Kentucky Green River Conservation Reserve Enhancement Program

Annual Program Accomplishment Report (CEP-68R)

FFY 2010

November 22, 2010

I. Executive Summary

The Green River is the most biologically diverse and rich branch of the Ohio River system. The greatest aquatic diversity occurs in a 100-mile section of unhindered river that flows from the Green River Reservoir Dam through Mammoth Cave National Park (the world's longest and most diverse cave system) in south central Kentucky. This section of the Green River Watershed includes 917,197 acres in the counties of Adair, Barren, Edmonson, Green, Hart, Metcalfe, Russell, and Taylor. Data indicate that agricultural runoff contributes high levels of sediment, nutrients, pesticides, and pathogens to the Green River and Mammoth Cave Systems. There are currently seven species listed as endangered by the U.S. Fish and Wildlife Service in the Green River System. In addition, the project area also includes several ecosystems recognized as Endangered Ecosystems of the United States, including native prairies, hardwood savannahs, canebrakes, and old-growth deciduous forest.

On August 29, 2001, the U.S. Department of Agriculture (USDA) and the Commonwealth of Kentucky agreed to implement a Conservation Reserve Enhancement Program (CREP) on the section of the Green River referenced above to restore up to 100,000 acres. The Kentucky Chapter of The Nature Conservancy (TNC) is one contributor, offering permanent easements to landowners in addition to CREP contracts and offering public relations and BMP implementation assistance. The Kentucky Department of Fish and Wildlife Resources (KDFWR) is a contributor, offering wildlife biologists and cost-shared positions with the Natural Resources Conservation Service (NRCS) to assist landowners and promote the program to enhance participation in CREP. The Kentucky Division of Conservation (KDOC) was designated as the state administrative contact agency for Green River CREP and distributes state cost share and incentive payments to landowners. Western Kentucky University (WKU) implements the water quality and biological monitoring for the program. Mammoth Cave National Park is also involved in the monitoring of the Green River and groundwater in the karst areas of the Green River CREP.

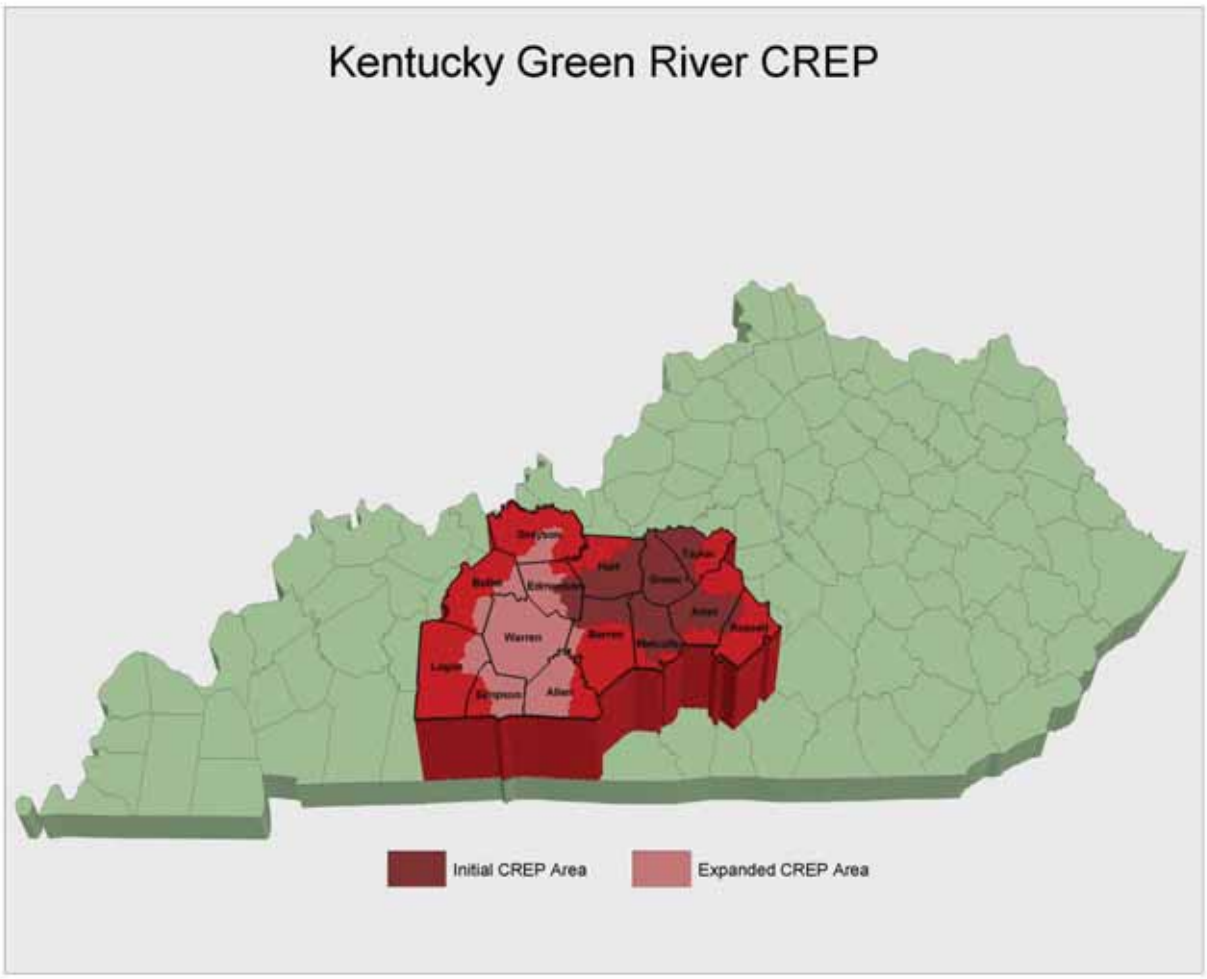
In late 2006, a proposal for an amendment to the Green River CREP was submitted to USDA. This proposal sought to expand the CREP region down river on the Green approximately 30 river miles to include environmentally significant watersheds downstream of the original project area and to utilize the community-based approach of this program to more effectively protect locally unique resources and provide better service to the local landowners.

View of Green River. Photo courtesy of TNC.

The proposed additional area included all or parts of Allen, Barren, Butler, Edmonson, Grayson, Logan, Simpson, and Warren Counties (see map on the following page). This area contains a total of 946,101 acres and includes counties that rank among the Commonwealth's top producers in several agricultural categories. In addition to the geographic expansion, practical changes to the program to more effectively service the local population and to protect unique natural resources were proposed. These proposals included the addition of the CP29-Marginal Pastureland Wildlife Habitat Buffer to effectively buffer sinkholes in the watershed's predominantly pastured sinkhole plain. In addition, expanded buffer widths on these sinkholes (buffered with the CP29) and on third order and larger streams (buffered with the CP22-Riparian Buffer practice) helped to more effectively meet local landscape needs.

After some discussion among USDA and state partner agencies, adjustments were made, and the proposal was accepted. An amendment to the Memorandum of Agreement was drafted, and the amendment became effective on February 6, 2007.

Federal Fiscal Year (FFY) 2010 has been a year that was utilized for installment of the final CREP contracts and work on the monitoring processes. As was documented in the annual report for FFY 2009, final contracting and acreage had been completed at that time. In that report, it was stated that 101,303.4 acres had been enrolled. Through some minor contract modifications/acreage cancellations, that total is now at 100,917.7 acres and 3,134 contracts. The allotted acreage for the Green River CREP has been fulfilled, and no further contracts will be accepted.



Aerial view of Green River Valley. Photo courtesy of TNC.

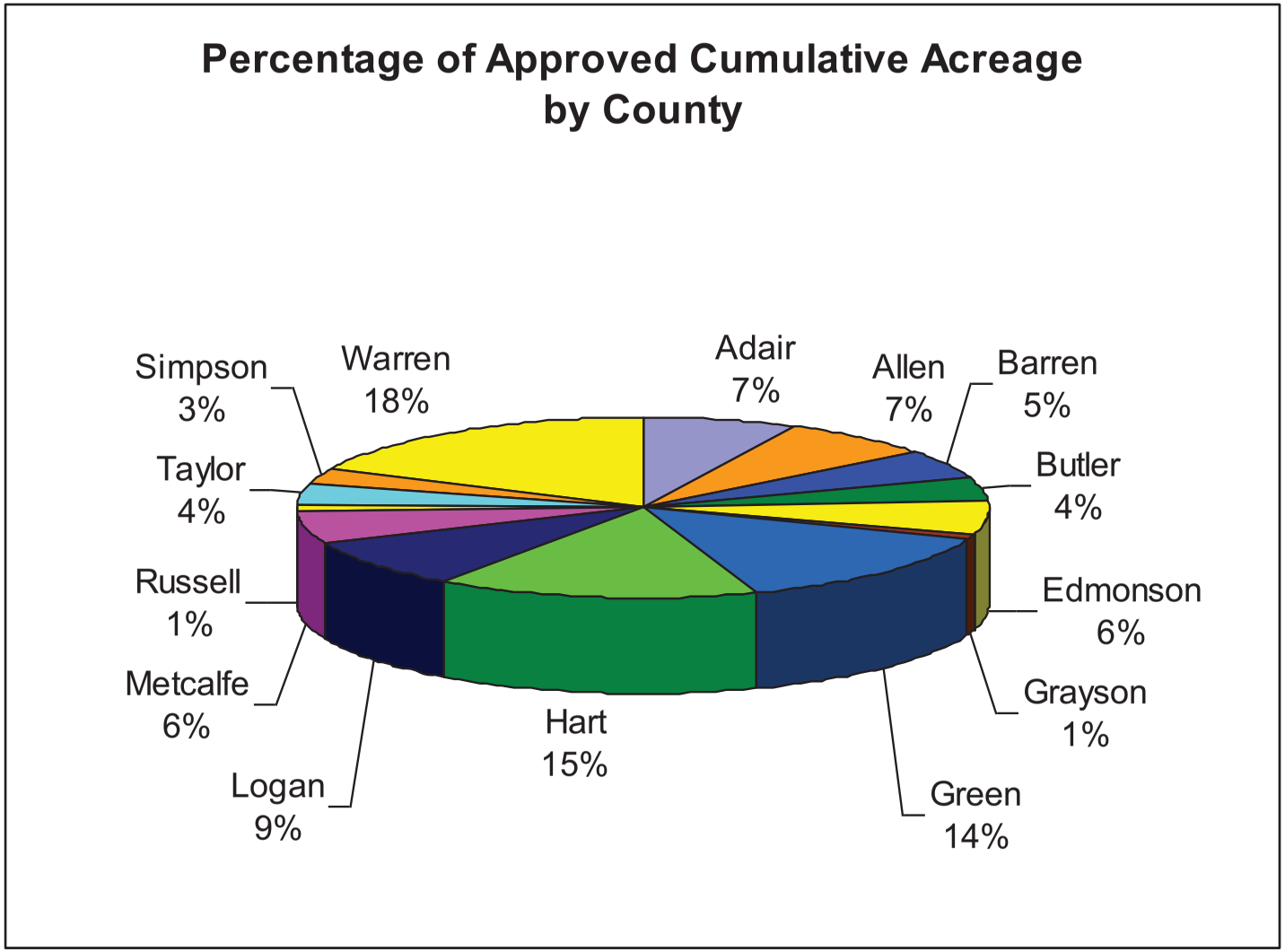
The following pages of this report contain visual aids that reflect program cumulative accomplishments and photographs of the region that represent the progress that has been made. More specific statistical analysis (annual by county and by practice) for all years of the program may be found in the FFY 2009 annual report.

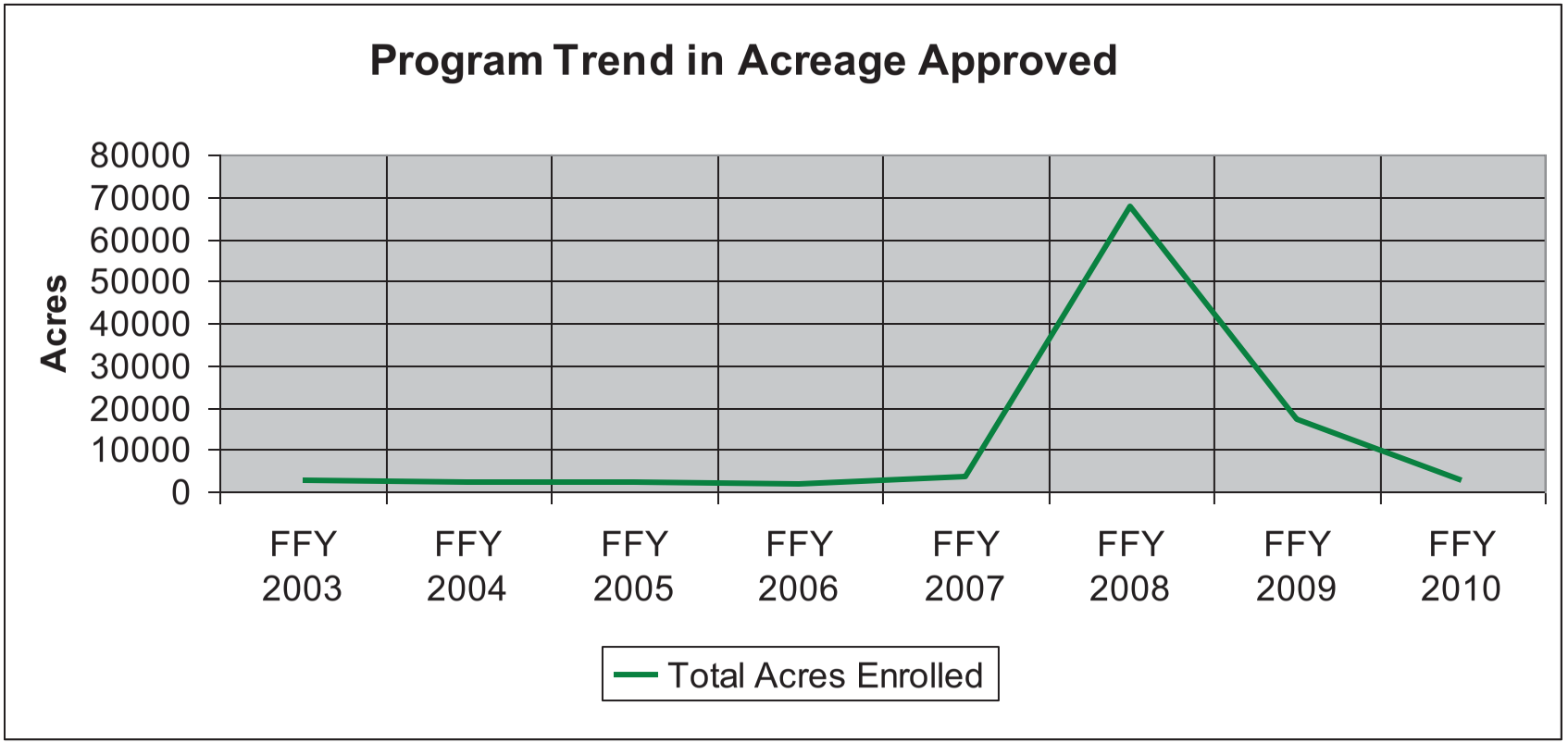
Brush Spring flowing into the Green River. Photo courtesy of TNC.

CREP Amendment Kick-off event in Barren County in August 2007

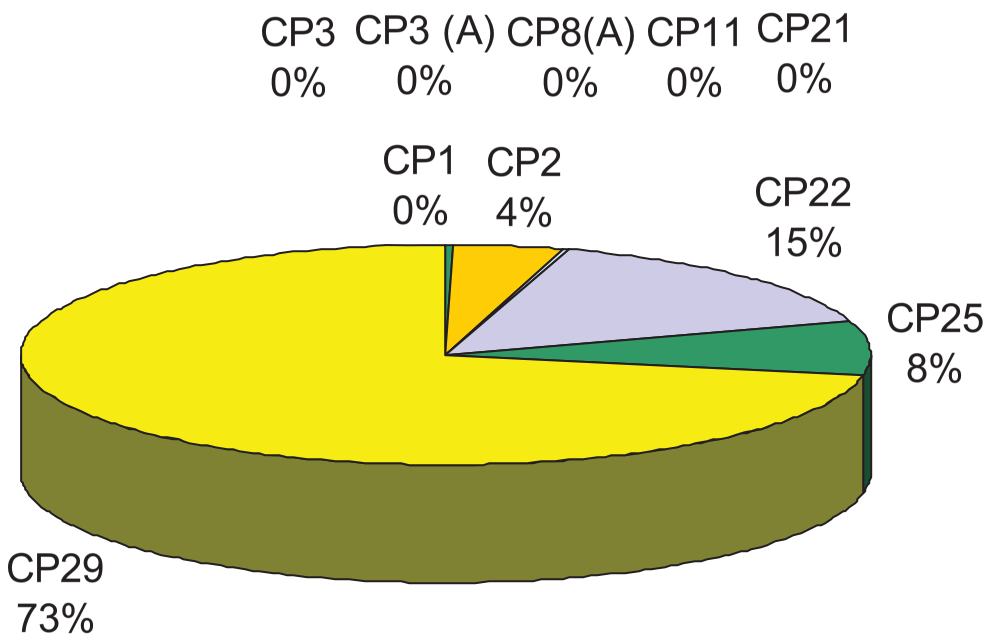
Areas such as the sinkhole plain have greatly benefited from the newly added CP-29 practice.

CREP Native Grass Planting


Percentage of Approved Cumulative Acreage by County
Adair 7%
Allen 7%
Barren 5%
Butler 4%
Edmonson 6%
Grayson 1%
Green 14%
Hart 15%
Logan 9%
Metcalfe 6%
Russell 1%
Taylor 4%
Simpson 3%
Warren 18%

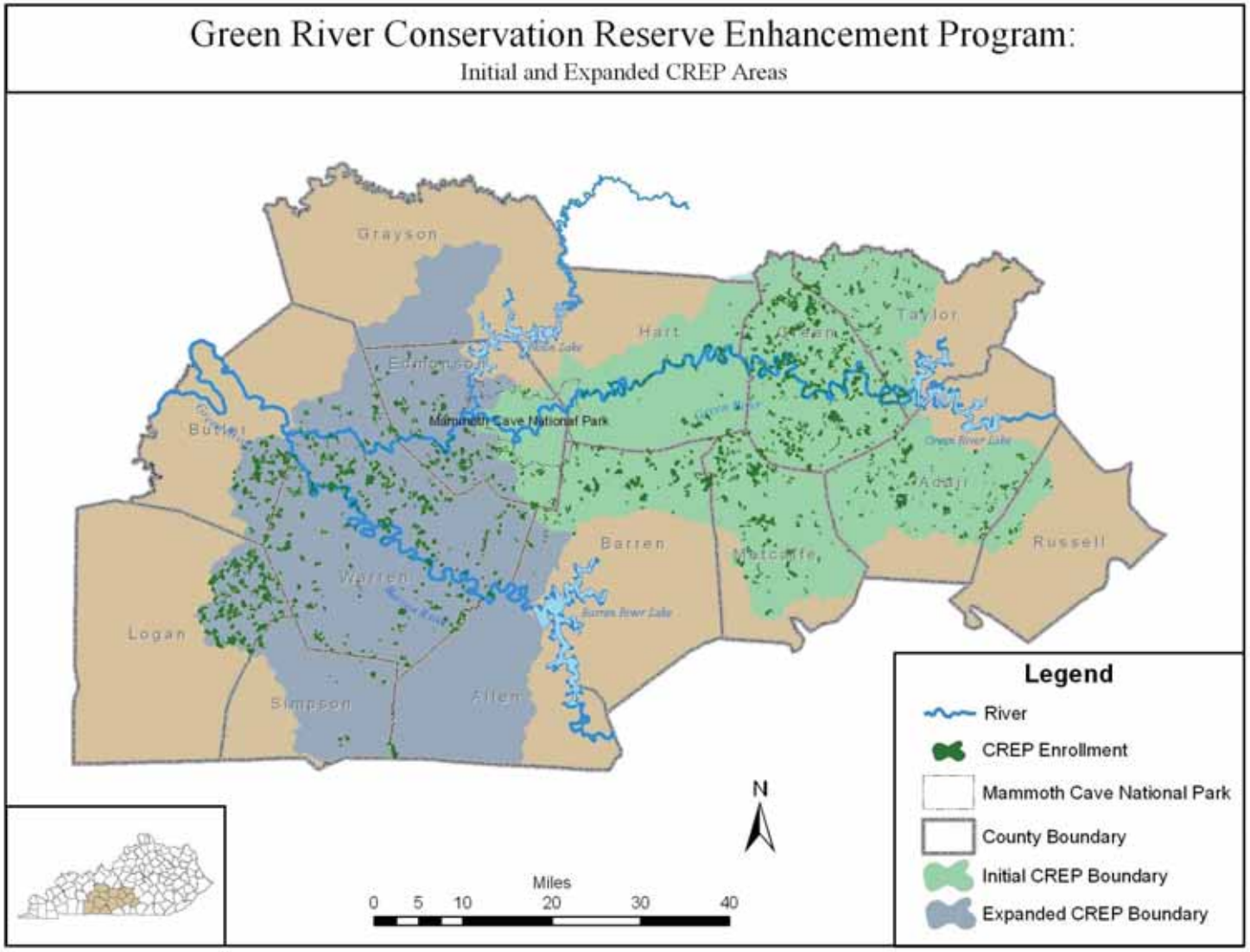

Program Trend in Acreage Approved
Acres
80000
70000
60000
50000
40000
30000
20000
10000
0
FFY 2003
FFY 2004
FFY 2005
FFY 2006
FFY 2007
FFY 2008
FFY 2009
FFY 2010
Total Acres Enrolled

Percent of Total Acreage by Practice



Program Cumulative Payment Summary

County	Number of Contracts	Average Acres Per Contract	Avg. Rental Rate Per Acre	Incentive Paid Per Acre	Total Estimated Cost-Share	Avg. Cost-Share $/Acre	Total Life of Contract Rental Payment
Adair	305	24	$142	$68	$1,447,084	$194	$15,021,503
Allen	210	35	$165	$81	$1,466,732	$201	$15,915,192
Barren	164	32	$131	$60	$901,069	$170	$8,953,617
Butler	105	38	$184	$90	$447,752	$111	$9,074,068
Edmonson	207	29	$172	$84	$1,018,837	$167	$13,565,976
Grayson	25	48	$176	$86	$203,081	$170	$3,133,409
Green	442	31	$155	$75	$2,360,750	$171	$29,530,450
Hart	440	35	$202	$98	$2,267,744	$148	$41,335,025
Logan	229	40	$245	$120	$1,392,035	$153	$30,471,509
Metcalfe	166	35	$139	$66	$1,070,186	$186	$11,034,427
Russell	42	29	$143	$69	$201,566	$163	$2,303,167
Simpson	82	34	$210	$103	$437,596	$159	$7,223,267
Taylor	199	19	$142	$68	$654,369	$170	$7,373,916
Warren	518	35	$219	$108	$2,739,835	$151	$52,851,583
Region	3134	32.2	$178.7	$88.77	$16,582,589	$219.78	$246,944,329



*This map was included in last year's report. Upon the preparation of this report, no updated map has been supplied.

GREEN RIVER CREP FEDERAL PAYMENT MATRIX

Federal CREP									
Practice Code	**Practice Description**	**Land Eligibility**	**Crop History**	**Base C/S**	**PIP**	**SIP** Acres X Full Years (not>10yrs) X $10	**SRR Incentive (ac/yr) % x SRR)**	**Maintenance Payment** ac/yr	**Maintenance w/fence //and water** ac/yr
CP1	Introduced Grasses and Legumes	HEL	Yes	50%			50%	$4	
CP2	Native Grasses	HEL	Yes	50%			75%	$4	
CP3	Tree Planting	HEL	Yes	50%			100%	$4	
CP3A	Hardwood Tree Planting	HEL	Yes	50%			100%	$4	
CP4B	Permanent Wildlife Habitat Corridors	HEL	Yes	50%			75%	$4	
CP4D	Permanent Wildlife Habitat	HEL	Yes	50%			75%	$4	
CP8A	Permanent Grass Waterways	NA	Yes	50%	40%	X	75%	$4	
CP9	Shallow Water Areas for Wildlife	NA	Yes	50%	40%		75%	$4	
CP10	Grass Cover-already established	HEL	Yes	0			50%	$4	
CP11	Tree Cover –already established	HEL	Yes	0			50%	$4	
CP12	Wildlife Food Plots	HEL	Yes	0			50%	N	
CP15A	Contour Grass Strips	NA	Yes	50%	40%		50%	$4	
CP21	Filter Strips	NA	Yes	50%	40%	X	75%	$4	$8//$9
CP22	Riparian Buffers	NA	Yes or MP	50%	40%	X	100%	$6	$8//$9
CP23	Wetland Restoration	Wetland	Yes	50%	**	**	100%	$4	
CP23A	Wetland Restoration Non-Floodplain	NHE	Yes	50%	**	**	100%	$4	
CP25	Rare and Declining Habitat	HEL	Yes	50%			100%	$4	
CP29	Marginal Pastureland Wildlife Habitat Buffer	NA	MP	50%	40%	X	100%	$4	$8/$9

Green River CREP

State CREP Cost Share/Incentive Matrix

State Practice Code	Federal Practice Code or Practice Description	State Cost Share Rate	State Incentive Rate	State Incentive Rate w/ Easement Option
KREP1	CP1	25%	25%	75% *
	CP2	25%	25%	75% *
	CP3	25%	25%	75% *
	CP3A	25%	25%	75% *
KCREP2	CP8A	25%	25%	75% *
	CP15A	25%	25%	75% *
	CP21	25%	25%	75% *
	CP22	25%	25%	75% *
	CP29	25%	25%	75% *
KCREP3	Livestock Water System	25%	25%	75% *
KCREP4	Fence	25%	25%	75% *
KCREP5	Stream Crossing	25%	25%	75% *

* Incentive available if permanent easement is offered on noted practice, and in watershed of federal contract.

- Cost share and incentive payments combined cannot exceed $7,500 per practice per state fiscal year.
- Each applicant or operation is limited to $20,000 total per state fiscal year, not to exceed $40,000 in any two consecutive program years.

II. State and Local Partners' Financial Contribution

The Kentucky Chapter of The Nature Conservancy (TNC)

The Kentucky Chapter of The Nature Conservancy has been a key CREP partner since the proposal was made to bring CREP to the Commonwealth of Kentucky. TNC funds, offers, and holds the optional permanent easements on CREP contracts that are eligible in the *original* CREP region. The eligibility is limited based on type of practice installed. In addition to the easements and associated duties, TNC has been active with program promotion; field and office assistance to local USDA offices with program implementation; funding initiatives for CREP meetings, field days and printed public relations materials; and conducting biological monitoring.

During FFY 2010, TNC reported that their primary work was the annual monitoring of the CREP permanent easements that had been enrolled into the program in previous years. No new easements were reported.

Kentucky Department of Fish and Wildlife Resources (KDFWR)

The Kentucky Department of Fish and Wildlife Resources has been a key partner in field implementation of the Green River CREP. KDFWR has contributed man-hours from several field positions, including KDFWR/NRCS liaisons and Farm Bill biologists, private lands biologists, four CREP biologists and four CREP technicians. One CREP biologist and all four CREP technicians were newly created positions in 2008 to help meet the landowner demand for this program. KDFWR personnel adopted many duties working both directly with landowners and with NRCS district conservationists. These biologists and technicians also helped with the physical establishment procedures, such as on site guidance and delivery of seed drills, spray equipment, etc. These biologists and

technicians also initiated landowner contacts and coordinated and/or assisted with field days and informational meetings. During FFY 2010, KDFWR dedicated 6,393.5 man hours to the CREP program with a total cost of $145,048.

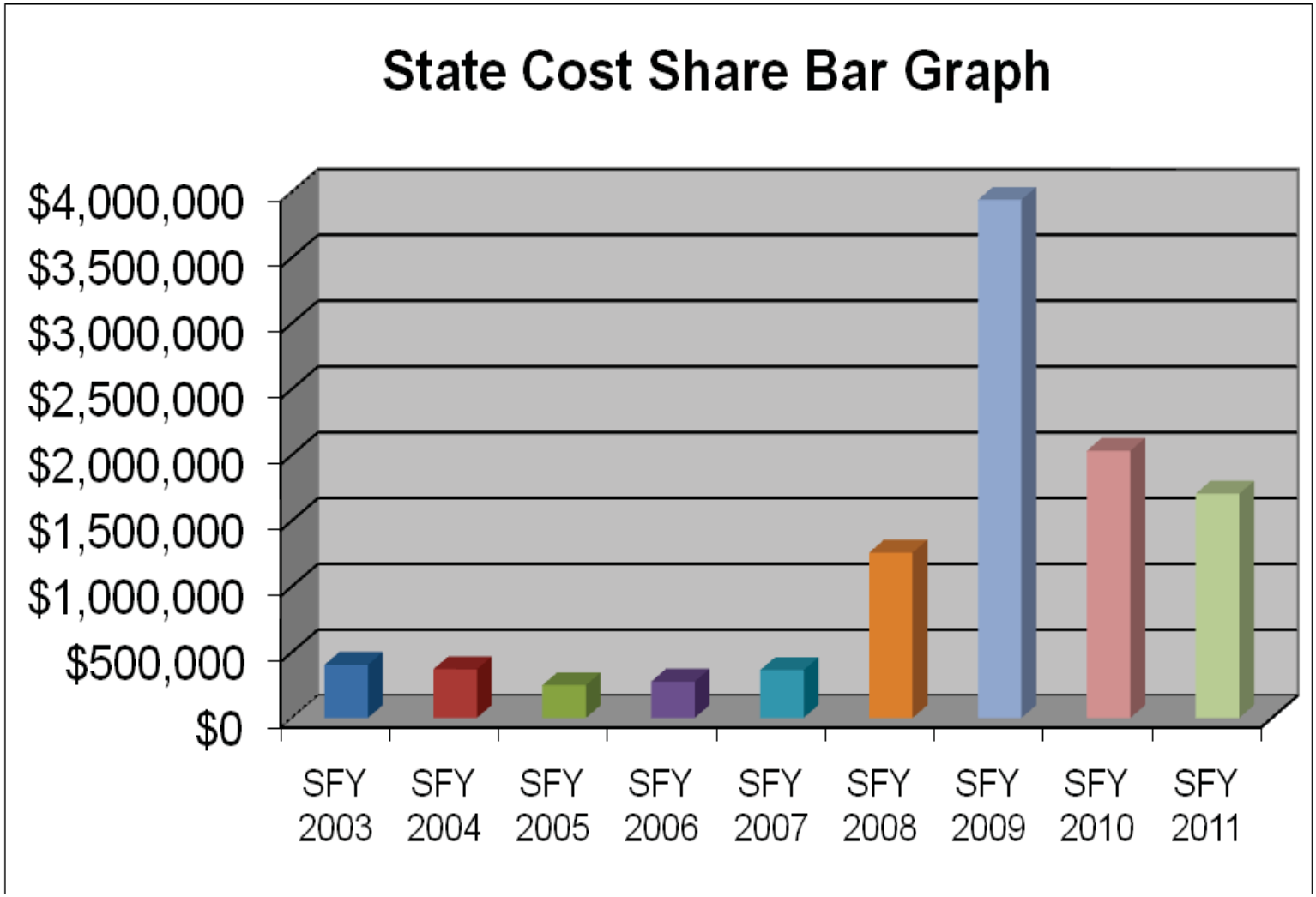
The above referenced CREP biologists and CREP technicians, which are supervised by KDFWR in partnership with NRCS, have greatly aided in the following tasks for this program: assisting with program promotion, planning, contract writing and modifications; on-site measurements and practice layout; site visits during practice installation; practice evaluation, final and annual status reviews; providing technical guidance on vegetation plantings which includes site preparation, planting, and post-planting management to ensure successful stand establishment; and assisting district conservationists with writing and/or modifying participants' contracts.

Additional costs to KDFWR not covered by the above referenced activities are as follows: cost shared funding for CREP coordinator position ($17,000) and cost share provided directly to landowners for implementation/management of CREP practices ($62,470).

KDFWR Biologist on native warm-season grass seed drill

Kentucky Division of Conservation
(KDOC)

The Kentucky Division of Conservation is the state contact agency for the Green River CREP. The Division administers the financial portion of CREP (state cost share and incentive payments) and works closely with local conservation districts and partner agencies in the promotion and administration of the program. In addition, the Green River CREP coordinator works through, and is primarily funded by, the KDOC. The following photos are of state practices offered for CREP, and the chart on the following page documents funds expended for CREP state cost share and incentive payments.



SFY 2003	SFY 2004	SFY 2005	SFY 2006	SFY 2007	SFY 2008	SFY 2009	SFY 2010	SFY 2011	TOTAL
$403,287.00	$369,958.00	$248,246.00	$276,246.00	$363,087.00	$1,256,224.00	$3,938,889.00	$2,031,601.00	$1,704,841.00	$10,592,379.00

Kentucky Division of Forestry
(KDOF)

The Kentucky Division of Forestry has been primary in providing technical assistance and guidance with tree planting practices within the Green River CREP. In addition to the tree planting specific practices (CP-3A), all riparian buffers (CP-22) are required to have a minimum of 50' or 100' of trees planted (depending on stream order) adjacent to the water body. In addition to technical guidance and assistance, KDOF personnel have also assisted landowners with tree seedling orders, most of which are through the KDOF state nursery. During FFY 2010, KDOF wrote 6 CREP practice plans, encompassing 18 acres. The agency worked over 90 hours on CREP activity (including plan writing and site visits).

Green River CREP Tree Planting in Edmonson County

III. Monitoring and Evaluation

Western Kentucky University is responsible for the organization and implementation of a comprehensive monitoring and evaluation plan to determine the success of program goals. This effort is funded through various grant sources, and is being implemented within the watershed. The following monitoring summary was submitted by Ouida Meier, Biology Department, WKU.

ANNUAL REPORT

Assessing changes across spatial and temporal scales due to conservation practices associated with the Kentucky Conservation Reserve Enhancement Program in the Upper Green River Basin

Annual report submission to:

National Resources Conservation Service
771 Corporate Drive, Suite 210
Lexington, KY 40503-5479

Project director:

Scott Grubbs, Ph.D.
Department of Biology and Center for Biodiversity Studies
Western Kentucky University
Bowling Green, KY 42101

Date:

November 4, 2010

Background

In 2001 the Upper Green River Basin was established as the geographic entity of Kentucky's U.S.D.A. Conservation Reserve Enhancement Program (CREP). The main goal of the nearly 40,000 ha Kentucky CREP is to reduce nonpoint source pollution loading (e.g., sediment, industrial fertilizer) into the mainstem of the Upper Green River and principle tributaries by recruiting landowners into incentive-based 10-15 yr. cooperative agreements of best management practices aimed to eliminate riparian-based agricultural and animal husbandry practices. Specific measurables that are incorporated in CREP goals are multifaceted and include (a) 10% reduction of sediment, nutrients, and pesticides entering the river and its tributaries from agricultural sources, (b) enhancement of aquatic and riparian habitat, (c) enhancement of aquatic wildlife populations habitat, (d) restoration of riparian habitat corridors, (e) reconnection of landscape-level ecological processes, (f) establishment of riparian buffers around sinkholes, (g) restoration of non-riparian wetlands, and (h) protection and restoration of subterranean ecosystems.

Outline of individual tasks

Task 1: NRCS/CREP GIS mapping and analysis activities
Task 2: Hydrology, sediment and water quality activities
Task 3: Direct terrestrial monitoring activities
Task 4: Project enhancements and pilot studies

Task 1 Progress Report: NRCS/CREPGIS mapping and analysis activities

Task 1 Manager: Ouida W. Meier, Ph.D., Center for Biodiversity Studies, Western Kentucky University. Report co-author: Christopher Johanson from the O. Meier Lab, WKU.

Workplan Overview: GIS mapping and analysis of land use in the Upper Green River Basin, and to begin to analyze historic and project water quality and biological data.

- **Activity 1: GIS mapping and analysis of land use in the Upper Green River Basin**

With the expansion of the CREP area being approved and implemented in the past year, my lab has begun working with the expanded area for some facets of our analyses. Previously we supplied maps for NRCS use during development of the expansion proposal, including considerations of stream order and selected regions for wider (1000') widths.

Much of the analytical effort this year has been development of watershed attributes at several scales that can be used in geostatistical analyses. Some of these were begun earlier and have now been completed, and others are in the process of development. Some of these analytical measures include stream sinuosity, landscape grade, evaluations of riparian corridor composition at different buffer widths, stream order and hierarchy, karst contribution, landuse composition and aggregate categories, habitat parameters, and network relationships.

Variations by major tributary watershed are apparent, and we expect these analyses to help us predict which watersheds might be releasing more contaminants (pesticide, nutrients, sediment, etc.) than others, and to test those predictions. Other gradients and attributes are being tested as potential correlates of water quality measurements. The results of some of these observations and preliminary analyses have been presented at meetings (see Presentations section), and a number of maps are provided in the Maps section. Higher resolution imagery is available upon request.

- **Activity 2**: **Analysis of historic and project water quality and biological data**

Model Evaluation
Numerous watershed modeling programs were examined for suitability in this project, both by downloading the software and documentation, and by reviewing journal citations. Models reviewed included AGNPS, AGWA, AnnAGNPS, ANSWERS, AQUATOX, APEX, BASINS, CASC2D, CAT, CORMIX, DWSM, GLEAMS, HEC-HMS, HSPF, KINEROS2, MIKE SHE, N-SPECT, PEST, PRMS, QUAL2E, QUAL2K, SPARROW, SWAT, REMM, WASP, and WEPP, among others. The most important criteria in evaluating the models were: the ability to model a large-scale watershed with non-point source pollution; current support and training in the model; geographically diverse published validation of the model; and an active community of users and developers.

The Soil and Water Assessment Tool (SWAT) was chosen because it meets all of the above criteria. SWAT is a physically based model that builds on earlier models developed by the Agricultural Research Service, including USLE, CREAMS, EPIC, and SWRRB. SWAT also includes an interface that allows data creation and analysis in ArcGIS.

Data Assessment and manipulation
At a minimum, SWAT requires elevation, land use, soils, and weather inputs. Other inputs can include pollution point sources, dam flow data, stream geometry, agricultural practices, pesticide loadings, nutrient loadings, and bacterial loadings.

For some datasets, the best source was easy to select; for example, a 10 meter Digital Elevation Model published by the U.S. Geological Society was acquired from the Kentucky Division of Geospatial Information.

Other data had multiple sources that required evaluation. For land use, there are 2001 and 2005 National Land Cover Database rasters at 10 meter resolution. There is also a USDA-NASS Cropland Data Layer published in 2008 at 56 meter resolution. Because SWAT is a continuous model, we had to consider temporal verity, resolution, accuracy, and detail when selecting a data source. We experimented with ways to combine the NLCD and CDL data to get the best of both datasets.

Two different soil data sources were also considered. STATSGO is a generalized soil map suitable for multi-county watersheds like this project. However, a study at Kansas State University demonstrated that better model results are obtained when using the county-level SSURGO soil maps. This required aggregating 16 different county maps into one database and the creation of a new soils lookup table. Improved model performance was confirmed locally in the Big Pitman Creek catchment.

SWAT requires precipitation and temperature inputs in order to model evapotranspiration, runoff, and stream flow. Wind, humidity, and solar radiation can be simulated by the model. We actually used the BASINS model to locate weather stations that were proximate to the catchments being modeled, and then used the National Climactic Data Center to obtain daily precipitation and temperature data. These data had to be converted to metric units, and where gaps in the data occurred, the data were simulated using the National Weather Service Method to estimate values from proximate weather stations.

We are still working to obtain additional data to enhance the accuracy and realism of the model. The difficulty remains obtaining data that are both accurate and temporally relevant. Because the SWAT model is continuous, we are careful to consider the effect of time. Land uses, agricultural practices, and pollution sources change with time, and imposing today's data on the past could reduce the accuracy of this physically based model.

We have located and downloaded available USGS and Ky DOW (EPA STORET) water quality data. We also have in hand full UGWW data, selected historic Ky DOW aquatic biological data, some regional data from UK, and WKU project data. Preliminary data on CREP enrollment contract areas were released to the project by FSA, and these are being incorporated into analyses of water quality and land use data and assessments of stream status.

Upper Green River Watershed Watch data have proven useful in that the study area includes the entire expanded Green River CREP area, volunteer samplers are able to collect samples throughout that large area in a higher sampling density (80-100 sites per sampling event) than the sites that DOW or WKU can cover, and the project now has retrospective data available for 1999-2008. Some of the maps and graphs from analyses are reproduced here.

Dr. Meier serves as the chair of the Science Advisory committee for Upper Green River Watershed Watch, the Kentucky Waterways Alliance Green River Basin delegate, a member of

the Green River Basin Management Team, and was a member of the Kentucky Watershed Modeling Information Portal Technical Advisory Group during its active period. These service efforts allow contact with other agencies and groups working in the basin to integrate our work with complementary efforts by others, and more easily acquire access to data and information coming out of these groups. A challenge of working with these data are their differences in sampling methods, regimes, and sites, and is another reason for involvement with these groups.

Dr. Meier also serves as the PI on an EPA grant focused on biological diversity and monitoring in the Green River, and the data that have begun to be harvested from that project will be an integral component for assessing baseline processes in the context of the CREP project. We will especially gain knowledge of event-driven changes in water quality coming from each tributary to the upper Green River from the EPA project. Some early data from that project's continuous water quality monitoring stations are shown here. More results from the EPA-sponsored project are included in an EPA report.

Dissemination of information in professional and regional settings is a deliverable of both major facets of this grant task. Presentations and posters presented at meetings are listed below, as are other activities that indirectly support this project.

Presentations or Presentation co-authorships, Professional Meetings:

Meier, Ouida, Albert J. Meier, and Scott Grubbs. 2009. Influences of the Conservation Reserve Enhancement Program on the upper Green River watershed in Kentucky. Ecological Society of America annual conference, Aug. 2009.

Otoo, James, Stephen Kenworthy, Michael May, Lee Florea, Ouida Meier and Chrissie Hollon. 2008. Suspended Sediment Transport Dynamics and Sediment Yields in Relation to Watershed Characteristics, Upper Green River Basin, Kentucky. Poster presentation, American Geophysical Union, 15-18 Dec 2008.

Meier, Ouida, Albert J. Meier, Scott Grubbs and Steve Kenworthy. 2008. Landuse changes and stream conditions in the Green River watershed: Overview and impacts of the Conservation Reserve Enhancement Program. Society for Conservation Biology.

Skaggs, Mathew, J.L. Bowers, Albert J. Meier, Cabrina L. Hamilton, T. Aaron Hulsey and Ouida Meier. 2008. Influences of land use, habitat scale, and weather on bird calling activity. Society for Conservation Biology.

Meier , Albert J., Jonathan L. Bowers, Cabrina L. Hamilton, Aaron Hulsey , Rafael Márquez , Matthew Skaggs , and Ouida Meier. 2008. Use of SongScope sound recognition software in the identification of breeding bird communities along the Upper Green River Watershed, Kentucky. Ecological Society of America.

Bowers, Jonathan L., Meier , Albert J., Cabrina L. Hamilton, Aaron Hulsey, Rafael Márquez , Matthew Skaggs, and Ouida Meier. Influence of land use, habitat scale, and weather on bird-calling activity, an update. The 2008 annual meeting of the Kentucky Chapter of the Wildlife Society. First Place in the student competition.

Meier, A., O. Meier, J. Bowers, C. Hamilton, M. Skaggs, R. Marquez and R. Bowker. 2007. Acoustic Monitoring of Bird Species in a Riparian Zone in Kentucky Using an Automated Recording System. International Bioacoustic Council (IBAC) annual conference, Italy, Sept 2007.

Additional Recent Presentations:

Meier, O. and A. Meier. 2010. Daviess County Audubon Society presentation (2 Mar 2010) and field trip (27 Mar 2010).

Meier, O. 2010. Upper Green River Watershed Watch 2009 Data Review. UGRWW annual conference, 20 Feb 2010. Posted.
Meier, O. 2008. Upper Green River Watershed Watch 2008 Data Review. UGRWW annual conference, 5 Dec 2008. Posted.
Meier, O. 2008. CREP Monitoring and Research in Western Kentucky. The Wildlife Society, Kentucky Chapter, 28-29 Feb 2008.
Bowers, J.L. A.J. Meier, C. Hamilton, M. Skaggs, A. Hulsey, and O. Meier. 2008. Influence of land use, habitat scale, and weather on bird calling activity. The Wildlife Society, Kentucky Chapter, 28-29 Feb 2008. [Best student paper award]
Skaggs, Matthew G., Cabrina Hamilton, Jonathan Bower, Aaron Hulsey, Albert Meier, Ouida Meier. 2007. Influences of Landscape Effects on Birds Calling. Presentation, Kentucky Academy of Science, Louisville, Ky, 9-11 Nov 2007.

Publications:
Grubbs, Scott A., Ouida W. Meier, and Albert J. Meier. 2007. Longitudinal patterns of fish assemblages in small unregulated subbasins: evaluating reach- and watershed-scale parameters. Hydrobiologia 592:211-223.
Additional manuscripts on modeling and analysis of water quality and land use in the Upper Green River basin are in preparation.

Research Reports:
Meier, O., S. Kenworthy, J. Marcus, and J. Alexander. 2008. Upper Green River Biological Diversity and Monitoring Project. Interim Report to the US Environmental Protection Agency.
Meier, O. 2007. Development of a Master Plan for the Upper Green River Biological Preserve, Western Kentucky University. Annual Report to the National Science Foundation.
Grubbs, S., O. Meier, S. Kenworthy, and A. Meier. 2005, 2006, 2007. Conservation Practices Associated with the Kentucky Conservation Reserve Enhancement Program. Annual Reports to the Natural Resources Conservation Service.

Additional Supporting Activities
Hosted statewide meeting with CREP partners 19 May 2010 at WKU focused on progress to date as land enrollment is completed.
Hosted meeting with KDFWR partners 23 Feb 2009 at WKU focused on mutual interests in avian and mapping work within CREP.
Principal Investigator, EPA Green River Biological Diversity and Monitoring Project. This project includes significant additional sampling, monitoring, and modeling work in the upper Green River basin that are serving as a critical supplement to our NRCS CREP work.
Thesis advisor to James Otoo, Geosciences M.S., Suspended Sediment Yields in Relation to Watershed Characteristics in the Upper Green River Basin, Kentucky. Graduated May 2010.
Thesis major professor to Mary Lohr, Biology M.S., non-thesis project evaluating human and animal waste inputs to the Barren River system. Graduation expected May 2012.
Thesis major professor to Christian Downing, Biology M.S. Sustainability of Western Kentucky University. Graduated Dec 2007.
SAS: Statistical Analysis Systems, Enterprise Guide workshop, WKU, 18-19 Oct 2010.
SWAT: Soil Water Assessment Tool workshop and conference, 2-8 Sept 2009, Boulder, Co. (attended by CJ Johanson).
Network analysis training workshop participant, 30 Nov 2007, led by Stuart Borrett of UNCW at WKU.
Public information display on Green River CREP and UGRBP projects, BGGreen campus-community sustainability event, Bowling Green,18 Oct 2007.
Participant in Kentucky Watershed Modeling Information Portal (KWMIP) advisory panel.

Upper Green River Watershed Watch (UGWW): Science Advisor, monitor two sites regularly, end-of-year data analysis for 80-100 sites, statewide Watershed Watch Science Advisors group, Interbasin Coordinating Committee representatives. Trained volunteers in water chemistry sampling and aquatic biota sampling protocols.
Kentucky Waterways Alliance, Green River Basin Delegate.
Division of Water Green River Basin Management Team, member and participant.
Co-Director, Upper Green River Biological Preserve – management efforts including GIS tracking and implementation of CREP contracts at the Preserve, contribution to final Resource Management Plan.

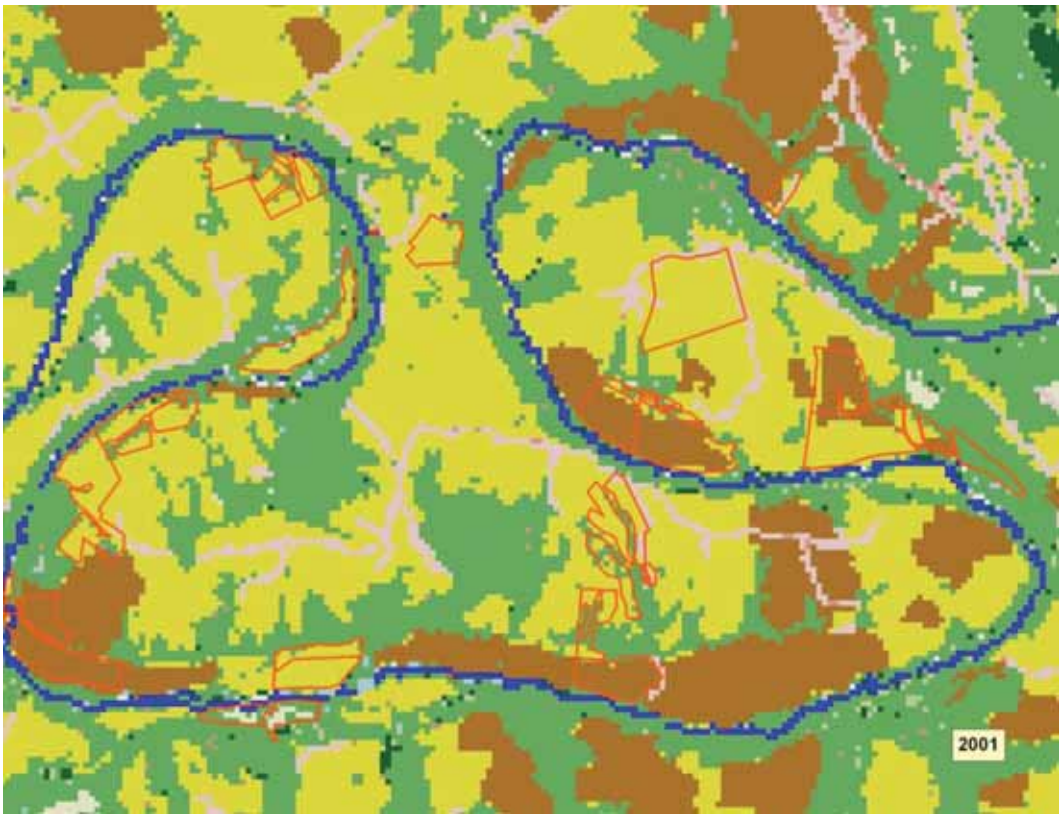
Maps and Analyses: A Selection

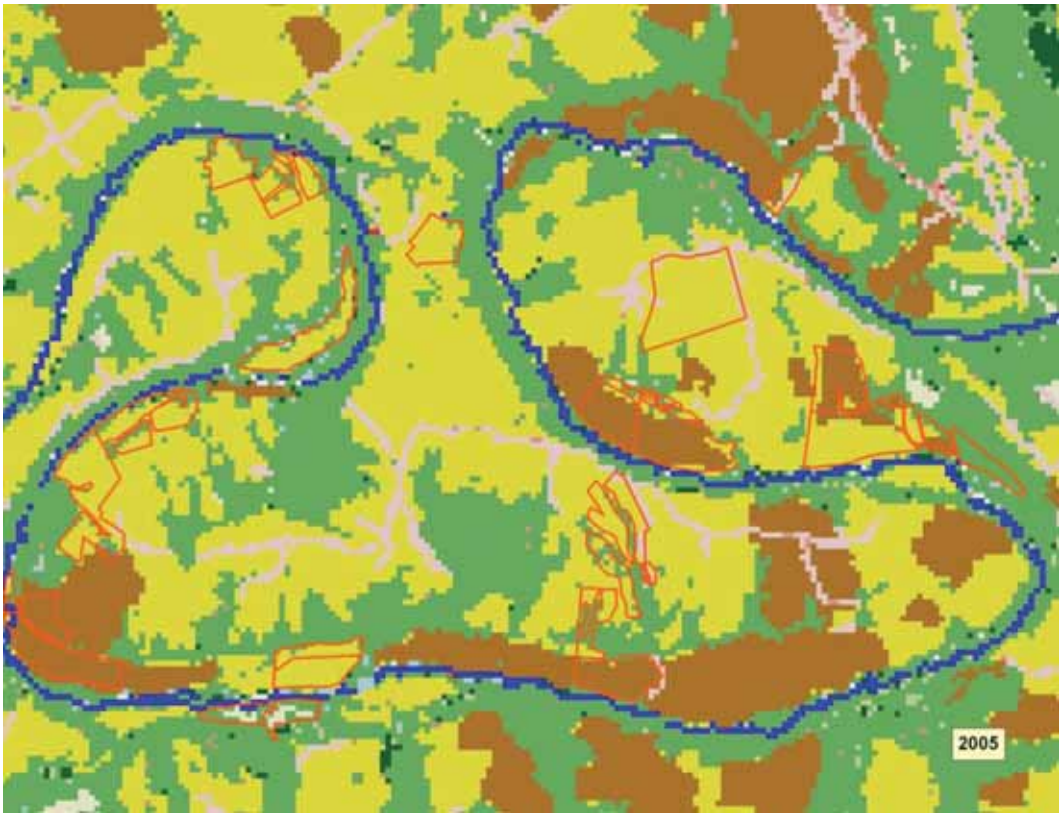
Numerous maps were produced in the course of gathering, synthesizing, and spatially analyzing geographic information, field observations, and water quality data to date. Following is a selection of maps and graphs. Higher resolution images are available upon request (ouida.meier@wku.edu). Additional spatial and statistical analyses are underway.

Change over time in outlined CREP contracts: aerial imagery (2004, 2006, 2008) and landuse classification (2001, 2005). Locations near Green River dam.

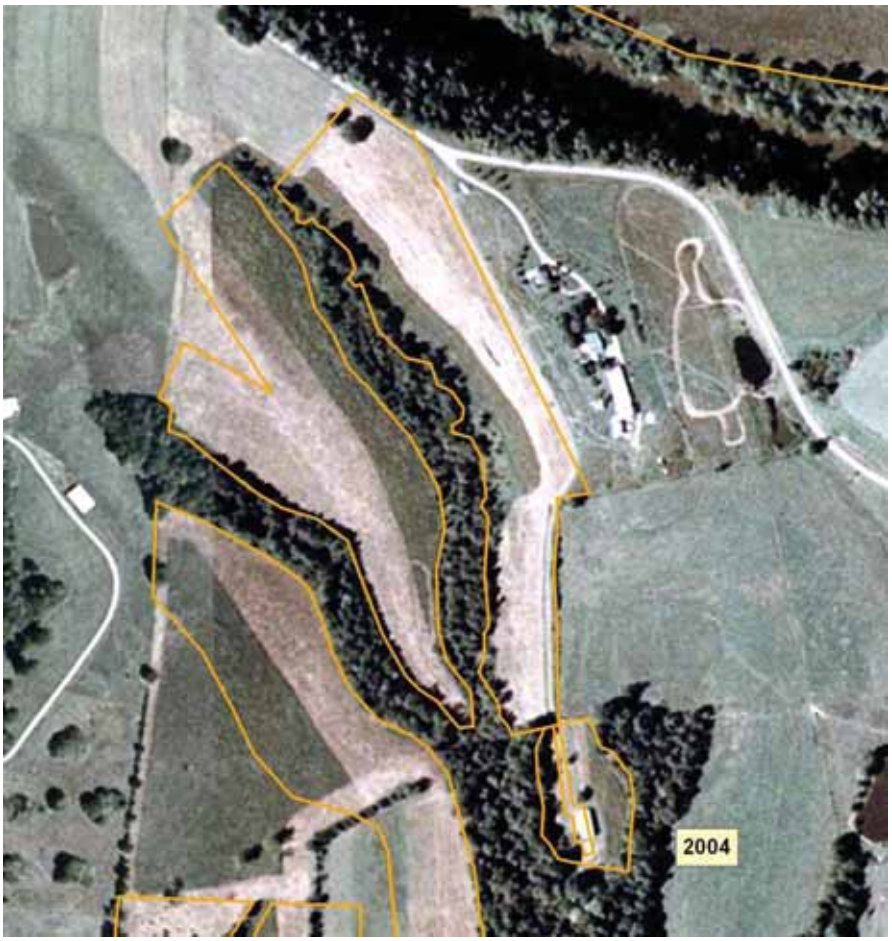

2006

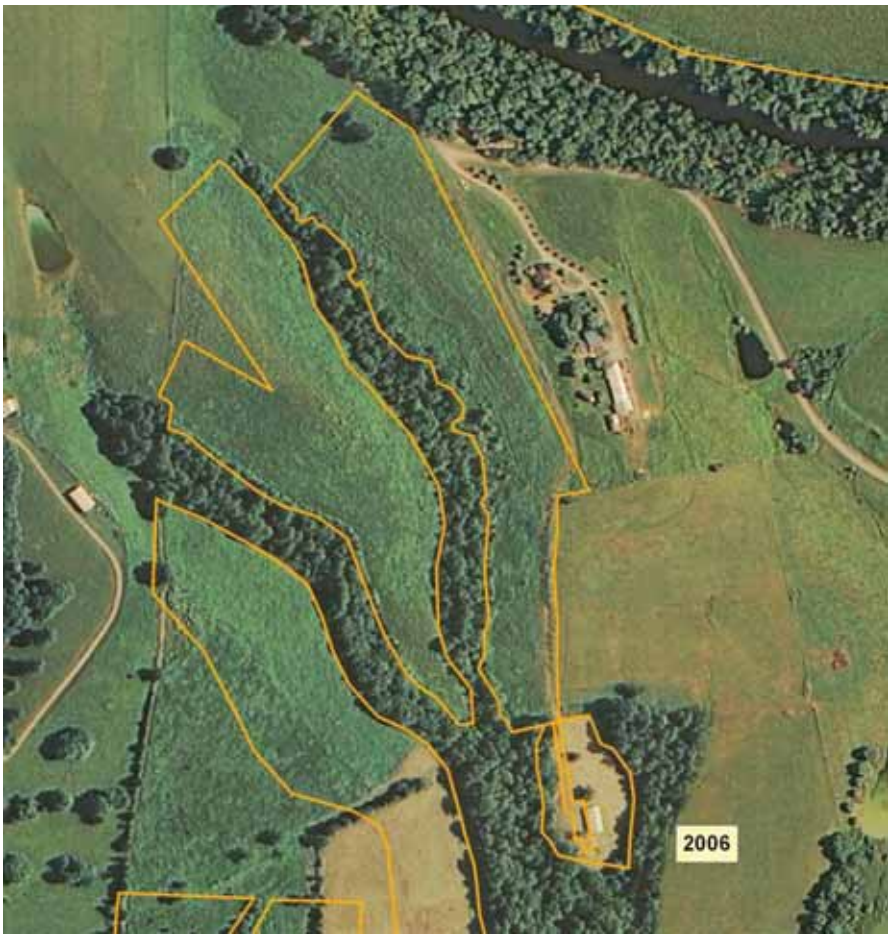

2008

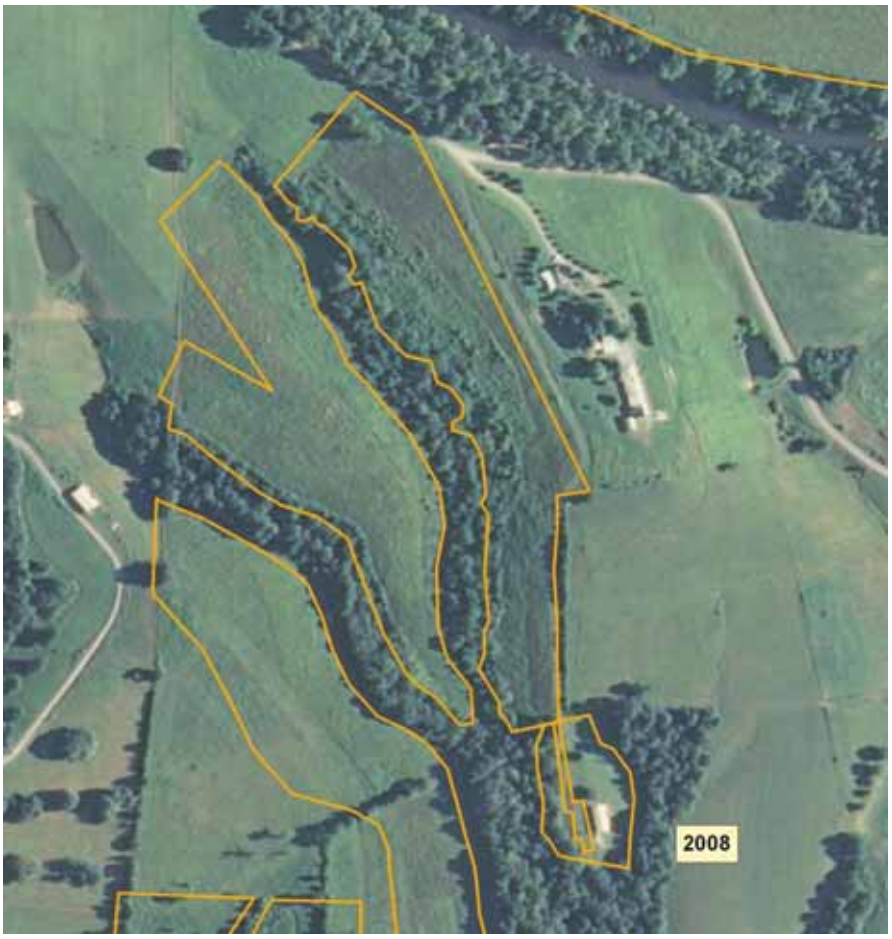

2001


2005

Change over time in CREP contracts: aerial imagery (2004, 2006, 2008) and landuse classification (2001, 2005).




2006


2008


2001

- Out of 1172 CREP contract polygons present in 2007, 28 (or 2.4%) had landuse classification changes between 2001 and 2005.
- Out of 10,461 acres of land under CREP contract as of 2007, 310 acres (3.0%) were in contracts that showed some landuse change between 2001 and 2005.
- Out of 310.3 acres of land in CREP contracts that showed landuse change between 2001 and 2005, the number of acres that changed were 33.5 (or 10.7% of those polygons).
- Out of 10,461 acres of land in CREP contract as of 2007, a total of 33.5 acres (0.3% of the total CREP contract area) showed some landuse change between 2001 and 2005.
- No information was available regarding the start date of the CREP contracts; landuse classifications from 2001 and 2005 were used because they were the only matched landuse data sets available. Therefore, these results say more about the potential of the available current and future landuse classifications to detect change than they do about changes in landuse due to CREP plantings and contracts.

Number of contract polygons with landuse conversions, 2001-2005:

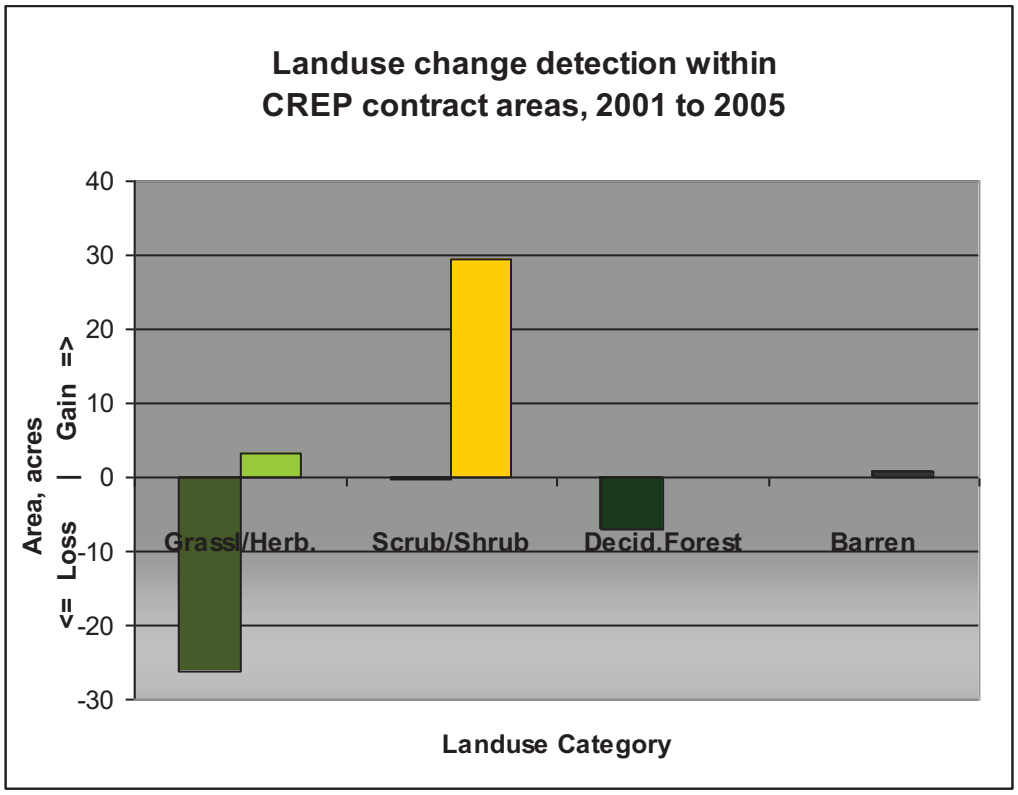
From\/ To>	Grassl/Herb.	Scrub/Shrub	Decid.Forest	Barren
Grassl/Herb.	0	18	0	2
Scrub/Shrub	1	0	0	0
Decid.Forest	6	4	0	0
Barren	0	0	0	0

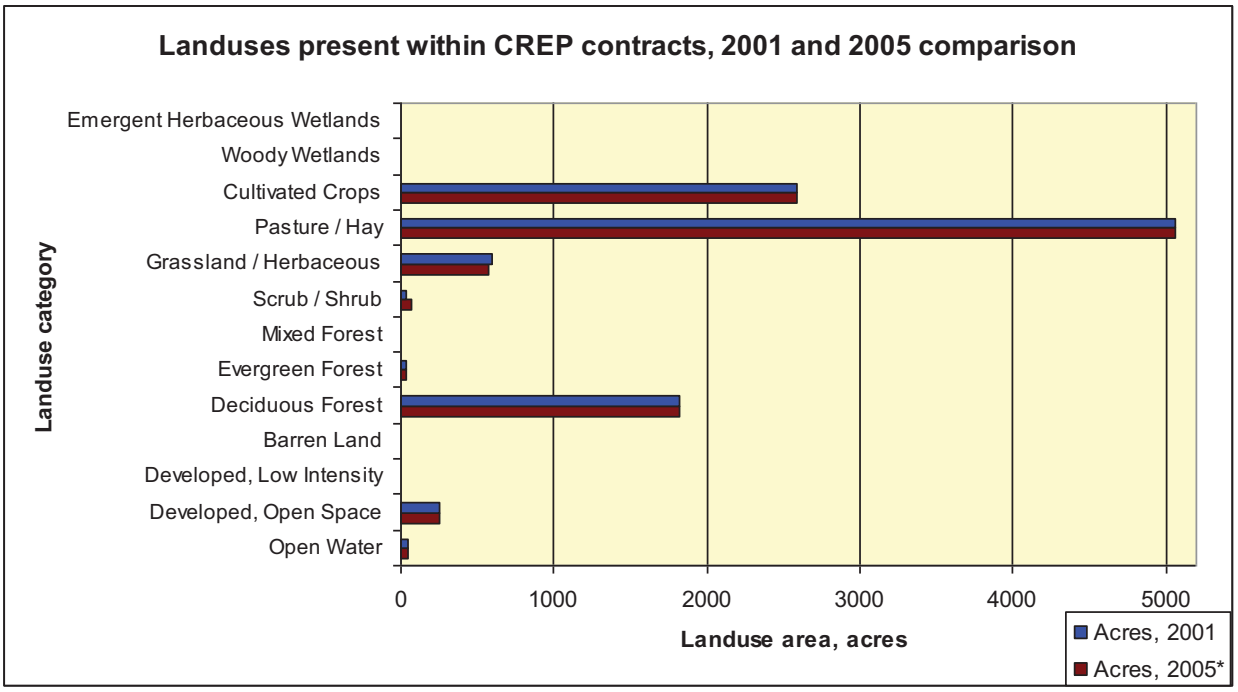
Total area converted within contract polygons with conversions (acres):

From\/ To>	Grassl/Herb.	Scrub/Shrub	Decid.Forest	Barren
Grassl/Herb.	0	25.43	0	0.82
Scrub/Shrub	0.14	0	0	0
Decid.Forest	3.02	4.09	0	0
Barren	0	0	0	0

Average area converted within contract polygons with conversions (ac/polyg):

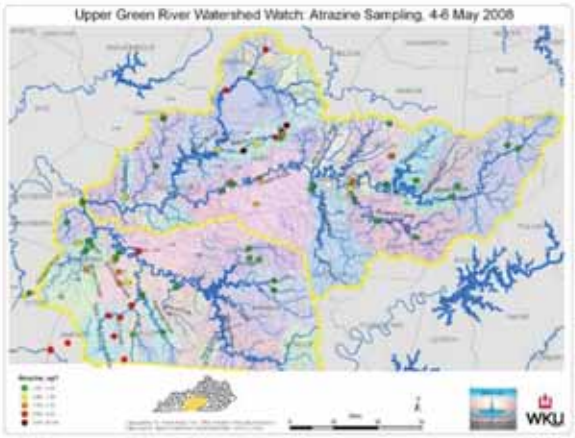
From\/ To>	Grassl/Herb.	Scrub/Shrub	Decid.Forest	Barren
Grassl/Herb.	0	1.41	0	0.41
Scrub/Shrub	0.14	0	0	0
Decid.Forest	0.50	1.02	0	0
Barren	0	0	0	0

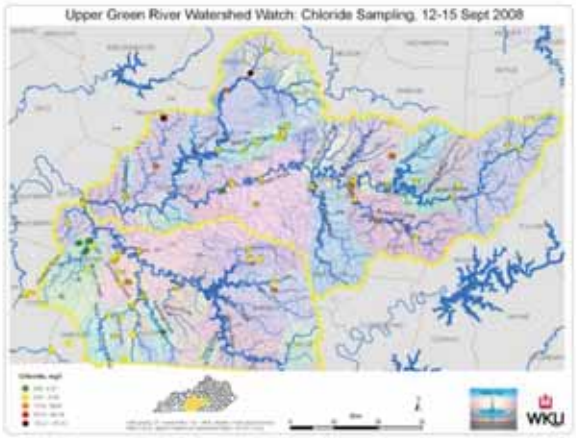


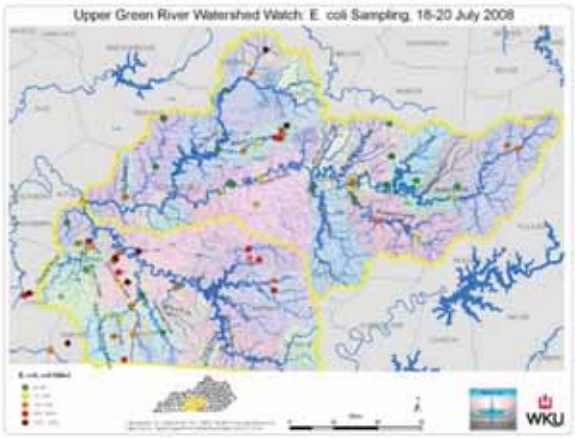


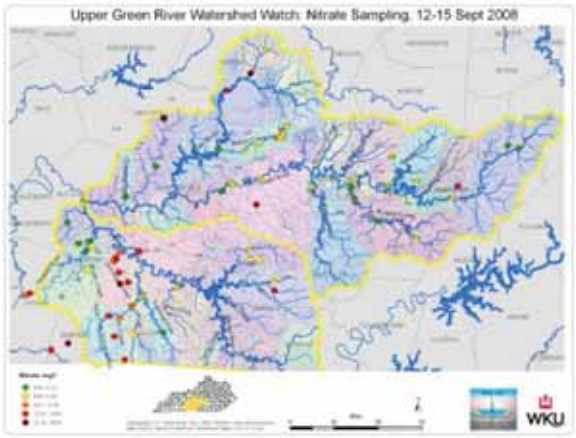
*based on change analysis of CREP polygons

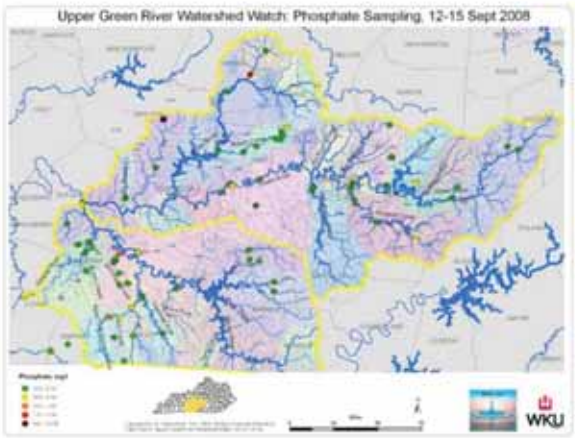
Upper Green River Watershed Watch data serves as a useful snapshot of water quality parameters collected basin-wide at 80-100 sites each spring, summer, and fall. 2008 data.

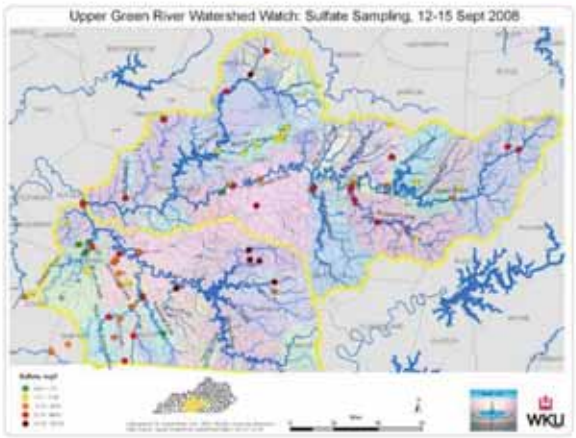

Upper Green River Watershed Watch: Atrazine Sampling, 4-6 May 2008
WKU


Upper Green River Watershed Watch: Chloride Sampling, 12-15 Sept 2008
WKU


Upper Green River Watershed Watch: E. coli Sampling, 18-20 July 2008
WKU

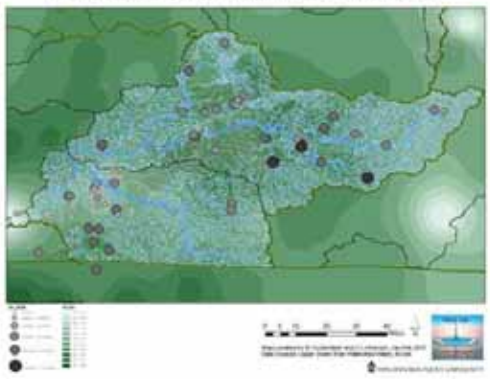

Upper Green River Watershed Watch: Nitrate Sampling, 12-15 Sept 2008
WKU


Upper Green River Watershed Watch: Phosphate Sampling, 12-15 Sept 2008
WKU

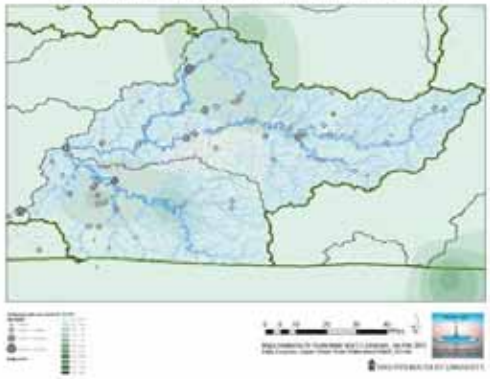

Upper Green River Watershed Watch: Sulfate Sampling, 12-15 Sept 2008
WKU

Upper Green River Watershed Watch data 2009.

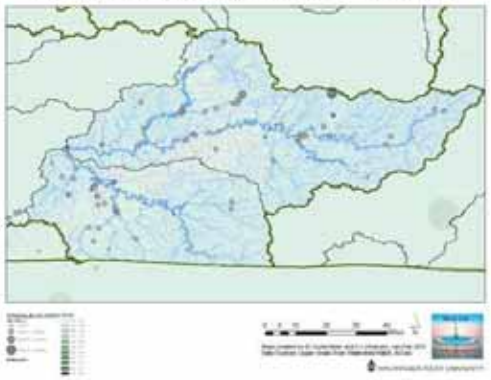
Lab Turbidity, NTU - Upper Green River Watershed Watch, May 2009



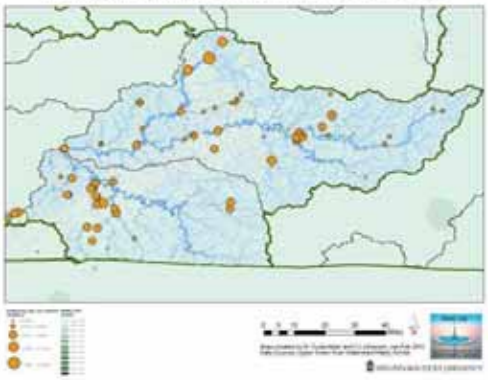
Lab Turbidity, NTU - Upper Green River Watershed Watch, July 2009



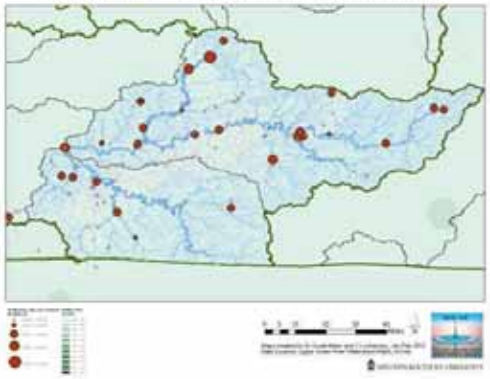
Lab Turbidity, NTU - Upper Green River Watershed Watch, September 2009



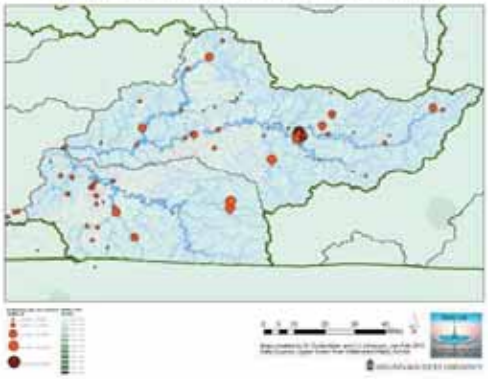
Chloride, ppm - Upper Green River Watershed Watch, September 2009



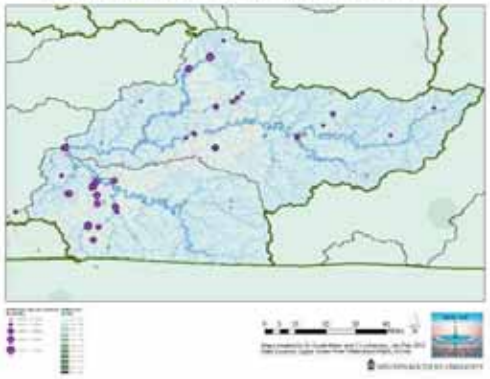
Bromide, ppm - Upper Green River Watershed Watch, September 2009



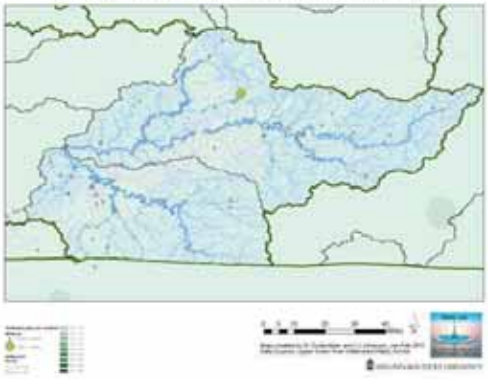
Sulfate, ppm - Upper Green River Watershed Watch, September 2009



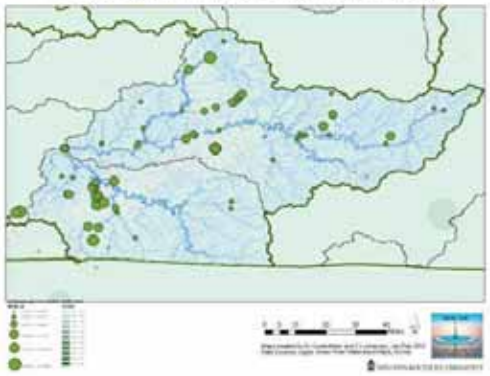
Phosphate, ppm - Upper Green River Watershed Watch, September 2009



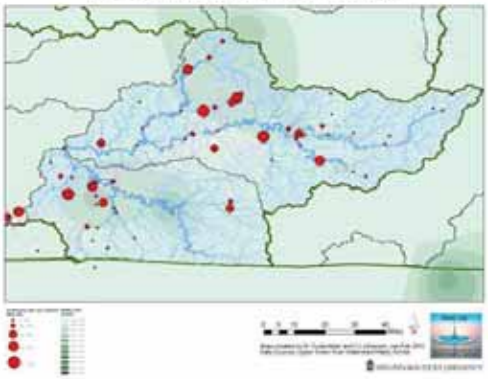
Nitrite, ppm - Upper Green River Watershed Watch, September 2009



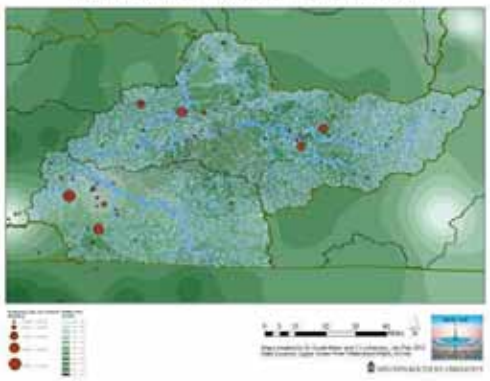
Nitrate, ppm - Upper Green River Watershed Watch, September 2009



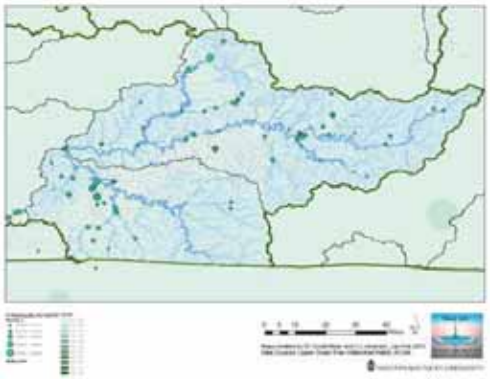
E. coli - Upper Green River Watershed Watch, July 2009



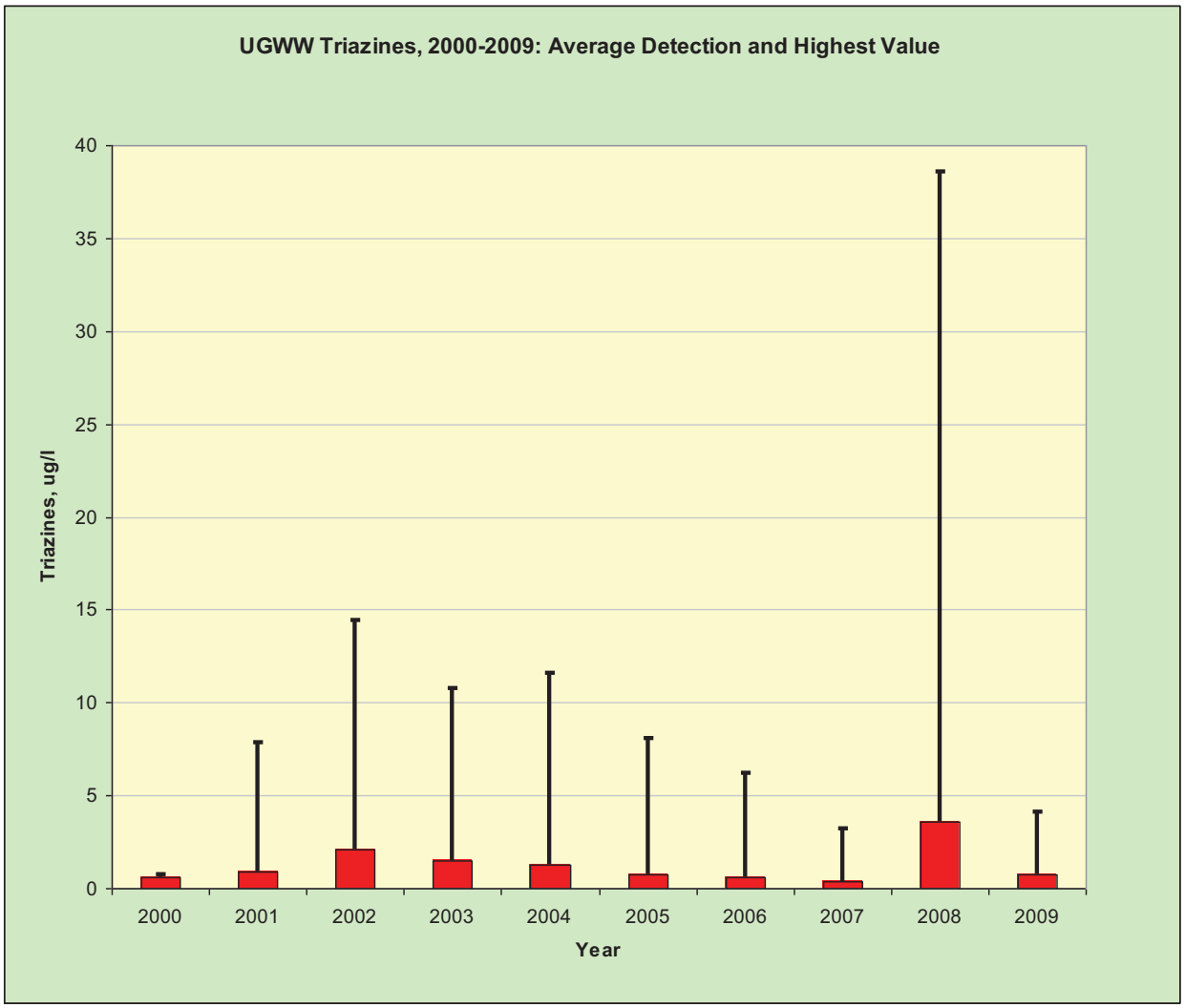
Atrazine, ppb - Upper Green River Watershed Watch, May 2009

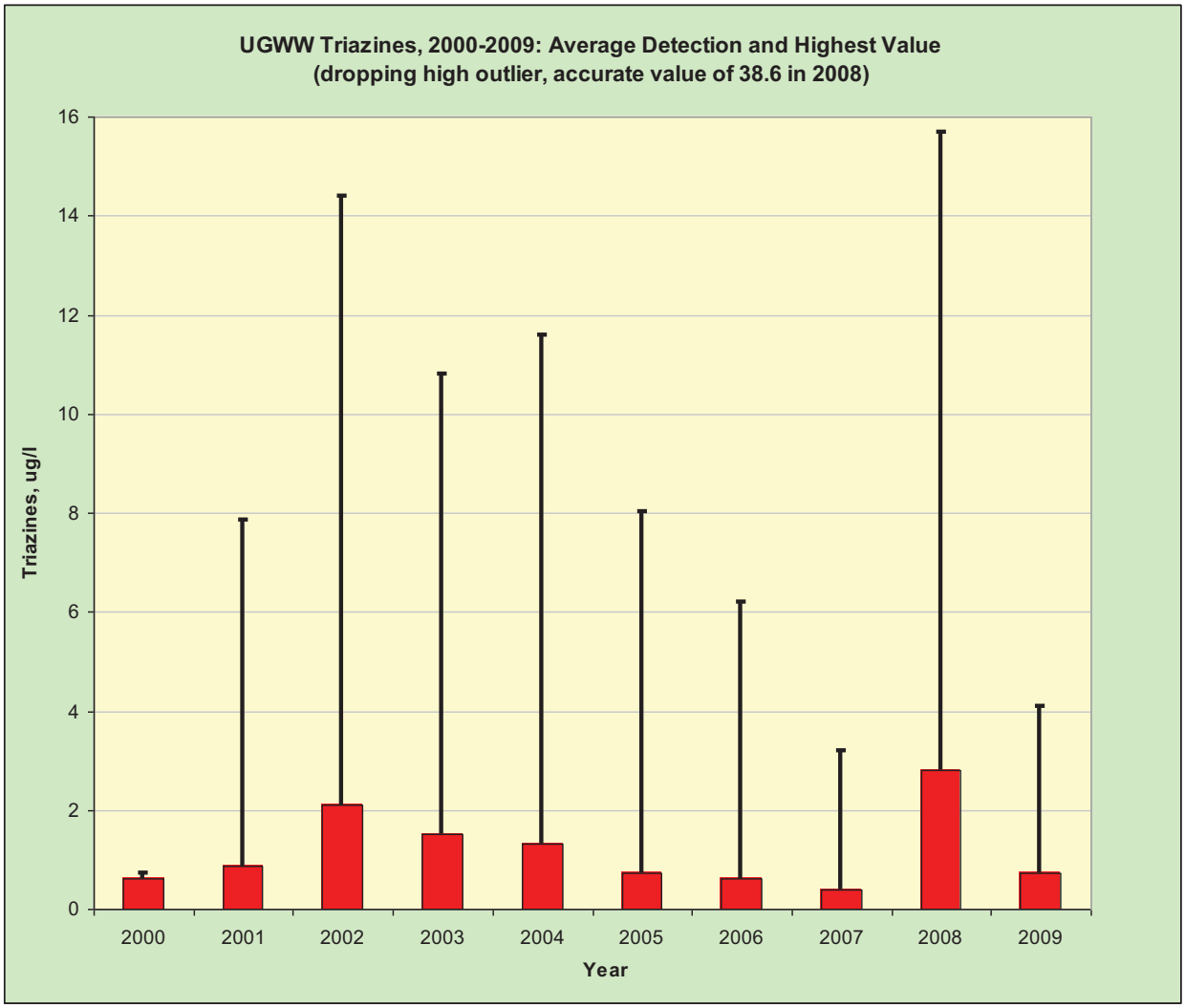


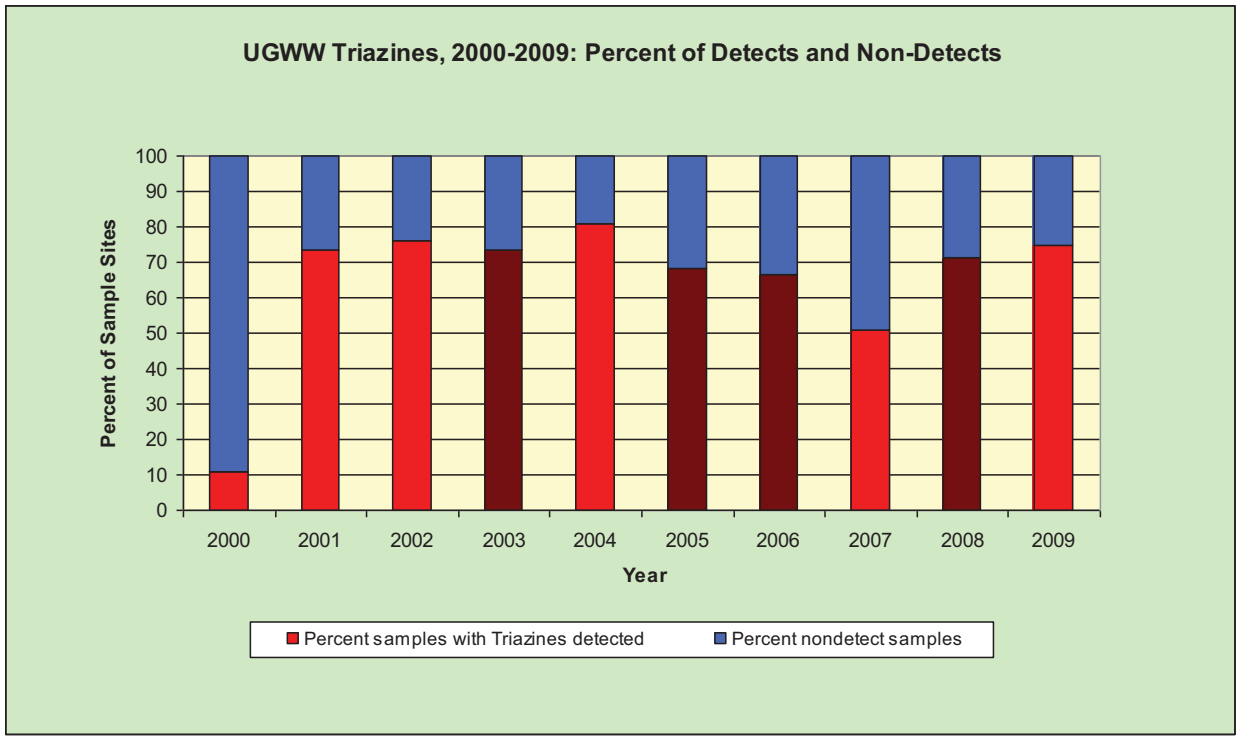
Fluoride, ppm - Upper Green River Watershed Watch, September 2009

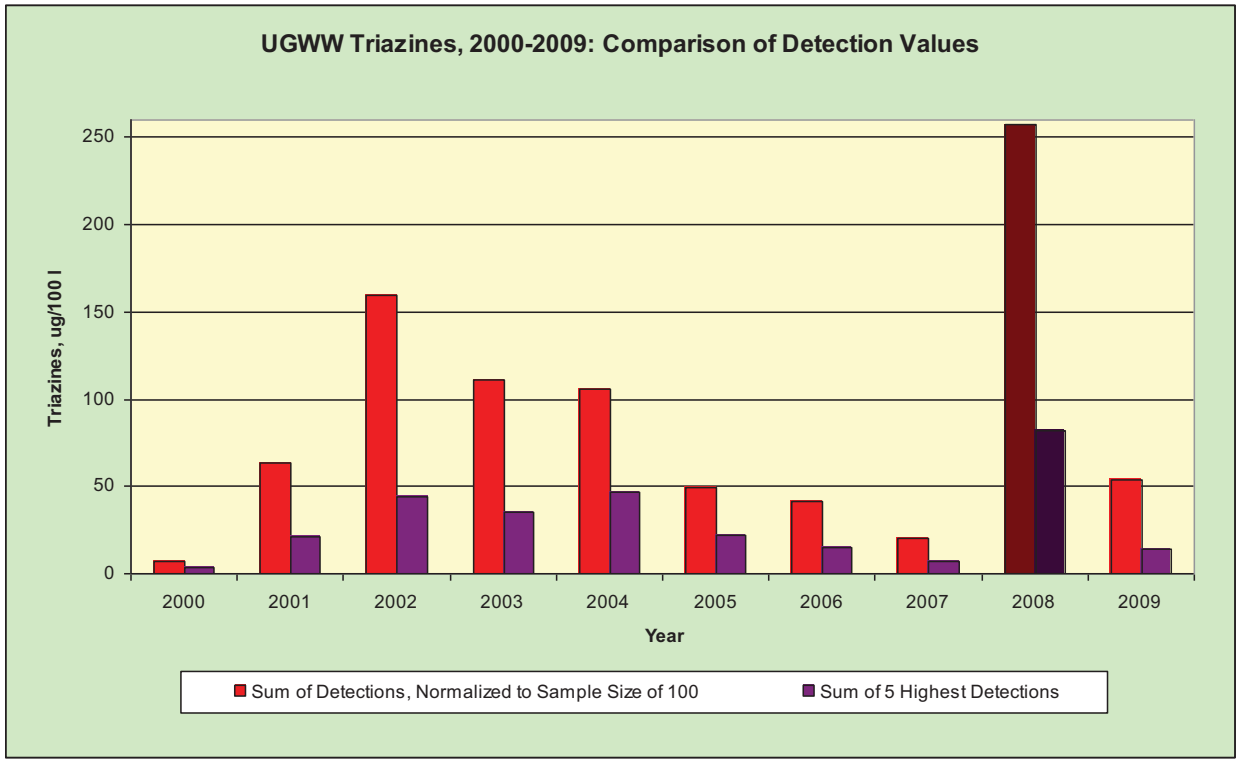


Basin-wide reductions in atrazine (as triazines) were observed from 2002 to 2007, but observed values rose sharply in 2008. This trend remains even if the highest sampling value in 2008 is omitted, and a recheck of lab data suggests that highest sampling value (38.6 ug/l) is in fact accurate. Reductions in pesticides are one important goal of the Green River CREP, and a predicted outcome of riparian corridor restoration. Much of the herbicide reduction observed prior to 2008 is likely due to shifts in producer choice of herbicide from atrazine to glyphosate, a pesticide with a shorter degradation half-life and less anticipated impact on organisms than atrazine. The elevation in 2008 may be partially explained by rainfall and runoff near the sampling event and an economics-driven move by producers back to less expensive pesticides, and perhaps cycling through pesticide choices as well. Raw data for analyses were taken from the Upper Green River Watershed Watch program.




UGWW Triazines, 2000-2009: Average Detection and Highest Value
(dropping high outlier, accurate value of 38.6 in 2008)
Triazines, ug/l
16
14
12
10
8
6
4
2
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Year


UGWW Triazines, 2000-2009: Percent of Detects and Non-Detects
Percent of Sample Sites
100
90
80
70
60
50
40
30
20
10
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Year
Percent samples with Triazines detected
Percent nondetect samples


UGWW Triazines, 2000-2009: Comparison of Detection Values
Triazines, ug/100 l
250
200
150
100
50
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Year
Sum of Detections, Normalized to Sample Size of 100
Sum of 5 Highest Detections

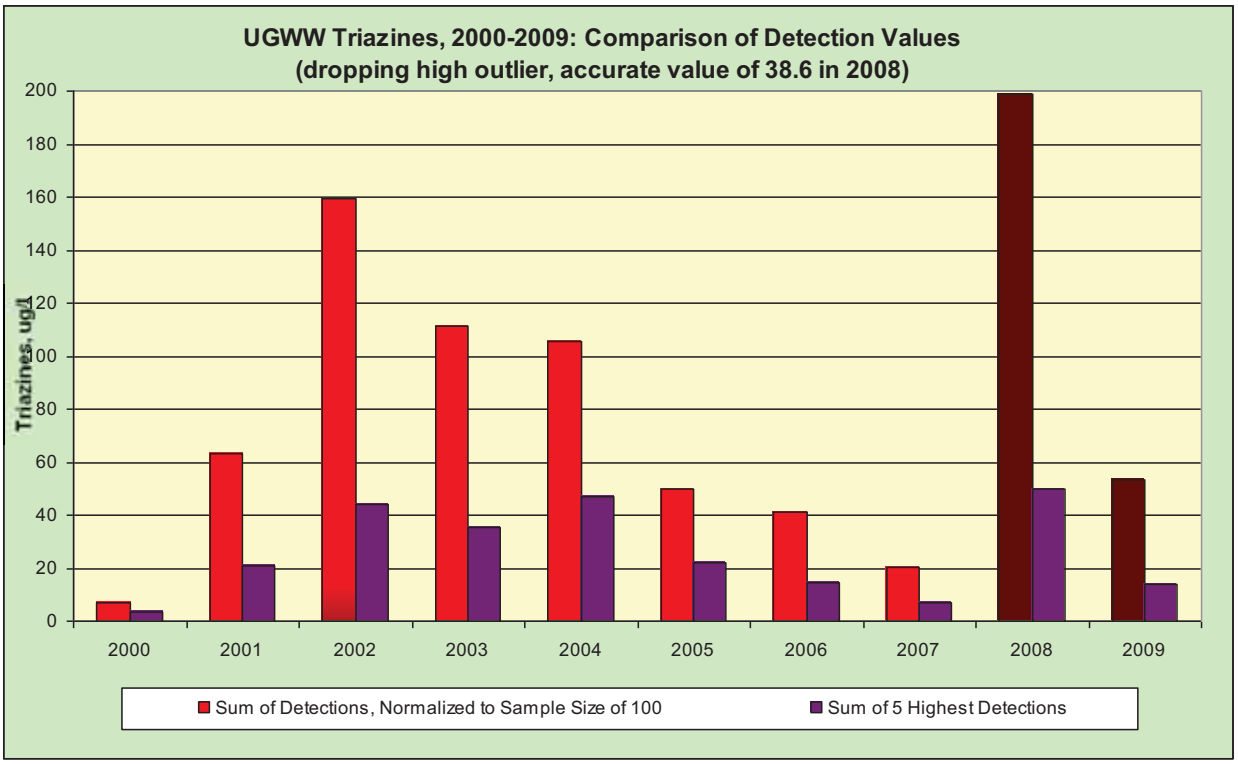
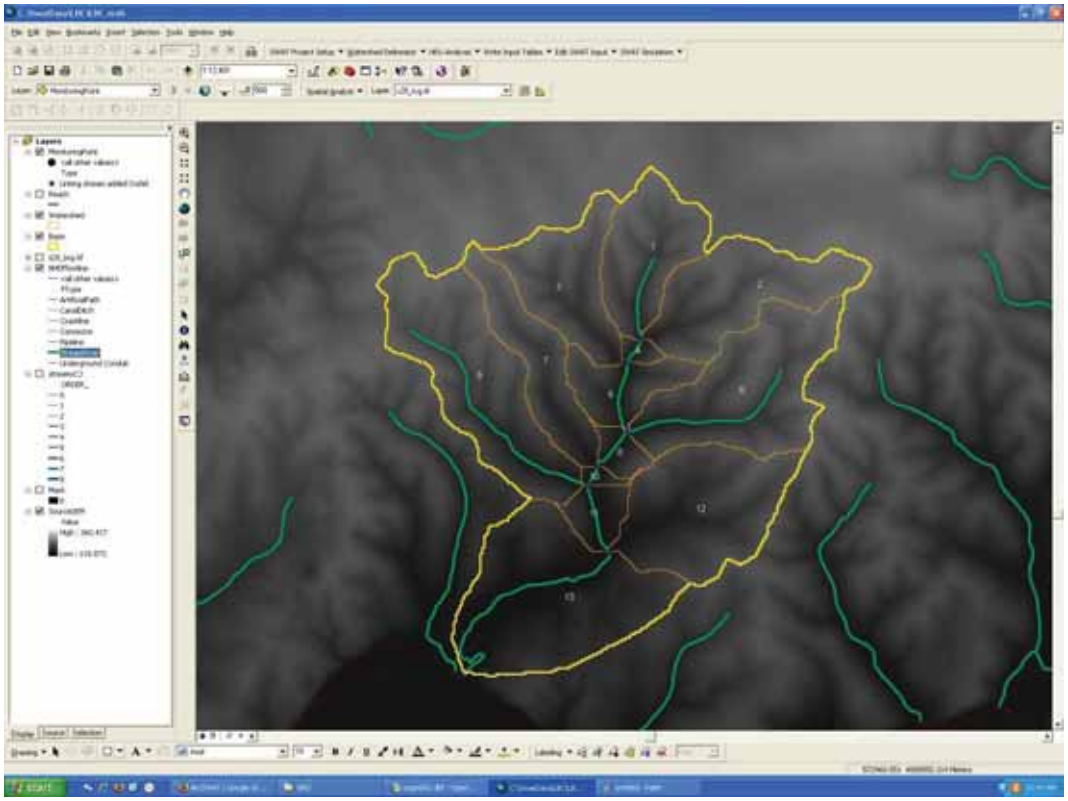
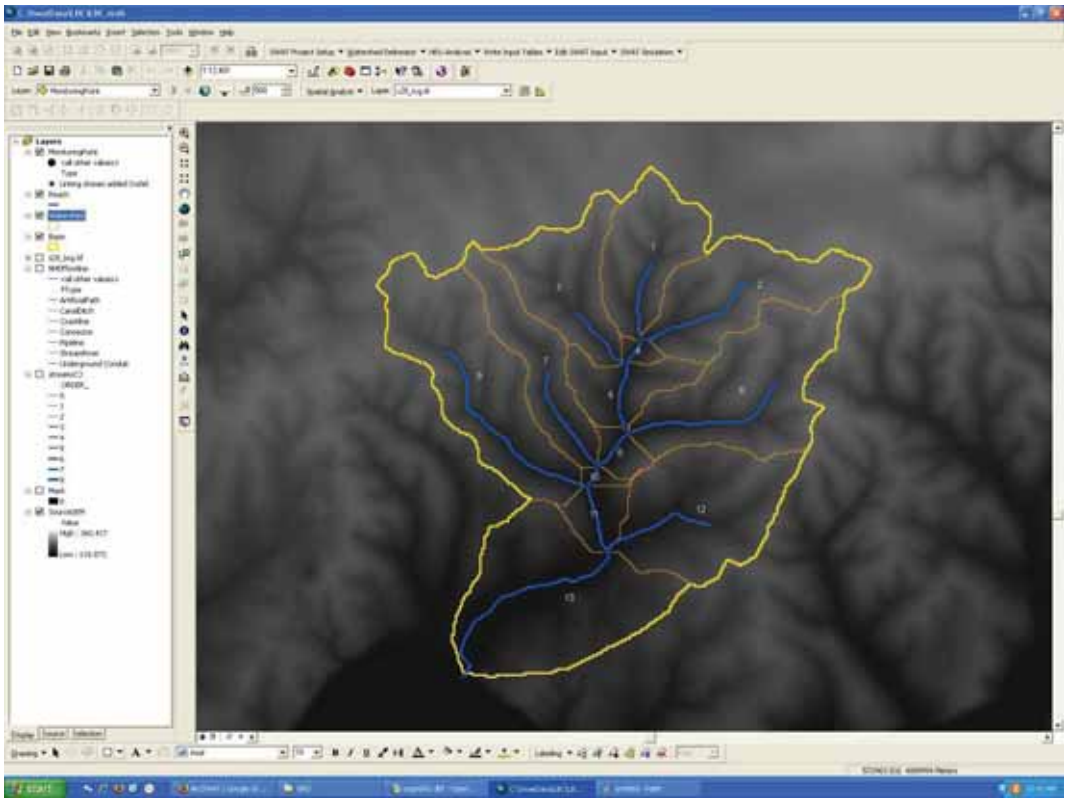
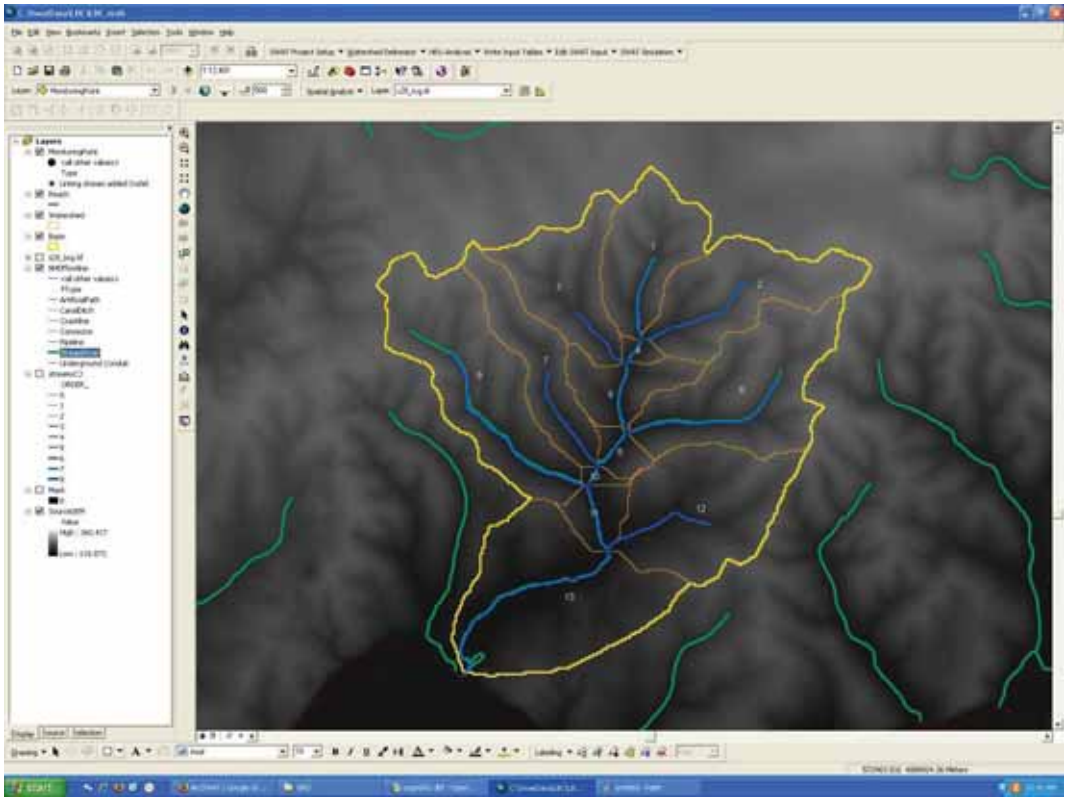

UGWW Triazines, 2000-2009: Comparison of Detection Values
(dropping high outlier, accurate value of 38.6 in 2008)
Triazines, ug/l
200
180
160
140
120
100
80
60
40
20
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Sum of Detections, Normalized to Sample Size of 100
Sum of 5 Highest Detections

Image series showing initial process of data development for use in Soil Water Assessment Tool (SWAT) model development. Little Buck Creek: NHD stream set (limited) and subwatersheds determined by DEM assessment; SWAT-calculated streams based on DEM drainages; concordance of NHD stream layers burned into DEM for proper connectance between stream segments, and SWAT-calculated stream layers, including to and from nodes within subwatersheds for hydrologic research unit inputs and outputs; SWAT-calculated stream layer and topography.







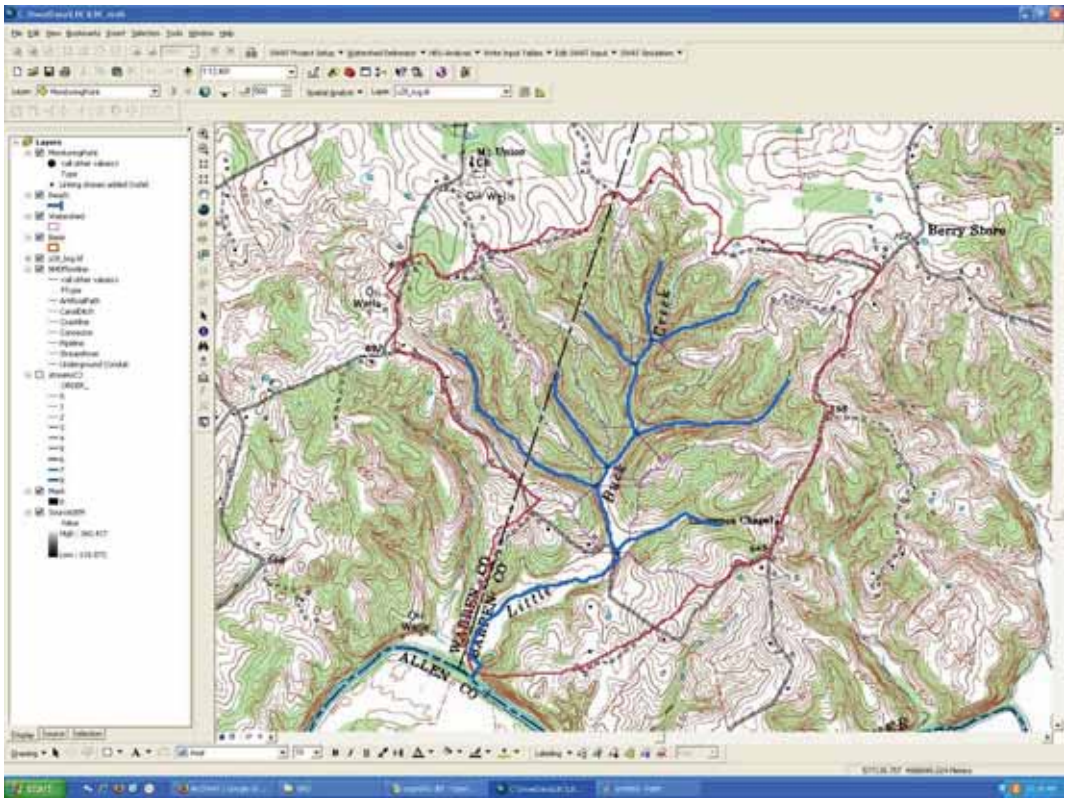
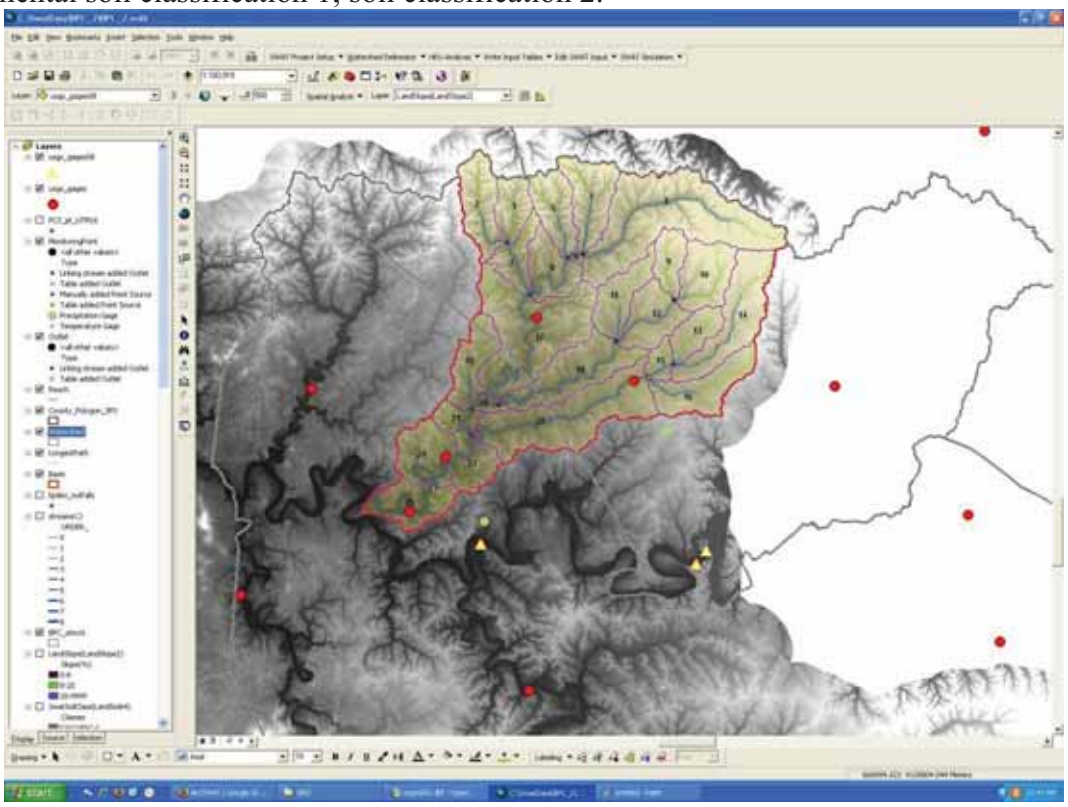
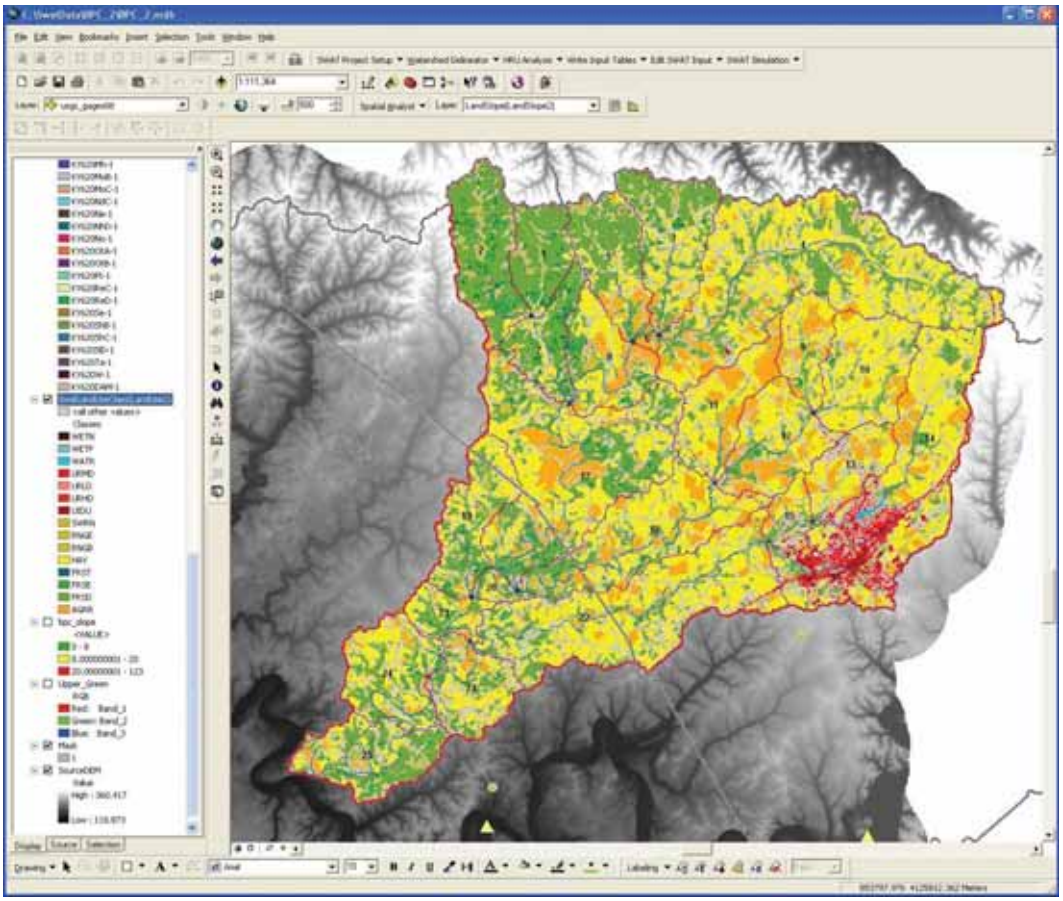
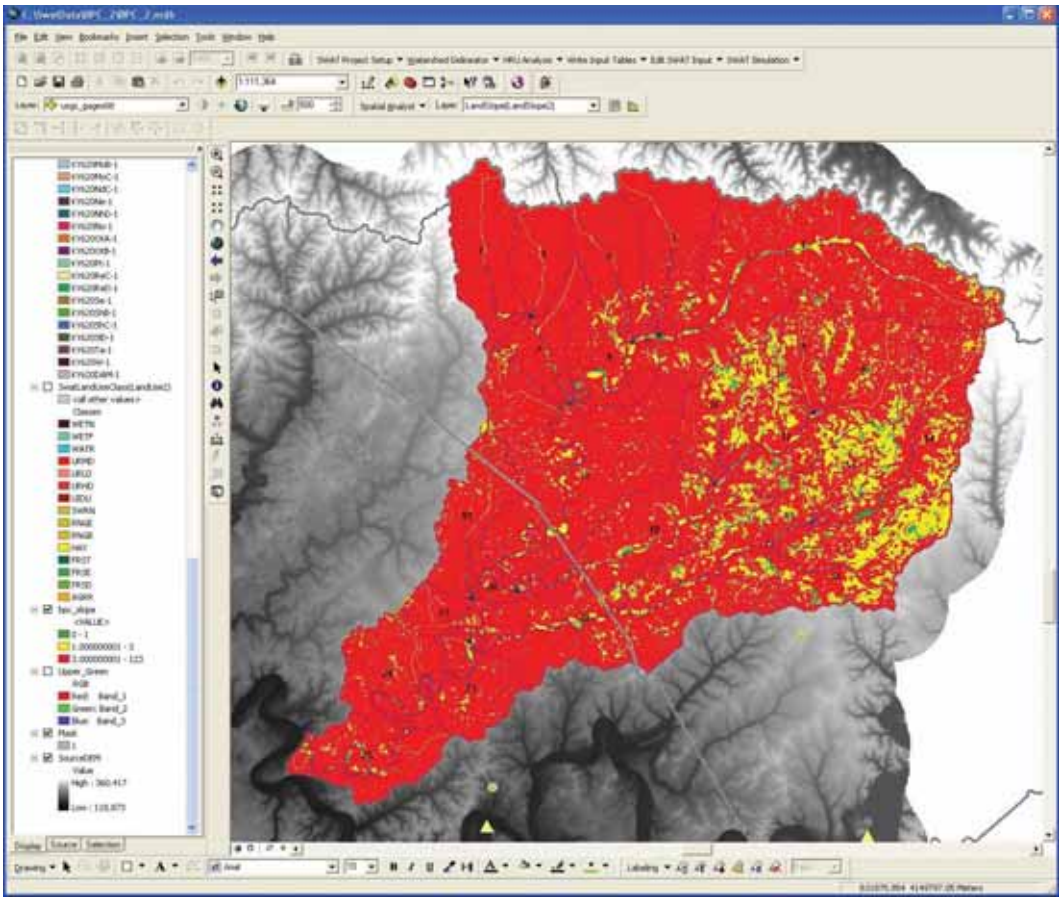
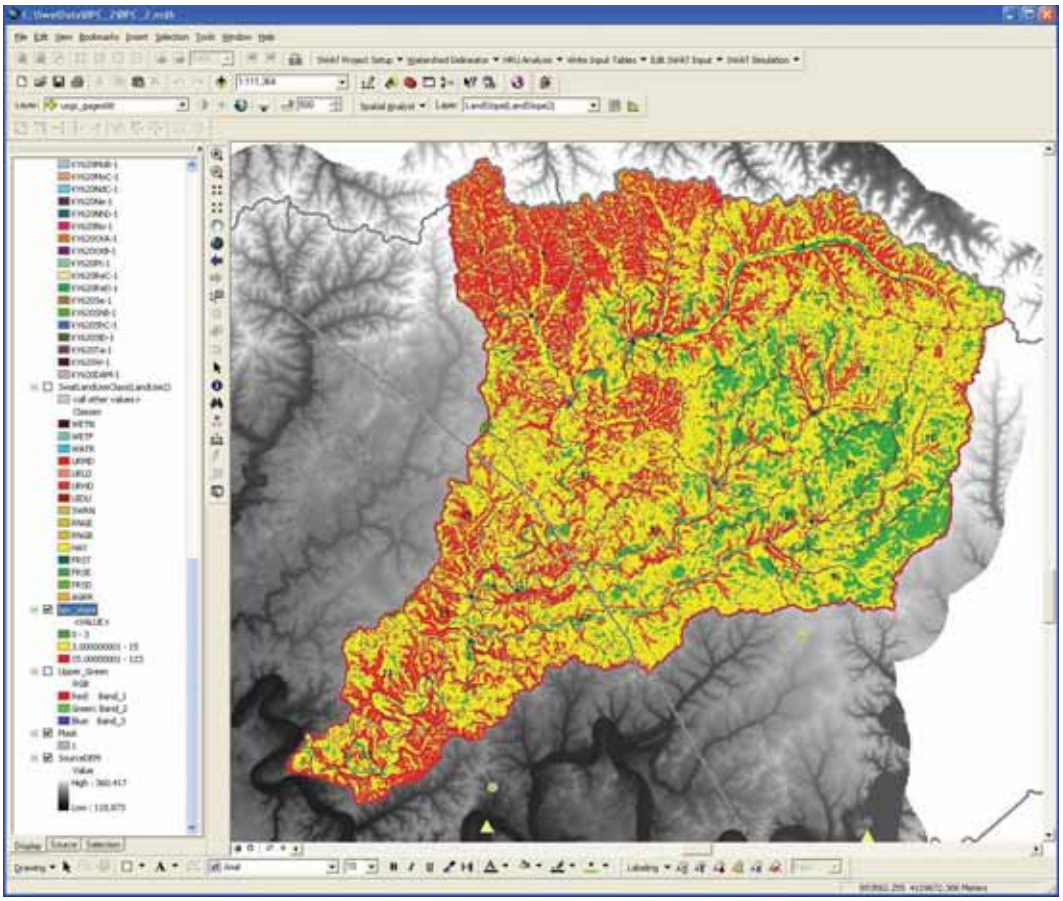

Mt Union
Berry Shore
Creek
Run
Little
WARREN CO
WARREN CO
ALLEN CO

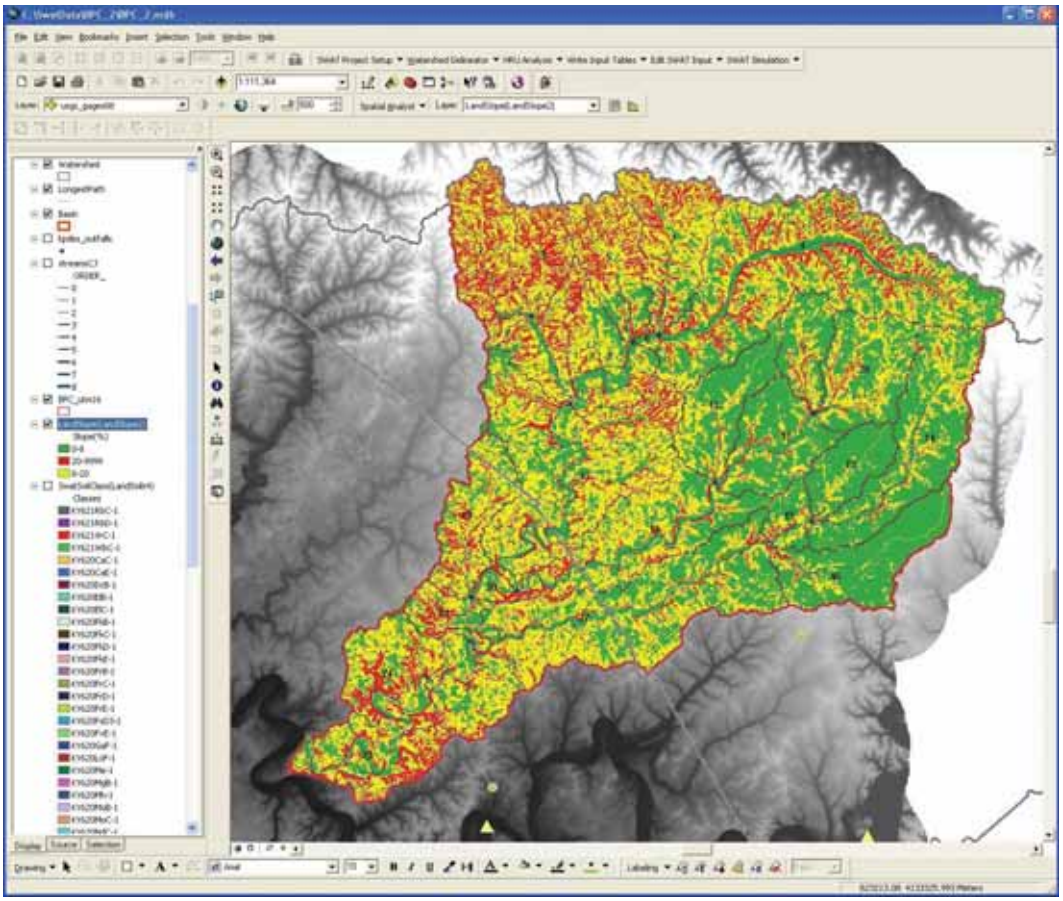
Image series showing process of data harvest, reduction, and assembly of geographic datasets for use in Soil Water Assessment Tool (SWAT) model development. Big Pitman Creek watershed: final subwatershed units (using process above) and regional data stations; aggregated land use attribution; experimental slope classification 1; slope classification 2; slope classification 3; experimental soil classification 1; soil classification 2.

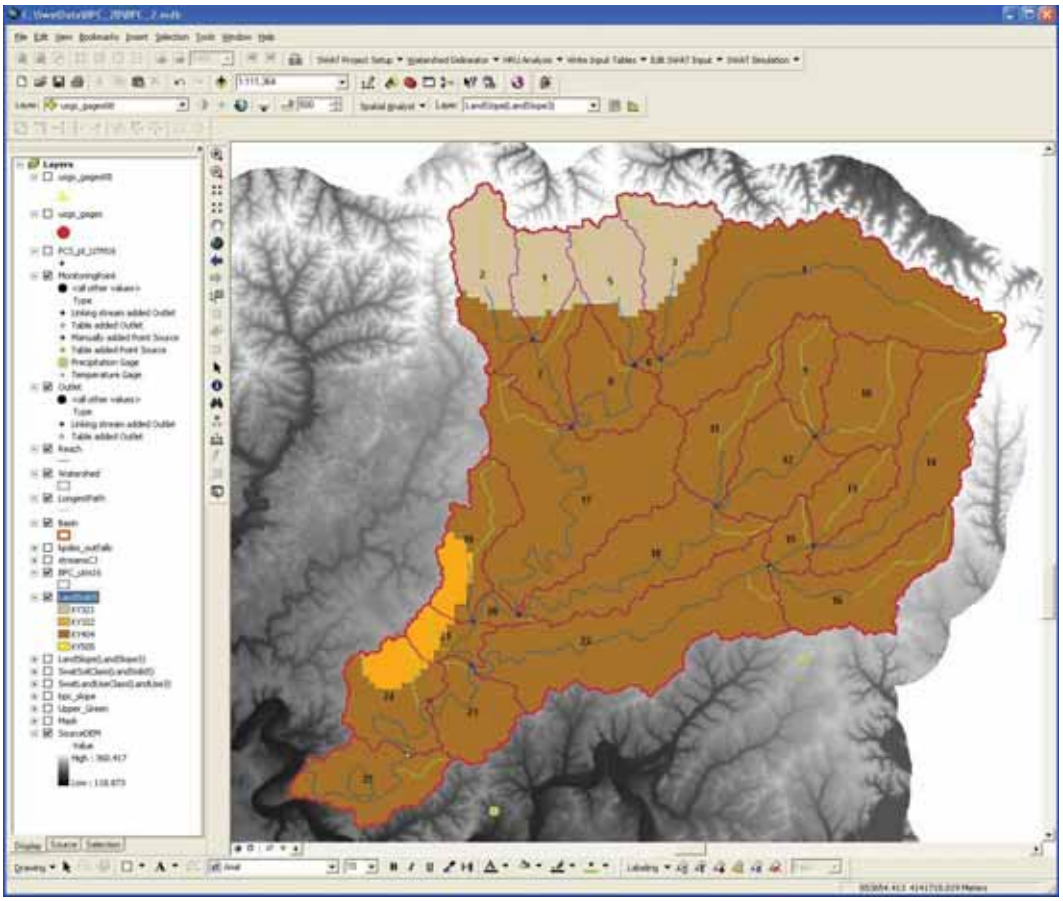












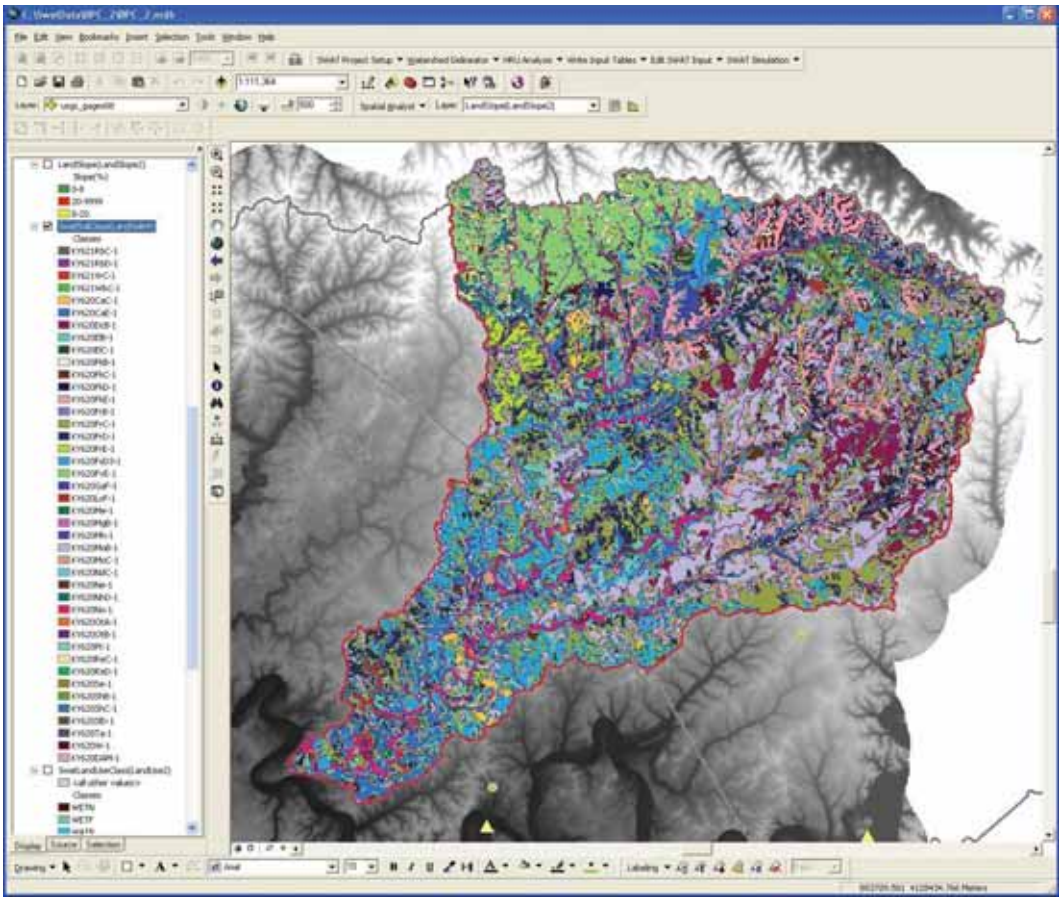
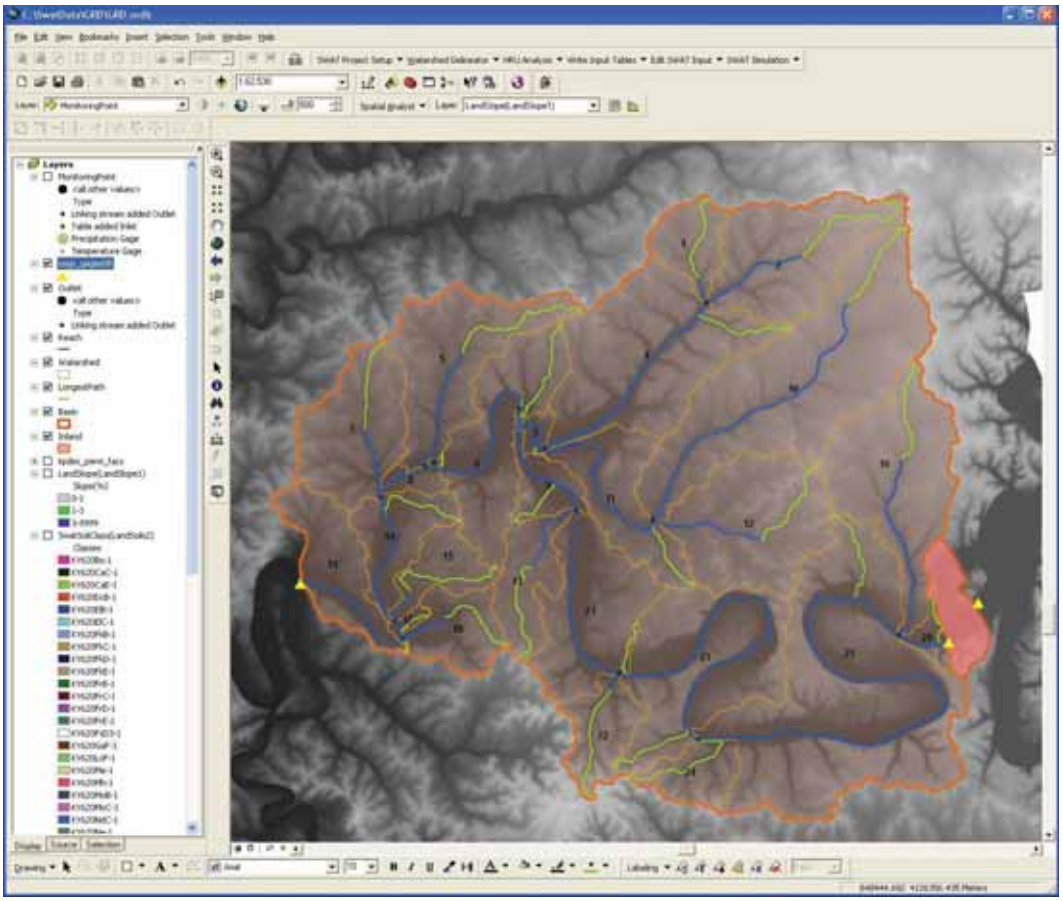
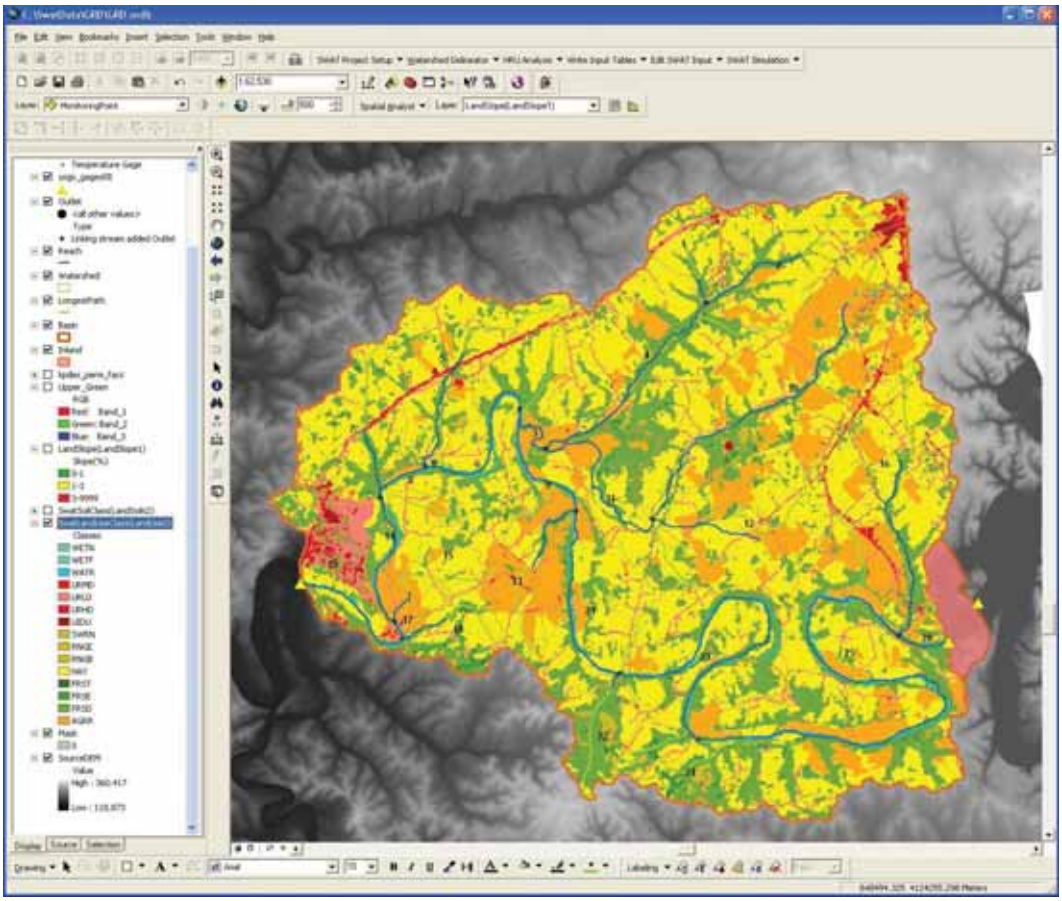
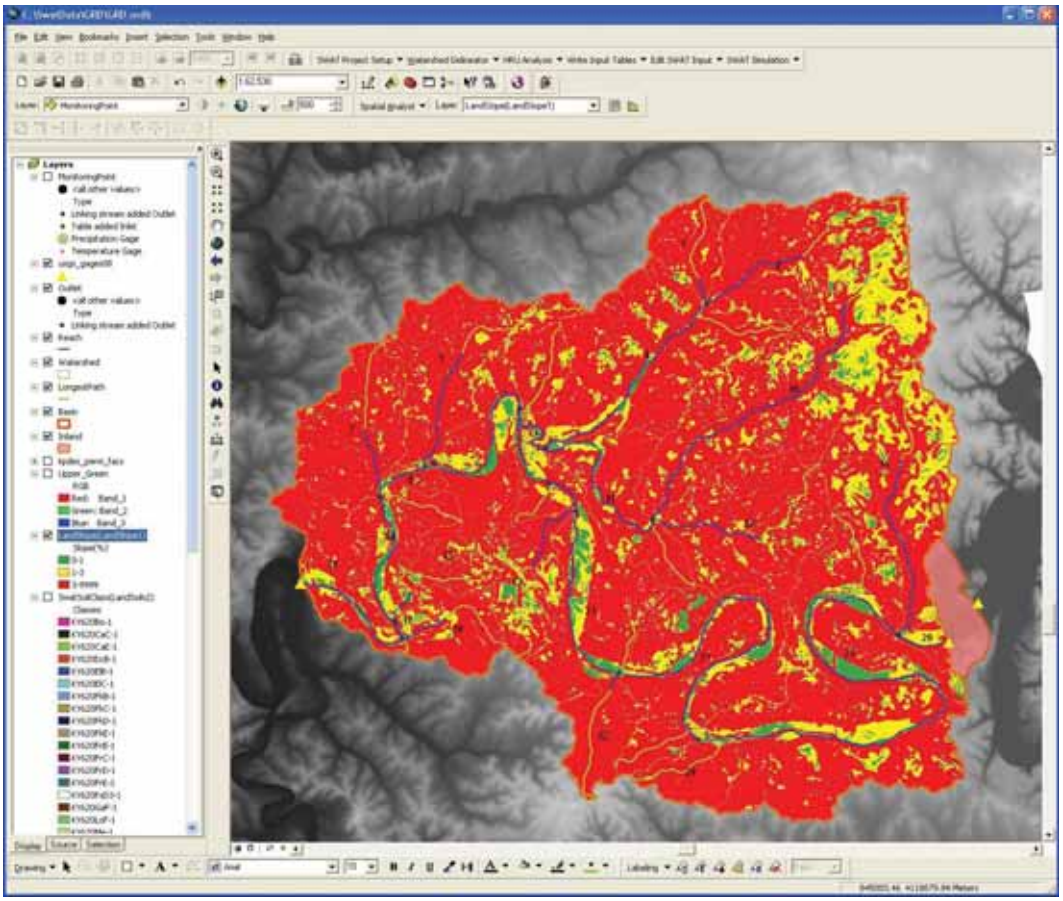
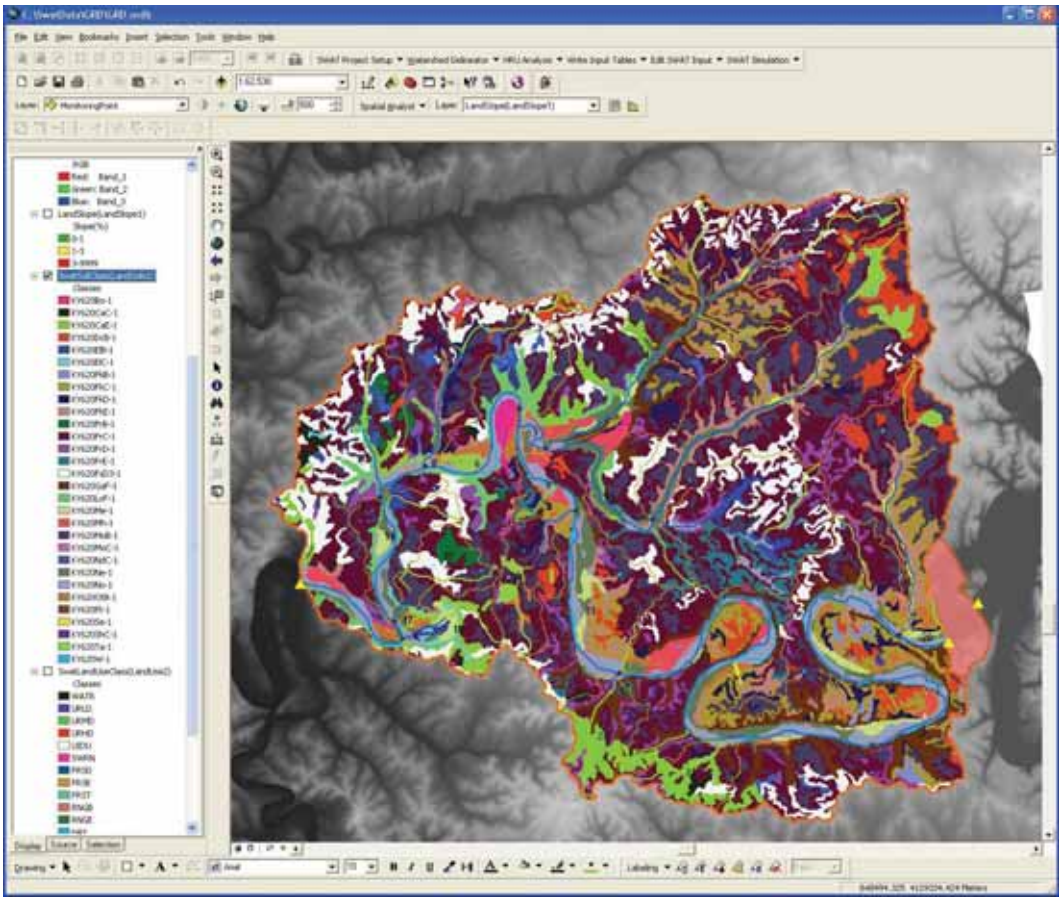


Image series (below) showing process of data harvest, reduction, and assembly of geographic datasets for use in Soil Water Assessment Tool (SWAT) model development. Green River Dam area: final subwatershed units and regional data stations; aggregated land use attribution; slope classification; soil classification. Each unique combination of landuse, slope, and soil classification within a subwatershed is defined as a hydrologic research unit (hru) that is the basis of the SWAT modeling process.

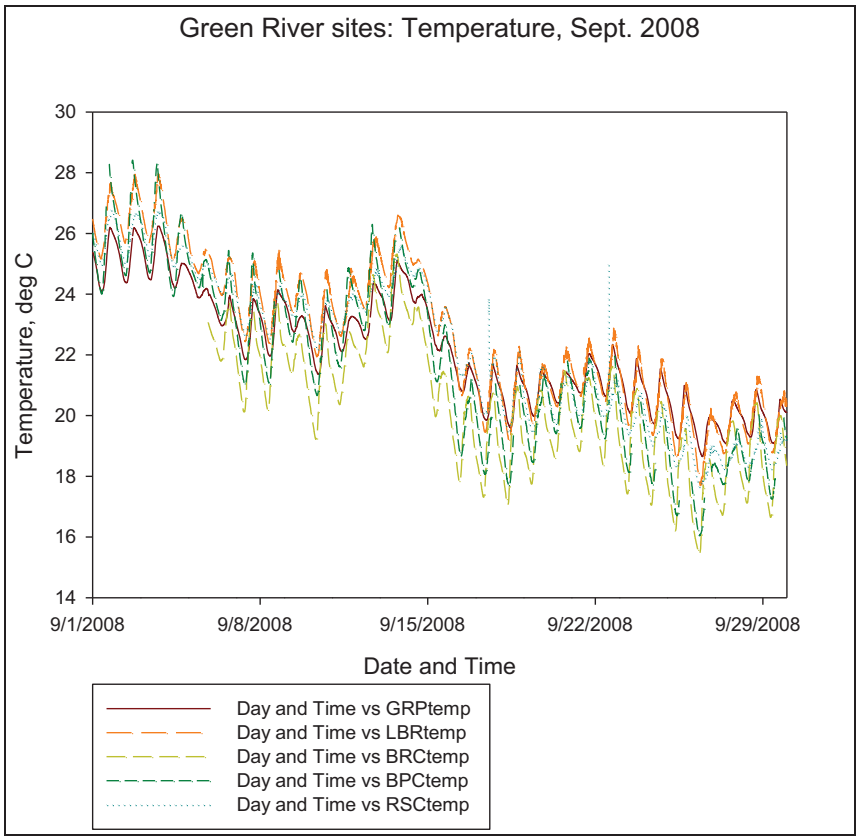


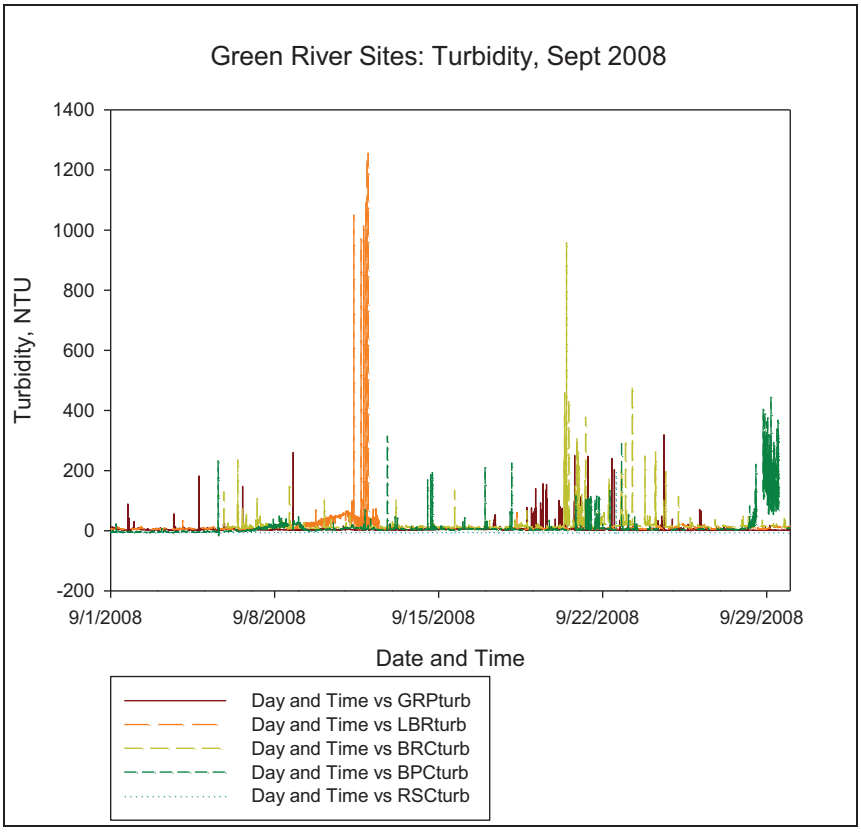


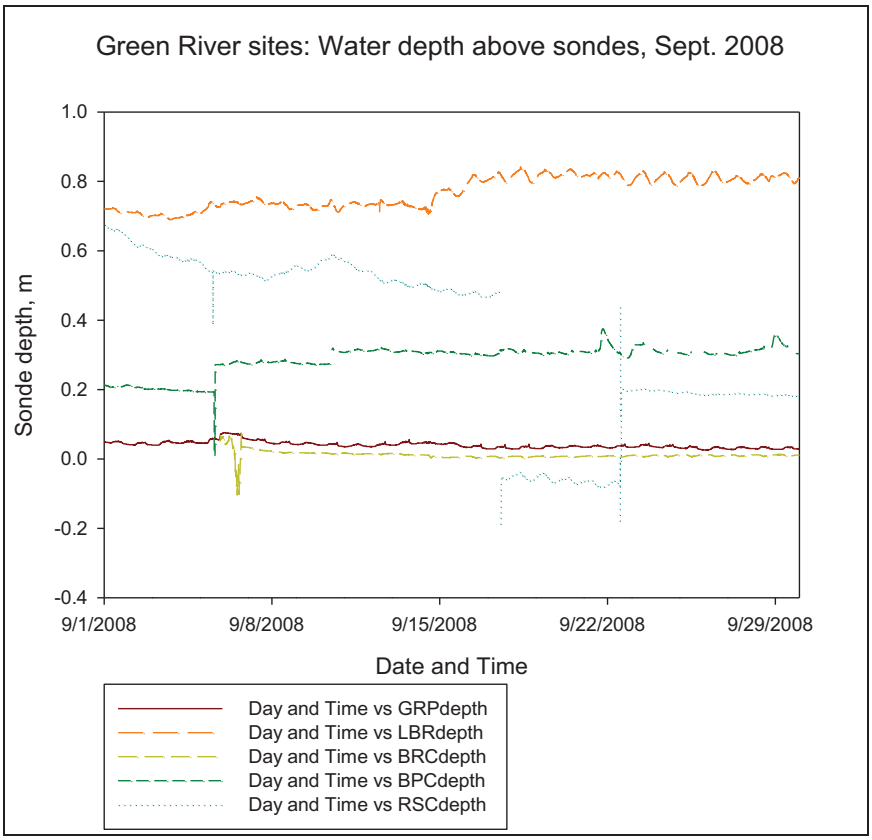


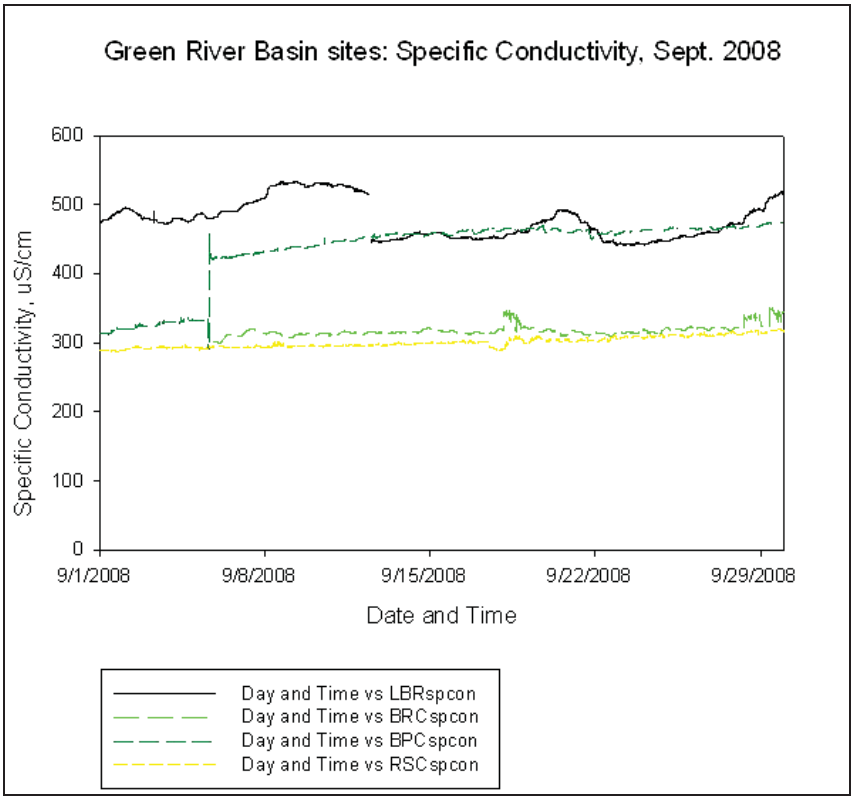


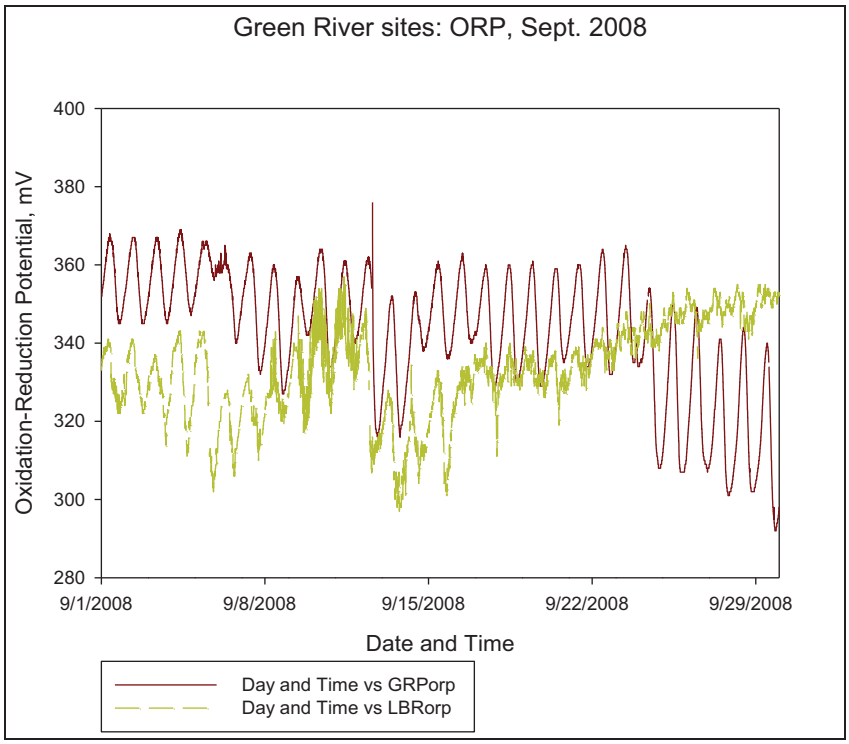
September 2008 marked the first complete month where deployed sonde data from an EPA-sponsored grant focused on diversity and monitoring in the Green River were remotely collected from all five field sites: the four major upper Green River tributary subwatersheds and the mainstem of the Green River below those inputs. Below are raw data from these sites for the month of September (not corrected for outliers and points where instruments were being serviced, or sites were being adjusted). These and subsequent data will prove invaluable in making event-based comparisons between contributing tributary subwatersheds within the upper Green River basin.

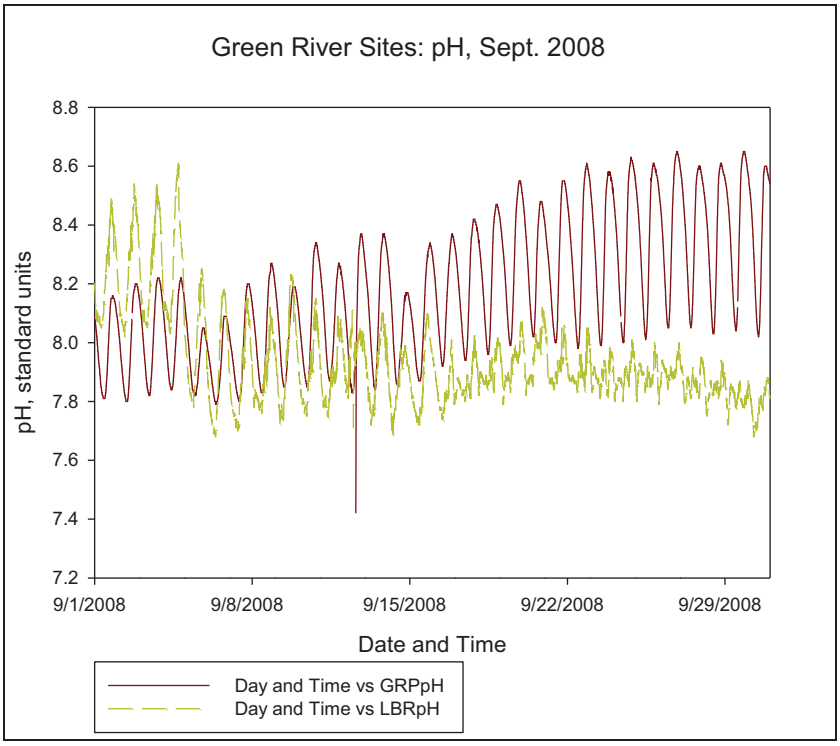

Green River sites: Temperature, Sept. 2008
Temperature, deg C
30
28
26
24
22
20
18
16
14
9/1/2008
9/8/2008
9/15/2008
9/22/2008
9/29/2008
Date and Time
Day and Time vs GRPtemp
Day and Time vs LBRtemp
Day and Time vs BRCtemp
Day and Time vs BPCtemp
Day and Time vs RSCtemp


Green River Sites: Turbidity, Sept 2008
Turbidity, NTU
1400
1200
1000
800
600
400
200
0
-200
9/1/2008
9/8/2008
9/15/2008
9/22/2008
9/29/2008
Date and Time
Day and Time vs GRPturb
Day and Time vs LBRturb
Day and Time vs BRCturb
Day and Time vs BPCturb
Day and Time vs RSCturb


Green River sites: Water depth above sondes, Sept. 2008
Sonde depth, m
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
9/1/2008
9/8/2008
9/15/2008
9/22/2008
9/29/2008
Date and Time
Day and Time vs GRPdepth
Day and Time vs LBRdepth
Day and Time vs BRCdepth
Day and Time vs BPCdepth
Day and Time vs RSCdepth


Green River Basin sites: Specific Conductivity, Sept. 2008
Specific Conductivity, uS/cm
600
500
400
300
200
100
0
9/1/2008
9/8/2008
9/15/2008
9/22/2008
9/29/2008
Date and Time
Day and Time vs LBRspcon
Day and Time vs BRCspcon
Day and Time vs BPCspcon
Day and Time vs RSCspcon


Green River sites: ORP, Sept. 2008
Oxidation-Reduction Potential, mV
400
380
360
340
320
300
280
9/1/2008
9/8/2008
9/15/2008
9/22/2008
9/29/2008
Date and Time
Day and Time vs GRPorp
Day and Time vs LBRorp


Green River Sites: pH, Sept. 2008
pH, standard units
8.8
8.6
8.4
8.2
8.0
7.8
7.6
7.4
7.2
9/1/2008
9/8/2008
9/15/2008
9/22/2008
9/29/2008
Date and Time
Day and Time vs GRPpH
Day and Time vs LBRpH

Task 3. Direct terrestrial monitoring activities

Task 3 manager. Albert J. Meier, Ph.D., Department of Biology, Western Kentucky University

- **Activity 1**: **Analysis and mapping of stream bank vegetation of the Green River.**

  Workplan overview. Our CREP/NRCS monitoring responsibilities within the Upper Green River Basin are to map streamside vegetation along the Green River and conduct point-based vegetation surveys.

  Update. No activities during October 2008 – September 2009.

- **Activity 2**: **Bio-acoustic monitoring of riparian corridor wildlife.**

  Workplan overview. Our CREP/NRCS monitoring responsibilities within the Upper Green River Basin are to develop catalogs of bird and frog calls, set up 20 recording stations, gather calls for at least two seasons, analyze calls, and relate calling to landscape level land use.

  Update: provided by Jacob Eldridge (WKU Biology Graduate Student) and Albert Meier

  Summary. Frog calls are currently being analyzed using SongScope, an acoustic recognition program from Wildlife Acoustics, Inc. This program is capable of generation a species recognizer by using training data of known frog calls. This model is then validated against the training data used to generate it to assure the model's accuracy; verification follows with the testing of the model against the larger dataset. We have developed recognizers for four frog species. The models were developed to minimize false positive identifications. When verified against a known data set. False positives in identification of individual calls are now approaching acceptably low percentages. False positives for Upland Chorus Frogs (*Pseudacris feriarum*) are 0.5%. False positives for Spring Peepers (*Pseudacris crucifer*) are 6 percent. False positives for American Toads (*Bufo americanus*) are 10%, and false positives for Fowlers Toads (*Bufo fowleri*) are 16%. We hope to be running some of these recognizers through the full set of our recordings in the next year.

- **Activity 3**: **Analysis of Restoration of Grasslands**

  Workplan overview. Conservation Reserve Enhancement Program (CREP) is replacing pastures with tall grass fields in the Kentucky's Upper Green River Basin

  Update: provided by Cabrina Hamilton (former WKU Biology undergraduate student), Aaron Hulsey (WKU undergraduate student) and Albert Meier

Avian Abundance in Conservation Reserve Enhancement Plantings and Pastures

Summary. A goal of the Conservation Reserve Enhancement Program (CREP) is to improve wildlife habitat. Past studies suggest CREP improves avian habitat and thus increases avian abundance within CREP fields compared to agriculture pasture fields. To test this in Kentucky's Upper Green River watershed CREP program, bird surveys were conducted in CREP and pasture fields. Species abundance was tested to determine if bird presence was significantly influenced by habitat (CREP vs. pasture). Bird presence was not significantly affected by habitat except for grassland generalist and summer generalist guilds. The occurrence of particular guilds and individual species within CREP or pasture indicates CREP is better suited habitat for a larger array of generalist avian species, while pasture supports a smaller number of non-generalist species. Other variables such as field area and landscape scales were not included in the tests, but may account for differences in species abundance between habitat types. This study offers information regarding the CREP program's achievement of improving wildlife habitat.

Task 4. Project Enhancements and Pilot Studies

Task 4 manager. Scott Grubbs, Ph.D., Department of Biology and Center for Biodiversity Studies, Western Kentucky University

Workplan overview. My CREP/NRCS monitoring responsibilities within the Upper Green River Basin reside with biological and ecological assessments that focus on fish and macroinvertebrate communities, and within the last two years, on the relationships between algae and nutrient levels. Monitoring activities were established on 60 stream segments, including 14 along the mainstem Upper Green River and 46 total from each of the subbasins (mainly Russell Creek, Big Pitman Creek, Little Barren River and Big Brush Creek). Three broad activities have been established:

- **Activity 1: Distribution patterns of riverine fishes in the Upper Green River Basin**

  Update: provided by Bjorn Schmidt (former WKU Biology Graduate Student) and Scott Grubbs

  Examining the role of niche similarity in the allopatric speciation of two sister species of darters in Kentucky: *Etheostoma kantuckeense* and *E. lawrencei*

  Summary. We examined two closely related sister species of orangethroat darters in Kentucky, *Etheostoma kantuckeense* (Barren River basin) and *E. lawrencei* (Green River basin), to determine if niche similarity or niche divergence impacted the lineage splitting of these taxa. Habitat preference was used as an indicator of ecological niche similarity, and was compared across three spatial scales (watershed, stream reach, and local microhabitat). Habitat preference across these three scales was similar for both species. They both were most abundant in small, headwater creeks within their respective drainages. They also were both more abundant in run habitats within a stream reach. Additionally, they were both associated with small to coarse gravel (1–40 mm diameter). These results support the hypothesis that niche similarity has facilitated lineage divergence for these taxa, possibly due to limited dispersal across intervening habitats that act as ecological barriers.

- **Activity 2: Distributional patterns of aquatic macroinvertebrates (including crayfish) in the Upper Green River Basin**

  Update: provided by Eva Ngulo (former WKU Biology Graduate Student) and Scott Grubbs

  Relationships between crayfish abundance patterns and environmental variables across two spatial scales in a central Kentucky river basin, U.S.A

Summary. The relationships between crayfish species abundance patterns during summer baseflow conditions and environmental variables at the watershed and reach scales were assessed across 30 study reaches in Kentucky's upper Green River basin, U.S.A. Mixed gravel-cobble and large boulder substrates were sampled from each reach. Six species in total were obtained. *Orconectes rusticus* and *Orconectes putnami* were obtained from 29 reaches each and combined comprised 92.6% of the total individuals collected. The most common *Cambarus* (*C. graysoni*) constituted 4.8 % of the total individuals obtained. Although *O. putnami* and *C. graysoni* had higher mean density values on large boulders, an independent measure t-test revealed non-significant differences. A similar result occurred for *O. rusticus*, with only slightly higher densities on gravel-cobble substrates. A canonical correspondence analysis (CCA) in the forward selection procedure reduced the number of environmental variables from 27 to five for the gravel-cobble data only. The second CCA revealed relationships between crayfish species abundance with percentage of urban land-use and stream-size related variables (e.g., temperature). Pearson correlations showed that density of only *O. rusticus* was related to percentage of urban land-use and temperature.

- **Activity 3: Evaluating spatial patterns of algal biomass accrual, and relationships to base geology, thermal patterns, and nutrient limitation, along the Upper Green River**

Update: provided by Mary Penick (former WKU Biology Graduate Student), Albert Meier, and Scott Grubbs

Algal biomass accrual in relation to nutrient availability along a longitudinal gradient of a riverine system

Summary. Nutrient limitation in aquatic ecosystems results from a deficiency in nitrogen or phosphorus levels relative to cellular growth needs. Nutrient limitation of freshwater systems is a function of biotic and abiotic factors. Biotic factors include vascular and nonvascular plant community composition. Abiotic factors include underlying bedrock and land-use activities (e.g. agriculture, septic systems). Nutrient availability directly affects growth, productivity, and community structure of primary producers. The purpose of this study was two-fold: (1) to assess the relationship between ambient algal biomass and in-stream nutrient levels along the longitudinal course of a river through a transition from weak to well-developed underlying karst bedrock, and (2) experimentally assess if periphyton was nitrogen or phosphorous limited between weak and well-developed karst sites. Sestonic and filamentous biomass (= chlorophyll-α) levels increased monthly along the longitudinal gradient. In contrast, periphyton biomass levels increased minimally monthly and displayed no longitudinal pattern. Nitrate and soluble reactive phosphorus levels exhibited distinct longitudinal increases, whereas total phosphorous displayed minimal change and ammonia levels decreased in the downstream direction. Total nitrogen (TN) levels increased upstream but decreased sharply in the well-developed downstream karst sites. The nutrient limitation assays revealed that the highest periphyton levels were with N + P treatments at the most upstream sites. Overall, in Kentucky's Green River algal biomass accrual appears to be mainly P-limited but likely also by TN availability during late summer.

IV. Recommendation

Buffered, large sinkholes (CP29) in Warren County, December 2009

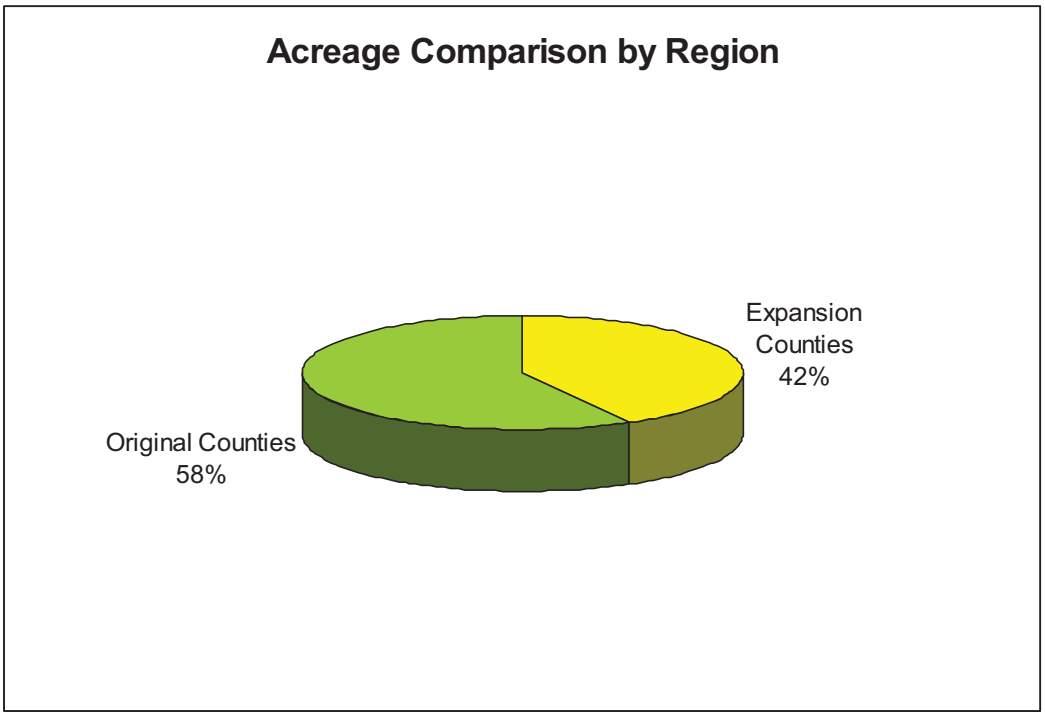
General Financial Overview: The Green River CREP was approved as a 100,000 acre and $110,000,000 program which was divided among USDA ($88,000,000 commitment), the Commonwealth of Kentucky state government ($17,000,000 commitment), and The Nature Conservancy ($5,000,000 commitment). These funds were those that were to be paid to landowners for conservation practices. These funding commitments do not include any expenses involved in the working and management of the program.

State Partners: The Commonwealth of Kentucky's state government agencies have, to this point, paid just under $11,000,000 to landowners in the forms of cost share assistance, practice incentives, and practice maintenance assistance. State cost share and incentive payments will continue be made in the coming two to three years due to regulatory annual limitations, but these payments will not have a significant impact on the overall total. After review of previous TNC monies paid to landowners and knowledge that some limited activity on easements has occurred, an estimate would be that their contribution may be approaching $1,000,000 as this report is written.

Federal Partners: Federal expenditures have far exceeded the originally pledged $88,000,000. Federal payouts will easily exceed $260,000,000 over the lifetime of these contracts. There are a few obvious reasons for these numbers to be larger than originally thought. Two very important factors happened, by coincidence, at nearly the same time

that likely played a substantial role in these numbers. First, the Kentucky FSA state office reviewed soil rental rates across the Commonwealth. Many rental rates were increased in our CREP counties. At nearly the same time, our expansion amendment was approved. This geographic expansion was generally to the southwest. This encroached into a more "high-end" agricultural area, encompassing some of the more productive agricultural counties in the Commonwealth. Soil rental rates are much higher in these counties, thus increasing cost on payments. A detailed statistical analysis would be needed to fully identify the scope of the economics of this program. This is also a primary reason that the state contributions have not been as high as the federal. State contributions are based on cost share amounts only and are unrelated to the soil rental rate incentives.

The following chart is a simple comparison of acreage enrolled into the program. It is related to the above conversation, as it shows how much of the land is in the expanded program area. In reality, the enrolled acreage is nearer a 50/50 split, as one of the counties, Edmonson, was part of the original area. It increased its land area with the expansion, and a significant percentage of its acreage is in the expanded area. It, however, is included as an original county in this chart.



The success of the Green River CREP in this small, rural area of south central Kentucky truly represents what this program was designed to do. The program started out rather slowly as compared with some other states that had already established CREP programs of their own. Partner agency personnel identified gaps in CRP program policy and design with local geographic and land use characteristics and created an amendment that truly embodies the intent of CREP. This is evident with the accomplishments in the more recent years of the program. The enrollment data and conservation benefits speak for

themselves. In addition to those programmatic changes that better fit the area, when the amendment was rolled out into to a new part of the region, experiences and failures from early in the process allowed the agencies to be much better prepared and ready for what had to be accomplished. It was an excellent lesson learned, and the field staff's adjustments were instrumental to the very quick success that was experienced.

Riparian Buffer in Allen County, December 2009

It is hoped that future endeavors similar to CREP will be able to benefit from the adjustments that were made with this program. It is a very nice and satisfying conclusion to the program, but future programs should take note of early problems so that the next program will be able to be implemented as smoothly as was the amendment and expansion. Concerns such as agency responsibilities and boundaries; personal, individual attitudes about the success of the program, i.e. employee buy-in; proper planning and reasonable expectations; timely hiring of a program coordinator and proper placement of that position; basic communication; and several other items all played a part of the early success level of this program but were overcome when the amendment was implemented. It is a testament to the agencies and the individuals involved that this program attained the success that it did as quickly as it did. Other, less obvious lessons were also learned. For example, in the time of current economic hardship, things such as the CREP National Forums that were conducted early in the decade may seem excessive to some with regard to paying for employee travel, etc. One of the key successes of the Green River CREP program was attained by simple networking and conversation at one of these forums.

While trying to determine how to amend the program and more effectively protect Kentucky's unique karst landscape, a simple conversation with employees from another state was initiated. The idea of including an additional practice, the CP29, was discussed, as this state used this practice for their sinkholes and karst features. That practice was included in the amendment, and despite only being in place for nearly two years, that practice has accounted for 73% of the Green River CREP's total acreage. It is sometimes small experiences and lessons such as this that can make huge differences in even the largest of programs.

There are very few contracts still left to be installed in the upcoming year, and a few federal and state cost shares and incentives left to be paid. However, in large part, the bulk of the work has been completed. All of the allotted acreage has been contracted, and as this program winds down, it is obvious that it has been a success for both the local landowners and the resources within this unique and deserving area. So many federal, state, and local agencies and individuals working together was at times trying, but the adjustments made and success of this program is a testament to those involved.

In addition to the accomplishments already documented in this report, the Kentucky Green River CREP Partnership received the prestigious 2007 Two Chiefs' Partnership Award. This award, which is given by the U.S. Forest Service and USDA Natural Resource Conservation Service, recognizes outstanding partnerships in forest conservation work among conservation districts, state foresters, the USFS, and NRCS. The award was presented in November, 2007.

Partner Listing:

USDA Farm Service Agency
USDA Natural Resources Conservation Service
The Office of the Governor
The Kentucky General Assembly
The Kentucky State Nature Preserves Commission
The Kentucky Soil and Water Conservation Commission
Kentucky Division of Conservation
Kentucky Division of Forestry
Kentucky Division of Water
The Kentucky Department of Fish and Wildlife Resources
The Nature Conservancy
Mammoth Cave National Park
Kentucky's Soil and Water Conservation Districts
Western Kentucky University

Thanks to the partner agencies and organizations for their commitment to this project and to the landowners and natural resources of this unique area. Also, thanks to those partner agency personnel that supplied information for the completion of this report.