Bumble Boosters Then and Now: Engaging Citizen Scientists in Pollinator Research and Conservation

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Everything starts somewhere. Bumble Boosters, a citizen science program based out of the University of Nebraska-Lincoln's Department of Entomology, started with the bee and with the early version of the World Wide Web. Since its establishment in 1999, the Bumble Boosters' mission was to further pollination conservation and education, while operating upon evolving technological platforms.

Bumble Boosters 1.0

Nebraska has had few surveys of its hymenoptera. The first biological survey within the state's territory was carried out in 1910, more than 50 years after Nebraska received its statehood. It would be another 50 years when LaBerge and Webb (1962) carried out a statewide survey of Nebraska bumble bees. By the late 1990s, when Bumble Boosters first established itself, another four decades had passed. By this time, the idea of including the general public in broad ornithological surveys had been popularized and demonstrated success. Drs. Marion Ellis and Doug Golick collaborated with several organizations throughout Nebraska, including Lincoln Public Schools, Folsom Children's Zoo (now Lincoln Children's Zoo), the University of Nebraska-Kearney, Chadron State and Wildcat Hills Nature Center. The program received its funding through the Nebraska Lottery's Educational Innovation Fund and focused on high schools, acquiring participation of 40 schools throughout the state. These organizations shared a set of goals to update the distribution and abundance of Nebraska's bumble bees, collect data on floral preferences of foraging bees, test artificial domicile designs and create a community of learners. Each goal had its own challenges.

In order to have participating teachers and students contribute bumble bee records, Drs. Ellis and Golick traveled throughout the state to conduct bumble bee workshops. This training was a traditional classroom setting. Students and teachers became familiar with identification, observation and collection methods, data collection and entry, specimen pinning, labeling and storage. An online key was developed (The Bumble Bee Identifier) for bumble bee identification and the Nebraska Florasearch used for flower identification. Students, teachers and researchers mapped and recorded location by hand since GPS units were still not readily available.

There is a long-standing interest to design an artificial domicile that successfully attracts wild, nest-seeking bumble bee queens. The hope is that such a design would provide nesting habitat and assist with bumble bee conservation. Bumble Boosters participants constructed numerous creative designs, ranging from traditional wooden boxes to lawn flamingoes buried with heads removed to create an entrance tunnel.

A primary goal of the project was to create a community of learners. On-site training workshops for participating schools encouraged communication between partners. In the late 1990s, the World Wide Web in its 1.0 state, flat and non-social, offered an asynchronous platform that was not yet capable of rich communication. Bumble Boosters partners relied on listservs and often used snail mail, corresponding on project issues by letter.

On the whole, Bumble Boosters came to a successful close in June of 2002. Together, Bumble Boosters collaborating partners collected over 3,200 specimens, all validated by the Department of Entomology. Locations previously surveyed by LaBerge and Webb were revisited and 19 of the 20 species were found. Only *Bombus morrisoni*, previously collected, was not. It was noted that the distributions of *B. huntii* and *B. bimaculatus* expanded. Across the state, 107 new county records were compiled. A list of floral species attracting foraging bumble bees was generated. Project data and practices generated several publications (Golick et al. 2003; Golick & Ellis, 2000, 2003, 2006). Unfortunately, none of the domicile designs succeeded in attracting bumble bee queens. However, if failure is a very real part of scientific pursuits, then students and teachers learned an important and authentic life lesson. Regrettably, communication could not be maintained by letters and visits across the state, and so, the community of learners that was created during the project, for the most part, dissolved after the summer of 2002.

Bumble Boosters 2.0

This past summer of 2013, Bumble Boosters was resurrected in a very different technological and social world. Despite its hiatus, public concern for pollinator conservation remained high. Collaborating partners are now commonly included in research though referred to as citizen scientists. Other organizations are filling the void of pollinator conservation research and conservation. Furthermore, the web having evolved from 1.0 to 2.0, provided a highly social, online network for instant communication. Platforms specifically designed for social networking, including Facebook, Twitter, blogs, are part of the general public's parlance.

The mission of Bumble Boosters today is to provide research-based educational programming, promote conservation of pollinators and engage the public in authentic

research involving pollinators. Bumble Boosters has become a foundation of the University of Nebraska-Lincoln and acts as an umbrella organization for various pursuits. Two citizen science projects are currently running: Building a Better Bumble Bee Domicile and Queen Quest. Entomology education research has become an integral component, involving research on citizen science outcomes, pollination knowledge and technology, including a newly developed app, *Pollinator2Plate*. Lastly, Bumble Boosters is affiliated and collaborates with other entomology programs, including Milkweed Watch, a UNL Dept. of Entomology citizen science program, BeeCorps, a UNL Extension program, Rural Pollinator Habitat, a Pheasants Forever and Quails Forever program, and NUBee, a beekeeping program for societal transitions.

The fact that Bumble Boosters' target audience has radiated from solely Nebraska high schools into an international forum can be attributed to the internet. With such a wide geographic audience, in-person visits are no longer possible. However the Bumble Boosters team can easily correspond and collaborate with participants throughout North America and beyond. The Bumble Boosters research target has expanded from bumble bees to pollinators in general, and more specifically, pollinator conservation outreach and education research. Instead of exclusively relying on grants, Bumble Boosters has crowd source its financial support. A successful Kickstarter campaign funded the launch for Bumble Boosters: Building a Better Bumble Bee Domicile.

Today, Bumble Boosters continues to experiment with online social networking, to engage a very motivated and eager online community and provide them with the tools and knowledge to have a true, positive impact in their communities. As the program looks to the future, it will continue to explore and develop research-based education programming, improving teaching and learning of science and conservation, reaching all age groups and play its part in building awareness around pollinator conservation.

References

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