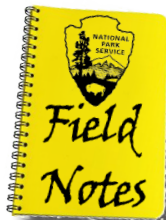




The Positive Side of ZERO



Zeroes and “No”s provide critical information for natural resource studies

Zero in history

The number zero is still a relatively new concept to Western mathematics. It is thought that around the year 1200, the Italian mathematician Leonardo Fibonacci brought it back with him (along with the rest of the Arabic numerals) from a trip to northern Africa. But the history of zero, both as a concept and a number, stretches far deeper into history, deep enough that we may never really know its true origins. At least as early as the 5th century Indian mathematicians were using it, though many other cultures continued to resist the idea of zero for centuries because of superstitions and the dark magic that surrounded it.

Zero in data collection

Today the concept of zero is taught to school children around the world and it is used thousands of times a day to make calculations in a wide variety of fields. Zeroes are also an integral part of sound data collection principles. That said - it can still be hard for some folks, especially citizen scientists, to diligently record zeros appropriately when collecting data for population or other natural resource studies. The problems come when people enter “N/A” (meaning not applicable/not available),

“0”s, and leave lines blank interchangeably on data sheets. These can mean different things to different people and intentions aren’t always clear to the person interpreting the data later. Proper use of these terms is of the utmost importance in distinguishing from when an observation (such as a bird sighting) was not recorded/attempted (a missing value) from when an observer recorded no individuals (zero) during a survey. Why is making sure to record zero’s correctly so important? Let’s look at a few examples.

As we know all too well in the Northeast, a temperature of ‘0’ does not mean there is ‘no temperature’ outside. Zero is a very real temperature we experience almost every winter here. Let’s say a group was collecting and analyzing temperature data over a period of time for New York State. On July 22nd, one of the collector’s thermometers malfunctioned. When answering the



For something that essentially represents nothingness, zeroes carry a lot of weight in data sets.



	Date: 3/20/17
Do you see/hear...	Time: 7:15 AM
Active individuals	y n ? <u>N</u>
Feeding	y n ? <u>N</u>
Fruit/seed consumption	y n ? <u>N</u>
Insect consumption	y n ? <u>N</u>
Calls or song	y n ? <u>N</u>
Singing males	y n ? <u>N</u>
Mating	y n ? <u>N</u>
Nest building	y n ? <u>N</u>
Dead individuals	y n ? <u>N</u>
Individuals at a feeding station	y n ? <u>N</u>
Check when data entered online:	☐

This data sheet for observing Hermit Thrushes may seem like it's not worth entering because "nothing was happening," but when Thrushes do actually arrive in the study area, this kind of information will help biologists better pinpoint the arrival date and other activities of the species.

question "What's the temperature?", they may be tempted to write "0" because no data was collected. You can quickly see how if this was averaged into the data set, it would greatly bias the results. And anyone examining the records at some future date would no doubt be surprised to discover frigid temperatures in New York in the middle of high summer. What the recorder should enter on the data line in a case like this is something that indicates the value was missed, such as "N/A" or some other predetermined code.

Zero and No in citizen science monitoring

Two commonly used crowd-sourced citizen science apps also need zeroes and/or "no"s to get a fuller picture of what is happening in the natural world. Taking them one at a time, eBird is an extremely successful web-based and smartphone controlled

app that helps biologists and bird enthusiasts keep track of bird populations and movements around the globe. Users record how many and of what type of birds they can identify over a certain time-period. When submitting their data the user is asked: "Are you submitting a complete checklist of the birds you were able to identify?" The way this seemingly innocuous question is answered will have a big impact on the data. Essentially, by answering "yes", this means that all other bird species that could potentially be in that area get a "0" entered into their "number observed" column because they were not seen. If "no" is entered then that means other species were in the area but not identified, so they will all get "N/A" put in their columns.

Another group that works with citizen scientists is the USA National Phenology Network. Volunteers help scientists track the comings and goings of the seasons and all the natural phenomena that comes with them (leaf-out, flower blooms, bird migrations, fall colors, etc.). Because they are trying to track changes over time, having as complete a data set as possible is important. One of the challenges in working with volunteers is that they don't feel it is worth their while to collect data when "nothing is happening" outside or they feel a sense of failure, for example, when entering a "No" for if they saw/heard a Hermit Thrush singing on their hiking route. To the contrary, zero and/or "No" aren't "no data", they are very good and important data and in the previous example would mean that Thrush were looked for but not seen or heard. Continuing with this example, if someone was recording bird observations for the Hermit Thrush and they put that they saw a thrush on 9/10/2016 and 5/8/2017 but failed to record when observations were made between this time when no thrushes were detected, the usefulness of the data to the scientist trying to understand Thrush ecology is limited.

The moral of the story here is, if you are helping out in a natural resource study, you can proudly and confidently enter 0's and No's where appropriate, knowing that you are providing good data that future study observers will thank you for.



Northeast Temperate Network
54 Elm Street, Woodstock, Vermont 05091
802-457-3368
<http://go.nps.gov/netn>
<https://www.facebook.com/NPS.NETN>

