

Environment

Young scientists study biofuels up close

by Tyson Daniels

A group of local 4-H students and advisors met in the Food Sciences building at Penn State Oct. 7 to learn more about the production and use of biofuels. This “Biofuel Blast” experiment was part of 4-H’s National Youth Science Day, and was replicated by students throughout the country. The program, which is part of the broader National 4-H Week, was begun in response to a marked decline in the numbers of engineers graduating from universities over the past decade.

Mya Rushton, the 4-H state council advisor, says that the National Youth Science Day is one part of the larger “One Million New Scientists, One Million New Ideas” campaign.

Rushton explained that the subject matter for the experiments are specifically chosen and carefully developed. She said that 4-H tries to “choose experiments that are fundamentally simple to complete, but allow for discussion of broader issues that are much more complex to make work.”

This year’s experiment did just that. Megan Marshall, a research associate with the College of Agricultural Engineering, aided the 4-H students in their biofuel endeavor. She said she was very impressed by the level of organization and design that went into the Biofuel Blast, which took part in two stages.

The first stage of the experiment involved mixing yeast with water and refined or brown sugar in a specimen bottle. The mixture was then capped with a balloon, and the yeast was given time to ferment, breaking down the sugar into roughly equal parts of ethanol and carbon dioxide. After 10 minutes, experiment participants measured the amount of CO₂ in the balloon by wrapping yarn around the circumference of the balloon, and cutting it off. By the 30-minute mark, the concentration of ethanol in the bottle was high enough to be detected by smell.

“The balloons were an excellent addition for dramatic effect,” noted Marshall. “They provided a very simple, and yet exciting indicator that the experiment was working. The true value of the experiment was actually see-



Photo provided

Local student Emily Allegar participates in the 4-H National Youth Science Day at Penn State in October.

ing the fermentation take place, and realizing that the filling of the balloon was a direct result of the microorganisms in the yeast

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Exclusive interview with Jean-Michel Cousteau

by Jill Gómez

Voices interviewed Jean-Michel Cousteau, the son of late Jacques Cousteau, on video Oct. 19 prior to his presentation on the Penn State campus. Shreyer Honors College invited Cousteau as the special guest of the 2009 Fall Signature Lecture. Cousteau’s organization, Ocean Futures Society, is committed to educating people around the world to recognize the “critical connection between humanity and nature” and to act to protect the global ocean.

Voices: *Between over-fishing, global warming and pollution, the degradation of the ocean seems irreversible. Can the ocean be saved, and what can people do—as industries or as individuals—to reverse the degradation?*

Cousteau: The real question is, can the human species be saved, because that’s what it’s all about. The ocean is our life support system, and if we mismanage it as we

are doing right now, we are heading toward bankruptcy, and that will affect us. The fish and the birds and the flowers and the creatures of the planet, they don’t care. That’s not the issue.

We have a tendency to disconnect ourselves from the ocean and say, you know, it’s somebody [else’s problem]. It’s our problem. We need to face up to the decisions that need to be made, and they’re not going to be easy, but the alternative is of no interest. In brief, the answer is no, it’s not too late.

Voices: *Our community is 200 miles from the nearest sea. Does our behavior here in State College affect the life of the sea?*

Cousteau: Every human being here on the planet is affecting the state of the ocean. That snow that is still outside is the ocean. The water you drink is the ocean. When you’re going to go skiing this winter, you’re skiing on the ocean. Everything goes back to the ocean, everything we put into it. We

are in the process of using the ocean as a sewage system. Well, it can take a lot of punishment, but there is a point when too much is too much. We’ve got to act upon what needs to be done so we can stop doing this. And it’s in our best interests. Nobody else cares; we do.

Voices: *Then what can we do to educate our children to care about the ocean?*

Cousteau: The beauty of the children is that they are like sponges. Provide them with the right information, it will get into their brains, they will educate their parents when they go home, and when they become the decision makers, they will make much better decisions than the present decision makers.

Voices: *Have there been any success stories in the last ten years?*

Cousteau: There are a lot of success stories, fortunately. There are a lot of young

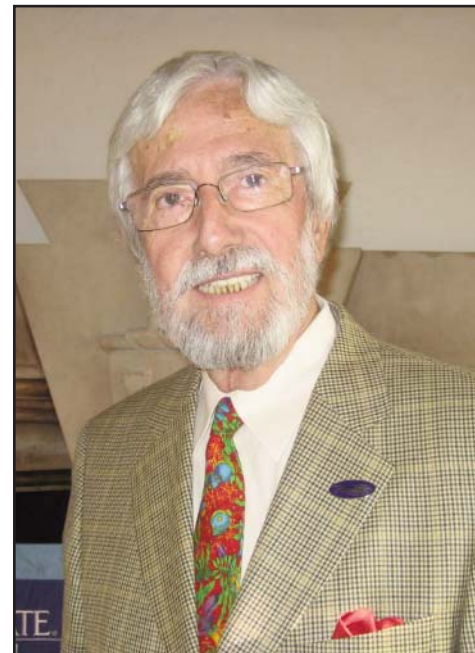


Photo by Jill Gómez

Jean-Michel Cousteau travels to promote the urgency of caring for the ocean.

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making ethanol.”

The second stage of the experiment was more in-depth, involving a control bottle with just yeast and water, a bottle of corn syrup and yeast and several bottles of regional biomass. The regional biomass included corn stover, which is the agricultural residue left after the grain is harvested, and material from some hybrid Poplar trees.

“It’s important to show these budding scientists the scientific method, so they get used to the process of science,” Marshall said. “The use of the regional biomass was also very important, because it was necessary to demonstrate the difference between fermenting simple refined sugars, and tough biomass. It’s a simple process, but not easy. Biomass requires additional processing to break down the cell walls in order make the sugars more accessible to the microorganisms.”

While the participants waited for their balloons to inflate, Marshall discussed with

them several contentious aspects of biofuels. These included the food versus fuel debate, which concerns using crops that would normally go to feed people or livestock for fuel, and the possible food price increases resulting from that; debates over the sustainability of biofuels, which asks if we will get more energy out of biofuels than we have to expend in making them; the carbon neutrality of biofuels, based on the plant’s absorption of CO₂ during its lifetime; and the challenges involved with revamping our entire fuel production and distribution systems.

“It is important that the students are asking these questions, because they are the ones who will be answering them, later in their lifetimes,” said Christy Bartley, 4-H state program leader.

“4-H is working to inspire America’s future workforce by increasing their exposure to the SET [Sciences, Engineering, and Technology] fields. This initiative intends to teach young people about preserving resources, and how we can transition into using more renewable resources,” said

Rushton. She added that “science and math can be scary for young people,” and that by holding experiments like the Biofuel Blast, “the national initiative makes science more fun and doable.”

Bartley said that is just one of many different projects that 4-H youth are involved with throughout the year which “provide hands-on, experiential learning that helps them develop life skills like teamwork, decision-making, citizenship and leadership, while helping them achieve a higher degree of independence.”

For the debut of National Youth Science Day last year, students created “hydro-gels” by mixing the absorptive powder from disposable diapers with water. Participants then compared the effectiveness of the hydro-gels against regular soil and water in sustaining plant life, and discussed possible uses of the gels for water conservation.

Rushton praised the Biofuel Blast for giving the participants a “clearer idea of what’s going on with climate change and alternative energy, from a science perspective.”

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people whom I have the honor of being in contact with, teaching, who are the best communicators, the best ambassadors, to go to the decision makers, whether to industries or governments, or at home, to tell their parents that something is happening. They have ideas on how to recycle, how to limit the use of energy, how to not waste water, and on and on and on. They know those things. We didn’t know it when we were kids, but they do know now.

Who is going to turn down a son or daughter when he or she tells you something that makes a lot of sense? You [won’t] argue because [he or she is] telling the truth. Kids tell the truth.

View the rest of this
Cousteau interview on video
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Native plant gardening helps maintain biodiversity

by Sally McMurry

Introducing a new column on native plants that will alternate between local residents Sally McMurry and Elizabeth Goreham.

If you're a gardener, you've probably noticed that native plants have gotten a fair amount of attention recently. Native plant talk seems to crop up on garden tours, at the handsome new arboretum in town, in books, in venues from scientific discourse to informal gardener chat. Even labels on plants for sale at big box garden centers have started calling attention to native plants.

What's it all about?

We'd like to know, so we agreed to find out about the world of native plants and report back to Voices, sharing what we learn. Our perspective is that of citizen environmentalists who are enthusiastic

"Some introduced species become invasive nuisances, supporting few herbivores and crowding out their native food plants."

--Sally McMurry

backyard gardeners, relatively new to the whole idea of native plants. There's a wealth of expertise out there; the botanists, horticulturists, entomologists, veteran native-plant gardeners and ecologists know far more about native plant taxonomy and science than do we. Our goal is to learn from them, report back to you, and find out why many believe that native plant gardening is not only a challenging, satisfying activity, but that it's a pursuit that can have a greater tangible impact on environmental

health than almost anything else you can do as an individual.

This inaugural column will summarize a few of the arguments for including more native plants in our gardening repertoire.

First of all, what qualifies as a native plant? Some definitions hold that any North American plant species that predates European contact can be considered a native. That can be a pretty loose definition, if you think about how many ecosystems there are across this vast continent. Prickly pear cactus, native to State College, Pa.? I don't think so! Entomologist Douglas Tallamy, author of *Bringing Nature Home: How You can Sustain Wildlife with Native Plants* (2009) proposes that to avoid such silliness, "let nature define nativity." What he means is that to qualify as "native," a species must be a functioning part of the ecological community within which it has coevolved. There are lots of species native to North America that (unlike prickly pear cactus) do grow very well here in central Pennsylvania — Douglas fir for example — but which didn't coevolve with other local species and therefore, according to Tallamy, contribute little or nothing to

maintaining local biodiversity.

And maintaining biodiversity is the single most important reason to plant natives. Natives contribute far more to biodiversity than do exotics. How can this be? In

Pennsylvania, for example, (according to the Pennsylvania Biological Survey) there are about 3,300 species of flora, and slightly less than two-thirds of them are native. Haven't the introduced plants increased biodiversity, by significantly increasing the number of species present? The answer, again according to Tallamy, is most assuredly not. These plants, for the most part, compete for resources but do not foster biodiversity because they can't relate to other organisms in the local ecosystem in a productive way. This is most apparent with regard to herbivores, mainly insects. For example, clematis vitalba, also known as "Old Man's Beard," supports 48 herbivore species in its European habitat. Here, it supports only one. Some introduced species become invasive nuisances, supporting few herbivores and crowding out their native food plants. Most introduced ornamentals just sit there in your yard — looking beautiful and even providing wildlife cover, to be sure — but as far as



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Horned grebe plays hide-and-seek with fans

by Alice L. Fuller

Some of the last falling leaves come down with a rattle, rustle and crackle as they bounce off one bare branch after another before hitting the ground. Others are caught by breezes and dip, swirl and pirouette gracefully and then softly sink to earth on their final journey. So the trees are not only left stripped of their covering but also of most of their bird residents and the migrants that until recently moved in and out of the leafy canopy.

As song and land birds depart, the lakes, ponds and streams become much more attractive to the bird observer for many water birds are still in the midst of their migration and some species may be found until water areas freeze over.

On some fall days, local lakes may be completely barren or bird life but at other times, especially after rainstorms, small flocks and rafts of water birds stop to rest and feed. Swimming apart from the ducks and garbed now in a subdued winter costume of white, gray and black is the little horned grebe. It often seems to play a game with the observer on the bank of "first you see me, now you don't."

Although this engaging little creature seems to disappear and reappear like magic, it is not intentionally playing hide-and-seek.



Quite likely the bird is hungry after a long journey and is diving in pursuit of small fish or other aquatic animal life.

Possibly an individual grebe might feel the human observer is a threat to its security and so dives and swims long distances underwater hoping to escape unwelcome attention.

One observer recorded in A. C. Bent's "Life History" watched a horned grebe remain under water for three minutes and travel 30 rods in a single dive. Grebes are the epitome of water birds. They seem to delight in their swimming and diving abilities. They are as much at home in the water as they are helpless on land.

Lobed toes on legs attached to the rear of the body make fine propellers for swiftly moving the grebe through the water, but this equipment is ineffective in lifting the bird from land.

Grebes occasionally mistake large parking lots glistening on a rainy night for some sort of pond. After such a misfortunate landing the grebe's only hope for survival is for some thoughtful human to rescue it and

humans have almost completely fragmented the ecosystems of North America. They see in the vast acreage of suburban tracts an opportunity to repair the damage, at least to some extent. Yet a typical subdivision or town-lot backyard is a biologically simplified affair, usually dominated by non-native plants. For one thing, there's all that grass. Enough has been said about the ecological downside to lawns that we don't need to belabor that point, except to mention that even if it's planted in natives, a lawn is a monoculture which adds little to biodiversity. Still less biodiversity is supplied by introduced ornamentals such as Norway maples and lilacs, for all their beauty and appeal. From the viewpoint of native herbivores and their bird and mammal predators, it's a bleak environment.

Native plant advocates argue that by planting a varied blend of native trees, shrubs, and

deposit it on a nearby pond or stream.

Both the horned grebe and another small relative, the pied-billed grebe, are common spring and fall migrants in central Pennsylvania. Although not as showy as many of the ducks, the horned grebe is rather natty in winter attire with white face, neck and breast, accented with a grayish-black cap and back.

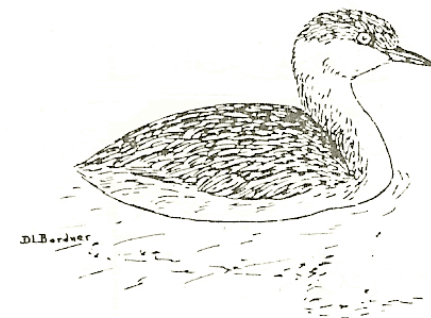
It the horned grebe has acquired breeding plumage when it returns in the spring, nothing will be subdued about it then. Then it wears the bright, buff-colored feathers on the head which gives the species its name while the neck and flanks are rufous-red.

Dorothy Bordner has sketched a horned grebe in winter plumage as we see them now on local lakes. In addition to the grebes, other water birds were prominent on the last roll call of birds made by the State College Bird Club, members reported seeing a flock of common loons flying overhead and white-winged and black scoters were observed on Colyer Lake.

Other waterfowl seen resting on local waters include Canada geese, mallards, gadwalls, lesser scaup, ruddy ducks, hooded and common mergansers and coots. Greater and lesser yellowlegs and semi-palmated sandpipers were late migrating shorebirds.

In the woodlands now denuded of leaves,

herbaceous perennials, suburbanites and town gardeners can make an environmentally positive contribution. They think that native plant gardening adds interest, variety



one can find a few late migrants such as brown creepers, red-breasted nuthatches, winter wrens and kinglets. Yellow-rumped warblers can still be seen, but this species is the last of its family to leave in the fall and the earliest to arrive in the spring. A flock of water pipits was spotted along Nixon Rd. near State College.

Now as the last leaves flutter to the ground, readers busy with such fall chores as raking leaves should also remember it's time to stock bird feeders if they haven't already done so.

It is a good idea to clean out bird houses, too, so that they will be ready for early spring tenants. Also prunings from shrubs and trees can be piled in a sheltered spot to provide protection for such ground loving species as juncos and white-throated sparrows or perhaps a stray towhee which for some unknown reason is spending the winter in the frozen north.

and most importantly, biodiversity to the landscape.

Future issues: the best plants for our area; and native plant gardening as labor saver.

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native herbivores are concerned, they might as well be plastic. This is because the herbivores in the local ecosystem have evolved to be able to eat and digest only plants that evolved along with them.

And why should we care about these little plant eaters, most of which are bugs we never see and which we might even be culturally predisposed to dislike? Because without them, the organisms that depend on insect herbivores are also deprived. Birds, for example, depend on the protein and other nutrients afforded by the insects that evolved along with them. And ultimately humans too need "ecosystem services" like clean air, clean water, and abundant plant life, all of which depend in some way on biodiversity.

Tallamy and his colleagues point out that