

## **Estimates of Waterfowl and Wetland Professionals Trained in University Waterfowl Programs 1980–2020**

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The North American Waterfowl Professional Education Plan (NAWPEP), conceived and implemented under the North American Waterfowl Management Plan (NAWMP), outlines a strategic vision for securing and enhancing the capacity of university programs to train waterfowl and wetlands professionals (NAWPEP Strategic Plan 2020). The NAWPEP's goal is to engage and assist universities/colleges and NAWMP partners with establishing, sustaining, and enhancing academic and experiential programs in waterfowl and wetlands science and management, in order that sufficient numbers of inclusively diverse professionals from across North America are available to sustain the excellence of future waterfowl science and management. The genesis of this initiative was stimulated in part through publications by Kaminski (2002, 2013; *Wildlife Society Bulletin* and *The Wildlife Professional*), which documented that university waterfowl-centric programs declined ~40% from ~55 in the 1970s–1990s to ~33 in 2013. In 2020, ~30 programs persist, eight of which are endowed in perpetuity (i.e., seven in the USA, one in Canada).

To the extent that the workforce currently carrying out the mission of NAWMP largely graduated from these vanishing programs, the waterfowl and wetlands community may face a future shortage of such professionals. Accordingly, the NAWPEP committee recognized the necessity of estimating the number of graduates required to fill anticipated employment needs and the historical and contemporary training capacity of university faculty to produce them. Here, we report on a survey of former and current faculty who mentored graduate students to determine the number of students who obtained a career associated with waterfowl and wetlands from 1980–2020.

We developed a list of 64 known living university faculty in the United States and Canada who led or now lead waterfowl-centric programs from 1980–2020 and could be contacted via email. Thus, survey recipients were not randomly selected and did not encompass the entire training capacity for professionals who work to advance the mission of NAWMP. Our goal was not to identify all faculty engaged with wildlife, wetlands, public policy, conservation, etc. across North America. Rather, because faculty who led or currently lead waterfowl-centric programs may be especially likely to produce graduates who obtain careers in waterfowl and wetlands, they were of particular interest to survey. We note that many leaders in the field who have produced cadres of excellent waterfowl and wetland graduates in the 1970s and 1980s have retired, passed, or were unavailable for contact, so our sample misses several important cohorts.

With the assistance of Clemson Ph.D. candidate Lauren Hernandez-Rubio Senn, we developed an anonymous survey in Qualtrics which was emailed to the 64 waterfowl faculty (with two subsequent reminders). The survey was comprised of three questions:

1. During what span of years have you served as a major professor to graduate students who acquired permanent positions in waterfowl- or wetlands-related arenas?
2. How many of your M.S. graduate students obtained permanent employment in a position related to the conservation, management, or science of waterfowl or wetlands after earning their M.S. degree? Please list numbers by decade of graduation date and include only those students for which an M.S. was their terminal degree.
  - a. 1980-1989
  - b. 1990-1999
  - c. 2000-2009
  - d. 2010-2019
  - e. If decadal numbers are unavailable, please provide total during your career
3. How many of your Ph.D. graduate students obtained permanent employment in a position related to the conservation, management, or science of waterfowl or wetlands after earning their Ph.D. degree? Please list numbers by decade of graduation date.
  - a. 1980-1989
  - b. 1990-1999
  - c. 2000-2009
  - d. 2010-2019
  - e. If decadal numbers are unavailable, please provide total during your career

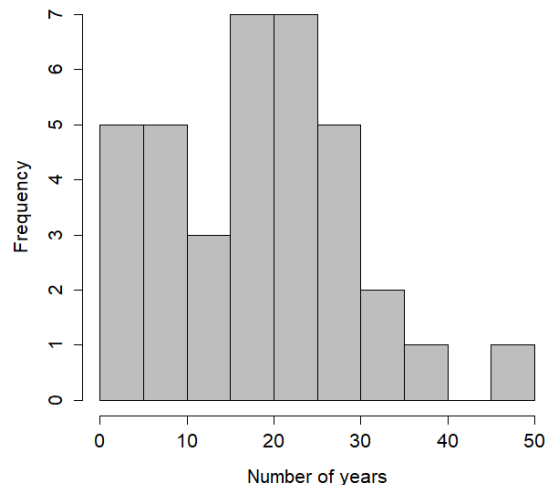
We received 42 responses to the survey, including two responses by email and not through the survey. Forty responses contained useful data, yielding an effective response rate of 63%. We had intended for the respondents to provide a range of years during which they taught (“during what span of years...”), but the majority of respondents simply indicated the total number of years they taught, preventing us from identifying the decades when they were active and training graduate students. This issue was compounded by respondents’ inconsistent use of explicit zeros (i.e., decades during which they did not teach were sometimes left blank or marked as zero students graduated). Thus, we were unable to estimate decadal training capacity and the number of graduates per faculty by decade.

Thirty-six faculty provided the number of years they taught, which ranged from <5 to 50 years. As expected, there was a positive relationship between the number of years taught and the number of students graduated who went on to careers in waterfowl and wetlands. During their current or past years of teaching, faculty members graduated an average of  $0.62 \pm 0.07$  SE students per year who obtained a career related to waterfowl or wetlands. Since 2000, survey respondents reported a cumulative graduation of 141 M.S. and 113 Ph.D. students, who obtained careers in waterfowl and wetlands. Dividing this total ( $n = 254$ ) by 20 years suggests about 13 waterfowl-wetlands post-graduate students acquired employment per year in the profession over the past two decades.

We were heartened to observe that, despite a sustained loss of waterfowl training capacity at universities, remaining faculty appear to be producing students who obtain careers in waterfowl and wetlands. Nonetheless, all responding survey recipients indicated they consistently graduated <1 M.S. or Ph.D. student on average per year over the 1980–2020 period. The number

of graduates finding employment in waterfowl and wetlands since 2000 seems greater than before; however, if pending faculty retirements result in permanent forfeiture of those waterfowl-centric positions, the losses may accumulate rapidly with an acute impact on the pipeline of future waterfowl and wetlands professionals. The choice to refill any particular faculty position with the same expertise is subject to fiscal limitations, perceived needed expertise, and administrative vicissitudes of universities.

This concern is heightened by the demography of current faculty teaching in waterfowl and wetland programs. While our survey did not inquire about the ages of respondents, we did obtain an estimate of the number of years faculty members have been teaching. These numbers are approximate given the variance in how respondents completed question #1, but a few general patterns emerge (figure below). First, the distribution is skewed toward faculty who teach or have taught  $\geq 20$  years. If an average academic career is 20-30 years, this suggests there may soon be a substantial loss of faculty when this cohort retires. Second, the distribution is bimodal, possibly reflecting a decline in hiring during the Great Recession in the late 2000s. Thus, when the older cohort retires, there may be insufficient backfill of waterfowl-wetland specialists to fill gaps. Third, there is a minor peak in the 1–10-year range, reflecting recent hires of new faculty since 2010. The question remains, however, whether there will be sufficient recruitment to compensate for expected retirements and departures. Thus, NAWPEP is committed to engage and assist universities/colleges and all NAWMP partners with strategies and actions to promote availability of professionals from across North America to sustain the future success of NAWMP.



Beginning in 2020, the NAWPEP team next plans to survey public- and private-sector NAWMP-related employers to determine numbers of employees with B.S. and post-graduate degrees they may need for anticipated positions between now and 2025. These numbers will be compared with estimated availability of professionals from this survey. Additionally, NAWPEP will survey universities to determine institutions' interest and capacity to train future waterfowl-wetlands professionals relative to anticipated hiring needs of employers. About 30 waterfowl-centric university programs remain in 2020 and most are in the United States, but we must endeavor to sustain existing and establish new programs, especially in Canada and Mexico where few or no programs exist, respectively.