32nd Annual Great Plains Limnology Conference

Nichols Hall
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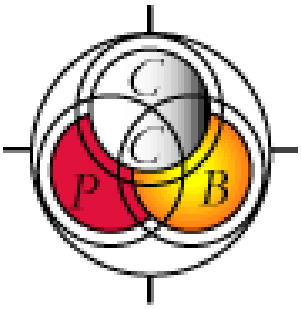
Hosted by:
Central Plains Center for BioAssessment,
Kansas Biological Survey



Program Agenda

8:00 a.m. **Registration, Poster Setup, and Refreshments**

8:30 a.m. **Opening: Don Huggins speaks about the USEPA Region 7 Regional Technical Assistance Group (RTAG)**

NUTRIENT CRITERIA

8:45 a.m. Val Smith and Debbie Baker
USEPA Region 7 lake nutrient criteria development

9:00 a.m. Walter Dodds
Nutrients, trophic state, and nutrient criteria in lotic and lentic waters

9:20 a.m. Aris Holz
Reservoir classification in agriculturally dominated ecosystems

9:40 a.m. Jack Jones
Trophic state of Missouri reservoirs: an overview of what we know in 2005

10:00 a.m. **Posters and Break**
Poster Presenters - please be available to answer questions.
Jason Beury and Irene Beeman
P-cycling, Agrochemicals and Cyanobacteria Blooms in Two Midwestern Reservoirs: A Comprehensive Approach to Eutrophication

Jessica J. Eichmiller and Walter K. Dodds
Hydrologic controls on short-term and long-term patterns in dissolved organic carbon concentration in prairie streams

Justin N. Murdock and Walter K. Dodds
Effects of Substrata Orientation and Surface Texture on Periphyton Variability

Eric Starkey and Bill Stark
Movement of the Pistolgrip Mussel (*Tritigonia verrucosa*)

WETLANDS

10:30 a.m. Jay Christensen
Horizontal and vertical distribution of *Hyalella azteca* across an emergent vegetation to open water gradient

STREAMS

10:45 a.m. Teresa Carroll
Hydrological variability and macroinvertebrate community structure in an intermittent, Karst Ozark Stream

11:00 a.m. John Havel
Zooplankton as bioindicators: diversity and abundance in the Missouri River

LAKES

11:15 a.m. Anthony Thorpe
Lakes of Missouri Volunteer Program – a review

11:30 a.m. Keith Koupal
Limnological variation associated with drought conditions in an irrigation reservoir in South-Central Nebraska

11:45 a.m. Lunch

LAKES Continued

12:45 p.m. Bill Sellers
Limnological assessments on management techniques at Borrow Pits in South-Central Nebraska

1:00 p.m. John Holz
Effects of barley straw on water quality and plankton community structure in hypereutrophic sandpit lakes

1:15 p.m. John Schalles
Remote detection of chlorophyll gradients in lakes, reservoirs, and estuaries

1:30 p.m. Kimberly Medley
Fish presence, hydroperiod, and flooding effects on pond zooplankton communities in reservoir floodplain

1:45 p.m. Jennifer Graham
Microcystin distribution among cyanobacterial size classes

2:00 p.m. Nicolas Fryda
Evaluation of larval Crappie (*Pomoxis* spp.) production in Nebraska Irrigation Reservoir

2:15 p.m. Closing

2:30 p.m. End of Limnology Conference

ABSTRACTS

P-cycling, Agrochemicals and Cyanobacteria Blooms in Two Midwestern Reservoirs: A Comprehensive Approach to Eutrophication

Jason Beury and Irene Beeman
Central Plains Center for BioAssessment, Kansas Biological Survey, University of Kansas, Lawrence, KS
jbeury@ku.edu

Overall, there are a variety of factors that contribute to the dominance of cyanobacteria in freshwater ecosystems. However, it is evident that eutrophic events are primarily a result of human influence. Therefore, alleviating the problems associated with eutrophication will depend upon both revealing and modifying the human activities that contribute to it. We will attempt to identify internal and external factors contributing to eutrophication in midwestern reservoirs and later apply our results to a practical evaluation of commonly proposed lake restoration techniques. Internal mechanisms include rates of nutrient release from sediment during anoxic conditions and effects of sedimentary re-suspension on nutrient concentrations in the water column. External loading includes excess nutrients, common herbicides and pesticides. One particular area of interest is the rapid proliferation of transgenic crops, the majority being of the Round-up Ready soybean variety; in the US from 1.2 million acres in 1996 to 120.0 million acres in 2005 (Monsanto Company). Recent studies have revealed harmful effects of Roundup PRO® Herbicide on non-target organisms such as amphibians and zooplankton (Geisy, 2000; Relyea, 2005). Roundup PRO® Herbicide is also listed as being slightly toxic to certain types of green algae. The studies mentioned here are somewhat contradictory in their findings and create an air of ambiguity around the actual effects of Roundup PRO® Herbicide on aquatic ecosystems. Thus, we will investigate the effects of several concentrations of Roundup PRO® Herbicide on aquatic ecosystems in conjunction with that of other chemicals commonly found in midwestern watersheds such as Atrazine, Metachlor, and Alachlor to further explore the relationship between externally loaded chemicals, internal phosphorus cycling, and sediment re-suspension with respect to cyanobacteria dominance. Our two main case studies for this series of experiments will be Clinton Lake, Lawrence, KS and Pony Creek Lake, Sabetha, KS. We will compare our experimental data with that of other studies involving eutrophic water bodies throughout the world to create a comprehensive analysis of eutrophic processes that combines newly emergent variables with those that are already well known.

Hydrological Variability and Macroinvertebrate Community Structure in an Intermittent, Karst Ozark Stream

Teresa M. Carroll
Department of Ecology and Evolutionary Biology, University of Kansas, Lawrence, KS
tcarroll@drury.edu

Research on the ecological effects of prolonged stream drying in karst systems has lagged behind studies of continually flowing epigean systems. Macroinvertebrate community responses to hydrological variation in the South Dry-Sac River of southwestern Missouri were examined over six seasons during 2003-2004. Stream permanence was quantified by measures of seasonal discharge, minimum discharge at summer baseflow, wetted riffle area-perimeter, and weekly bankfull percentages. Community composition was determined by collecting three samples in each of ten riffles per season (180 samples) along a 1-km stretch of the stream located along a natural fault line in the Ozarks. Invertebrate communities were described with measures of density (total and for selected taxa), richness, and diversity and similarity indices. Principal Components Analysis identified hydrological factors over physiochemical measures as being responsible for the greatest proportion of variation in abiotic factors among riffles. Analysis of Variance techniques demonstrated that significant differences in invertebrate response variables existed among riffles when grouped by hydrological rather than seasonal parameters. Finally, a positive, linear relationship was present between riffle permanence and both overall invertebrate density and abundance of EPT taxa (Ephemeroptera, Plecoptera, and Trichoptera). A negative linear relationship was found between both Shannon and Simpson Diversity Index measures and riffle permanence. Results are discussed in relation to the role of hydrological variability in determining the biodiversity of karst stream communities.

Horizontal and vertical distribution of *Hyalella azteca* across emergent vegetation to open water gradient

Jay R. Christensen and William G. Crumpton
Department of Ecology & Evolutionary Biology, Iowa State University, Ames, IA
jayrc@iastate.edu
Crumpton@iastate.edu

Perennial emergent vegetation, like cattail (*Typha spp*.), predominates in depressional wetlands. These vegetated areas often support invertebrates, which are an important trophic link in aquatic systems. Cattails often form dense stands, which can lead to a decrease in oxygen concentrations. Along the emergent to open water vegetation gradient, a dissolved oxygen gradient often develops. Both vegetation and dissolved oxygen may influence the horizontal and vertical distribution of wetland invertebrates. It is hypothesized that invertebrates will be more abundant in the transition zone where emergent vegetation and dissolved oxygen concentrations are moderately abundant and that a vertical compression of invertebrates will occur in the presence of a vertical oxygen gradient.
Stratified activity traps measured the vertical relative abundance of a representative organism, *Hyalella azteca*, in the summer of 2003. Quantitative measurements of *H. azteca* densities were taken from May to October of 2004 across the vegetation gradient. Samples were taken at 10 meters into the cattails (emergent zone), at the emergent-open water interface (transition zone) and 8 meters out in the open water (open water zone). Water temperature, dissolved oxygen measurements, and dry weights of plant species were determined at each zone.
Emergent zones experienced higher levels of severe hypoxia (DO<1ppm) and a stronger vertical profile, but the horizontal distribution of *H. azteca* across the vegetated zones was similar. Horizontal densities were correlated to amounts of non-rooted floating plants (r^2=.37), consisting mainly of *Lemna trisulca* and *Spirodela polyrhiza*. The vertical distribution of *H. azteca* was more compressed into the upper water column in the emergent zone. Litter densities in this study were lower than previous studies at the site. Long-term vegetation dynamics of wetlands could produce higher litter amounts and result in extended hypoxia in the emergent areas. The strong vertical compression may so severely restrict *H. azteca* that it would experience horizontal compression out of areas of high litter.

Nutrients, Trophic State, and Nutrient Criteria in Lotic and Lentic Waters
Invited Presentation
Walter K. Dodds
Division of Biology, Kansas State University, Manhattan, KS
wkdodds@ksu.edu

Nutrient enrichment can impair water quality, but creating functional relationships between nutrient concentrations and biologically relevant parameters can be problematic and several questions need to be answered. How do we define trophic state? How are nutrients and trophic state linked? Does the functional linkage vary across ecoregions? How do we define the reference state? I propose trophic state be based on the heterotrophic and the autotrophic activities of aquatic ecosystems. Data suggest that nutrients, predominantly N and P, influence both autotrophic and heterotrophic state. Several statistical methods can be used to assess how linkages between nutrients and trophic state vary across ecoregions, with analysis of covariance being particularly useful in this regard. Several methods can be used to estimate the reference condition, even in the absence of true reference conditions. These methods have been tested in Kansas Reservoirs and tend to converge on trophic boundaries near the mesotrophic-eutrophic boundaries suggested in the peer-reviewed literature by other investigators.

Hydrologic controls on short-term and long-term patterns in dissolved organic carbon concentration in prairie streams

Jessica J. Eichmiller and Walter K. Dodds
Division of Biology, Kansas State University, Manhattan, KS
eich@ksu.edu

Discharge and dissolved organic carbon (DOC) data from King's Creek and four of its intermittent tributaries on Konza Prairie Research Natural Area, Kansas, were collected three times per week during periods of flow from 1995-2001. Changes in hydrologic flow path explain major trends in DOC concentration as streams recover from drought over several weeks. Streams exhibited low surface water DOC concentrations (1.05 mg/L, SD 0.70, n=2429) at baseflow, high flows following a drought caused 3-9 fold increases in DOC (up to 8.91 mg/L), and gradual resumption of stream flow following drought yielded increased DOC concentrations over several days of continuous flow. We propose a model in which hydrologic flow paths explain observed trends in DOC dynamics. We assume three compartments, soil, groundwater and streamwater. When water flows slowly from the soil to the stream through groundwater, microbial activity lowers DOC concentration. When floods occur, DOC moves rapidly from soil to stream channels. When high flow is sustained after a flood, soil DOC is flushed through the system leading to a gradual decline in DOC. Over yearly time scales, DOC concentrations are consistent with our model. Although floods which occur during periods of baseflow occasionally result in DOC data which deviate from previously observed patterns, and there are spikes in DOC concentration without a corresponding increase in discharge, the yearly mean DOC concentrations show a significant negative linear relationship with flow frequency (R^2= 0.74, p<0.0001). Yearly flow frequency was calculated as the fraction of flow days per year, which ranged from 0.03 to 1.0 in the study streams. We conclude that flow frequency may indicate predominant hydrologic flow path, which explain long-term patterns in historical DOC data for prairie streams.

Evaluation of Larval Crappie (*Pomoxis* spp.) Production in a Nebraska Irrigation Reservoir

Nicolas J. Fryda[(1)], Keith D. Koupal[(2)], and W. Wyatt Hoback[(1)]
[(1)] University of Nebraska at Kearney
[(2)] Nebraska Game and Parks Commission
frydanj@unk.edu
hobackww@unk.edu

The University of Nebraska at Kearney and the Nebraska Game and Parks Commission teamed up to determine larval crappie production within coves and in the reservoir during spawning season. Larval crappies were collected from 5 locations from May to June 2004 and 11 locations in 2005. Weekly larval crappie (≤ 11-mm TL) production was then estimated to determine densities of each location based on the amount of water sampled. Additionally, limnological characteristics for turbidity and thermal regime were collected to determine correlative associations. Extrapolated results will be used to predict overall larval production in Sherman Reservoir.

Microcystin distribution among cyanobacterial size classes

Jennifer L. Graham[(1)] and John R. Jones
University of Missouri, Department of Fisheries and Wildlife Sciences, Columbia, MO
[(1)] Current Address: U. S. Geological Survey, Kansas Water Science Center, Lawrence, KS
jlgraham@usgs.gov

Cyanobacteria of all size classes produce toxins although the uniformity of toxin distribution among size classes has not been well described. Plankton nets with mesh sizes between 10 and 100 µm often are used to concentrate cyanobacteria for toxin analysis. Because sampling with plankton nets excludes smaller size classes, sampling methods may affect observed toxin concentrations. During August 15-21, 2004, the cyanobacterial communities in samples from 30 northern Missouri and Iowa lakes were separated into five discrete size classes (> 100, 53-100, 35-53, 10-35, and 1-10 µm) to determine the

distribution of the cyanotoxin microcystin (MC) among size classes and to assess the effects of collecting samples with plankton nets on MC concentration. The cyanobacterial community was separated by sequential filtering through 100-, 53-, 35-, and 10-µm nitex mesh sieves and a 1-µm glass fiber filter. MC was measured in whole water (total MC) as well as each filtrate, and values in discrete size classes were calculated by difference. Prior to MC analysis samples underwent three freeze-thaw cycles to lyse cyanobacterial cells and release cell bound MC; MC was measured by enzyme-linked immunoassay (ELISA). MC was detected in 83% of lakes, and total MC values ranged from undetectable to 7.0 µg/L (mean=0.8 µg/L). MC values were greatest in the > 100-µm size class (range: nd to 6.4 µg/L; mean=0.5 µg/L) and decreased systematically with decrease in size class. Sampling with 100-, 53-, 35-, and 10-µm plankton nets was simulated by summing discrete MC values. On average, simulated use of a 100-µm plankton net underestimated total MC values by 51%, compared to 37% using a 53-µm net, 28% using a 35-µm net, and 17% using a 10-µm net. Collecting MC samples with plankton nets, regardless of mesh size, may greatly underestimate total MC concentrations. Whole water samples minimize underestimation due to sample collection and are the best option for characterizing total MC concentrations.

Zooplankton as bioindicators: diversity and abundance in the Missouri River

John E. Havel and Kimberly A. Medley
Department of Biology, Missouri State University, Springfield, MO
johnhavel@missouristate.edu

Large rivers are among the most disturbed environments on earth, yet their biotic communities remain poorly understood. The EMAP-Great River Ecosystems project (EPA funding) has as its main goal assessing the condition of three large rivers of the central US (Missouri, upper Mississippi, and Ohio). The project involves collaboration among numerous agencies to study physico-chemical characteristics and biota of these rivers. To assess the potential for zooplankton as bioindicators, we are investigating the distribution, diversity, and abundance of zooplankton. Here we report on results from a summer 2004 survey of 68 sites on the Missouri River, from RM 1700 (Montana) to the confluence with the Mississippi River. To date, we have identified a total of 61 taxa (rotifers to genus, cladocerans to species, copepods not yet identified). Taxa richness at each site ranged from 3-25 and was generally lower in the lower (channelized) zone of the river. Rotifers numerically dominated most sites, whereas copepods were common only in the lower zone. Cladocerans were diverse but in low abundance throughout the study area. Multivariate analyses reveal that community structure follows a downstream trend that is, in turn, correlated with several other river features. We are currently attempting to pull apart the relative importance of impoundments and floodplain sources for supplying immigrants and the cohesiveness of communities in the flowing river.

Reservoir Classification in Agriculturally Dominated Ecosystems
Invited Presentation
Aris A. Holz[(1)], John C. Holz[(1)], Kyle D. Haogland[(1)], James M. Merchant[(2)], and Henry H. H. Bulley[(3)].
[(1)] School of Natural Resource Sciences, University of Nebraska-Lincoln, [(2)] Center for Advanced Land Management Information Technologies, University of Nebraska-Lincoln, [(3)] University of Nebraska-Omaha
aholz2@unl.edu
jholz1@unl.edu
khoagland1@unl.edu
jmerchant1@unl.edu

Nebraska has been selected as a representative agricultural region to develop a reservoir classification methodology. Ninety-three reservoirs were grouped based on the in-lake parameters of maximum depth, alkalinity, specific conductance, total phosphorus, nitrogen to phosphorus ratio, chlorophyll *a*, Secchi depth, total suspended solids, and temperature. A novel ecological continuum approach was developed, which identified 22 reservoir classes that were compared to reservoirs grouped by the following geographic areas: ecoregions, subecoregions, watershed classes, and combined watershed/land-use classes. Reservoirs grouped by combined land-use/watershed classes were best at predicting current water quality, followed by reservoirs grouped by watersheds. Therefore, it appears the natural watershed

signals are masked by land-use within some areas of this agricultural region. Ecoregions do not adequately represent reservoir water quality, because they do not take into account watershed run-off.

Effects of Barley and Straw on Water Quality and Plankton Community Structure in Hypereutrophic Sandpit Lakes

John C. Holz and Aris A. Holz
School of Natural Resources, University of Nebraska, Lincoln, NE
jholz@unl.edu
aholz2@unl.edu

Application of barley straw to lakes can be an inexpensive, non-toxic method of controlling algae. As the straw decomposes in the lake, it releases a chemical, which inhibits algal growth, but is apparently non-toxic to macrophytes, zooplankton, insect larvae, and fish. However, experimental testing of this management technique in the U.S., especially in the Midwest, has been very limited. The effects of barley straw on a hypereutrophic sandpit lake community in Nebraska were investigated in a mesocosm study involving 8 1000-L fiberglass tanks containing natural plankton assemblages. An 8-wk tank study was conducted which included two treatments with four replicates each: (*i*) barley straw addition at a rate of 34 g per tank and (*ii*) no barley straw addition. The straw was wrapped in 6.35-mm (0.25 in) mesh netting and suspended approximately 10 cm below the surface immediately after the tanks were filled with lake water. In a complementary study, approximately 420 kg of barley straw (25 bales) was wrapped in 6.35-mm mesh netting and suspended in the upper meter of a 1.62-ha hypereutrophic sandpit lake. The straw additions in both the tank and lake studies had no effect on total phosphorus, total dissolved phosphorus, orthophosphorus, total nitrogen, nitrate + nitrite-nitrogen, pH, temperature, turbidity, water transparency, chlorophyll *a*, or phytoplankton and zooplankton species composition.

Trophic state of Missouri reservoirs: an overview of what we know in 2005
Invited Presentation
John R. Jones
University of Missouri, Department of Fisheries and Wildlife Sciences, Lincoln MO
JonesJ@missouri.edu

For thirty years the limnology program at MU has systematically inventoried reservoir resources within the state to answer three basic questions: 1) what are they like; what controls them; and are they changing over time. During the past year we have a better understanding of how nonpoint source inputs, morphology and hydrology determine nutrient levels in most water bodies. This analysis provides a basis for estimating potential for reservoir nutrient control agricultural landscapes. We have also come to appreciate the benefits of long term data collections to identify changes over time in our reservoirs.

Limnological Variation Associated with Drought Conditions in an Irrigation Reservoir in South-Central Nebraska

Keith D. Koupal
Nebraska Game and Parks Commission
keith.koupal@ngpc.ne.gov

For the past three years the Nebraska Game and Parks Commission in conjunction with the University of Nebraska-Kearney has conducted an extensive limnological and biological sampling effort at Harlan County Reservoir in South-Central Nebraska. The first two years of this study occurred with extremely low water conditions and limited reservoir inflows. Comparatively in 2005, the rainfall improved to "normal" amounts and reservoir inflow was present most of the year. I intend to examine the annual variation that has occurred for water temperature, dissolved oxygen, turbidity and chlorophyll a during this time frame. Specific discussion will focus on temporal variability associated with these parameters. I will also share spatial variability for these parameters throughout the reservoir and how this information has altered the management philosophy at this reservoir.

Fish presence, hydroperiod, and flooding effects on pond zooplankton communities in a reservoir floodplain

Kimberly A. Medley and John E. Havel
Department of Biology, Missouri State University, Springfield, MO
kam797t@missouristate.edu

Composition of local communities is a reflection of both local and regional processes. Connection of floodplain ponds through inundation by an adjacent reservoir provides corridors for regional dispersal, while biotic interactions and disturbance by flooding and desiccation can limit which species persist. We explored the effects of site characteristics including hydroperiod, flood frequency and fish presence on crustacean zooplankton community composition (presence/absence) and structure (percent abundance) in 29 ponds surrounding Truman Lake, Missouri. Using 10 years of lake level data and pond elevations, we reconstructed the flood history of the ponds. Ponds were inundated 0-56 times over the ten-year period. Fifty-eight species of zooplankton were detected in the ponds, 18 of which were also detected in the lake. Species richness was significantly lower in ponds containing fish than in those without fish. Cluster analysis revealed little community similarity between ponds and the lake and distinguished four clear community types among ponds. Further analyses indicated that flood frequency had no significant effect on community composition or structure, whereas hydroperiod had a minor effect on community structure. The presence of fish appeared to be more important in constraining local community composition than flood frequency, hydroperiod, and other site characteristics.

Effects of Substrata Orientation and Surface Texture on Periphyton Variability

Justin N. Murdock and Walter K. Dodds
Division of Biology, Kansas State University, Manhattan, KS
murdockj@ksu.edu

Physical characteristics of substrata can potentially alter periphyton structure and accumulation by increasing vertical surfaces and surface heterogeneity. Unglazed tiles set at three orientations (0^o, 45^o, and 90^o relative to the stream bottom) and six substrata of varying surface roughness (glass, glazed tiles (2), unglazed tile, brick, and natural stone) were deployed in a Kansas prairie stream for three weeks. Substrata were analyzed for loosely attached, tightly attached, and total periphyton chlorophyll *a*. 90^o substrata averaged 80 mg chl *a* m^{-2}, 34% and 37% less than 0^o and 45^o tiles respectively. Additionally, biomass variability among 0^o and 45^o tiles was more than twice that of 90^o tiles (SD = 18.6, 25.3, and 8.8 respectively). Periphyton biomass followed a unimodal trend with increasing surface roughness. Biomass ranged from 47 mg chl *a* m^{-2} on glass (R_a 2.5 µm), to 130 mg chl *a* m^{-2} on stones (R_a 86 µm), to 90 mg chl *a* m^{-2} on bricks (R_a 96.5 µm). Regression analysis of surface roughness versus chl *a* showed a better correlation for tightly attached (R^2 = 0.83, p = <.001) than loosely attached (R^2 = 0.37, p = .001), or total (R^2 = 0.77, p = <.001) periphyton. These results suggest that physical characteristics of stream substrata (roughness and proportion vertical area) can influence periphyton growth and should be considered when designing stream periphyton sampling protocols, especially when artificial substrata are used to sample periphyton accrual. Finally, collecting periphyton by scraping the surface can leave a significant amount still attached to the substratum. Therefore whole substratum extraction is recommended for assessing periphyton chlorophyll concentrations.

Remote Detection of Chlorophyll Gradients in Lakes, Reservoirs, and Estuaries

John Schalles[(1)], Christine Hladik[(2)], and Megan Machmuller[(1)]
[(1)] Biology Department, Creighton University, Omaha, NE
[(2)] Environmental Science Institute, Florida A&M University, Tallahassee, FL
jfsaqua@creighton.edu
christine.hladik@famu.edu
Megan.Machmuller@creighton.edu

Most approaches for remote estimation of phytoplankton chlorophyll are based on the absorption of water column sunlight by algal pigments in the presence of light scattering by algal cells and non-algal particles. This interplay of pigment-specific absorption and particle scattering produces graded responses in the emergent reflectance spectra signals detectable by radiometer instruments. Inland and estuarine habitats present serious challenges to the interpretation of diagnostic light signals because of the diversity of optically active constituents, which partially mask the fundamental phytoplankton absorption and scattering relationships. Since 1997, we measured hyperspectral water reflectance, chlorophyll, suspended solids, and CDOM in the estuarine mixing zones and near shore waters of 22 coastal rivers in six states between Mississippi and Delaware. Our group has collected parallel data from eutrophic lakes and reservoirs in the Midwestern U.S. Chlorophyll concentrations varied over three orders of magnitude (0.2 to about 400 mg/m^3), yet followed orderly patterns within estuarine mixing zones and reservoir longitudinal transects. We will compare different schemes (semi-empirical and inverse modeling) for optimum efficiency and accuracy in remote chlorophyll assessments in Case 2 waters and present a recent example of scaling to airborne, hyperspectral imagery using the University of Nebraska's new AISA Eagle sensor system.

Limnological Assessments on Management Techniques at Borrow Pits in South-Central Nebraska

Bill W. Sellers and Keith D. Koupal
Nebraska Game and Parks Commission
billsellers@yahoo.com
keithkoupal@ngpc.ne.gov

Along the Interstate 80 corridor there are a chain of borrow pits, which stretch from Hershey to Grand Island Nebraska. In total there are approximately 60 that are managed by the Nebraska Game and Parks Commission. Recently, there were two fisheries management techniques applied to these borrow pits that rendered the following studies. One of the management techniques applied was the implication of a hypolimnetic aeration system to deplete stratification at Ft. Kearny SRA lakes. As a result, we assessed the water quality to determine if the benefits of increased fish habitat would be offset in the long term by inadvertent changes in water quality. With the obvious depletion of stratification by the aerators a significant change in turbidity occurred in months of June, July, an August. A maximum Secchi disk reading in aerated lakes was 1.63 meters as compared to non-aerated lakes at 3.03 meters. This change in water clarity effected sunlight penetration and the future growth of rooted vegetation. The second of the two techniques administered by management biologists was the renovation of Middle Mormon Island Lake with the use of liquid rotenone. A study was conducted to evaluate the effects on non-targeted organisms. Water quality changes and the response of zooplankton were documented to further understand the subsequent impacts of rotenone on borrow pit fisheries. This study is currently in progress and only the framework will be presented.

USEPA Region 7 lake nutrient criteria development
Invited Presentation
Val Smith [(1)], Debbie Baker [(2)], and Elizabeth Smith [(2)]
[(1)] Department of Ecology & Evolutionary Biology, University of Kansas, Lawrence, KS
[(2)] Kansas Biological Survey, Lawrence, KS
vsmith@ku.edu
dbaker@ku.edu

The US EPA Region 7 Regional Technical Assistance Group (RTAG), facilitated by the Central Plains Center for BioAssessment at the Kansas Biological Survey, is charged with establishing nutrient criteria for lakes, streams, and wetlands of the USEPA Region 7 and the Central Plains Region (activities are posted at www.cpcb.ku.edu/progwg/html/nutrientwg.htm). RTAGs were formed in each US EPA region, as part of the US EPA's Clean Water Action Plan 1998, with a goal of protecting aquatic life from nutrient overenrichment. Specifically, the RTAGs work to implement facets of the National Strategy for the Development of Regional Nutrient Criteria (www.epa.gov/waterscience/standards/nutrient.html) (US EPA 1998). The National Strategy consists of an ecoregional waterbody-type approach, using Omernik ecoregions as the geographic basis for nutrient criteria guidelines. An ecoregion approach is being used because waterbodies in each ecoregion experience natural variations in nutrient levels during the year. Designation of nutrient criteria by ecoregion will allow researchers to separate this natural variability from unnaturally high levels of nutrients. Nutrient criteria will be designated by waterbody since a single, regional criterion will not account for natural variation in the response of water bodies to nutrient loading. The RTAGs coordinate efforts to establish nutrient criteria in two phases: Development Phase: The US EPA will provide assistance to State and Tribes to develop nutrient criteria to be expressed as numerical ranges. Implementation Phase: States and Tribes will include the developed criteria as part of their water quality standards within three years after developing the criteria. Currently, US EPA Region 7 RTAG has completed the development phase regarding lake nutrient criteria and is completing a document detailing this process. To review the steps of criteria development for lakes, we will discuss the contents of this document.

Movement of the Pistolgrip Mussel (*Tritigonia verrucosa*)

Eric Starkey and Bill Stark
Fort Hays State University, Hays, KS

Documentation of vagility in freshwater mussel populations in natural settings is generally unknown. Understanding the behavior of individual species will aid in conservation and management of this most imperiled group of freshwater macroinvertebrates. Thus the objectives of our study are to: 1) define parameters that influence movement in the pistolgrip, 2) document seasonal patterns of movement, and 3) evaluate differences in movement among individuals. Characterizing factors that effect movement and the magnitude of movement might provide insight into conservation strategies for rare species where samples might be inadequate. Preliminary results indicate that pistolgrip mussels are capable sizeable movements over the course of their lifetime.

Lakes of Missouri Volunteer Program – A Review

Thorpe, A. P., D.V. Obrecht and J.R. Jones
University of Missouri, Columbia, MO
thorpet@missouri.edu

The Lakes of Missouri Volunteer Program (LMVP) utilizes “citizen scientists” to help monitor lake water quality across the state. The MU coordinated program has similar goals and monitors the same parameters as many statewide surveys. The advantage of incorporating volunteers into monitoring efforts ranges from a reduction in cost per sample to benefits such as outreach/education. While there may be some minor disadvantages in relying on volunteers, the overall usefulness of the data makes the program

worthwhile. This is especially true when the volunteer program is paired with other efforts that can address some of the limitations of volunteer monitoring.

Acknowledgements

Thanks to Andy Dzialowski for organizing this year's conference; Anne Leaser for developing the agenda; Debbie Baker and Bob Everhart for editing the program; Alex Bartlett and Austin Oberzan for helping to prepare for the conference; James Kriz, Mary Anne Blackwood, Adam Blackwood, and Irene Beeman; and USEPA Region 7 Regional Technical Assistant Group for participating in the conference.

Central Plains Center for BioAssessment

The Central Plains Center for BioAssessment (CPCB), which is nested within the Kansas Biological Survey at the University of Kansas, was created in 1998 to be a center of aquatic expertise and to facilitate the exchange of information among individuals and organizations involved with aquatic issues within the Central Plains. Much of our work is concentrated within USEPA Region 7 (Kansas, Iowa, Missouri, and Nebraska). However, our focus extends into the Central Plains area of the Great Plains Region of Canada and the US. As a non-regulatory scientific entity, one of our primary goals is to facilitate cooperation among academicians, scientists, the States, Tribes, and other public entities in the region that will result in collaborative research on issues of aquatic ecology and water quality. To this end, we host workshops to encourage open exchange of information and ideas, and make the workshop proceedings available over our web page. We are also a member of two workgroups, the CPCB Biological Criteria Workgroup and the USEPA Region 7 Nutrient Criteria Workgroup, and coordinate meetings for the members of these workgroups. We are involved with research projects which include the analyses of historical lake and stream data to determine ecoregional trends in water quality; supplementation of this data through collection of biological, physical, and chemical data from streams and lakes in KS, IA, MO, and NE; and the modeling of lake/watershed interactions to estimate potential effects of nutrient loads on eutrophication. We can be reached through our website at www.cpcb.ku.edu.