

Field Notes



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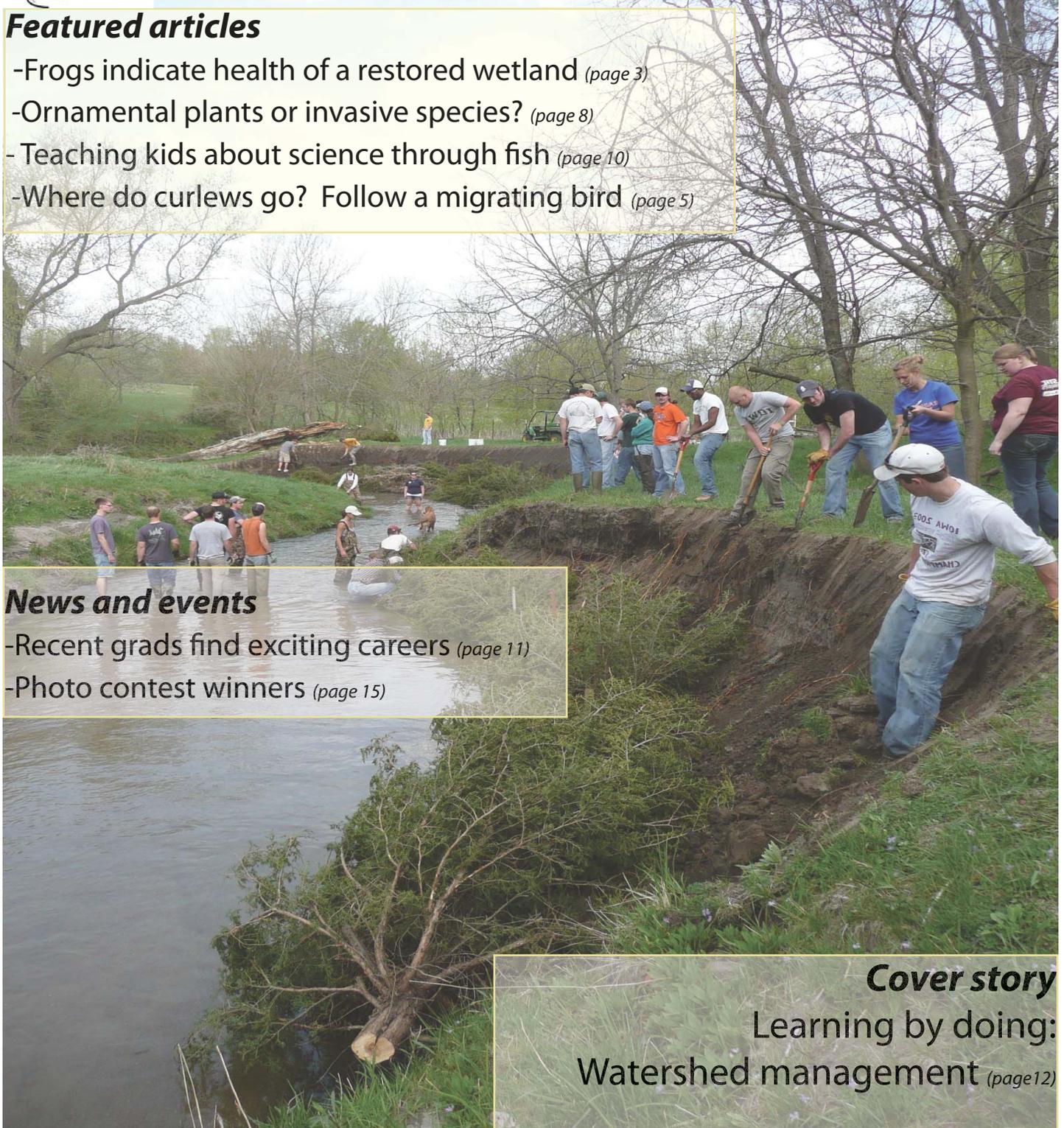
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Photo: Honorable
mention in contest for
Megan Lansing

Letter from the Chair

Welcome!

Welcome to the first issue of Field Notes, a publication about and by graduate students in the Department of Natural Resource Ecology and Management (NREM) at Iowa State University. With this issue begins what I hope will become a long-standing tradition, namely a public sharing of the accomplishments of a very dedicated and talented group of Masters and Ph.D. students.

Field Notes is the brain child of the NREM graduate students. Its goal is to showcase not only research accomplishments of the graduate students, but awards they have won, jobs they find themselves in after graduation, and other items of interest. This first issue provides a nice cross section of research conducted by both animal ecology and forestry graduate students including articles on wetland quality, woody invasive plants, curlews in Nebraska, hands-on environmental science for students, and a piece on collaboration among students, faculty, and staff in an effort to reverse severe erosion problems on a local farm.

As departments go, NREM is still relatively new on campus. The department came about in 2002 with the merger of the former departments of Animal Ecology and Forestry. As with any merger, some of the activities of the former departments combined effortlessly, and others, took a bit more work. Some of the courses that were formerly Animal Ecology or Forestry now carry NREM designators.

Graduate programs of the two departments have been streamlined, and we now see more animal ecology students in forestry classes and more forestry students in animal ecology classes. Collaboration on research projects is happening more frequently, and there is more interaction among our students at both the undergraduate and graduate levels.

This publication marks another positive step toward integrating the department and helping everyone, both within and outside the department, to understand and



Field Notes

Editorial Committee:

Michaelleen Gerken

William Headlee

Leigh Ann Long

Anna MacDonald

Todd Ontl

Paul Skrade

Dr. Rebecca Christoffel

appreciate the breadth and depth of research that goes on in NREM. Without the tremendous amount of time and effort contributed by the graduate students to those research projects, the department would be much, much less productive than it currently is. I congratulate the graduate students for bringing a great idea to fruition. A special thanks to all of the people who contributed to this first issue regardless of whether they were authors, editors, or “behind the scenes” workers so necessary to a successful venture such as this.

So, sit back and enjoy this inaugural issue of Field Notes. If you didn't contribute to this issue, think seriously about doing so for a future issue.

--Steve Jungst

Is mitigation working?

Amphibians and turtles as indicators of wetland quality

Like many large rivers in the US, the Missouri River was dammed and channelized in the 20th century by the U.S. Army Corps of Engineers. This was done for flood control, to facilitate barge traffic, and for other reasons in a series of projects referred to as the Missouri River Bank Stabilization and Navigation Project (BSNP).

River channelization makes flow more consistent and prevents flooding patterns that maintain a dynamic system of floodplain wetlands. However, many of the animals and plants in the floodplains of the Missouri River are accustomed to a constantly changing system. The Water Resources Developments Acts of 1986 and 1999 and



by Tyler Grant

Tyler grew up wandering the hills and catching the lizards, snakes, and frogs of Utah foothills, deserts, and wetlands. He received his B.S. in Biology from Utah State University, after which he worked for the Bureau of Land Management in El Centro, California, as a field technician. He then received his M.S. in Wildlife Biology from Colorado State University, where he studied monitoring methods and off-highway vehicle impacts on the flat-tailed horned lizard (*Phrynosoma mcallii*), a proposed endangered species. After receiving his M.S., he worked for the U.S. Fish & Wildlife Service in Carlsbad, California, for 4 years, where he worked on several studies of endangered species, including the Coachella Valley fringe-toed lizard (*Uma inornata*), Pierson's milkvetch (*Astragalus magdalenae* var. *peirsonii*), Laguna Mountains skipper (*Pyrgus ruralis lagunae*), and coastal cactus wren (*Campylorhynchus brunneicapillus*), in addition to conducting endangered species consultations and working with new or existing regional conservation plans. Tyler is seeking a Ph.D. in Wildlife Ecology.

<Tyler with snapping turtle.

...if any part of the system is not functioning, it will likely have an effect on amphibians

Missouri River Mitigation Project sought to reverse some of the effects of the BSNP. This project included wetland protection in various areas along the Missouri River from Sioux City to the Missouri River-Mississippi River confluence.

My research is part of a multi-state project to look at these wetlands to determine if they are functioning as they should. My research should also inform managers in how to improve wetland function.

Amphibians were chosen as indicators of wetland functionality for several reasons. Amphibians use aquatic habitat for breeding and their larval (tadpole) stage, but adults use the upland (non-aquatic) habitat. Thus if any part of the system is not functioning, it will likely have an effect on amphibians.

Different amphibian species also use different types of wetlands. Some prefer shallow, fishless, temporary wetlands,

while others prefer permanent, deep wetlands. So a diversity of amphibian species indicates a healthy variety of wetlands.

Finally, since amphibians have permeable skin as adults and live in the water as tadpoles, they are more sensitive to toxins in the water than other species. For these reasons, amphibians make good indicators of wetland health and function to support a variety of species. The study area in Iowa consists

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of Tieville Bend, Decatur Bend, and Louisville Bend, near Onawa, Iowa. Wetlands in the study area were mapped in 2009 and consist of distinct “ponds” of various sizes and large backwaters that are connected to the river. Wetlands were surveyed for calling frogs and toads.

Call surveys involve listening and identifying frogs by their calls for 5 minutes per survey at each wetland. Three rounds of call surveys were conducted because of the variation in dates that different species call. Calling frogs do not guarantee that breeding occurs however, so we also conducted dip-net surveys for tadpoles.

Seven species were found to be common: midland

chorus frog (*Pseudacris maculata*), northern leopard frog (*Lithobates pipiens*), plains leopard frog (*Lithobates blairi*), Woodhouse’s toad (*Anaxyrus woodhousii*), gray treefrogs (*Hyla versicolor* and *Hyla chrysocelis*), Blanchard’s cricket frog (*Acris blanchardi*), and bullfrog (*Lithobates catesbeianus*). Tadpoles from all these species were also detected.

buckets into the ground so their mouth is level with the ground. The buckets are placed at each end of a fence. When frogs try to get past the fence, they move along the fence until they fall into a bucket. Fences were placed at regular intervals around the wetlands. Pitfall trapping worked

more water from Gavin’s Point Dam in mid-June and water levels at my study area increased 6 feet. Nearly all my pitfall traps were flooded and are underwater still as of November. Because 2010 was a particularly wet year and the Missouri River hadn’t seen such high levels since 1997, this offers an interesting opportunity to learn from a system that is fluctuating between a dry year (2009) and a wet one (2010).

As any ecologist knows, the weather can change your plans and you have to adapt. Flooding confined toad juveniles from the pond with the most adult toads into a particular area allowing my crew and I to capture 300-400 baby toads in a few hours. We did so on

several occasions and marked the toads under the skin with Visible Implant Elastomer, a material that remains under the skin of the toad for life, similar to a tattoo. We marked 2200 juvenile toads. Subsequent captures should provide interesting information on survival and movement of juvenile toads.

We also wanted to estimate turtle population size. We trapped turtles after the flooding for 6 weeks in an area accessible despite the flooding. We captured 43 snapping turtles (*Chelydra serpentina*), 16 false map turtles (*Graptemys pseudogreographica*), 51 painted turtles (*Chrysemys picta*), and 1 spiny softshell (*Apalone spinifera*). We recaptured a few turtles



Releasing Woodhouse’s toads captured by hand at study site (photo T. Grant)

well for Woodhouse’s toads and chorus frogs, but not as well for other species. I marked 125 adult Woodhouse’s toads and a similar number of chorus frogs. The goal was to mark juveniles as they left the wetland and capture them again as adults to determine if the full cycle of reproduction was occurring, however, flooding prevented capture of juveniles.

As any ecologist knows, the weather can change your plans and you have to adapt.

A subset of wetlands was chosen for pitfall trapping. Pitfall trapping involves setting 5-gallon

High water levels in 2010 prompted the U. S. Army Corps of Engineers to begin releasing

but not enough to conduct a meaningful mark-recapture analysis. The multi-state committee and funding agencies are considering whether we should conduct turtle trapping next year.

While much data has yet to be collected and data analyses have yet to be conducted, these preliminary observations indicate that at the very least the wetlands of the Missouri River floodplain are functioning as wetlands should to some degree. A variety of species are present in a variety of types of wetlands. Few, if any, wetlands are unoccupied. I look forward to learning more and providing information that the Iowa Department of Natural Resources and U.S. Army Corps of Engineers can use in construction and management of wetlands. ↓



Gray tree frog (photo T. Grant)

The Curlews of Western Nebraska

It's dawn on a chilly May morning in the Nebraska Sandhills. I'm huddled on a hillside, my knees sinking into the sand, a pair of binoculars pressed to my eyes. In the howling wind I hear the quivering calls of a curlew from somewhere off in the distance. My eyes strain to find the bird, and I finally do, pacing back and forth on the still winter-bleached grassland. It takes one last nervous look around, slyly vanishes into the grass, and at the same time another

by Cory Gregory

curlew flushes nearby. "Ah ha!" A curlew just swapped places with its mate to incubate their clutch of eggs.

After more than an hour of stalking and mindless muttering, my patience rewarded me with the location of a curlew nest! But let's back up. What is a curlew? The Long-billed Curlew (*Numenius americanus*) is a shorebird, the largest in North America—standing nearly two feet tall, with long legs and neck, and aptly named for its nearly foot-long decurved bill. The bird's size and long down-curved bill make it one of the most recognizable species of shorebird. In fact, a drive through the grasslands of western Nebraska during the spring is almost certain to provide glimpses of this large shorebird. They are most often seen walking methodically through meadows and low swales, probing for grasshoppers and beetles with their long bills.



Cory Gregory is a Master's student in the NREM department and plans to graduate in 2011. He was born in western New York State and has lived in Tennessee, Michigan, Kansas, and now Iowa. He majored in Biology (with a Zoology emphasis) at Andrews University in southwest Michigan for his undergraduate studies. He has been interested in birds from a young age, and has worked with a variety of seabirds and shorebirds in places like northern and southern Alaska, Hawaii, and throughout the Midwest.

Natural History

Long-billed Curlews spend three to four months each spring and summer breeding in grasslands of western North America. Unlike most shorebirds that nest close to water, curlews nest in rolling prairie and grazed meadows, sometimes far from water. Curlew nests are not elaborate, no more than grass-lined depressions in the ground. Males and females share incubation duties of their four eggs almost constantly for 30 days. The chicks are capable of leaving the nest just a few hours after hatching. Parents aggressively defend

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them by hazing predators with steep, screaming dives, swooping down as close as two or three feet from the predators. While adults are mounting such defenses, the blotchily patterned chicks crouch and stay completely still, perfectly camouflaged in similarly colored grass and sand.

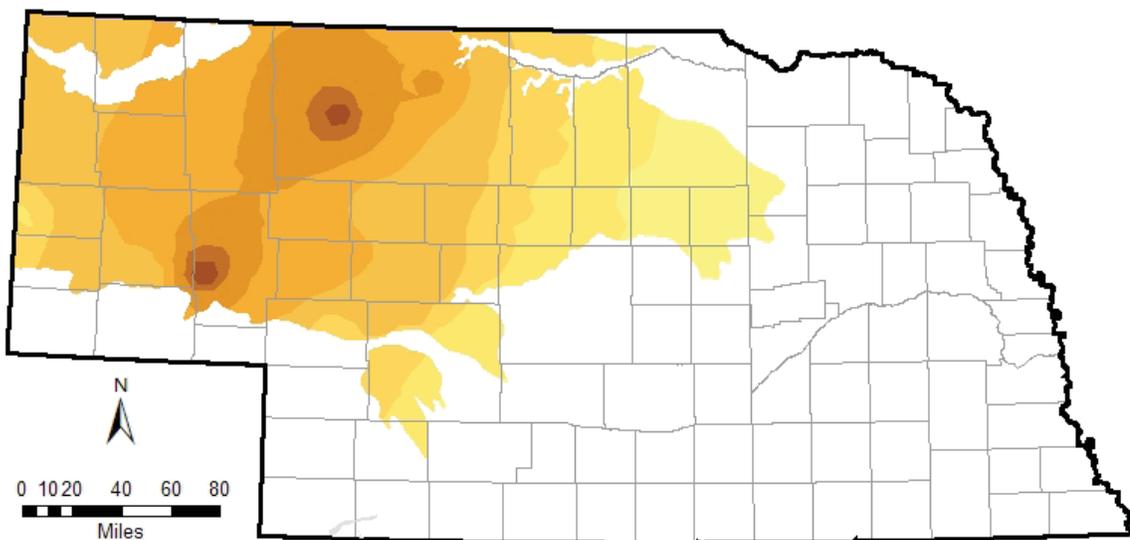
The curlew is considered a highly imperiled species in the U.S.

After two weeks with both parents, chicks are left in the care of the male. Females congregate and migrate south, sometimes as early as June. As the summer wanes, the males and the young gather into small flocks and migrate south to wintering grounds as well. By mid-September they will be gone from Nebraska for another year. Curlews migrate south to the Pacific Coast, the Gulf Coast, and elsewhere in the southern United States and Mexico. They winter on lagoons and mudflats, as well as dry grasslands and prairie dog colonies. Since the advent of satellite-tracking technology, it is now known that curlews nesting in Oregon travel south to the Central Valley of California. But where do the curlews from Nebraska go? Until now, very little research has been done on curlew migration from Nebraska.

Curlews in Nebraska

Before the tallgrass prairie was converted to agriculture, the range of Long-billed Curlews was much more extensive than it is today; they nested as far east as Illinois and Indiana. As mid-continent grasslands were settled, the curlew's range shrank to

Presumed current breeding distribution and abundance of Long-billed Curlews in Nebraska according to Breeding Bird Survey data by Sauer et al., 2005 (image by Joel Jorgenson)



Curlew nest (photo C. Gregory)

the west—out of Indiana, out of Iowa, and by the late-1800s, out of eastern Nebraska. As the use of center pivot irrigation spread in the 1970s, the native grasslands used for nesting were replaced with crops and the number of curlews nesting in the state continued to decline. Today, the curlew is considered a highly imperiled species in the United States and although it is not federally listed as threatened or endangered, many experts believe their numbers are still declining due to degradation and loss of habitat.

Nebraska Research

To learn more about Long-billed Curlews in Nebraska, we initiated a study in the Sandhills of western Nebraska. The first aspect of the study was to estimate the number of breeding curlews in Nebraska by using distance sampling, a

method that allows us to estimate densities without taking a census or surveying the entire population. We can then extrapolate this density to the entire area for a statewide population estimate.

During two summers, more than 1,400 random roadside points were surveyed for both curlew

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presence and the distances to the birds. The results of these surveys are still being analyzed, but when completed will establish a defensible estimate of the number of breeding curlews in Nebraska. Another aspect of the study was to answer questions about the curlew's biology, such as what factors affect the survival of chicks and what habitat is being used at nesting sites. To answer these questions, we are also studying the curlews on a much smaller scale.

Our first task was to find curlew nests; no small feat because these sandy-brown birds blend in exceptionally well with the grassland vegetation of western Nebraska. By spending days watching certain pairs of birds, we began to zero in on where they nested. The next step was to capture adult curlews on their nests. Two of us would cautiously approach the nest holding a long, rectangular bird net between us. If the curlew flattened down, deciding to rely on its cryptic camouflage to escape detection, we simply placed the net over the nest and captured the bird.

Bird in the Hand

Captured adults were weighed and measured to assess gender. We also clipped a toenail to take a small blood sample for potential genetic research. A uniquely-numbered metal band was placed around the leg so that information such as longevity could be determined if the bird or band was found elsewhere. We returned regularly to check nests throughout the season. By placing eggs in a small container of water and observing how high the eggs floated, we could approximately determine what day the chicks would hatch.

On hatch day, we placed tiny radio-transmitters on chicks so that the location of chicks could be determined each of the following days. By measuring habitat use of young chicks, we hope to be able to make management suggestions for land-owners who wish to provide habitat for curlews. Even though analysis of data is ongoing, it is clear that newly hatched chicks can

One-day and two-day old chicks were moving more than a mile in less than 24 hours!

relatively long distances shortly after hatching. In fact, one-day and two-day old chicks were documented moving more than a mile in less than 24 hours!

Where Curlews Go

Adult curlews only spend a quarter of the year on the breeding grounds in Nebraska. To understand the annual life cycle and the array of threats they face throughout the year, it is important to know where the curlews winter. By attaching satellite transmitters to two adults, we were able to track the birds after they left the state. Sandy and Bailey, as the birds were named, roamed western Nebraska through much of June. One day Sandy bolted and flew straight to Texas in less than 24 hours; in contrast, Bailey migrated more leisurely, stopping in Kansas and Oklahoma before reaching Texas in about a week.

Eventually, both curlews settled just south of the U.S. border at coastal lagoons in northeastern Mexico. Finally, we had proof that curlews nesting in Nebraska migrate to the Gulf Coast region.

When all the information gathered from these seasons of field research is analyzed, we will have a far greater understanding of the status of this emblematic shorebird of Nebraska's grasslands and potential/probable threats to their future, and will be able to make recommendations to ensure that their populations stabilize. ↓

This female Long-billed Curlew wearing a satellite-transmitter was tracked to Mexico in 2009 (photo by C. Gregory) m o v e



Risk Assessment for Woody Invasive Plants in the Upper Midwest

by Em Kapler



Invasive plants are one of the banes of natural resource professionals. Aggressively displacing native vegetation, invasive plants can pose serious challenges for nature preserves and restoration programs, especially where goals center around conservation of native biodiversity. Once an invader gets into an area, it can be very difficult to eradicate, even where funds and resources are available for such efforts. For managing invasive plants, the general consensus can be described with Ben Franklin's adage "an ounce of prevention is worth a pound of cure."

Most introductions of non-native plants are the product of deliberate human intention rather than accident. Non-native plants have all sorts of uses to us, from food to fiber, ornamentation to erosion control. Sometimes a non-native plant will naturalize, or reproduce and sustain a population without human assistance. Of those that naturalize, a few go on to become invasive.

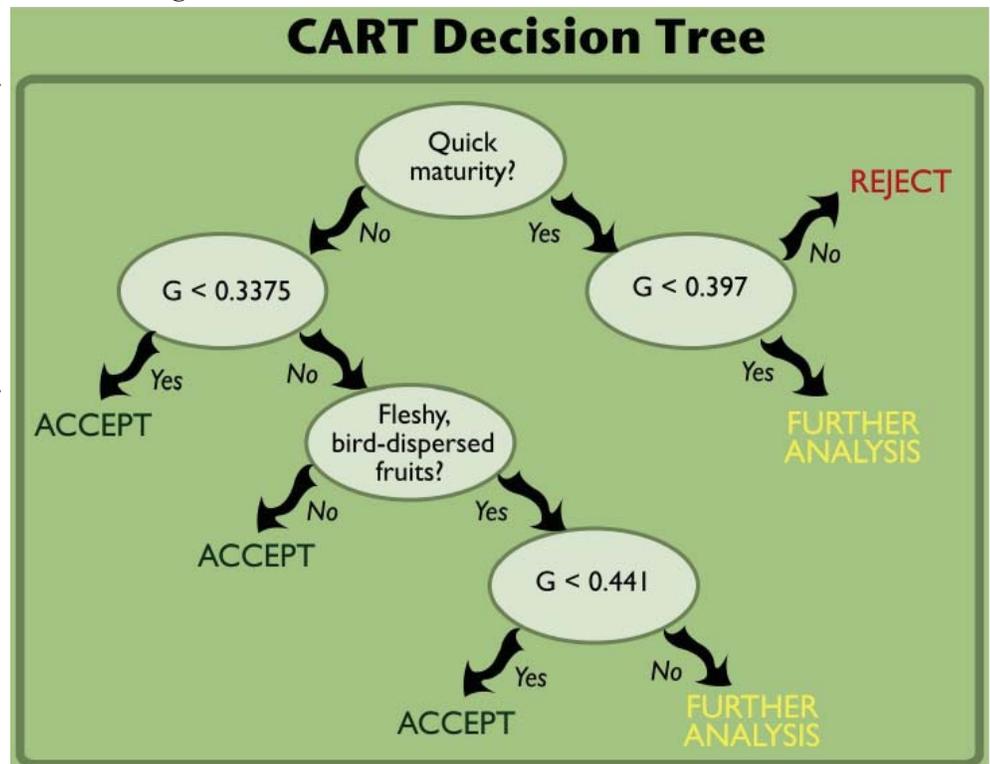
People are unlikely to give up completely on introducing novel, non-native plants because of a few bad apples. Instead, is there a way for us to screen these species prior to their introduction to prevent bringing in the next invasive bane?

There are several prevention-

based approaches to invasive plant management, and among them is a process called risk assessment.

Broadly, risk assessment involves calculating the probability of harm given an exposure. In the context of invasive plants, that means examining the likelihood of a

Em Kapler is an Iowa born girl from Cedar Rapids. After working at the Chicago Botanic Garden in plant conservation for a couple years, she developed a love of plants both native and exotic. Fascinated by the natural world in general, she strives to learn about it through science, mysticism, and folklore. new plant introduction becoming the next invader. As there is no silver bullet for determining if a plant will become invasive, making a good risk assessment model can be a challenge. My research focuses on risk assessment models for naturalization of non-native woody plants in the Midwest.



Example decision tree classifying non-native plants by risk level. Higher G-value species are more pre-adapted to the climate of the study area, the more pre-adapted, the more likely it will naturalize easily. (image by E. Kapler)

Having a risk assessment model for woody plants in particular is useful, as trees and shrubs have longer life cycles and considerable lag time before naturalization and invasion occur, which makes field trials less feasible. The basis for many of our models are decision trees (see figure, pg 8) focusing on characteristics of woody plants that contribute to naturalization, such as how quickly the plant reaches maturity or whether or not it has fleshy, bird-dispersed fruits. We also incorporate a statistic called the G-value, or geographic-risk value.

Successful naturalizers are more likely to come from certain areas of the world than others, so we compile native-range data on a woody plant to help evaluate its risk of naturalizing. Put another way, the G-value represents how pre-adapted the woody plant is for the climate to which it is going to be introduced.

Ideally the model should be easy to use and understand for the people incorporating it into their professional operations

The models I work with classify non-native woody plants into one of three outcomes. The plant is accepted (low risk of naturalization), rejected (high risk of naturalization) or designated as needing further study. Ideally, we want to minimize the number of species our models can't classify and end up in the "further study" category. We also want to minimize errors in the models. For many models, rejection of a plant that has shown no evidence of naturalizing (called a "horticulturally-limiting error") is the most common type of error. Accepting plants that are known to naturalize, or "biologically significant errors", are less common.

If we want risk assessment models to be used by groups involved in plant introduction (most significantly the horticultural industry) we need to maintain low horticulturally-limiting error rates, as high errors represent potential profit loss. Exactly what level of error industry professionals see as acceptable is another aspect I am evaluating, along with

Non-Native Woody Plants Naturalized in Iowa

COMMON NAME	SCIENTIFIC NAME
Norway Maple	<i>Acer platanoides</i>
Amur Maple	<i>Acer tataricum ssp. ginnala</i>
Tree of Heaven	<i>Ailanthus altissima</i>
Japanese Barberry	<i>Berberis thunbergii</i>
Common Trumpet creeper	<i>Campsis radicans</i>
Northern Catalpa	<i>Catalpa speciosa</i>
Oriental Bittersweet	<i>Celastrus orbiculatus</i>
Russian Olive	<i>Elaeagnus angustifolia</i>
Autumn Olive	<i>Elaeagnus umbellata</i>
Winged Euonymus	<i>Euonymus alatus</i>
Border Privet	<i>Ligustrum obtusifolium</i>
European Privet	<i>Ligustrum vulgare</i>
Japanese Honeysuckle	<i>Lonicera japonica</i>
Amur Honeysuckle	<i>Lonicera maackii</i>
Morrow's Honeysuckle	<i>Lonicera morrowii</i>
Trumpet Honeysuckle	<i>Lonicera sempervirens</i>
Tatarian Honeysuckle	<i>Lonicera tatarica</i>
Barbary Wolfberry	<i>Lycium barbarum</i>
Osage Orange	<i>Maclura pomifera</i>
Crabapple	<i>Malus sylvestris</i>
White Mulberry	<i>Morus alba</i>
White Poplar	<i>Populus alba</i>
Manchu Cherry	<i>Prunus tomentosa</i>
Common Buckthorn	<i>Rhamnus cathartica</i>
Buckthorn	<i>Rhamnus davurica</i>
Glossy Buckthorn	<i>Frangula alnus</i>
Chinese Buckthorn	<i>Rhamnus utilis</i>
Japanese Rose	<i>Rosa multiflora</i>
Black Locust	<i>Robinia pseudoacacia</i>
Sweetbrier Rose	<i>Rosa rubiginosa</i>
European Dewberry	<i>Rubus caesius</i>
Japanese Raspberry	<i>Rubus parvifolius</i>
White Willow	<i>Salix alba</i>
Brittle Willow	<i>Salix fragilis</i>
Whitecrack Willow	<i>Salix X rubens</i>
European Mountain Ash	<i>Sorbus aucuparia</i>
Siberian Elm	<i>Ulmus pumila</i>
Wayfaring Tree Viburnum	<i>Viburnum lantana</i>
European Cranberry Bush	<i>Viburnum opulus var. opulus</i>

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attitudes towards invasive plants more generally. Other groups that have an important say in potential risk assessment policies for invasive plants include land managers, gardeners, and landowners. These groups will also be surveyed for their thoughts on invasive plants and risk assessment. Additionally, the survey examines whether or not people's perceived relationship with nature has any influence on their attitudes about invasive plants.

Combined with an understanding of stakeholder attitudes, my hope is to produce a regional risk assessment model for the Upper Midwest. Ideally the model should be easy to use and understand for the people incorporating it into their professional operations. While this is just one step in efforts to manage invasive species, if adopted widely it offers reason to hope the next woody plant introduction can be prevented from being an invasive one. [↓](#)

Interactive Fisheries Education with Salt Creek Pupfish

By Maria C. Dzul

“The fish is slimy!” one 4th grade student exclaimed. This remark was followed by uproarious laughter from the other five students. These moments were becoming increasingly frustrating. It was my duty to teach the students how to measure fish, and times like this made it difficult to keep the students focused.



Handling a fish was a novel experience for most; students seemed simultaneously intrigued and disgusted by the flopping, slimy fish. Most students gasped the first time I took a fish out of the water and held it in my palm. “Put it back! It’s going to die!!!” they would shriek. I reassured them that fish could survive a few minutes out of water.

I ventured to Death Valley in February 2010 as a graduate student

to study movement patterns of the Salt Creek pupfish, a small-bodied fish endemic to Salt Creek located on the floor of Death Valley.

Salt Creek is a spatially heterogeneous and temporally dynamic habitat for its resident fish. Composed of runs, pools, and marshes, Salt Creek experiences annual temperature fluctuations ranging from 0 to 40°C in shallow areas (though temperature is more constant in deep pools). Furthermore, the lower portions of

Maria attained a B.S. from University of Michigan, Ann Arbor in 2007. She is currently working towards a M.S. in Wildlife Ecology from I.S.U. Maria works with Dr. Mike Quist and Dr. Steve Dinsmore to develop a population model for the endangered Devils Hole pupfish. She is interested in using population models to detect population trends and assess conservation efforts. This project is funded by the Death Valley Natural History Association and the National Parks Foundation.

Salt Creek are ephemeral (that is, they dry up in summer due to high rates of evaporation and are wet again in autumn).

In response to seasonal habitat changes, Salt Creek pupfish population size fluctuates throughout the year. During spring months, pupfish are plentiful and reproduce wildly, but fish begin to die in summer as water evaporates from the lower portions of the stream. It is estimated that Salt Creek pupfish population size

Working with elementary and high school students is very gratifying...

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changes by two orders of magnitude throughout the course of the year. Thus, understanding how fish move throughout Salt Creek would provide insight as to how fish have adapted to survive in a harsh desert stream environment.

I spent countless hours marking fish with visual implant elastomer tags (VIE) in different habitats along the stream, and more countless hours searching for recaptured fish to assess their movement.

As part of my project, I agreed to participate in the Death Valley F.I.S.H.E.S. (Fisheries Investigations for Students through Hands-on Environmental Science) program, an environmental education program which was part of Death Valley R.O.C.K.S. (Recreation Outdoors Curriculum for Kids though Study). Death Valley R.O.C.K.S. is an environmental education program funded and organized by the National Park Service, Death Valley Natural History Association, the National Park Foundation, and other partners.



Pup fish with red visual implant elastomer (VIE) tag located at the base of the fish's tail (photo M. Dzul)

The R.O.C.K.S. program brings students from urban southern California into Death Valley National Park for three days of camping and exploration. The F.I.S.H.E.S. program was composed of four stations: a fish measuring station, an aquatic invertebrate station, a water chemistry station, and a game station. I was put in charge of the fish measuring station. I taught students

Above, below: Students removed the fish from the bucket using a dipnet, measured length using a measuring board, identified gender, and then looked for VIE tags. (photo M. Dzul)

how to measure length, identify gender, and search for tags on Salt Creek pupfish. Data collected by students were used to study Salt Creek pupfish movement patterns. The F.I.S.H.E.S. program taught 244 students from seven different schools in grades 4 -12 about the ecology of Salt Creek.

Regardless of whether the students understood the implications of the movement study, I found great value in providing them with hands-on experience. Even the most seemingly inattentive students became enthusiastic when it was their turn to handle fish. Many students approached me after the program and thanked me for the experience. Working with elementary and high school students is very gratifying, and I encourage other graduate students to seek out opportunities in environmental education.

For more information on the Death Valley R.O.C.K.S. visit: <http://dvnha.org/death-valley-rocks.html>



Learning from Prairie Creek

By Anna MacDonald

This a story about a farm and creek in rural Iowa and about preparing students to face real-world situations in the field of natural resources. Natural Resource Ecology and Management (NREM) at Iowa State is rooted in its diverse, interrelated courses and research, which enhance students' learning experiences and the strength of our department. Part of an NREM education involves making the connections between theory and practice in managing natural resources.



As Aldo Leopold put it, "Land ecology is putting the sciences and arts together for the purpose of understanding our environment." One key lesson to be learned in ecology is how to apply our understanding in the field.

Severely eroded streambank on Prairie Creek (photo J. Randall)

Environmental Science, as well as Agronomy, Landscape Architecture, English, and others.

Watershed Management students participate in assessing and restoring local watersheds by protecting streams

One course that is equipping students with skills to address natural resource challenges is Watershed Management, taught by Dr. Richard Schultz. This course unites students from a wide variety of disciplines, which creates an opportunity for students to learn from each other. More than 10 majors have been represented in the class, including Fisheries, Forestry, Wildlife, and

The objective of the course is to give students a practical understanding of how water moves through the landscape. "It's very field-oriented," explained Dr. Schultz. "What I'm trying to do is make them (students) aware, and help them see problems on the landscape related to water movement."

Anna MacDonald is pursuing a Master's in Wildlife Ecology. She's a native of Des Moines, and received her B.S. in Animal Ecology from Iowa State in 2007.

Her research is focused on how birds respond to the integration of prairie into agricultural fields, a conservation practice that may have multiple benefits such as improved water quality, soil conservation, and wildlife habitat.

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Hands-on projects in field and lab courses help teach not only technical skills, but also offer an example to synthesize and apply topics from class. Watershed Management students participate in assessing and restoring local watersheds by protecting streams. Each year Dr. Schultz provides a major field project for his class which requires

They were losing land every time the stream changed course... They knew they needed to stabilize the creek channel to protect their land

the students to evaluate a stream related problem, design a system to address the problem, and then physically install at least a portion of their designed solution. For the past two years, the Watershed Management course has been assisting with stream bank stabilization projects on Two Fox Farm.

NREM department members Dr. Jesse and Natalie Randall purchased Two Fox Farm in northeastern Boone County, Iowa in 2007 with plans to use the existing pasture land for their horses. They also plan to establish a hay field and picnic shelter, and eventually plant a mix of site-suitable Christmas and deciduous trees. When they purchased the farm, there was significant bank erosion along Prairie Creek in the horse pasture. There was also extensive bank erosion in the adjacent upstream livestock pasture, which influenced stream flow through the Randall property. Like Prairie Creek, many streams in Iowa are still adjusting their channels to carry the increased runoff that they must handle as a result of our intensive agriculture and urbanization.

The Randalls soon saw that any time the water level rose, bank erosion would occur and debris would pile up, forcing the water to channel around the debris, causing the additional loss of large chunks of the bank. They

Students help install cedar revetments to stabilize the stream bank under the supervision of Dr. Richard Schultz (in stream top, right). Students in background plant willows. (photo N. Randall)



continued...

were losing land every time the stream changed course, which put their future plans for the farm in jeopardy. They knew they needed to stabilize the creek channel to protect their land. They began by moving the pasture boundary to exclude the stream, giving the stream bank a 10-15 foot buffer away from the fence.

Dr. Randall and Dr. Schultz discussed the

chance for collaboration at Two Fox Farm and the opportunity for students to learn from this situation. Students would have to explore options and determine which stabilization methods would best meet the Randalls' objectives.

Stream bank revetments are designed to protect the lower portion of the bank from undercutting by the stream. Undercutting erodes the lower part of the bank, causing the upper portion to collapse into

'Wow, we had a positive effect that benefited the stream and the landowners.' -Tim Parks, graduate student

the channel. There are two general approaches to protecting the bank from undercutting – one is known as hard engineering and includes the use of large rock or rip-rap and other structures to stabilize the bank. The other is bioengineering



Students wire trees to fence posts to secure the revetment at Prairie Creek (photo by J. Randall)

which uses primarily plant materials and some natural rocks. Bioengineering is applicable to small- to medium-sized streams and provides a more ecologically friendly solution to bank erosion. Prairie Creek is the ideal size for bioengineering solutions.

There are numerous kinds of bioengineering techniques. Schultz and Randall wanted to demonstrate the use of the least expensive method, since there

is very little cost-share money available to landowners for tackling bank erosion problems. The materials used for this project are usually close at hand – cedar trees grow in ditches and on abandoned pastures, and willow

thickets grow along many streams. Installing cedar revetments with willow stakes would show students in this class a method that is relatively easy to install with readily available materials. The Randalls took advantage of an opportunity to remove a large number of cedars from a neighbor's pasture. Bundles of dead, densely branched hardwoods or evergreen branches can also be used for revetments, but require significantly more work to create and install.

Eastern red cedars are well suited for use in stream bank revetments because they hold their needle-like leaves for nearly a year after being cut, unlike other trees which drop their needles soon after harvest. This helps the cedars to slow the water flow, and allows sediment to collect in the branches. As sediment builds up, the slope of

continued...

the stream bank becomes more gradual, and seeds of other plants have an opportunity to germinate.

In 2009, the first class of 47 students installed two cedar revetments along the bank of Prairie Creek by staking freshly cut cedar trees along the bottom one-third of stream banks, the critical point to prevent undercutting. Rows of trees with branches pointing downstream were overlapped and anchored to the bank with old fence posts and wire. It's important for the trees to be secure along the entire length of the stream bend receiving contact with the fastest current, since erosion can become focused where trees are loose or missing and eventually threaten the entire revetment. Jesse and Natalie added a third revetment to a steep bank on their property line where they were concerned about the creek encroaching on their pasture land.

In 2010, the Watershed Management class improved the work initiated in 2009 by extending and adding layers to some of the existing revetments, and installing a new revetment upstream on the neighbor's property. Minimal bank reshaping was done for this project by cutting back the top overhanging portion of the bank to reduce the slope. Fast-growing willow cuttings were planted on the bank slope directly above the revetment for stability. Additional willow stakes and red osier dogwood seedlings were planted on the bank edge by the revetment because these plants quickly develop root systems that help hold the bank in place.

Tim Parks, a graduate student in Fisheries Biology, noted the importance of communication and cooperation within and among groups. Having an opportunity to learn about watershed management techniques in the field helped students learn about decision-making processes. "By working in the stream you begin to understand the dynamics of flowing water by seeing the results of what worked and what didn't work in the previous year.

You see that the sedimentation of trees works quickly, and think, 'Wow, we had a positive effect that benefited the stream and the landowners.'"

The work done by Watershed Management students was put to the test by summer floods in 2010. The first flood came on July 7. Natalie Randall recalled, "It was so bizarre when we came home... we thought that an impoundment had broken." Two Fox Farm had only received half an inch of rain that day, but further north at the stream's source, 6 inches of rain had fallen in an hour, which caused flash flooding downstream. They thought the pasture would be safe and out of reach of the flood, but the water ran fast and high enough to push out t-posts and pile up logs and other debris in the pasture.

Prairie Creek flooded again on August 11, 2010, as did much of Ames and central Iowa. "We knew it was going to go over its banks," Natalie recalled. "It was at its banks and they were calling for more rain overnight." When they woke up, the water was already receding, but the high water level was marked by a debris line of branches, grass, and mud in the trees, which suggested that the water had been 3-4 feet above the banks of the channel.

Flooding at Prairie Creek in August, 2010. Student-installed banks stabilization largely survived the flooding, despite water being 3-4 feet above the banks. (photo by N. Randall)



The extent of the damage wasn't clear until the water receded. They lost wooden corner posts that had been buried deep underground, and the force of the flood blew out the high-tensile fencing and attached t-posts. The pasture gate was floating 50 feet away in the stream, tethered by wire that was still connected. The Randalls decided to change the design of the pasture instead of re-installing the corner posts and gate. With the increasing occurrence of flooding in Prairie Creek, Jesse and Natalie saw no need to install infrastructure that would create extra repair and clean-up work in the future.

Although the fence was destroyed, the work of almost 100 students paid off. The revetments performed well and remain relatively intact. The ends of revetments are where loss usually occurs if there are major floods shortly after installation. The powerful water current ripped out two cedars from the end of a revetment installed in late April of 2010, which created a small wash-out there. Another wash-out occurred in an unprotected section of the stream bank. The quality of the students' work lasted although fences and gates washed away, and Dr. Schultz agrees, "They've really done a nice job."

By partnering with the Watershed Management course, the flood damage to the stream bank was minimal compared to what could have happened if it had been left unprotected. Over time, the stream bank revetments will continue to collect sediment, plants will establish, the stream banks will stabilize themselves, and birds and other wildlife will use the plant thickets that develop on the banks. Until then, damaged revetments will be repaired, vulnerable areas will be protected, and the creek will be monitored for trouble areas that crop up. Most importantly, scores of students and future land managers will continue to experience the importance of stream bank stabilization first hand.

The work of the students in Watershed Management was beneficial to Prairie Creek, but the experience with stream bank stabilization is even more valuable to any student intending to do applied natural resource management in a state like Iowa, where intensified land use has changed how water moves across the landscape. The education that NREM students receive from experiences in the classroom, lab, and field, gives them the knowledge to understand the ecology of an area and the skills to better manage our natural resources.↓



Photo:Honorable mention in contest for Ryan Penney



Photo:Honorable mention in contest for Chelsea Wolf

Where are they now?

Recent graduates find exciting careers



Travis Neebling is a 2009 graduate and is now the reservoir research biologist for the Wyoming Game and Fish Department. For his MS in Fisheries Biology, Travis worked with Dr. Michael Quist and studied sampling designs and gears for effectively sampling fishes in Iowa's non-wadeable rivers. He also evaluated the relationship between fish assemblages and habitat characteristics in these systems. In his current position, Travis conducts fisheries research and annual monitoring on large reservoirs and assists with other fisheries research and management projects throughout the state.

Dr. Lars Brudvig majored in Ecology and Evolutionary Biology for his Ph.D. in 2007. Lars worked with Dr. Heidi Asbjornsen to experimentally use fire to restore oak savannas near Saylorville Lake in Iowa to understand the ecology and restoration of understory plant biodiversity and tree regeneration. Lars is an Assistant Professor of Plant Ecology at Michigan State University (MSU) in the Department of Plant Biology. His research studies what human-caused changes on the landscape mean for plant biodiversity and potential restoration. Prior to joining the faculty at MSU, Lars worked as a post-doctoral researcher, investigating the impacts of landscape corridors for understory plant populations and communities.



Ryan Marquardt worked with Dr. James Pease for his MS degree in 2008. Ryan majored in Sustainable Agriculture and studied nesting grassland birds in southwest Iowa in rotationally grazed pastures that incorporated warm-season grasses. He owns and operates Wild Rose Pastures (www.wildrosepastures.com), a direct-market farm selling pasture-raised chicken, turkey, and eggs as well as grass-finished lamb and beef. He and his wife Janice farm 40 acres in southern Jasper County in the sandy hills covered in prairie remnant pastures. They welcomed the birth of their daughter Hazel this year. Ryan is also Chair of the board of the non-profit Iowa Network for Community Agriculture (INCA).

Valerie Hentges earned her MS in Animal Ecology in 2008 under Dr. Timothy Stewart. For her thesis project she studied macroinvertebrate communities and related environmental features in prairie pothole wetlands of Iowa. She analyzed biological, physical, and chemical parameters to assess health of the wetlands. She is now working for the Missouri Department of Natural Resources as an Environmental Specialist in the Watershed Protection Section. Valerie is the technical and ecological support for the state's federally funded (EPA) nonpoint source pollution water quality grants. She is the technical lead on wetland, agricultural, and endangered species grants, as well as program reporting software systems.



Field Notes Photo Contest Winners!



Overall winner

Above: *Into the Sunset* by Kelsey Drey. Taken July at South Twin Lake in Calhoun County, Iowa.

Category: Animal



Left: Winner *Butterfly Breakfast* by David Brady. Taken in

September in Heredia, Costa Rica.

Right:

Runner-up *Acris crepitans* perched upon fallen leaf by Danielle Axline.

Cricket frog floating in a puddle at Chichaqua, central Iowa.



Left: Winner *Leaf Over Muddy Water* by Corey Lange.
 Taken in rural Taylor County, Iowa.
 Below: Winner *Bloodroot - Sanguinaria canadensis* by Em
 Kapler. A spring ephemeral found in Iowa's woodlands,
 it was once used by Native Americans as a source of red
 dye Taken April in Munn Woods, Ames, Iowa.



Category: Plant



Category: Landscape

Left: Winner *January sunrise* by
 Todd Ontl. The phenomenon of the
 vertical column of light occurs when
 sunlight passes through ice crystals in
 extremely cold air; January, Ames,
 Iowa.
 Right: Runner-up *secret ranch resident*
 by Mae Petrehn. American Bittern
 flushed mid-September on a natural
 lake in the northeast edge of the
 Sandhills.

