UPWIND

from the Arcata Marsh Interpretive Center
Vol 26, Issue 2, Spring 2019

Our Mission: To stimulate understanding of the Arcata Marsh & Wildlife Sanctuary, its relationship with Arcata's integrated wastewater treatment system, the surrounding watersheds and bay, and their link with the Earth's water cycle

Penguins on South Georgia Island.

Upcoming Lectures

On Friday, May 17, join Andrea Tuttle for a lecture on "South Georgia Island: What does a small, distant island have to do with the Arcata Marsh?" South Georgia Island lies in the sub-Antarctic, 1000 miles east of the tip of South America. Fed by nutrient upwelling, it teems with fur seals, penguins, nesting albatross, and other pelagic species. Like Humboldt Bay, it serves as a beacon of hope for successful ecosystem recovery after past exploitation. But also like Humboldt, it faces the overarching threats of climate change. This talk will tell the story of overhunted seals, Norwegian whalers, invasive reindeer and rats, and the aggressive conservation efforts to restore the beautiful wild reserve of today. Andrea, now a consultant in forest and climate policy, formerly served as director of the California Department of Forestry and Fire Protection and member of the California Coastal Commission and Northcoast Regional Water Quality Control Board.

On June 21, Damon Goodman of the US Fish & Wildlife Service will explore the biology of California's lampreys. Native lampreys often are overlooked in riverine management due in part to their lifestyle. However, lampreys play a critical role in the ecology of our rivers, as ecosystem engineers and food web superstars. This talk will examine problems they face and discuss efforts that are underway to conserve them. Damon is the lead for Pacific lamprey conservation efforts in California and has been exploring their biology over the past 15 years. He has found himself in nearly every primary stream in California with access to the ocean and has co-authored 21 peer-reviewed publications on native fishes.

Damon Goodman.

On July 19, Jessica Coming of the Watershed Stewards Program (WSP) will talk about the WSP in general and salmonid life history and research in Humboldt County in particular. She is serving at BLM's Arcata Field Office.

All free FOAM lectures start at 7:30 p.m. at the Arcata Marsh Interpretive Center. Seating is limited to the first 50 attendees, on a first-come, first-served basis. For more information, call 826-2359.

Website: www.arcatamarshfriends.org
Facebook: www.facebook.com/Friends.of.the.Arcata.Marsh

What Makes a Popular Kids' T-shirt? Help Godwit Days Decide

The Godwit Days festival is thinking about creating a child-sized T-shirt that would feature several winning designs from this year's Student Bird Art Contest. The shirts would be sold starting at next year's 25th anniversary festival.

The Godwit Days Board is asking the public to help decide what would make an attractive shirt motif. Between May 12 and June 16 (Mother's Day to Father's Day), stop by the Arcata Marsh Interpretive Center and vote. All cash prize winners from 2019 are on display for you to peruse.

Rather than picking the most skillful renditions of birds, evaluation criteria should be what would 1) translate well into being printed on a T-shirt and 2) be most appealing to younger children to wear. One vote per person! Specific directions will be given at the wall display.

Dog Waste Update

By Cindy Kuttner

Humboldt Pet Supply's Spring Marsh Cleanup Event was a big success. It attracted many families, who cleaned up over 63 pounds of dog poo and trash. Nine local businesses donated to a scavenger hunt: folks could find rocks along the trails that were painted with the logos of the businesses and use the rocks to collect their prize. The event cleaned all the Marsh trails except the Oxidation Ponds and the spur trail along the north side of the Bay.

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FOAM award winners Caley Miller, Sean Coontz, Charlotte Brands & Stella Pepper.

FOAM Science Fair Awards

By Sue Leskiw

For the 14th year, FOAM sponsored an award at the Humboldt County Science Fair in mid-March for the best project related to wetlands. Due to the quality of the projects in 2019, second- and third-place prizes were given.

First prize went to Sean Coontz, a 7th grader at Jacoby Creek School, for his project, "Which Wastewater Treatment Plant Discharges More Microfibers into Humboldt Bay?" He hypothesized that Eureka's plant would discharge more microfibers/microplastics than Arcata's because Arcata has longer retention time in its pond system (10-40 days vs. < 1-2 days, depending on whether the season is wet or dry). According to Blue Ridge Outdoors, washing synthetic clothing such as a fleece jacket releases tiny polyester fibers too small to be caught by washing machine filters, so they flow into the sewage system and finally into the sea. Fish mistake these fibers for food, putting them at risk of suffocation, and humans who eat seafood could be harmed. In total water sample sizes of 200 ml tested at each plant, Sean found 22 microfibers in Arcata and 29 in Eureka. Extrapolating to the actual water volumes released from the two locations, Eureka released 1.1 billion microfibers into Humboldt Bay on the dry season date Sean took his measurements (285 per gallon of water) and 1.6 billion (265 per gallon) during a wet season test, while Arcata released 309 million in the dry season (189 per gallon) and 785 million (227 per gallon) in the wet season.

Second prize was awarded to Caley Miller, an 8th grader at Kneeland School, for her 2-year study of salinity tolerance of freshwater algae at the Arcata Marsh. The purpose of her experiment was to determine the effects of different salinity levels on these organisms, with Caley hypothesizing that salinity concentrations higher than 3.5% (ocean level) would increase mortality rates. She found that in salinities above 2%, the salinity was detrimental within 1 day; at 2%, there was complete population depletion within 2-4 days; and at 1%, all the algae were dead within 5 days. If microorganisms at the bottom of the food chain can't survive the increase in salinity expected from rising oceans, then animals that eat those organisms also will not survive.

Third prize went to the team of Charlotte Brands and Stella Pepper, 6th graders at Pacific Union School, for "It All Flows to the Ocean," which examined bioswales, landscape elements created to filter polluted water. Bioswales can help the environment by filtering stormwater before it enters storm drains. The girls created a sod platform whose angle could be adjusted, in order to test its efficiency at reducing runoff turbidity. Charlotte and Stella predicted that a 10% slope would have the best outcome in capturing sediment, while also testing 3% and 6% slopes. Their results found the 6% slope—which is the maximum slope for actual bioswales—provided the most filtering.

Both Sean and the team of Charlotte and Stella were among the fewer than 20 students from Humboldt County selected to compete at the state science fair in April.

The intrepid bird art hanging bunch. Not shown: Tom Allen.

Godwit Days Volunteers

By Sue Leskiw

FOAM sends out a heartfelt thank you to the following people who volunteered to help with FOAM activities at the 24th Annual Godwit Days Festival in April:

► FOAM's Bird Fair booth was staffed by Rick Brown, Gail Coonen, Elliott Dabill, Denisse Hernandez, Sue Leskiw, Sharon Levy, and Mark Wilson.

► Helpers who hung the 910 pieces of student bird art were Katy & Tom Allen, Max Brodie, Ken Burton, Laura Carlos, Donna Clark, Frank Ferguson, Denisse Hernandez, Sue Leskiw, Stephanie McCaleb, Lew & Judie Norton, Susan Penn, Bill & Carolyn Prescott, and Barbara Reisman. Thanks to Sue Leskiw, Mary Ann Madej, Jude Power, Janet Zich, and several members of the Fortuna CCC for taking the show down.

► Jay Seeger snapped photos of the art winners and Alex Stillman set up the refreshments at the award ceremony.

► Dee Dee Jones, Lynn Jones, Sue Leskiw, Mary Ann Madej, and HSU students Kaylen Kemper, Leah Lehr, Mya Esquivel, and Jocelyn Navarro Ortega welcomed about 50 children plus their parents during 2 hours of nature craft activities. Stations were clay Marsh critter ornaments; wooden bird calls; paper bird hats and masks; rock owls, chicks, and penguins; and toilet paper tube owls.

► George Ziminsky and Dave Couch led a combined bird walk/wastewater treatment plant tour and Katy Allen led a kids' bird walk at the Marsh.

Bird mask. Photo by Sue Leskiw.

Bird hat. Photo by Sue Leskiw.

Rock owl. Photo by Sue Leskiw.

What's New at the Marsh

By George Ziminsky

► The owl's clover is in bloom and birds are nesting throughout the Marsh! Butcher's Slough is showing more Humboldt Bay owl's clover each year, a beautiful reward for all the hard work involved in salt marsh restoration.

► Black-capped Chickadees and Tree Swallows are shopping around and choosing homes, and the Marsh welcomes Bushtits to its list of breeding birds!

► Docents have been busy offering free tours to schools from throughout the area, with many more to come.

► Monica Bueno has returned and will be staffing again, so stop by and say hello.

► Pete Haggard has been generous with his knowledge, time, and sweat as he continues working on the Native Plant Garden in front of the Interpretive Center. Thanks, Pete!

► Summer Young Explorer Camps will again turn AMIC into a beehive of activity in the afternoons starting June 17.

► The previous art show featuring local landscape painters was very popular and brought in many appreciative visitors. The current Godwit Days kids' bird art exhibit is also proving popular, so come on by!

Rehabbed Abodes for Wood Ducks

By Dave Couch

Wood Ducks were abundant in the recent past at the Arcata Marsh. HSU's chapter of the California Waterfowl Association had erected nesting boxes in willows around the oxidation ponds. In spring, it was common to see broods of Wood Ducks swimming in the ponds.

However, the boxes degraded with exposure to the elements and were taken down about 5 years ago. Wood Duck sightings dropped greatly. I noticed the boxes sitting behind an Arcata Marsh Research Institute building, so last year I salvaged them, did a poor job of refurbishing three of them, and installed them in willows on the dike between Oxy Pond 2 and the treatment marshes. Last year, they did not seem to get used, but there was a report of Wood Duck chicks at the oxidation ponds.

Jim Froland, a retired California Fish and Wildlife warden, spotted one of the boxes and asked the City if he could refurbish it. He was tasked with refurbishing all three boxes and re-hanging them. He accomplished this and made the boxes much more secure on the willows.

During the Godwit Days tour of the treatment plant, we observed several male Wood Ducks swimming in an oxidation pond. Last week, I spotted a pair exhibiting what I considered to be courtship behavior. I'm hoping for babies in the near future!

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The next Marsh Cleanup Event will be held in June. (After June 1, Google "Marsh Cleanup Event" to find out which day.) It will include displays along the trails that explain why dog poo is toxic to the Marsh.

Is dog poo toxic? On a recent visit to Breckenridge, CO (known for its dog-friendly atmosphere), the April 27 Summit Daily News reported that the city's dog park is closed indefinitely due to "high levels of fecal bacteria left over from dog poop." Anne Murphy, Breckenridge's open space and trails manager, reported that "One gram of dog feces can contain 23 million fecal coliform bacteria, along with a horror parade of parasitic worms and viruses…"

That's why we ask Marsh-walking dog owners to Bag It, Carry It, and Dispose of It…their dog's waste, that is!

Academy of the Redwoods Visits the Marsh

By Sue Leskiw

When I recently picked up FOAM's mail, I found a thank-you card from a group of students from Academy of the Redwoods, an early college high school housed at the College of the Redwoods Campus. Besides containing handwritten comments of appreciation from the students, the card enclosed several photographs of students both in the Interpretive Center and touring the Marsh. Many students especially enjoyed seeing the Marsh birds.

I asked AMIC staff person George Ziminsky for background information. George replied that on March 8, a group of 40 students and two teachers came for a tour. The class split into two groups: one went with Dave Couch to the wastewater treatment plant, while the other walked around the Marsh proper with docents Louise Bacon-Ogden and Lynn Jones. Then they switched places so each group had both tours. He noted that the lead teacher, Angeline Holtski, is the daughter of Al Wolski (one of our steady weekend volunteer staffers) and Mary Ann Madej (a FOAM slow-tour co-leader and special event volunteer).

I asked Ms. Holtski, who teaches biology and geometry, for more information and e-files of the photos for UPWIND. She replied that the tour attendees were biology students. They were taking the tour as part of their Ecology and Biogeochemical Cycles Unit. Following their visit to the Arcata Marsh, the students returned to the classroom and built their own wastewater treatment systems for an Engineering and Design Lab. They tested their designs with simulated wastewater and analyzed the water quality before and after treatment. Then, students applied their knowledge of water quality to how their treatment system would impact the surrounding environment and biodiversity. "Another fun fact is that many of the students entered the Godwit Days art contest and dropped off their submissions while on the field trip." [One student, Jack Dahl, won an honorable mention for his Spotted Owl painting.]

2019 Student Bird Art Contest Results

By Sue Leskiw

Some 910 local K-12 students entered the 16th Annual Student Bird Art Contest, held in association with the 24th Annual Godwit Days Spring Migration Bird Festival in mid-April. FOAM and Redwood Region Audubon Society cosponsored the competition.

All entries were displayed at the Arcata Community Center during the festival and copies of the 1st, 2nd, and 3rd-place winners, as well as Best Bird in Habitat awards, are hung at the Arcata Marsh Interpretive Center through June. A booklet containing the artwork, as well as group photos of the winners taken during the awards ceremony, will be posted at www.arcatamarshfriends.org in late May.

Forty-one monetary prizes totaling $650, plus 31 honorable mention certificates, were awarded.

Kindergarten

1st Place: Cassidy Lloyd, Kneeland School, Peregrine Falcon

2nd Place: Isabelle Graham, Dow's Prairie School, Spotted Owl

3rd Place: Ruby Hall, Jacoby Creek School, Anna's Hummingbird

Grade 1

1st Place: Story Mintey, Freshwater School, American Robin; Ender Guthrie, Fuente Nueva Charter, Spotted Owl

2nd Place: Phoebe Rogers, Jacoby Creek School, California Quail; Soren James, Redwood Coast Montessori, Pileated Woodpecker

3rd Place: Gunnar White, Trinity Valley Elementary, Barn Owl; Fiona Frazer, Fuente Nueva Charter, Common Loon

Grade 2

1st Place: Bony McKnight, Coastal Grove Charter, Townsend's Warbler

2nd Place: Josie McKelvy, Trinity Valley Elementary, Wood Duck; Sebastian Bunz, Garfield School, Belted Kingfisher

3rd Place: Taalin Brown, Fuente Nueva Charter, Spotted Owl; Kiera Alves, Dow's Prairie School, Anna's Hummingbird

Grade 3

1st Place: Jade Frimodig, Fuente Nueva Charter, Northern Flicker; Isla Davidson, Redwood Coast Montessori, Bald Eagle; Na'omi Heitchler, Trinity Valley Elementary, Bald Eagle

2nd Place: Aubrey Lloyd, Kneeland School, Peregrine Falcon; Aubrey Waxler, Morris Elementary, Common Loon

3rd Place: Maxwell Collins, Garfield School, Black-crowned Night-Heron; Kyla Benzinger, Garfield School, Great Blue Heron

Grade 4

1st Place: Sarah Coyle, Ambrosini School, Bald Eagle; Nichole Cook, Morris Elementary, Marbled Godwit

2nd Place: Rose Callahan, Union Street Charter, Red-breasted Nuthatch; Violet Cook, Freshwater School, Great Blue Heron

3rd Place: Zoe Roemer, Pacific Union, Belted Kingfisher; Malia Hilleary, Northern United Charter, Wood Duck

Grades 5&6

1st Place: Ruby Soto, Green Point School, Belted Kingfisher; Lily Bazemore, Union Street Charter, Red-breasted Nuthatch

2nd Place: Saanvi Virnave, Sunny Brae Middle School, Common Ravens; Meta Bee Nave, Fuente Nueva Charter, Varied Thrush

3rd Place: Flora Shaw, Redwood Coast Montessori, American Avocet; Josie Klawitter, Green Point School, Western Tanager

Grades 7 through 12

1st Place: Jasmine Rudin, Eureka High, Purple Finch

2nd Place: Christina Smith, Eureka High, Northern Flicker

3rd Place: Madai Cruz, Eureka High, American Wigeon

Best Depiction of Bird in Habitat

Keilani Goodrich-Brinckhaus, Grade 1, Alder Grove Charter, Western Gull; Lilia Mendes, Grade 2, Dow's Prairie School, Tufted Puffin; October Mintey, Grade 5, Freshwater School, Buffleheads; Anna McLaughlin, Grade 5, Fuente Nueva Charter, Snowy Plover; Jayna Kline, Grade 12, Eureka High, Western Meadowlark

Honorable Mentions

Kindergarten: Myla Edson, Dow's Prairie School, Varied Thrush; Annayal Graves, Dow's Prairie School, American Robin; Hayden Ham, Dow's Prairie School, Spotted Owl. ***Grade 1:*** Wyatt Sessoms, Dow's Prairie School, Belted Kingfisher; Ninnamich Richardson, Trinity Valley Elementary, Hummingbird; Aurorah Tracy, Trinity Valley Elementary, Hummingbird; Echo Kimball, Trinity Valley Elementary, Barn Owl. ***Grade 2:*** Rosie Aguirre, Blue Lake School, Common Loon; Nikki Davis, Dow's Prairie School, American Goldfinch; Caleb Harris, Dow's Prairie School, Great Blue Heron; Ruby Moreno, Dow's Prairie School, Anna's Hummingbird; Emelie Cabodi, Trinity Valley Elementary, Bald Eagle; Coral Morris, Fuente Nueva Charter, Spotted Owl. ***Grade 3:*** Fisher Bjorkstedt, Fuente Nueva Charter, Belted Kingfisher; Lillian Pinnegar, Homeschooled, Wood Duck; Kjersti MacDonald, Garfield School, Spotted Owl. ***Grade 4:*** Zeke Lee, Redwood Coast Montessori, Forster's Tern; Brooke Weeks, Morris Elementary, Cedar Waxwing; Elana Dens, Union Street Charter, American Goldfinch; Iris Quinlan, Union Street Charter, Bald Eagle; Lucas Vandermeer, Union Street Charter, Black-crowned Night-Heron; Oni Orcutt, Trinity Valley Elementary, Steller's Jay. ***Grade 5:*** Slate Savra, Fuente Nueva Charter, Spotted Owl. ***Grade 6:*** Wynne Pevec, Northcoast Preparatory Academy, Northern Flicker; Jayla Kan, Redwood Coast Montessori, Common Loon; Bella Hardell-Moreno, Redwood Coast Montessori, Cliff Swallow. ***Grade 7:*** Meguire Bartosz, Alder Grove Charter, Northern Pintails; Nova Blaisdell-Jordan, Zane Middle School, Osprey. ***High School:*** Jack Dahl, Academy of the Redwoods, Spotted Owl; Nicolette Reinsmith, Eureka High, Tufted Puffin; Hannah Murdoch, Eureka High, Cedar Waxwing

1st-, 2nd-, and 3rd-place winners, Kindergarten-Grade 1.

1st-, 2nd-, and 3rd-place winners, Grade 2..

1st-, 2nd-, and 3rd-place winners, Grades 3&4.

1st-, 2nd-, and 3rd-place winners, Grades 5-12. All photos by Jay Seeger.

Best Bird in Habitat Award winners.

Honorable Mention winners, Kindergarten-Grade 3.

Honorable Mention winners, Grades 4-12. All photos by Jay Seeger.

Snowy Plover by Eleanor Abell, Grade 1 (2017).

Plovers Fight for Protection

By Cosette McCave

A snowy plover egg sits in a small depression on Clam Beach. A raven creeps up on the lonely egg and pecks it in half. The scavenger slurps up the contents and flies away before the father arrives back at the nest.

Alexa DeJoannis, president of Redwood Region Audubon Society, gave a lecture about the threatened snowy plover on January 18. She began studying birds in southern California with burrowing owls. DeJoannis graduated with a Master's in wildlife from HSU. Her ornithology professor, Mark Colwell, introduced DeJoannis to researching snowy plovers. She has been in love with them ever since. "I only study cute animals," DeJoannis joked.

Many people use nature as a getaway from stressful lives. Humboldt's beaches and dunes are peaceful place to take a stroll. They are also an important place in our environment. Dunes slow wind, break storms when they crash in from the ocean, and protect roads and homes from these weather conditions.

Snowy plovers rely on beaches and dunes as their home. They dig shallow depressions in the sand to use as nests. DeJoannis emphasized how snowy plovers rely on their eyes to find food and watch for predators. The beach is their preferred habitat, since it's nice and open. Unfortunately, European beach grass is taking over their ecosystem. Snowy plovers can't see over this invasive plant species, making them vulnerable to predation.

DeJoannis discussed how people greatly impact plovers. Litter has helped corvids thrive. Beaches became an attractive home for corvids such as ravens and crows because of garbage. These clever birds then began attacking plover nests, finding an egg much tastier than trash. "Everybody deserves protection from predators," DeJoannis explained.

Many nests have been destroyed by people not watching where they step. Snowy plovers nest right on the sand and expertly disguise their nests from predators with shells or wood. Therefore, many people are unaware that these creatures are right beneath their feet. People should be on the lookout for small scoops in the sand with speckled eggs laid inside.

Plovers have grayish-brown backs and tops of their heads, with white bellies. Their plumage changes during the breeding season (February through September). This is when they develop a black stripe above their eye and on their necks. These stripes usually are more pronounced on the males who are trying to impress a female."That's evening wear," DeJoannis said.

Restoration efforts have focused on pulling invasive beach grass. Native plants like beach strawberry are planted. Snowy plovers can easily see over shorter native plants. Fences have been put up around plover nesting sites during breeding season to prevent nest destruction. People can listen to experts and become educated on the issue. If humans work together to protect the little guys, the snowy plover may just have a chance.

What Can Dinosaurs Teach Us About Global Warming? (Take 1)

By Elliott Dabill

I discussed this question during a FOAM lecture on February 15. If Nature can be as capricious as my luck at hitting a baseball, maybe the Great Game should be an analogy for the Mesozoic era, the 185 million years or so that included the dinosaurs ruling the major food niches Earth. There were three big strikeouts around their time of dominance, extinctions that wiped out so much life that we would have been shocked to see the before and after pictures of the devastation. The opposing team was Nature itself.

First up at bat: the organisms before the Permian extinction, the greatest killing of them all. There were no dinosaurs during the Permian era, just reptiles in various stages of resembling mammals, some amphibians, and others. The meanest-looking was a group called the gorgonopsids. Go on, Google the gorgons, but garner your fears for this mouthful of teeth. Now imagine one with a baseball bat and yelling with the arrogance of a dominant athlete "Give me your best stuff." Bad call. The "stuff" turned out to be a flood of lava from the Siberian Traps, an outflowing so large that it could cover Europe a kilometer deep. The CO_2 and other nasty gases produced acid rain and warming so severe that the oceans and wetlands released methane that further exaggerated the warming and made the atmosphere uninhabitable. Methane eventually converts to CO_2, which caused the oxygen to plummet from 30% to 12% of the air. The combination of heat and suffocation wiped out 75% of the land species and 95% of ocean dwellers. It's never been this bad on earth since, and probably took 10 to 30 million years to recover the complexity of life. Those atmospheric processes are happening now, with humans driving the change much faster than this episode 250 million years ago, but don't be distracted from the game. The gorgon struck out, was then hit by a pitch, and the umpire stopped by to kick him to make sure he was out.

Once the land and oceans were cleared of the beasts that dominated, new species evolved to fill those empty spaces in what are called adaptive radiations. Dinosaurs appeared, and you can imagine them cheering as the older teams were crushed, but the major leagues now had some new fearsome competitors. Dinosaurs would contest with other archosaurs, beasts that look like alligators with long legs, and some

large amphibians that survived the mass killing. We are used to thinking of dinosaurs as the best hitters that ever lived, but during this next period of time, the Triassic era, the dinosaurs were almost sent down to the minor leagues.

Put the bat in the clawed hands of the early dinosaur *Coelophysis*, six feet long and skinny, no taller than my dog. At the end of the Triassic, 50 million years later, it's time for another set of fastballs. The volcanoes this time were along the Appalachian mountain region, as the supercontinent broke up and lava emerged in quantities large enough to again poison the atmosphere and kill off another 75% of species. The pattern of high CO_2 repeated, the heat was overwhelming, and researchers are looking for other factors that might have contributed to the killing. Our guesses about what that was like include a heat index (temperature + humidity) of 165 degrees in the Iranian city of Bandar Mahshahr in August 2015; that's the temperature at which you cook a chicken. Some animals die directly from the heat, others because of the ancillary effects of water loss, plants wilting, and so on. But wait, the dinosaur team is cheering! Why? There is some uncertainty, but dinosaurs (like birds) had a respiratory system way more efficient than humans and could account for their ability to survive and hit curve balls while their opposing teams dropped out and took up fossil making. For the next 135 million years or so, the dinosaurs dominated all the major food niches on land, reached sizes similar to the great whales in our oceans, and became overconfident in their abilities as athletes.

You may have heard about the third strikeout: the end-Cretaceous extinction that in one day caused such a ruckus from an asteroid that the sun was blocked out for months, plants died, dinosaurs starved, and here we go again: 75% of the species are gone. Two other looming disasters made it much worse. First, the Deccan Traps in India and the surrounding ocean were boiling out lava in enormous quantities, with the results familiar from the previous extinctions. This was another double-whammy that seemed to be intent on making sure that the lessons of the past were learned. The last looming disaster can be visualized by imagining a *Tyrannosaurus rex* trying to hold a bat in its dinky arms. Nobody could mess with a *T. rex* except another *T. rex,* so they can be forgiven for thinking they were above the kind of drubbing the SF Giants are getting these days. And yet their slow bat speed meant they died with the others. The survivors of this extinction included one group of birds (there had been three different kinds). They might have pulled through because they ate seeds that were not destroyed in the extinction event. But no birds will play baseball with you today. They just look at their gripless wings and shrug their shoulders; they learned that Nature bats last, as a bumper sticker suggests.

Now it's our turn at the plate. We have created this ever-advancing civilization based on the carbon compounds buried underground. Since CO_2 emissions increase each year, it appears we don't want to give up burning that carbon. The birds survived the last time this happened on such large scale, and they are now trying to change habitats, going quietly extinct a few at a time, and otherwise suggesting that the time has come to take it seriously. Choose your own metaphor, but it's the bottom of the ninth and we're losing the game. Optimists say there is still time to win, but the world I grew up in is gone, probably forever, and I hate the thought of being kicked by the umpire.

What Can Dinosaurs Teach Us About Global Warming? (Take 2)

By Cosette McCave

Elliot Dabill gave a lecture on February 15 on the topic, "What Could Dinosaurs Teach Us About Global Warming?"

"Of course the answer is a lot," Dabill said. He stated that during this time, the continents were crashing into one another to create Pangea. Volcanoes began erupting. The lava produced was enough to cover Europe.

Dabill said the heat from the lava cooked limestone and coal, which then threw carbon dioxide and sulfur into the atmosphere. The large amount of gases, carbon dioxide and methane specifically absorbed heat from the sun. Permafrost would then melt, which threw even more methane into the atmosphere. During this time, oxygen was being sucked out of the air.

Dabill referenced statistics that there was only 12-16% oxygen in the air, compared to 21% today. Such low oxygen levels would make it very difficult to breath at higher elevations. "For example, you couldn't travel to Willow Creek."

According to Dabill, this is when dinosaurs began to evolve. This is also when Pangea started to break apart. Oxygen levels were just beginning to recover, only to crash again. Volcanoes and poison gas again began to spew into the air. "Huge volumes of lava were coming out," Dabill said.

The Earth started to heat up and oxygen levels crashed quickly. "Volcanoes had to be a factor," Dabill said.

Many of the animals during these eras went extinct due to the low oxygen. Thankfully, dinosaurs had special lungs with air sacs. This type of lung system allowed the dinosaurs to absorb more oxygen than other animals. The air sacs also helped absorb and exhale heat from the air, allowing dinosaurs to survive while other animals suffered and went extinct.

"I never knew the reason dinosaurs survived," said attendee Katy Allen.

That is when it shifted into the Jurassic era. The dinosaurs began to take over. "Dinosaurs ended up running the world," Dabill said.

Today, the Earth is heating up faster than ever. This is due to the mass of carbon dioxide being emitted across the planet by humans. "The human influence is irrefutable," attendee Bill Prescott opined.

The fast melting of glaciers and sea level rise are two issues of concern. People across the planet are counting on glaciers to provide water for their rivers. Sea level rise will destroy homes and infrastructure for millions of people.

"The more you hear about global warming, the more you understand it," Prescott said.

Humans also have a trick to combat these issues. Humans can put their brains together to solve climate change once and for all. "This is only the beginning," Dabill stated.

Volunteers Needed!

The City has been scrambling to find enough help to keep the Interpretive Center open on weekends. After completing paperwork (and getting fingerprinted at City expense), it only takes 30 minutes to be trained on how to staff the welcome desk. Here's your chance to give back to the Marsh and meet interesting people while you're doing it. Please call 826-2359 today!

Don't forget to select your favorite Godwit Days kids' T-shirt designs. Voting ends Sunday, June 16!

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Freshwater Marsh Critters

By Elliott Dabill

Walk to the westernmost window in the Interpretive Center, the one behind the spotting scope. On your left hangs Gary Bloomfield's drawing of the microscopic life that is a foundation for the pond life of the Arcata Marsh. The painting and its invertebrates were the subject for John DeMartini's March 15 lecture. He knows them well following decades of dipping out water samples and studying the "beasties," as they were called by Van Leeuwenhoek, the first microscopist.

Above the waterline in the picture, you can see several vertebrates that feast on this environment. We all like the frogs and birds of the marsh, but notice also the dragonfly and his toddler in the lower right corner under the water. Dragonfly larvae seem to be constantly hungry and able to eat whatever crosses their paths. Go ahead and Google "dragonfly naiad mouth parts" and see if you don't awake in a sweat dreaming of Martians. There are fossils of dragonflies bigger than two feet across, thanks to high levels of oxygen and fewer predators 300 million years ago. The water strider is also above the water line, gracefully showing off its knowledge of water physics by keeping its weight down and taking advantage of the cohesion keeping the surface layer tough. Graceful, but another hunter that does his skating to gnash mouthparts on smaller bugs.

Now follow Dr. DeMartini under the water as he points out the fishes that we can see, to get to the aliens we can't. On the extreme right of the painting is a stickleback, common in both fresh and salt water. A mosquitofish is in the middle, like the ones we put in the oxidation ponds to control their eponymous food. Just above the head of the stickleback is a circle magnified to show the tiny creatures closer to the bottom of the food web. A hydra on the left is related to sea anemones and has the same explosive darts to capture the even tinier food particles in the next magnification circle to the left. At the bottom is a cyclops, named for its single eyespot. In Sudan, these cyclops still harbor the larvae for guinea worms that hatch out as people there drink the infested water. The worms mature within human bodies and travel under the skin to emerge in a painful blister. The people then wind the 3-foot-long worm on a stick over several days. Former president Jimmy Carter has taken on the heroic task of eliminating this pest and his team is very close. There is an amphipod (*Gammarus*) in the middle of the circle, waiting there to donate her crustacean body as food to larger denizens of the pond. A small circle on the left gets magnified into the large circle in the middle of the painting, showing a group of even smaller organisms.

This highest magnification shows us two similar crustaceans like *Daphnia*, or water fleas, with their tiny arms dangling over their heads as though doing a strange

dance. If you held up a water sample from the Marsh ponds, you could see tiny pepper spots doing that higgledy-piggledy dance, leaving us to wonder at the party life down there that we can't know.

Now, enchantment. Get out your own microscope and watch as the yellow funnel-shaped *Stentor* twists and bumps its breakdance on a stem and a *Paramecium* spins and tumbles its oval body in a 3-dimensional ballet. To the right of the red *Bosmina* is my favorite—a rotifer—helicoptering its cilia to set up a food-capturing current of water. This whole scene will capture your imagination and compel you into studying biology to get more stories.

The last magnification circle displays red *Tubifex* worms and ostracods that look like swimming clams, waiting like the other beasties to donate their bodies to ostracod chowder-loving animals. Finally, on the extreme left end of the painting is everyone's favorite blood sucker, the leech. Related to earthworms, leeches trade your blood meal for production of leech eggs so that their children can suck blood from your children. You won't always know about the theft because of the hirudin peptide they secrete in saliva to keep blood from clotting. This is useful for some human diseases, a gift to humanity probably originating from the guilt caused by blood-sucking in the first place.

John DeMartini's walk through this bundle of surprises is infectious, as each tiny creature reveals a secret life of its own and participates in a food web we are familiar with at a larger scale. For visitors to the Marsh, we hope to lend out John's glasses to reveal his knowledge not only of the wonder that satisfies our curiosity, but the practical education in this picture of how our marshes do their captivating but invisible work of treating wastewater.

What we need now is another painting at the scale of bacteria, to get to the bottom of how it all works. Our interpreter for this lowest level would do well to copy the lifelong enthusiasm of Dr. DeMartini.

Visitor Info & Comments

Since our last issue, guests from the following states have signed in to the log book at the Interpretive Center desk: Alaska, Connecticut, Hawaii, Idaho, Minnesota, Montana, Nevada, New Mexico, New York, North Carolina, Oregon, South Dakota, Utah, Vermont, Washington, and Wisconsin. International travelers hailed from Brazil, Canada, Germany, Ireland, Norway, and Taiwan.

Some took the time to write comments: "Great things to explore… Amazing views!… Very nice center… Lovely place!... Very informative!... So beautiful!... Great adventure for the kids… Haven't been by in a while, nice as always… Center is awesome… Very safe and nice adventure… Gorgeous… Wonderful plein air exhibit… So peaceful… I will be back… Wonderful to be here on a rainy day!... Great visitor center and beautiful marshes… Outstanding… Thanks for having a bathroom… One of our favorite birding sites… Inspiring… WOW… Great info, I hope other coastal areas copy your wastewater treatment!... Are ticks common here?... Love it!...Outdoor paradise."

Heads Up!
The FOAM Annual Meeting & Volunteer Appreciation Lunch will be held on Sunday, September 29.

Calendar of Events

[Docent tours leave the Interpretive Center every Saturday at 2 pm]

May & June—Winners of 16th Annual Student Bird Art Contest (see p. 5)

May 17—South Georgia Island lecture, Andrea Tuttle, 7:30 pm (see p. 1)

June 13—FOAM Board Meeting, 6:30-8 pm

June 16—End of voting for Godwit Days kids' T-shirt designs (see p. 2)

June 21—Lamprey lecture, Damon Goodman, 7:30 pm (see p. 1)

July & August—Paintings by Paul Rickard

July 11—FOAM Board Meeting, 6:30-8 pm

July 19—Watershed Stewards/ salmonid life history & research in Humboldt lecture, Jessie Coming, 7:30 pm (see p. 1)

Thanks to Our Supporters, January-April 2019

► Best Friends ($100+): Karen Isa; Lorraine Miller-Wolf (NEW Life Member!); Jane Riggan*; George Waller; Ellen Weiss & Nathan Copple

► Sponsors ($50-99): Glen & Dee Anne Jones; Joan Sikkens & Valgene Phillips; Ann Diver-Stamnes & Steve Stamnes; Cynthia Rudick (Canton, OH)

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► Donations: $450 from Redwood Curtain Brewing Company, for FOAM December Pints for Nonprofits event; $250 from Daniel Sanborn; $200 from Life Member Paula Dawson (Mill Valley); $133.76 from Life Member Los Bagels (proceeds from Godwit Days donation jar); $75 from Life Member Gena Pennington; $50 from Lorraine Miller-Wolf; $52.50 from Truist; a pair of binoculars from Steven Stamnes; $106.72 from AMIC donation box

* = New member

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Mark Your Calendar for:

South Georgia Island Lecture, 5/17
Godwit Days Shirt Voting Ends, 6/16
Lamprey Lecture, 6/21
Watershed Stewards/Salmonids Lecture, 7/19

MEMBERSHIP APPLICATION

Name _____

Address _____

City, State, ZIP _____

Phone _____ E-mail _____

Please check the appropriate membership category:

___ Individual $25 ___ Family $35 ___ Student/Senior $18

___ Sponsor $50 ___ Best Friend $100 ___ Life Member $750

___ I would like more information about volunteering for FOAM,

FRIENDS OF THE ARCATA MARSH, PO Box 410, Arcata CA 95518 **arcatamarshfriends.org**

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If you are receiving a complimentary copy of this newsletter, please consider joining FOAM.
If you were a member, but have allowed your membership to lapse, please renew.
(See mailing label for your expiration date.)
Interpretive Center street address is 569 South G Street, Arcata.
FOAM mailing address is PO Box 410, Arcata CA 95518. You can reach us by phone from 9 am to 5 pm Tuesday through Sunday and 1 to 5 pm Monday at 707-826-2359.