



Yolo Basin Foundation advances scientific research at the Yolo Bypass Wildlife Area

by Robin Kulakow, former Executive Director

The Yolo Basin Foundation board of directors announced the initial three recipients of the Kulakow-Julian Graduate Student Fellowship. The first award was made in January 2016 to Rebekah Bergkoetter, and in September two additional fellowships were awarded to UC Davis graduate students Sarah Stinson and Myfanwy Johnston.

Robin Kulakow reported, "We are pleased to provide support to these excellent scientists and future resource management leaders in a range of fields all related to Yolo Basin Foundation's goals of inspiring and educating people about wetland conservation."

The basic research undertaken by the three recipients will provide data assessment of food web diversity, species adaptations to climate change and fish behavior on the floodplain that will have direct implications for future conservation efforts at the Yolo

Bypass Wildlife Area. The location of the study sites at the Wildlife Area will offer an opportunity for the Foundation to educate the public about species conservation requirements and approaches.

Rebekah Bergkoetter is a graduate student at California State University Sacramento in the Department of Biological Sciences with an expected graduation date of fall 2017. Her Master's research topic is **Morphological and Behavior Differences among *Daphnia* from Vernal and Permanent Ponds in relation to UVB exposure.**

Recent studies have shown increased levels of ultraviolet B (UVB) radiation are reaching Earth due to atmospheric ozone loss. *Daphnia* are a keystone species within freshwater ecosystems, playing a significant role in freshwater environments and vernal pools in particular. Common forms of protection against UVB

overexposure exhibited by *Daphnia* are high cuticular melanin concentrations and avoidance behaviors such as vertical or horizontal movement.

According to Rebekah, "The effects of UVB exposure on laboratory raised *Daphnia* are well studied, though there is little information pertaining to vernal pool specimens. The shallower, potentially clearer, and more exposed vernal pools of the Sacramento Valley allow for greater exposure of UVB to *Daphnia* than nearby permanent water bodies." She will investigate which mechanisms of avoidance and protection are employed by vernal pool *Daphnia* compared to specimens found in nearby permanent water bodies. She will also perform three separate studies that examine the differences between permanent water body and vernal pond *Daphnia* in relation to UVB defense.

Sarah Stinson is a PhD student at UC Davis in Ecotoxicology and Genomics with an anticipated graduation date of spring 2019. She works in the Connon Lab located in the School of Veterinary Medicine. The title of her research topic is **Genetic techniques enhance biodiversity monitoring in the Yolo Bypass.** According to Sarah, "This project will develop environmental DNA (eDNA) monitoring techniques to enhance taxonomic identification of invertebrate biodiversity within the Yolo Bypass Wildlife Area."

The use of eDNA techniques to assess water samples taken on study sites located at the Yolo Bypass Wildlife Area is expected to produce comprehensive, efficient and reproducible data for the rapid

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January 2017 brought storms and flooding to the Yolo Bypass Wildlife Area.

Big Day of Giving
May 4th!

Research continued from p. 1

assessment of biodiversity of invertebrates that make up the complex food web supporting wetland dependent wildlife. Using state-of-the-art genetic tools to monitor the biodiversity of the food web may be used to inform wetland management decisions in the future.

Myfanwy Johnston is a graduate student in Wildlife, Fish and Conservation Biology at UC Davis with an anticipated graduation date of June 2017. Her thesis topic is **Migration Behavior of Native Fishes in a Modified Floodplain**. Myfanwy will use the fellowship to continue her work on evaluation of fish passage at the Lisbon Weir.

The Lisbon Weir is located in the tidally influenced Toe Drain on the eastside of the Yolo Bypass Wildlife Area about seven miles south of I-80. As a flap gate weir, Lisbon Weir is designed to “flap” open when flood tide water pushes against the gates, then flap closed when the tide begins to ebb, storing tidewaters behind the weir and making it an

available water supply for the rice fields and wetlands on the northern portion of the Wildlife Area.

Lisbon Weir is typically passable by all fish species during flood tides, but it becomes impassable to most when ebb tides combine with low flows in the Toe Drain. When correlated with data from the flow gauge located at the weir, preliminary ranks of fish passage based on species-specific physiological traits can be assigned to Lisbon Weir at various discharge levels. Myfanwy’s research will provide a statistical analysis based on



Graduate students Myfanwy Johnston, Rebekah Bergkoetter, and Sarah Stinson discuss their research at the Wildlife Area with Robin Kulakow.

telemetrically-recorded fish movements above and below the weir. The resulting fish passage model can be used to predict when Lisbon Weir is passable by salmon and sturgeon. 🌊

Kulakow-Julian Scholarship Fund

Students interested in applying for the fellowship are encouraged to contact Robin Kulakow at robin@yolobasin.org. Fellowship applications for the 2017-2018 academic year will be available March 2017 with a deadline of June 30, 2017.

The Kulakow-Julian Family established the Yolo Basin Foundation Graduate Student Fellowship Fund in recognition of the Yolo Basin Foundation’s 25th anniversary and to honor its founder Robin Kulakow. The gift provides support for selected graduate students from University of California, Davis and California State University, Sacramento who are working in the areas of environmental education, environmental sciences, or environmental/conservation policy. The fellowship awards are for research that is directly related to the Yolo Bypass Wildlife Area or the larger Yolo Bypass.

Summer Day Camp: Discover the Wetlands

Please note: Yolo Basin Foundation’s popular summer day camp is expanding! In addition to students entering 3rd and 4th grade, a new camp for 1st and 2nd graders has been added.

Join Discover the Flyway staff and docents for our five-day summer camp program. Campers will explore the world of wetlands through different science themes including water, soil and animal adaptations. They will participate in outdoor activity stations, conduct experiments and create art in the Yolo Bypass Wildlife Area Demonstration Wetlands. Camp size is limited to 12 participants per session. The suggested donation is \$90 for Yolo Basin Foundation members and \$115 for non-members.

Pre-registration is required, so mark your calendars for April 3 when registration will open on our website at www.yolobasin.org. For more information contact Heidi Satter, hsatter@yolobasin.org

Each session runs Monday through Friday, 9 am–12 pm. Two sessions of each camp will be offered. Sessions repeat; register for one camp only.

WETLAND WONDERS

Step into the world of wetlands by conducting a wetland pond study, tracking wetland animals, creating watercolor art and more!

For students entering 1st or 2nd grade in the fall (register for one)

Session #1 June 12-16 • Session #2 June 26-30

SOIL SCIENTISTS

Explore the geology of wetlands by taking your own core sample, making a soil horizon and participating in the Great Percolation Race. Get the dirt on soil!

For students entering 3rd or 4th grade in the fall (register for one)

Session #1 June 19-23 • Session #2 July 10-14



Yolo Basin Underfoot

by John McDermott, Education Associate

It is 245 million years ago (mya) and you find yourself in a time-travelling kayak floating on top of what will someday be the Yolo Bypass Wildlife Area. Don't move, you're going to be here awhile. California is a vast shallow sea, and the closest landmass is what is now western Nevada. This entire coastline is a subduction zone, with the oceanic plate sliding beneath the North American plate. Immense pressure and friction cause some of the downgoing plate to melt into magma. This magma then rises, slowly cooling into igneous rock, and sometimes reaching the surface, erupting as volcanoes.

The massive amount of magma cooled, crystalized, and by 200 mya, has risen to form the ancestral Sierra Nevada mountain range. This range is larger and taller than today's Sierra and forms a rain shadow, capturing moisture along its western slopes. For the next 150 million years, sediment laden water is dumped into the sea beneath your kayak, forming deposits nearly 32,000 feet thick. At the same time the subduction zone has moved offshore, allowing a basin to form underneath your kayak, known as a fore-arc basin. This change allows the deposition of the 32,000 feet of sediments that make up the Proto-Great Valley. Today these deposits are known collectively as the Great Valley sequence and can be best seen in the canyons along Putah, Cache, and Stony Creeks.

Meanwhile, at the subduction zone, a deep trench has formed and is filling with sediment. Underwater avalanches, called turbidity flows, are pouring vast amounts of material into the trench. As the oceanic plate subducts, sediments are pulled into the trench mixing, folding, crunching, and forming into what is known as the Franciscan *mélange*. By 66 mya the Franciscan has been pushed landward wedging under the Great Valley sequence and forcing the tilting that we see today.

Comfortable in your kayak? Not much longer, I promise. 37 mya gold is being removed by streams and rivers from the Mother Lode ore rock of the Sierra and emplaced as placer gravel deposits along drainages of the western slopes, to be heavily mined in the nineteenth century. Much of the mass of the Sierra has been eroded away,

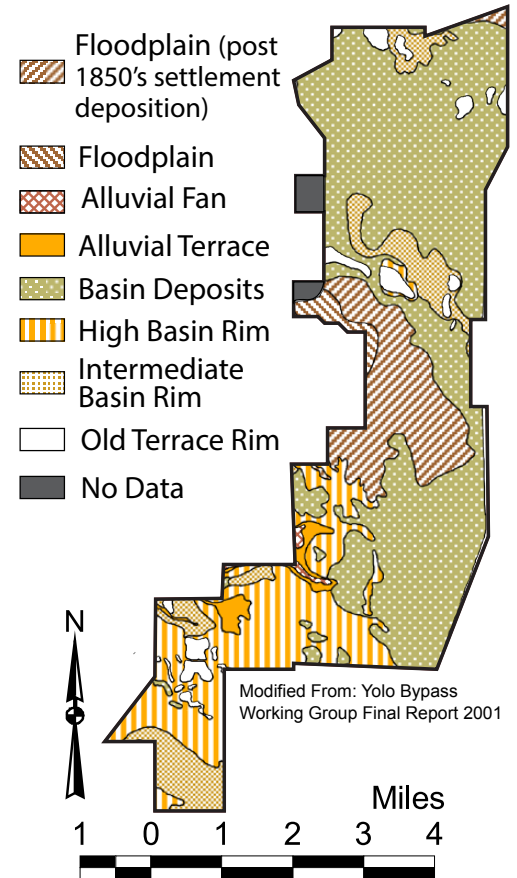
while the Coast Range has risen and closed off much of the Proto-Sacramento Valley from the ocean, creating an inland sea.

You're STILL floating in that kayak, but it is 25 mya, and a change is underway. After millions of years of subduction zone tectonics, the oceanic plate is disappearing underneath the North American plate and being replaced by the transform boundary that exists today, the San Andreas Fault. Meanwhile, renewed volcanism causes vast volcanic mudflows and basaltic lava flows from the east and continues for the next 10 million years. These flows are today known as the Mehrten, Laguna, and Tuscan formations which buried the Great Valley sequence and are best seen on the eastern side of the Sacramento Valley, along the west side of the American River in Auburn.

Finally, 5 mya, you are able to get out of your kayak, stretch, and walk around. Everything is in place for the modern Yolo Basin, except for 5-million-years worth of sediment, and there is a lot of it, so don't stand still for too long. Sediment pours from every drainage in the Sierra and Coast Range, forming massive alluvial fans. The ancestral Sacramento River can't keep up and struggles to carry a small fraction of the sediment out to sea. The valley narrows as it fills with sediment. These sediments are known as the Tehama formation and can be seen along the lower slopes of the Capay Valley due to continued uplift of the Coast Range, and beneath the Yolo Basin are more than 2,500 feet thick.

One mya Cache and Putah Creeks are cutting their modern drainages, dropping their sediments in the valley in broad alluvial fans. The Sacramento River is depositing sediments with each flood, some more than 300 feet thick, forming the edges and floors of small depressions within the broader Yolo Basin. At the same time the river is cutting new, more efficient channels, and abandoning old ones. This can be seen today and on historic maps as the oxbow lakes, Green's and Washington. Seasonal flooding of the Sacramento River also creates natural levees and terraces, enclosing much of the Yolo Basin and cutting off Putah Creek. Putah Creek begins draining into the Putah Creek Sinks, depressions with

YBWA Landforms



Map highlights landforms present in the Yolo Bypass Wildlife Area.

slightly more permeable sediments, allowing the water to infiltrate the ground.

By 20,000 years ago all of the components of the modern Yolo Basin are in place, and people begin to populate the area. Geologically, the surficial deposits of the modern basin are laid down in their current form. Then in the past 160 years, massive numbers of people arrive and become a geologic force, causing sediment deposits from hydraulic mining in many of the drainages of the Sierra, forcing the Sacramento and other rivers to flow unnaturally, confining the Yolo Basin to a fraction of its former size, and finally restoring some of the wetlands that populated the basin.

Which brings us to the modern-day Yolo Bypass Wildlife Area. Sorry for making you sit in that kayak for so long. 🌊

STAFF

Executive Director: Martha Ozonoff
(530) 756-7248 mazonoff@yolobasin.org

Office Manager: Leanne Villa
(530) 757-3780 lvilla@yolobasin.org

Volunteer Coordinator: Michael Herrera
(530) 758-1018 mherrera@yolobasin.org

Education Coordinator: Heidi Satter
(530) 757-4828 hsatter@yolobasin.org

Program Coordinator: Corky Quirk
(530) 902-1918 cquirk@yolobasin.org

Development Coordinator:
Kara Smith
530-757-4842 ksmith@yolobasin.org

Education Associate:
John McDermott
(530) 757-4828 john@yolobasin.org

Bookkeeper: Guadalupe de la Concha

I.T. Coordinator: Joy Elson
(530) 318-0973 jelson@yolobasin.org

Grant Coordinator: Katrina Beedy
(530) 559-7486 kbeedy@yolobasin.org

Policy Director: Robin Kulakow
(530) 757-3780 robin@yolobasin.org

Newsletter Editor: Ann Brice
(530) 757-3780 abrice@yolobasin.org

Yolo Basin Foundation

Street address:
45211 County Road 32B
Davis, CA 95618

Mailing address:
P.O. Box 943, Davis, CA 95617

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Ruddy Duck
Yolo Bypass Wildlife Area
photo by Jim Dunn

Friday, February 24:

Duck Days Welcome Reception and Student Wildlife Art Show
5:30-7:30 pm • Davis Art Center • 1919 F Street, Davis

Saturday, February 25: Workshops, Field Trips & Activities

All Day • Yolo Bypass Wildlife Area Headquarters
45211 County Road 32 B (Chiles Road), Davis

Fun for the Whole Family!

For a full schedule of events and to register for Duck Days go to www.yolobasin.org.

For more information call
Yolo Basin Foundation at 530-757-3780.