average daily stream water temperature were derived from environmental variables and water temperatures measurements at 101 sites within the basin. Multiple linear regression, multiple non-linear regressions, and Akaike information criterion were used to select the final models. These models were then used to estimate average daily water temperature for 323,014 individual 120 meter long reaches within the basin under various land use and climate scenarios. Changes in the growth potential of six species were then estimated for each reach using published bioenergetic models under various water temperatures scenarios.

RESULTS

![Graph showing factors affecting water temperature in small streams](Image)

![Graph showing factors affecting water temperature in large streams](Image)

![Graph showing changes in growth potential](Image)

![Graph showing air temperature and climate change](Image)

KEY FINDINGS

- Reforestation could counteract only ~33% of changes driven by climate change
- Water temperature and fish GP were most negatively affected by climate change in small to moderate sized Coastal/Piedmont streams
- Climate change had lowest positive affect on GP of warm water species in the Piedmont
- Reinfusion of cool water into warmer water bodies could have the potential to increase fish growth potential

FUTURE STUDIES

- Add influences of ground water
- Develop web-based tool for management that serves results

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