

**26<sup>th</sup> Annual Meeting of the  
Rocky Mountain Chapter of the  
Society of Environmental Toxicology and Chemistry**

**April 18 - 19, 2013**

**University of Colorado – Downtown Denver Campus  
Science Building (SI), 1151 Arapahoe Ave., Denver, Colorado 80217**

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Meeting registration and details are also available on the RMSETAC website: [www.rmsetac.org](http://www.rmsetac.org)

# **Please join us for the 26th Annual Meeting of the Rocky Mountain Chapter of the Society of Environmental Toxicology and Chemistry.**

Meeting Dates: **April 18 - 19, 2013**

Meeting Place: University of Colorado – Downtown Denver Campus

Science Building (SI), 1151 Arapahoe Ave., Denver, Colorado 80217

## **Thursday, April 18, 2013**

8:30 – 9:00 Registration and Coffee

9:00 – 10:30 Urban Legends in Environmental Statistics Part 1 – Dr. Dennis Helsel Practical Stats

10:30 – 10:45 Coffee Break

10:45 – 12:15 Urban Legends in Environmental Statistics Part 2 - Dr. Dennis Helsel Practical Stats

12:15 – 1:45 Lunch (provided) and travel to Denver Zoo

2:00 – 4:00 Denver Zoo Sustainability Tour

5:00 – social at place to be determined

## **2013 SHORT COURSE**

**Thursday, April 18, 2013 (8:30am - 12:15pm)**

### **Urban Legends in Environmental Statistics Given by Dr. Dennis R. Helsel**

Several 'urban legends' have kept statistical tools used by environmental scientists in the dark ages. I'll describe what the misinformation has been, and available new tools to improve our standard practices.

Legends include:

1. Parametric methods (based on a normal distribution of data) have more power than nonparametric methods.
2. t-tests on logarithms determine whether one group's mean is higher than another.
3. Outlier tests tell you which data are wrong.
4. Putting regression equations through the origin is fine if I expect y to be 0 when x is 0.
5. Thirty observations are enough to do what I want to do with my data.
6. Substituting one-half the reporting limit works fine if there aren't too many nondetects.
7. Standard statistical methods can be applied to data recorded every 5-15 minutes.

These and other legends will be tackled as time permits, including "I've always heard that...." questions from the floor.

Dr. Dennis R. Helsel

Dennis Helsel (Ph.D. Environmental Science and Engineering, Va Tech) is a consultant on statistical methods for environmental and natural resource issues through his firm, Practical Stats, LLC. He has authored three textbooks: *The Unofficial Users Guide to ProUCL4* (2012); *Statistics for Censored Environmental Data using Minitab and R* (2012) presenting methods for handling data below detection/reporting limits; and *Statistical Methods in Water Resources*, originally published by Elsevier and now freely available online (<http://www.practicalstats.com/books/>). Dr. Helsel has published in a wide variety of journals, including *Human and Ecological Risk Assessment*, *Applied Geochemistry*, and *Environmental Science and Technology*. He worked as a hydrologist, geologist, and statistician for thirty years at the US Geological Survey before starting Practical Stats. For his training courses in applied statistics within the US and internationally, he received the Distinguished Achievement Award in 2003 from the American Statistical Association's Section on Statistics and the Environment. A full list of publications and courses are available on [PracticalStats.com](http://PracticalStats.com).

# 2013 FIELD TRIP

## Thursday, April 18, 2013 (2:00 – 4:00 pm)

### Behind the Scenes Sustainability Tour at the Denver Zoo

#### Trash=Power and Other Denver Zoo Sustainable-isms

Have you ever heard of the process of gasification? The Denver Zoo gasification system has such a varied waste stream making for an interesting and unique learning experience.



trash + poop = POWER  
**GASIFICATION**

Or did you know that solar tubes can light an animal exhibit?

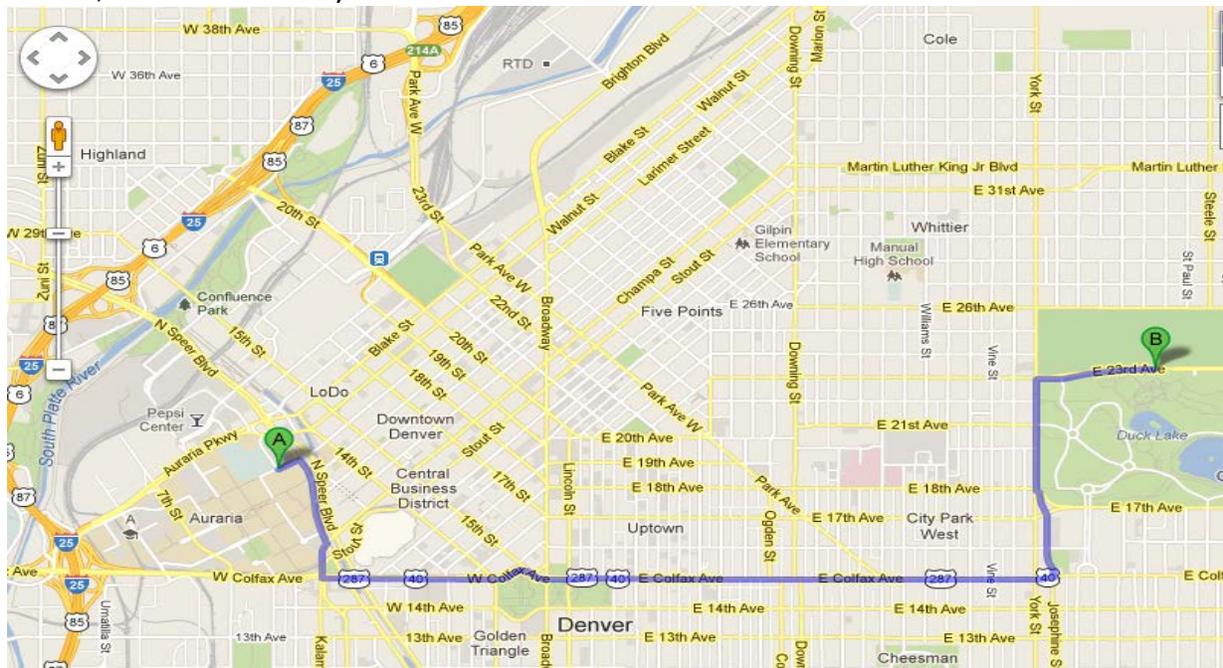
Find out more about these questions in our 2 hour tour around Denver Zoo focusing on all our sensational sustainable features and practices.

The Denver Zoo was awarded The Association of Zoos and Aquariums' (AZA) first Green Award in 2011, ranking the zoo as the greenest zoo in the country for its outstanding sustainability practices.

Please join us for the unique experience, tailored specifically for RMSETAC meeting attendees.

**Space is limited so please register early.**

The Denver Zoo is located about 3.5 miles from the CU Downtown Campus at 2300 Steele St. Denver, CO 80205 in City Park.



# 26th Annual Meeting of the Rocky Mountain Chapter of the Society of Environmental Toxicology and Chemistry April 18-19, 2013

## RMSETAC Meeting Schedule

### Friday, April 19, 2013

8:30 – 9:00 Registration and Coffee

9:00 – 9:10 Greeting from ENVIRON and University of Colorado – Denver Campus

9:10 – 10:10 Featured presentations: **“GOT SELENIUM?”**

**Nimmo, Del.**, CSU-Pueblo *Bioaccumulation of Selenium by the Bryophyte *Hygrohypnum ochraceum* in the Fountain Creek Watershed, Colorado*

\*\*\***Carsella, Jim.** CSU-Pueblo. *Selenium bioaccumulation by *Hygrohypnum ochraceum*: Evidence for a selenium transport mechanism.*

**Herrmann, Scott.** CSU-Pueblo. *Concentrations of Total Mercury and Selenium in Resident Fish of the Fountain Creek Watershed, Colorado*

10:10 – 10:30 **Special RMSETAC Lifetime Achievement Award Presentation**

10:30 – 11:00 Break and Poster Social I

11:00 - 11:15 **Anderson, Jordan.** Colorado Parks & Wildlife. *Effects of dietary and aqueous cadmium exposure on survival, growth and subcellular distribution within livers, kidneys and intestines of cutthroat trout*

11:15 - 11:30 \*\*\***Traudt, Elizabeth.** Colorado School of Mines. *Toxicity of binary mixtures of nickel, copper, and cadmium to *Daphnia magna**

11:30 – 11:45 \*\*\***Williamson, Jacob.** Colorado School of Mines. *Geochemical and aquatic toxicological analysis of the mine-waste impacted North Fork of Clear Creek*

11:45 – 1:15 Lunch (on your own) and Board of Directors Meeting

1:15 - 1:30 **Clements, William** - Update on SETAC North America

1:30 – 1:45 \*\*\***Montano, Manuel.** Colorado School of Mines. *Metal oxide nanoparticle characterization by collision cell single particle-ICP-MS.*

1:45-2:00 \*\*\***Sepulvado, Jennifer.** Colorado School of Mines. *Transport Potential of Perfluoroalkyl Acids (PFAAs) at AFFF-impacted Sites: 1-Dimensional Column Studies*

2:00 – 2:15 \*\*\***Gray, Evan.** Colorado School of Mines. *Extraction of silver and gold nanoparticles from tissues using tetramethylammonium hydroxide and single particle ICP-MS*

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## RMSETAC Meeting Schedule

2:15 - 2:30 \*\*\***Hallagin, Andrea**. University of Colorado – Denver. *Testicular apoptosis and cellular proliferation in fathead minnow exposed to wastewater treatment plant effluent*

2:30-3:00 Coffee and Poster Social II

3:00 – 3:15 **Vajda, Alan**. University of Colorado – Denver. *Infrastructure investment improves ecosystem health*

3:15 – 3:30 **Keteles, Kristen**. USEPA Region 8. *Use of vitellogenin as a screening tool to determine exposure of fish to endocrine-active chemicals*

3:30-3:45 Student judging deliberations

3:45 - **Student Awards and Raffle**

## Posters

\*\*\*Albuti-Lantz, Munira. University of Colorado – Denver. Effects of acute Triclosan exposure on the gut microbiome of the fathead minnow

\*\*\*Faizi, Z. University of Colorado – Denver. Histological assessment of intersex gonads in fish exposed to wastewater treatment plant effluent.

Sanchez, Brian. US Fish and Wildlife - Emerging contaminants on the Baca National Wildlife Refuge: presence and effects on native fish.

Skigen, Sarah. GEI Consultants, Inc. Recalculation of the Chronic “Water + Fish” Arsenic Standard for the North Fork Gunnison River

\*\*\*- Considered for either best student poster or platform presentation

**Please volunteer to be a judge of student presentations and posters!**

### Best Student Platform

Carsella, Jim  
Traudt, Elizabeth  
Williamson, Jacob  
Montano, Manuel  
Sepulvado, Jennifer  
Gray, Evan  
Hallagin, Andrea

### Best Student Poster

Albuti-Lantz, Munira  
Faizi, Z

**26th Annual Meeting of the Rocky Mountain Chapter of the Society of Environmental Toxicology and Chemistry April 18-19, 2013**

**Friday April 19, 2013 - FEATURED PRESENTATIONS  
"Got Selenium?"**

**Bioaccumulation of Selenium by the Bryophyte *Hygrohypnum ochraceum* in the Fountain Creek Watershed, Colorado**

Nimmo, D. R. † Turner, J. A. † Herrmann, S. J. † Carsella, J. S. ‡ Lehmpuhl, D. W. ‡

† Department of Biology, ‡ Department of Chemistry, Colorado State University-Pueblo, 2200 Bonforte Boulevard, Pueblo, Colorado, USA

Thirty-gram samples of the bryophyte (*Hygrohypnum ochraceum*) were deployed "in situ" at 14 sites in the Fountain Creek Watershed, spring and fall, 2007 to study selenium (Se) accumulation. Dissolved, total, and pore (sediment derived) water samples were collected and water quality parameters determined while plants were exposed to the water for 10 days. There was a trend showing plant tissue-Se uptake with distance downstream in both spring and fall and a modest association between Se-uptake in plants with hardness in the spring but not the fall. There was a strong correlation between Se in the water with total hardness in both seasons. Curiously, the plants took up Se from water by factors of  $5.8 \times 10^3$  at Green Mountain Falls and  $1.5 \times 10^4$  below Manitou Springs in the fall of 2007---and several other sites were high, primarily in the upper reaches of the watershed. (We question how is this possible)? However, the mean minima and maxima of Se in the plants in each of the three watershed segments appeared similar during both seasons. We found direct relationships between the pore and dissolved Se in water in the spring ( $R^2 = 0.84$ ) and fall ( $R^2 = 0.95$ ) and dissolved Se and total hardness in the spring and fall ( $R^2 = 0.92$ ). These data strongly suggest that *H. ochraceum* was a suitable indicator of Se bioavailability and Se uptake in other trophic levels in the Fountain Creek Watershed after finding Se in fish tissues at all 14 sites.

**Selenium bioaccumulation by *Hygrohypnum ochraceum*: Evidence for a selenium transport mechanism**

Carsella, J.S. \* Crans, D.C. † Bonetti, S. J. ‡ Nimmo, D.R. † Herrmann, S.J. † Lehmpuhl, D.W. ‡

\*Cell and Molecular Biology Program and †Department of Chemistry, Colorado State University, 1005 Campus Delivery, Ft. Collins, Colorado, USA

‡ Department of Chemistry and † Department of Biology, Colorado State University-Pueblo, 2200 Bonforte Boulevard, Pueblo, Colorado, USA

Aquatic bryophytes have been used to study the impacts of trace level contamination of heavy metals in aquatic ecosystems in Colorado. Since a near linear uptake of zinc, cadmium and lead by bryophytes is known we hypothesize that bryophytes will accumulate selenium in a similar fashion. To test the ability of bryophytes to accumulate selenium, porous nylon bags containing the aquatic bryophyte *Hygrohypnum ochraceum* were placed at 14 sites in the Fountain Creek Watershed. The metals and metalloids monitored include: calcium, magnesium, iron, lead, arsenic, selenium, nickel, cobalt, copper and zinc. The plants were exposed to Fountain Creek water for 10 days in the spring and fall of 2007. Samples of water were characterized three times per site during the ten-day exposure. The plants were recovered from the sites and analyzed for metals by ICP-MS. Selenium uptake by the plants was significant between Colorado Springs and Pueblo in the spring with the plants showing an accumulation of 160,000 times the total selenium in the water in the Lower Fountain Creek area. In the fall the plants showed an accumulation of 100,000 times the total selenium concentration in the water present in the in Upper Fountain Creek area. The overall results showed that the bryophytes' accumulation of selenium was independent of the selenium concentration in the water. Based on these results we investigated if other factors, such as iron, may affect the transport of selenium by bryophytes. This was tested by monitoring the presence of dissolved iron in the water with selenium. The iron-dependent selenium transport mechanism in the bryophytes recently discovered is consistent with the variations found in this bioaccumulation data.

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**Friday April 19, 2013 - FEATURED PRESENTATIONS  
"Got Selenium?"**

**Concentrations of Total Mercury and Selenium in Resident Fish of the Fountain Creek Watershed,  
Colorado**

Herrmann, S. J. † Nimmo, D. R. † McGarvy, K. M. † Carsella, J. S. ‡ Lehmpuhl, D. W. ‡

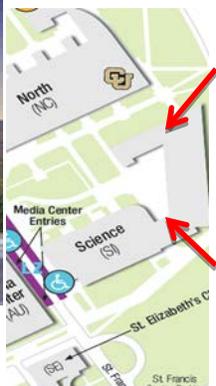
†Department of Biology, ‡ Department of Chemistry, Colorado State University-Pueblo, 2200 Bonforte Boulevard,  
Pueblo, Colorado, USA

During 2009 and 2010 two studies were initiated that focused on total mercury (THg) and selenium (Se) concentrations in whole-body fish and selected tissue types of 155 resident fish at 14 sites in the Fountain Creek Watershed of south-central Colorado. Dissolved and total water samples were collected and analyzed concurrently with fish samples of six fish species using inductively coupled plasma mass spectrometry (ICP-MS). As water flowed downstream in the watershed, weathering of surface shales resulted in increasing concentrations of dissolved and total Se; THg concentrations for both water fractions tested consistently below detectable limits. Whole-body concentrations of Se increased with downstream distance while whole-body THg trended higher at upstream sites. Mean whole-body concentrations analyzed by ANOVA indicated significant differences between sites for THg ( $p < 0.001$ , d.f.=13) and Se ( $p < 0.0001$ , d.f.=13). Interspecific comparisons of Se concentrations in whole-body homogenates showed flathead chubs highest, followed by stonerollers, white suckers, brown trout, creek chubs and longnose suckers in descending order; THg was greatest in white suckers followed by brown trout, stonerollers, longnose suckers, flathead chubs, and creek chubs. Concentrations of Se in all four tissue types (ovary, skin, liver, muscle) in gravid females of the first watershed-wide study increased downstream, particularly in ovarian tissue; whereas THg approached or exceeded the CDPHE advisory level (300  $\mu\text{g}/\text{kg}$ ) in epaxial muscle tissue at five sites. In a follow-up second study of 11 tissue types from 23 brown trout at the uppermost four sites in the upper Fountain Creek segment, preliminary data show THg concentrations were greatest in back kidney, followed in order by liver, spleen, heart, pyloric ceca, and epaxial muscle. Collectively, the internal soft tissues present more THg to predators and consumers than external tissues such as gills or skin.

# LOGISTICS INFORMATION

## 26<sup>th</sup> Annual Meeting of the Rocky Mountain Chapter of the Society of Environmental Toxicology and Chemistry April 18- 19, 2013

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FRIDAY MEETING  
SI 1111

THURSDAY WORKSHOP  
SI 1086

**Meeting Location:** The meeting location is the [University of Colorado Denver](http://www.colorado.edu) downtown campus.

All meeting activities are housed in the Science Building (SI), located along the south side of Speer Boulevard at [1151 Arapahoe Ave.](http://www.colorado.edu), in between Lawrence Ave. and Arapahoe Ave., across the street from the Denver Center for Performing Arts.

The workshop on Thursday 4/18/2013 (8:30am – 12pm) is in room SI 1086.  
The meeting on Friday 4/19/2013 is held in room SI 1111.

**Getting there:** The Science Building is a 10 minute walk from the Market Street Station, and the Auraria Campus is served by RTD bus and light rail.

If driving, from Interstate Hwy 25, take the Speer Boulevard exit, East. The CU Auraria Campus is about a mile from I25.

There is limited parking on campus, but lots and rates can be found by clicking on the following link: [parking map.](http://www.ahec.edu/parking/2011%20Parking%20Map.pdf) (<http://www.ahec.edu/parking/2011%20Parking%20Map.pdf> )

**Lodging:** The Curtis Denver - a DoubleTree by Hilton Hotel is the closest hotel to the campus. <http://www.thecurtis.com/>. The Oxford Hotel is the closest hotel that will offer a government rate room (<http://theoxfordhotel.com>). Many other hotels are a short, free bus ride away from the meeting. See [www.experiencedowntowndenver.com](http://www.experiencedowntowndenver.com) for a great resource for accommodations in downtown Denver.