ND EPSCoR
Established Program to Stimulate Competitive Research

News & Notes

January 2020

Investing in ND

At the start of this new decade, it's an appropriate time to reflect on the mission of ND EPSCoR and the many accomplishments during the past year.

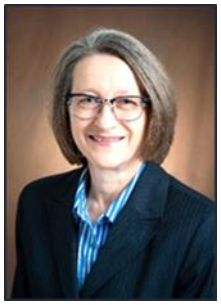
Investing in research: One core element of the ND EPSCoR mission is to help increase the capacity and competitiveness of researchers across the state through strategic programs and financial investments. Whether talking about experienced senior faculty or supporting the efforts of junior faculty just starting their careers, ND EPSCoR has invested in research at all 11 EPSCoR-participating institutions within the North Dakota University System and North Dakota Association of Tribal Colleges. Federal and state dollars have been thoughtfully dispersed by the state office, resulting in new equipment, undergraduate and graduate student support, additional high-performance computation services, and new discoveries and product development through experimentation and field studies.

Research investments in the Centers for Regional Climate Studies (CRCS) and Sustainable Materials Science (CSMS) have resulted in the discovery of new bat habitats and new dragonfly species in the region; improved models to better predict blizzards, climate shifts, surface water runoff, and air quality emissions; updated fertilizer recommendations for various ND crops; and helped develop new biobased polymers and coatings from ND commodity crops such as wheat bran, soybean oil, and corn stover. As importantly, these investments have lead to an expanded collaboration network across the 11 participating institutions that will benefit ND into the future.

Investing in STEM talent development: The December graduations around the state reinforce ND EPSCoR's commitment to STEM workforce preparation. With EPSCoR funding throughout the past five years over 580 undergraduate and graduate students have been able to conduct research, learning first-hand the joys of discovery and the need for perseverance during days of struggle. Another example of developing STEM expertise is the STTAR program, where interns use their talents for businesses across ND in a variety of STEM capacities. The 2020 program is now open! (see page 2). As noted by many students, the opportunity to do hands-on research and gain practical experience can be a driving force in their continued academic success.

Investing in outreach: Now more than ever, it's critical to share accurate scientific information to excite our next generation STEM students and engage our communities in dialogues on science as a public good. Students and faculty have diligently worked to share their research through publications, presentations, and outreach to the benefit of citizens across the state. CRCS has involved Stakeholders from across the region in their research efforts, while CSMS has conducted both entrepreneurial and translational workshops. Likewise, the NATURE program reaches communities across ND, involving middle, high school, and college American Indian students in STEM exploration. Other professional development opportunities for K-12 teachers help support STEM instruction across the state.

Investing builds our state: ND EPSCoR continues to invest in research, STEM talent development, and outreach because these are foundational elements in the continued economic health, growth, and prosperity of our state. Expanded research capacity provides needed answers to perplexing questions asked by individuals, industries, and policymakers. A better-prepared workforce ensures that companies will continue to choose ND as a place they want to grow. Expanding our reach means that students in our state have the opportunity to explore career options and stretch to their potential.



As we begin a new year, we hope you'll join us in supporting these continuing efforts that help propel our state forward.

Regards,

Kelly A. Rusch, Ph.D., P.E., BCEE
ND EPSCoR Executive Director

STTAR business applications open

The Students in Technology Transfer and Research (STTAR) program, a ND EPSCoR-sponsored program, offers ND-based businesses the opportunity to cost-share student internship salaries during the summer of 2020. The applications for 2020 are now open.

"The benefit to the organizations," said **Shireen Alemadi**, ND EPSCoR STEM manager, "is the opportunity to have upper-division students—juniors through graduate school—who can use their training and expertise to help find solutions to technical challenges within an organization." The cost-sharing by ND EPSCoR provides $5 per hour toward the student's summer salary.

For students like **Hunter Goerges** (above) at Amity, it's an opportunity to work in a ND industry, gain valuable work experience, and add to their resume. A number of the 2019 employers also noted that they often look to past interns when they have a full-time job opening in their companies.

There is a limit of 20 businesses for the 2020 program, and applications are accepted on a first-come, first-served basis. The qualifying criteria include:

- The business must be a ND company, or have a ND-based office,
- The work/project must have a science, technology, engineering, or math focus for the internship,
- The internship must be a minimum of eight weeks, and a maximum of 12 weeks,
- The ND EPSCoR contribution for the internship is up to $2,400 per individual student.

For more information or to obtain a business partner application, please see https://www.ndepscor.ndus.edu/programs/sttar/ or contact Shireen Alemadi at shireen.alemadi@ndus.edu or call 701-231-8264.

CRCS Stakeholders to meet

CRCS research has been enriched by the involvement and support of several individuals from across the state who are part of a volunteer Stakeholders group. From input at monthly meetings to research updates, they have been an essential component of the CRCS effort.

The CRCS Stakeholders are gathering at UND on January 24, 2020, to discuss the dissemination of results and continued plans for collaboration beyond the INSPIRED-ND Track-1 funding, according to **Aaron Kennedy**, CRCS co-lead and associate professor in Atmospheric Sciences at UND.

Registration open for Annual Conference

Registration is now open for ND EPSCoR's Annual Conference, which will be held April 21, 2020, at the Alerus Center in Grand Forks. The annual event will once again feature faculty and student researchers for both the Center for Regional Climate Studies (CRCS) and the Center for Sustainable Materials Science (CSMS).

Confirmed speakers for this year's event include **Jose Colom-Ustariz**, NSF program officer, and **Pips Veazey**, project director for Alaska EPSCoR. In addition, students and faculty will have the opportunity to present their research in two poster sessions.

***Colum-Ustariz, Jean Ostrom-Blonigen**, ND EPSCoR State Projector Administrator, **Kelly Rusch**, ND EPSCoR Executive Director, and **John Mihelich**, NSF Track-1 Co-PI at the 2019 Annual Conference.*

Registration for the ND EPSCoR Annual Conference is now open at bit.ly/2020nd. CRCS and CSMS participants can use the portal to submit both their registration for the conference and the abstract information for their posters. Detailed guidance on the poster presentations are outlined on the website.

Less toxic and renewably sourced

Many common polymeric materials (e.g., polyurethanes or plastics) used in everyday applications may also contain a highly reactive chemical: isocyanate. Because of its reactive properties, it has been a favored choice for creating various plastics. The challenge for researchers and consumers? Isocyanate is also toxic.

Alex Hart, CSMS researcher and graduate student in Coatings and Polymeric Materials (CPM) at NDSU, has been working with his advisor, **Dean Webster**, CSMS lead and chair of CPM, to find a replacement for isocyanates, especially in foams and similar polymers. In the process, Hart is working to develop foams that incorporate biobased materials as the monomers (building blocks) to make the polymers more environmentally friendly. One of the key biobased materials Hart uses is kraft lignin—a byproduct of the wood pulp industry, which is both abundant and renewable.

Several benefits of this research effort include:

- new products that will mimic the positive characteristics of existing useful products but without the toxic elements,
- waste products, such as the kraft lignin, will be incorporated into new useful materials, rather than disposed of as landfill,
- the new products are not only less toxic but are also biodegradable at the end of their product life, ensuring less environmental impact.

"If we can continue this research, it would allow consumers to purchase foam that is from renewably sourced materials which, in turn, allows them to be greener," Hart (above) said. "This research is very important to me because it has the potential to create a market for a waste material, kraft lignin. I would like to see this material incorporated into as many new products as possible."

At this stage of the research, Hart noted the foams made from lignin are very hard and rigid, which has limited functionality by most industries. The foams have a short reaction time of about 10 seconds, which may lead to a potential use of the foams in a sprayed-on application. The other goal with the kraft lignin foams is to make them flame retardant using more environmentally friendly additives.

After that, the next step in Hart's research involves finding new biobased materials that can create foams with different properties. These biobased sources include sucrose, soybean derivatives, and other plant-based materials, which could potentially make foams with softer and more flexible characteristics.

"I had a great chemistry teacher in high school who got me interested," Hart said. "When I found out that NDSU had a polymer program, I chose to come here because I really wanted the opportunity to do research. CPM has been a blast—I've learned so much, and I'm hoping to be able to teach and continue to do research."

Tiger moths in disguise

What happens to an insect when a predator comes near? Often it means lunch for the predator. But some insects, such as the tiger moth, have adapted to mimic the appearance of more poisonous insects, discouraging predators.

Research on the adaptable tiger moths is being conducted by **Melissa Sisson**, who had received a doctoral dissertation assistantship (DDA) and is a current graduate student in Biology at UND. "I'm studying the evolutionary history of tiger moths," Sisson said, "to better understand their ability to mimic wasps, bees, and other poisonous insects. It's important to look at the characteristics of the species to help us gain an understanding about the biodiversity of insects. Every creature affects the ecosystem, and we need to learn more about how these species survive, and their impact on others."

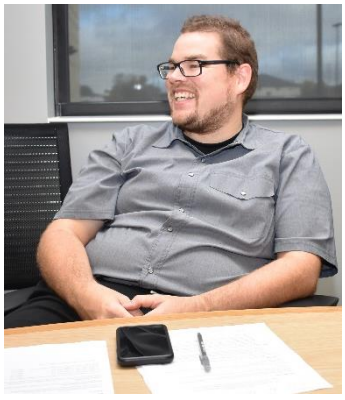
What makes her work especially interesting, Sisson said, was that various characteristics don't follow ancestral lines. "Just because a 'grandparent' had that suite of characteristics doesn't mean that the 'grandchild' will have the same characteristics," she noted. Sissons's advisor, **Rebecca Simmons**, UND Biology professor, added that sometimes moths that are not "related" converge on a common appearance, making identification even more challenging.

Recently, Sisson presented a ten-minute oral paper titled *Using Phylogenetics to Understand the Evolution of Wing Patterns in Mimetic Tiger Moths (Lepidoptera: Erebidae)* at the Annual Meeting of the Entomological Society of America (ESA) held in St. Louis, MO; the ESA is the largest entomological society in the world.

Sisson (above) is planning to complete her doctorate later this year and then hopes to use her education and research experience to teach entomology classes and continue research. She appreciates the access she has had to UND's research laboratories and the opportunity for professional collaborations—it's been helpful in her work, and will be the focal point in her next presentation at the 2020 ESA conference.

Warming climate impacts reported

A recent news article in the *Grand Forks Herald* provided insights from **Aaron Kennedy** (below), CRCS co-lead and associate professor in Atmospheric Science at UND. He noted the most dramatic change in the Grand Forks' region is the depth of winter temperatures. The cold winter temperatures are becoming milder at a far faster rate than the summers are warming. Kennedy said a key hypothesis may be the impact of agriculture.



Certain crops such as soybeans and corn, Kennedy said, affect humidity in an area since they are more efficient in turning summer heat into water vapor in the air, helping keep the ground cooler.

For more information, please see https://www.grandforksherald.com/news/weather/4840908-Grand-Forks-climate-warmer-wetter-in-century-long-shift.

EPSCoR support for ND K-12 instructors

There are still openings! The STEAM Energy Teacher Professional Development Module, an enroll-anytime self-paced online course, is open and available: https://register.und.edu/learning/jsp/session.jsp?sessionId=PDE.20.0522&courseId=TL.ONL.SE&categoryId=10062

As a part of the INSPIRE-ND involvement, the first 25 Science teachers in ND who complete this course will be reimbursed for the total cost of the course (and receive information to promote STEM instruction in their classroom). **Ryan Summers**, Education and Workforce Development (EWD) researcher and assistant professor of Science Education at UND, said there are still **EPSCoR sponsorships available.**

Once enrolled, participants have 60 days to complete the modules. These modules were developed with funding from North Dakota's current National Science Foundation (NSF) EPSCoR RII Track-1 cooperative agreement.

This three-module course explores aspects of STEAM (science, technology, engineering, arts, and mathematics) instruction through an integrated investigation of sustainable cities. Participants will imagine, research, design, and build their own sustainable city while considering how this integrated curriculum may be effectively taught in their classrooms. Each module has a specific content focus that participants will engage with through both a learner and teacher lens, allowing them to develop a deeper understanding of energy sources and consumption, city design, geography, climate, and population.

For more information, please contact Summers at ryan.summers@und.edu or call 701-777-3144.

Researchers present at annual meeting

Several CRCS faculty and student researchers presented their work at a recent American Geophysical Union Annual Meeting, held in San Francisco in early December. The collaborative efforts reflect the ongoing research efforts that explore the impacts of the changing climate and agricultural production choices on North Dakota and the surrounding region.

Investigating the Impact of Land Cover Change on the Northern Great Plains by **Kaela Lucke** (presenting above), **Aaron Scott**, **Aaron Kennedy**, **and Jon Starr** (all UND).

From Instrumentation to Outreach: Applications of 3D Printing to Promote Education in the Atmospheric Sciences by **Aaron Kennedy, Nicole Loeb, Aaron Scott, and Kaela Lucke** (all UND).

Identification of Blowing Snow Events over the Northern Great Plains with GOES-16 by **Aaron Kennedy** (UND) and Carl Jones.

Feasibility of Downscaling NAAPS Aerosol Fields for Incorporating More Realistic Aerosol Direct Effects in WRF-Chem Simulations by **Brittany Carson, Jianglong Zhang** (UND), along with Peng Xian, Jeffrey Reid, and Jared Marquis.

Evaluating WRF-Chem Model Performance for Baseline Summer Scenario over the US Northern Great Plains by **Carlos Bucaram** and **Frank Bowman** (both UND).

An Investigation into the Impacts of Crop Type and Acreage Changes on Surface Albedo by **Jon Starr, Jianglong Zhang** (both UND), **David Roberts** (NDSU), and Jeffrey Reid.

The Puzzle of Topographic Depressions: A Decade-long Effort to Put the Pieces Together by **Xuefeng Chu** (NDSU).

Application of Joint Probability Distribution Function to Customize Drought Categorization based on Spatial and Temporal Distributions of Drought by **Mohammad Hadi Bazrkar** and **Xuefeng Chu** (both NDSU).

Spatial Distribution of Depressions and Their Retention Capability at a Watershed Scale by **Ning Wang** and **Xuefeng Chu** (both NDSU).

Modeling of Dynamics of Runoff Contributing Areas in Depression-Dominated Areas by **Lan Zeng** and **Xuefeng Chu** (both NDSU).

Macro-scale Hydrologic Modeling for Depression-Dominated Cold Climate Regions by **Mohsen Tahmasebi Nasab** and **Xuefeng Chu** (both NDSU).

Funding opportunities

Department of Energy - Office of Science: Building EPSCoR-State/National Laboratory Partnerships

The U. S. Department of Energy's EPSCoR program is receiving applications for building EPSCoR-State/DOE-National Laboratory Partnerships **DE-FOA-0002215**. These partnerships are to advance fundamental, early-stage energy research collaborations with DOE national laboratories. (Information on DOE National Laboratories at http://www.energy.gov/about-national-labs.) Participation by graduate students and/or postdoctoral fellows is required. Junior faculty from EPSCoR jurisdictions are encouraged to apply. The use of DOE user facilities is encouraged. Areas of additional interest: Quantum Information Science, Energy Storage, Microelectronics, Data Science/Machine Learning/Artificial Intelligence, and Plastics Recycling.

For more information, the link to the grant is: https://www.grants.gov/web/grants/view-opportunity.html?oppId=322933

Pre-application deadline (limit of 3 per institution): January 16, 2020, at 5 p.m. Eastern Time.

Deadline for applications: March 27, 2020, at 5 p.m. Eastern Time.

Some campuses may have an earlier pre-submission process—check with your sponsored programs office.

NASA Cooperative Agreement Notice (CAN) Notice

In response to the FY 2020 Cooperative Agreement Notice (CAN) solicitation, North Dakota NASA EPSCoR is soliciting research proposals from faculty to promote and expand NASA research in North Dakota.

One proposal will be selected by ND NASA EPSCoR for full submission for the CAN.

Details and guidance for pre-proposals can be found on the ND NASA EPSCoR website here: http://blogs.und.edu/jdosas/2019/12/nd-nasa-can-fy2020-announcement-rfp-2/

Pre-proposal was due: **Noon, January 13, 2020**.

Following preliminary proposal selection by ND NASA EPSCoR, the selected PI must submit a Notice of Intent (NOI).

NOI deadline is January 24, 2020.

The full proposal deadline is **March 6, 2020**, at 11:59 p.m. Eastern Time.

NSF Track-4: EPSCoR Research Fellows:

The RII Track-4 Fellows program **NSF 18-526** provides an opportunity for non-tenured faculty to spend extended time at premier research facilities. The fellowship period may be used to initiate new or expand existing collaborative relationships, or to make use of unique equipment not available at the PI's home institution. Any research topic eligible for consideration under NSF's policies will be considered for support.

***Deadline*: March 10, 2020**, 5 p.m. local time.

Eligible PIs employed by institutions of higher education must hold a non-tenured faculty appointment. No PI who has received an award in any previous RII Track-4 competition may submit a proposal under this solicitation. RII Track-4 awards will be made as standard grants, not to exceed $300,000 nor 24 months in duration. Only single-PI proposals will be considered, with a limit of three proposals per institution (work with your sponsored programs). See: https://www.nsf.gov/pubs/2018/nsf18526/nsf18526.htm

NSF Track-2 funding deadlines:

EPSCoR Research Infrastructure Improvement Program: Track-2 Focused EPSCoR Collaborations (RII Track-2 FEC) **NSF 20-504**.

Letter of Intent was Due: **December 20, 2019.**

Full Proposal Deadline: by 5 p.m. submitter's local time, **January 24, 2020.**

- There is a limit of a single proposal from each submitting organization.
- Each proposal must have at least one collaborator from a different RII-eligible EPSCoR jurisdiction as a co-Principal Investigator (co-PI).

More information at the ND EPSCoR website or: https://www.nsf.gov/pubs/2020/nsf20504/nsf20504.pdf

Department of Defense Workshop

The Department of Defense is hosting a second free outreach meeting to educate researchers about the DOD research efforts. *How to Engage: DoD Basic Research Enterprise* will be held **February 20, 2020**, at Louisiana State University in Baton Rouge. In 2017, Congress reauthorized and funded the DEPSCoR (Defense Established Program to Stimulate Competitive Research) in order to enhance the capabilities of institutes of higher education, to increase the number of university researchers, and increase the probability of long-term growth in competitive federal funding.

For more information and registration, please see https://www.lsu.edu/research/depscor

Upcoming events

- **CRCS Stakeholders Meeting**, January 24, 2020, at UND.
- **ND EPSCoR Annual State Conference:** April 21, 2020, at the Alerus Center, Grand Forks, ND; Registration is now open at bit.ly/2020nd.
- **ND EPSCoR ND-ACES Management/Leadership Workshop**: April 22, 2020, at Research 2 at NDSU, Fargo, ND, with **Pips Veazey**, project director for Alaska EPSCoR.

NATURE Sunday Academy sessions

Sunday Academy (SA) is a program offered through NATURE, helping Native American students in grades 7-12 develop an interest in STEM disciplines. SA sessions rotate to all the tribal college/university campuses.

To review any of the topics, please check https://www.ndepscor.ndus.edu/ndep/nature/sunday-academy/stem-module-topics/

For more information about Sunday Academy or any NATURE program, please contact **Scott Hanson**, NATURE coordinator at scott.martin.hanson@ndus.edu.

Light Energy led by all site instructors
February 9, 2020 Topic for all sites

Water is Life led by **Ali Alshami** (UND-ND EPSCoR Emerging Areas and Translational Seed Awardee)
March 1, 2020 (SBC)

What Lives in Wetlands? led by **Jon Sweetman** (NDSU)
March 1, 2020 (TMCC)

Winter Weather led by **Aaron Kennedy** (UND-CRCS co-lead/researcher)
March 1, 2020 (UTTC)

Oxygen Sensing in Water led by **Julia Zhao** and **Xu (Steve) Wu** (both UND)
March 1, 2020 (CCCC)

Synthesis of Gold Nanoparticles led by **Alex Parent** (NDSU-CSMS researcher)
March 1, 2020 (NHSC)

Updates from ND EPSCoR State Office

Travel guidance updates

*By **Janelle Smith** (right)*
Business Manager

As we start the New Year, it seems like a good time to revisit a few travel policies. There's guidance on domestic versus international travel below, as well as other considerations when planning your travel.

- **Domestic vs. international travel**

ND EPSCoR has followed NSF guidance on domestic vs. international travel. Previously, NSF allowed travel to Mexico and Canada to be considered domestic travel. Recent changes to this guidance now limit domestic travel to travel within and between the U.S., its territories, and possessions. Travel that includes Canada and Mexico is now considered international and is no longer allowed on the current NSF EPSCoR Track-1 award (or any other funding).

- **Airfare**

Please be aware of the "Fly America Act," which requires the use of U.S. air carrier services for all air travel and cargo transportation services funded by the U.S. government, including federal awards. You can find more information, including exceptions under "Open Skies Agreements" at the link below. Please also check with your institution's Grant and Accounting staff to ensure compliance in your travels. https://www.gsa.gov/policy-regulations/policy/travel-management-policy/fly-america-act.

- **Driving**

When driving is the most economical means of travel, employees should make use of the North Dakota state fleet motor pool whenever possible. There are significant savings when using a fleet vehicle vs. reimbursement for mileage on a personal vehicle.

- **Using rental cars**

Use of rental cars may be allowed when the employee flew to their destination, but only in cases where the use of the vehicle justifies a rental instead of other services such as taxi, Uber, shuttle, etc. The use of rental vehicles is discouraged unless the cost-effectiveness of doing so is self-evident.

As always, please don't hesitate to ask if you have any questions (janelle.smith@ndus.edu or 701-231-1048). We are always happy to help.

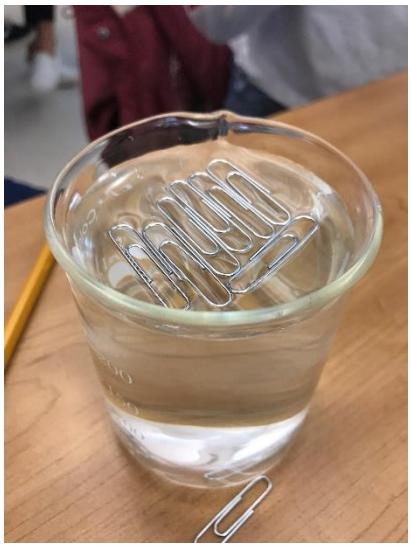
Water use and Sunday Academy

*By **Scott Hanson** (right)*
Tribal Colleges Liaison Manager,
NATURE Coordinator

In November, I attended UTTC for the Sunday Academy, which was facilitated by **Ali Alshami**, Emerging Areas Seed, Translational Seed, New Faculty Startup awardee, and assistant professor in Chemical Engineering at UND.

For the cultural presentation, **Robert Fox** spoke about several different tribes' beliefs about water. He talked about creation stories, flood stories and ceremonies involving water. At UTTC, Fox is a cultural and fitness specialist in the Wellness department and an agro-ecology technician in the Land Grant department.

Alshami provided the student participants a website link that had extensive information about water use and the water footprint. (A "water footprint" can be defined as the amount of fresh water used to produce or supply goods and services used by a particular person or group.) The students were surprised to learn how much water was required to produce various common products. For example, it takes 1800 gallons of water to produce a pair of jeans. Food production is very water-intensive as well since it can take 108 gallons to produce a pound of corn, 216 gallons to produce a pound of soybeans, and as much as 1800 gallons to produce a pound of beef.



The participants then did a number of activities that helped them understand water's unique properties. During the surface tension activity, they had fun competing with each other to see which group could suspend the most paper clips on the surface of a glass of water (left).

Activities of note

Elinor Coatings in Fargo, North Dakota, received a five-year subcontract worth $3.2 million from the University of Dayton Research Institute (UDRI) and the Air Force Research Lab at Wright Patterson Air Force Base in Dayton, Ohio, as part of a Department of Defense contract to research the areas of advanced behavior and life prediction of aerospace materials for the U.S. Air Force. Research performed at Elinor's facilities at the NDSU Research Park will focus on aircraft corrosion and multimetal primers. Elinor CTO **Dante Battocchi**, assistant professor in CPM at NDSU, was the recipient of a ND EPSCoR New Faculty Startup Award.

Aaron Kennedy, CRCS co-lead and associate professor in Atmospheric Sciences at NDSU, will be helping host the UND Aerospace Community Day 2020 on Saturday, February 8, 2020, from 10 a.m. to 3 p.m. at the UND Aerospace Center in Grand Forks.

Center for Regional Climate Studies (CRCS) publications

A New Algorithm for Delineation of Surface Depressions and Channels by **Xuefeng Chu** and **Ning Wang** (both NDSU) in Water, 2019, 12(1), 7, 1-14, DOI:10.3390/w12010007.

Depression Threshold Control Proxy to Improve HEC-HMS Modeling of Depression-dominated Watersheds by **Xuefeng Chu** and **Kendall Grimm** (both NDSU) in Hydrological Sciences Journal, 2019, 65(2), 200-211, DOI: 10.1080/02626667.2019.1690148.

Macro-HyProS: A New Macro-scale Hydrologic Processes Simulator for Depression-dominated Cold Climate Regions by **Xuefeng Chu** and **Mohsen Tahmasebi Nasab** (both NDSU) in Journal of Hydrology, 2019, 580, 124366, 1-20, DOI:10.1016/j.jhydrol.2019.124366.

Mitigating Impact of Devils Lake Flooding on the Sheyenne River Sulfate Concentration by **Afshin Shabani** (UND), **Xiaodong Zhang** (UND), **Xuefeng Chu** (NDSU), and **Haochi Zheng** (UND) in Journal of the American Water Resources Association, 2019, 1-13, DOI:10.1111/1752-1688.12825.

Stay in touch

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