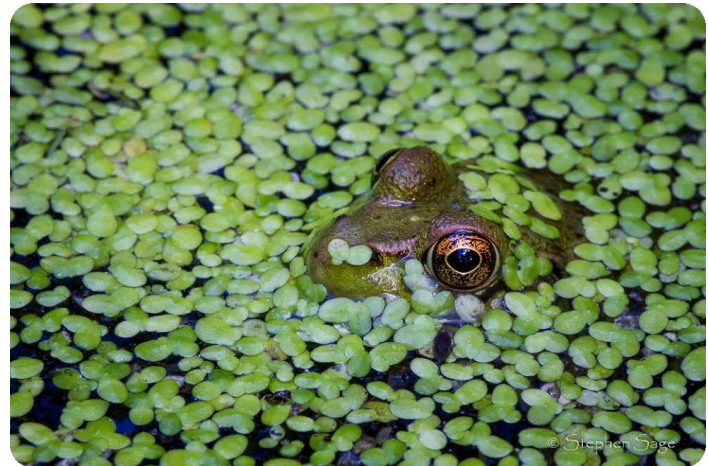


## THIS ISSUE

**Sunday, January 10 Open Hours:**  
**The Too-Common Green Frog**  
**Coffee Break, January 14**  
**MLK Day Camp, Jan 18**  
**Shrink That Footprint Resolution**

## Hey, They're Indicating!



Green Frog.

Photo © Steve Sage.

We led a few wildlife day camps for kids here before Christmas. On one afternoon Carol and I walked the back of the property with the students. We waded through the tall, brown canary grass that surrounds the back vernal pond. Usually very shallow and frozen by this time in most other years, at the onset of this winter it appeared the pond might be as much as three feet deep in the middle. Carol stepped closer to the spongy edge with a few of the kids. Suddenly, a multitude of distinctive ripples distorted the smooth, dark surface. Small, unseen aquatic creatures, alarmed by the movement of large mammals overhead, were fleeing from the shoreline.

“There are *tons* of tadpoles in here,” Carol commented to me over her shoulder. A frown of displeasure accompanied the news.

Wait. Aren’t tadpoles in a pond a good thing? Not in this case...

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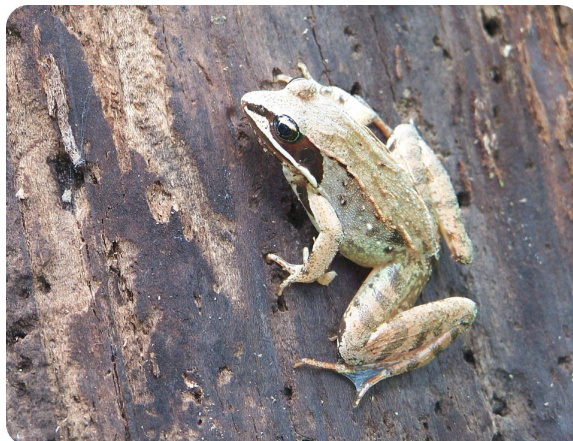
When discussing frogs to audiences I often mention that, in general, people’s knowledge about them is quite limited, largely because the entire scope of information learned in school (perhaps in a lower elementary classroom) is rudimentary at best. Thus, to a large extent, most kids grow into adults who harbor only generic notions: a frog is green, a frog says ‘ribbit’, a frog lives in a pond, a frog eats bugs, a baby frog is a tadpole... To assume this is all you need to know to understand frogs is the equivalent of assuming addition and subtraction are all you need to know about mathematics, or that learning the difference between nouns and verbs is all you need to know about reading and writing.

Many would argue that those educational disciplines are “more important,” and therefore, warrant detailed study over years delving into a complicated array of postulates, formulas, tenses and genres, and, additionally, how mastery over this knowledge aids your ability to understand and function effectively in the world. I’d argue that our mainstream academics, merely beginning at the elementary level, needs more detailed study of frogs. Indeed, just as advanced knowledge of mathematics, reading comprehension and writing skills are indispensable to the further study of the various physical sciences, technologies, social sciences, and humanities, advanced knowledge about frogs provides a potent requisite to understanding and monitoring the natural environment around us. This, in the face of our ever-present penchant for altering our surroundings out of necessity, for convenience, or just to suit a fancy.

Frogs are easily-observable organisms on the landscape and require fresh water for their reproduction. Further, many of their adult stages require physically intact, chemically-untainted ecosystems adjacent to the reproductive wetland. All amphibians are equipped with sensitive, thin, glandular skin that is highly-permeable to water, air, and any of myriad compounds that may be mixed in - harmless or toxic. Their shell-less eggs and developing aquatic larvae are even more sensitive to water quality.

We've all heard it enough in some form or another that it has become almost cliché: *Frogs are indicators of environmental health*. Yet, if they happen to actually be indicting something is wrong who is noticing? For starts, you would be in no position to notice if you're incapable of even identifying the frog species inhabiting your neighborhood.

We have accumulated nearly three decades of personal experience with Michigan-native frogs and their ecology. We also enjoy an intimate relationship with the season-to-season, year-to-year fluctuation and function of two vernal ponds that exist on our property. We waded through them many times each year observing, recording, and gleaning samples to use for educational programs and exhibits. Thus, we'd be the first to acknowledge that, yes, frogs are excellent indicators of the health of the environment. Secondly, starting in 2010, we've been emphasizing this to students, audience members and readers of our newsletters: *They're indicating!*



*Wood Frog.*

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Vernal ponds can be found pooling in low spots across the country landscape. Most are natural sinks for run-off from rain and melting snow. Their depth changes radically throughout a year and between years based on rates of precipitation and evaporation. In general they are at their deepest in early spring, and, in most years, reduced to shallow mud holes or dried up completely amid the relatively hot, dry dog-days of August. Not surprisingly then, they are incapable of supporting fish. This is the key factor in making them such critical amphibian nurseries. Most species of Michigan frogs have the greatest reproductive success in vernal ponds. Fish found in a deeper, permanent pond will devour eggs, young tadpoles and even adult frogs of smaller species if they attempt to reproduce there.

Small species like Spring Peepers, Chorus Frogs and Wood Frogs absolutely need vernal or fish-free, weedy ponds to reproduce. In late March or early April, barely after ice has left the pond, they arrive en masse to noisily breed on our ponds. Algae bloom quickly, creating a glut of sustenance for the growing tadpoles. By late June, and well ahead of the drying days to come, young metamorphs of these species

leave the pond and disperse throughout the surrounding landscape. Our yard is hopping with them. They spend the rest of the summer and early fall eating tiny prey items and growing into adult-sized frogs. The American Toads, Leopard Frogs and Tree Frogs are not far behind.



*Female Green Frog.*

*Photo © Steve Sage.*

A seventh species also breeds here. Tadpoles of the large Green Frog suffer a much higher percentage of mortality on our vernal ponds than the above frogs in a typical breeding year, but this species has evolved some physiological and behavioral traits that more than make up for the losses – so much so that we ought to call it “Super Frog.”

Of all thirteen species found in the state, this one easily boasts the longest breeding window. From early May to early August, Green Frogs will deposit eggs nearly anywhere with standing water. This includes permanent ponds and lakes as well as vernal ponds, rivers, smaller streams and even roadside ditches. Many of these settings, due to chemical runoff, siltation, or developed surroundings, are downright inhospitable to most other species.

A Bull Frog is so large that a tadpole in Michigan cannot grow and metamorphose in one summer. Therefore, this species definitely cannot breed in a vernal pond. Egg-laying takes place from late May to early July. Overwintering tadpoles do not emerge as froglets until the end of the following summer. By comparison, Green Frog tadpoles require three months'-worth of warm waters to mature. Tadpoles hatched from eggs laid in May are developing into frogs in August. However, tadpoles from eggs laid in July or later end up spending the winter under the ice then metamorphosing the following spring. In this respect the Green Frog's breeding window is so long it plays out like two breeding seasons in one year – a feat no other native frog can attain.



*A Green Frog tadpole requires about three months to mature, but many late-season tadpoles must spend the winter under the ice.* Photo © Steve Sage.

Historically, Augusts in the Midwest have been characterized as hot and relatively dry. Despite a passing thundershower or occasional drizzly day, evaporation exceeds precipitation. Vernal ponds shrink dramatically, and often disappear altogether. The above-mentioned smaller species have evolved to reproduce in this fleeting environment. They lay eggs early and their tadpoles develop rapidly in a race to beat the draw-down, and they do. So do the early-season Green Frog tadpoles. However, as the pond evaporates into a mere mud hole, the rest of the Green Frog tadpoles have no chance. You can approach the edge and see the roiling created by closely-packed, writhing bodies as they flounder in their shrinking, warm, black bath. We've learned to not bother with any rescue attempt. Lethal bacterial growth, accelerated by the unusual warmth and closeness of their bodies, has doomed them already. Despite pickings as easy as shooting fish in a barrel, the local herons seem to know better. "Stay away from the toxic tadpoles."

We've come to accept this reality as completely natural and very normal to the life cycle and survival strategy of the Green Frog. It is basically the same one that insects, like mosquitoes, use to their advantage so well. Simply put, we call it "bombarding the world with young," and, in a sense, daring the world to try and eat or otherwise kill them all. Countless individuals are sacrificed in the name of survival and expansion of the species.

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Enter the summer of 2009. After twenty years of experiencing the above scenarios the weather in this particular August went haywire: cloudy, cool and rainy throughout. Old timers talked about how they never remembered an August like this. Entering winter our vernal ponds were far deeper than we'd ever seen at this time of year. By contrast, in other years some standing water may have existed and froze to ice in the winter. However, if any Green Frog tadpoles survived to that stage the harshness of the winter would make the shallow water freeze thoroughly enough to kill the tadpoles underneath.

For the first time in our twenty years of observation, when the ice melted in the spring of 2010 the Wood Frogs, Chorus Frogs and Peepers had company. Large tadpoles swam in abundance among the breeding frogs – a strange and somewhat unsettling sight as we waded among them. Sure enough, as spring advanced we noticed no tadpoles of the smaller species among the huge Green Frog tadpoles, now



growing legs. That summer our yard was completely devoid of the metamorphs of these three species. Leopard froglets were scarce, too. Had the Green Frog tadpoles somehow negatively affected the survival of these other tadpoles?

The weather patterns through the following August and ensuing winter reverted back to what we had come to accept as normal. Green Frog tadpoles failed to survive the winter of '10-11. As expected, the other species experienced reproductive success the following spring. By fall of 2011 the water depth in the vernal pond was deep enough that the Green Frog tadpoles were still alive, but not deep enough for them to survive the winter, assuming they would be killed from the freeze as in so many years past.

But, that December kicked off what we began to call the “Whimper” of 2011-12. Few days dipped below forty degrees all month. (Sound familiar?) The pond remained open. The resulting rain instead of snow actually increased the depth a bit. We finally were blessed with some normal winter weather later in January, but the cold snaps were brief and many more days hovered in the 30s throughout February. Perhaps on a few occasions an ice cap of an inch or so developed on the pond surfaces, but nothing nearly thick enough to winter-kill the inhabitants.



*Wood frogs breed annually in early spring. In 2012 they experienced a complete reproductive collapse.*

As I drew near, I inched slowly closer so as not to disturb the water too much, then turned my flashlight on the area where we had seen the egg masses during the day. The beam illuminated not eggs, but a huge mass of wriggling Green Frog tadpoles, all snouts probing inward. One by one they became spooked and broke away from the bunch and into the murky depths. They had definitely been feeding on the Wood Frog eggs, now much reduced in number. Two nights later I waded back to the same spot. There were no eggs remaining. Those of the other frog species are much harder to locate in the vernal pond than Wood Frog eggs, but I had little doubt that they had met the same fate.

June of 2012 saw many days reach one hundred degrees or more. Our vernal ponds were reduced to mud, then baked into cracked, dry, irregular, gray tiles before the month was out. If the Green Frog tadpoles had not been present to eat the eggs that spring it wouldn't have made a lick of difference. The pond having been cooked to oblivion so early in the season would have doomed the tadpoles anyway.

In addition to the glaring lack of metamorphs in our yard that summer we would go long stretches without seeing a single adult Wood Frog, Spring Peeper or Leopard Frog, either. The degree of mortality was obviously huge.

Frogs of all species take advantage of warm, rainy nights to disperse across the landscape. Such movements are especially prevalent during spring or early fall. Among other advantages the movement guarantees an influx of genetic diversity for every pond across the countryside. On wet roads over these evenings hopping frogs of varied species are illuminated by the headlight beams. We slowly drive area roads with a purpose on such nights. Over years we feel we've gotten a firm handle on specific population shifts of species that inhabit the area through such observation. Chorus and Leopard Frogs

aren't what they used to be on our breeding ponds, nor do we spot them crossing wet country roads with nearly the frequency we used to. It's an indication that these are not isolated failures on our ponds alone.

We drove these same roads on a few such nights in September and October of 2012 when the roads should have been hopping with dispersal activity. It wasn't unusual to go a half mile or more between isolated sightings of any species. The sense of foreboding we felt was almost too much to stifle.

Luckily for the earth and for us, natural life is resilient when given a chance. The following spring we thought we sensed a minor decline in the volume of Wood Frog and Peeper vocalizations, but, with the absence of Green Frog tadpoles, plus abundant rainfall and a coolish spring and summer (Now it was China's turn for record-breaking heat.), reproductive success had returned in the spring of 2013. The ensuing cold and brutal winters of 2013-14 and 2014-15 also ensured no Green Frog tadpole survival, so the past three springs and summers have been strong reproductive years, but...

Hold on, now. Here we go again. This wimpy-weathered December has been a near carbon copy of 2011. As of the first week of January the Green Frog tadpoles are alive, well, and abundant, swimming in substantially deeper water than most years. Our fingers are crossed, but we have our doubts that they will be winter-killed. Will the upcoming seasons fall in step with those of 2012? Either or both phenomena spell yet another year of failure for these frogs. If so, after twenty years observing continuous reproductive success here these species will have experienced nearly complete reproductive failure in three of the past seven years!

Yes, they've certainly demonstrated their resilience, but, individuals of most of these species live and breed over only a few years at best. A complete turnover of generations occurs over this short span. How could more frequent or successive years of weather-induced reproductive failure *not* push them to, or over the brink of existence?



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We've been determined to protect this habitat since we first arrived in 1988. However, we find ourselves powerless to stop a growing atmospheric threat – one that trumps any effort to preserve habitat: the prevalence of extreme weather associated with a man-made, changing climate that too many of us have taken too lightly for too long.

There is no doubt - they're indicating. Now, where do we find the collective resolve to do something about it?

-Jim McGrath



### ***Catch Nature Discovery on WLNZ's Coffee Break on January 14***

Jim is scheduled to appear this month on Thursday, January 14 at 9:45am discussing wildlife topics. The show airs weekdays from 9 to 10am on 89.7 FM. Listen live online at [lcc.edu/radio/onair/](http://lcc.edu/radio/onair/) or watch it live (or later in the day at 6pm) online at [lcc.edu/tv/watch](http://lcc.edu/tv/watch).

We'll post a Facebook reminder prior to the 6pm airing.





*The ubiquitous Green Frog can be found on almost any body of water throughout the state.*  
*Photo © Steve Sage.*

# ***The Too-Common Green Frog***

***Sunday, January 10***

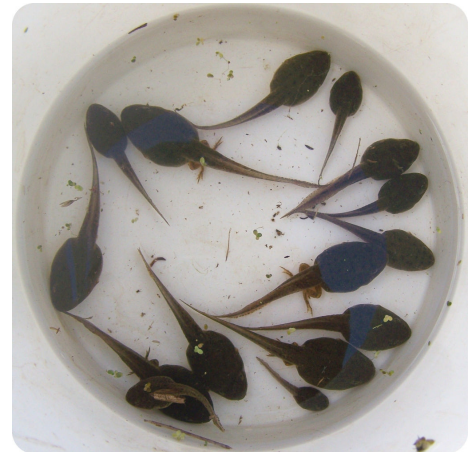
***Doors open from 1 to 5pm***

***Admission: \$5/person***

Michigan's second largest frog can be found everywhere and almost anywhere there is water in every county in the state. While nearly all the others among thirteen frog species here are experiencing varied levels of decline, the Green Frog may actually be increasing in number. In some cases its expansion is appearing to be negatively-affecting some smaller species' ability to survive. At 2pm, sit-in on the presentation *The Too-Common Green Frog*. Live specimens, beautiful Powerpoint images, and audio recordings from our CD, *Frogs of the Great Lakes Region* are used to familiarize participants with the identification, life cycle and ecology of this ultra-adaptable species. Also learn how our changing climate with increasingly-extreme weather patterns is enhancing the Green Frog's ability to breed in vernal ponds to the detriment of the breeding success of many other species.

As a bonus, any interested participants will be given a partially-grown Green Frog tadpole to take home (while supply lasts) to attempt to rear into a frog, while the supply lasts. Care instructions will also be provided. (If possible, please bring your own small container in which to transport them.)

There is also opportunity to visit and interact with the rest of our huge zoo of Michigan snakes, turtles, frogs, and salamanders. Staff is available to help visitors of all ages make the most of their time here.



## ***MLK Wildlife Day Camp***

***Monday, January 18***

***9am to 3pm***

Join us for a full day of in-your-face nature. Indoor activities include lots of interaction with our snakes, turtles, frogs, salamanders and lizards, as we handle, feed, and learn about them along the way. Participants will keep their own bird checklists of species seen at the feeders. Outside activities, too. A hot lunch, snacks and hot chocolate are provided. Enroll in advance by email or phone. COST: \$55/student.

# *A 'Shrink That Footprint' Resolution*

In last month's *Wild Times* I mentioned the start-up of Arctic Deeply, a website "designed to help you understand the complex web of environmental, social and economic issues in the High North. Editors and expert contributors are working around the clock to bring you greater clarity and comprehensive coverage of Arctic issues." Here are some examples worth watching/reading.

First, a 2015 State of the Arctic report. <https://youtube/e0oLzNpEQ-w>

Michael Rawlins writes *Is the Arctic Becoming a Carbon Source?* In this unsettling report Rawlins demonstrates how scientific data is showing that the Arctic tundra, historically a carbon sink on the planet is becoming a carbon emitter for the first time in recorded history, as permafrost thaws due to anthropogenic emissions from fossil-fuel combustion.

<http://www.arcticdeeply.org/op-eds/2015/12/8135/arctic-carbon-source/>

According to [www.shrinkthatfootprint.org](http://www.shrinkthatfootprint.org) Americans lead the world by a long shot in CO2 emissions per capita - 21.2 tons! The flip-side of this mind-boggling figure is that there are countless ways to start shrinking that footprint significantly in every aspect of your life - starting today. Half of the per capita footprint is related to housing (heating/cooling) and transportation. This website will help you in every way you or they can imagine. There's one thing they can't help any of us with, though... Personal resolve. How about one more new year resolution? This site will pump you up and get you going.



Our kids pooled their gift funds and bought us our first solar panel kit. Thus, begins the first stage of powering our nature center with renewable energy!

-JM

Become a fan of *Nature Discovery* on Facebook!

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