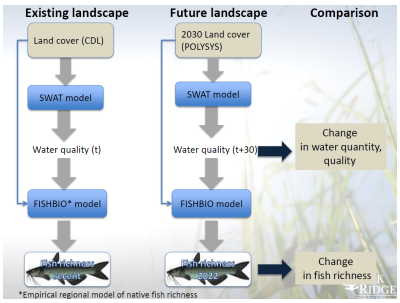
OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY
FACT SHEET

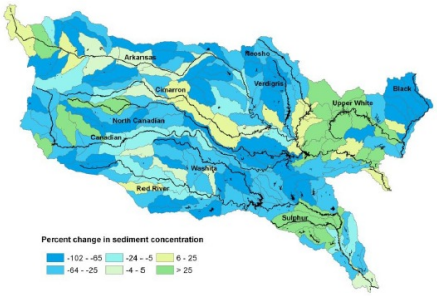
Future Bioenergy Landscapes influence Water Quality and Biodiversity

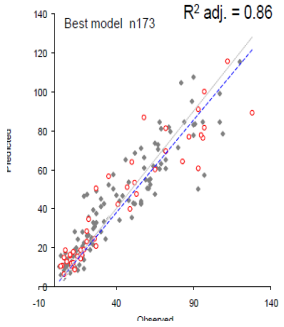
The future of the bioenergy industry depends on allaying concerns about adverse environmental impacts. Public trust can best be earned by discovering and implementing bioenergy standards that promote the long-term economic viability of bioenergy feedstock production while protecting biodiversity. We are developing science-based models to quantify projected changes in aquatic biodiversity in response to conversion of agricultural lands to grow dedicated bioenergy crops and to harvest residues.

Modeling water quality at a regional scale

The ecological health of rivers is an integrated measure of the landscapes that they drain. Our modeling efforts start with watershed modeling at a regional, river-basin scale (left). We used an economic model (POLYSYS) to project crop changes under different assumptions about energy crop prices and future yield. The SWAT model estimated historical and future water quality at the scale of USGS 8-digit hydrologic units.







Modeling change in aquatic biodiversity

We developed empirical models of fish richness based on historical land cover and SWAT-estimated loadings of water, nutrients and sediment. We used path analysis to explore direct and indirect causal linkages between fish diversity and land-use change. Preliminary results for the Arkansas-White-Red river basin suggest improved average water quality (middle) and fish richness (right), but with regional variation.

Our long-term goal is to bring ecological values into the equations used to make spatial decisions guiding the biofuel industry, such as where to site biorefineries and where to grow which crops. To advance this goal, we developed a spatial ecological valuation model to quantify benefits to fish richness.

Together, these methods will identify places where bioenergy can be produced using suitable crops or residues that enhance or protect water quality and aquatic biodiversity.

Point of Contact:
Henriette Jager, Oak Ridge National Laboratory, Oak Ridge, TN 37831-6036, jagerhi@ornl.gov