

# Estimated capacity and future need for trained and educated professionals in waterfowl management and conservation

*Prepared by the North American Waterfowl Professional Education Plan Committee: Michael G. Brasher, Joel Brice, Eduardo Carrera, John Eadie, Diane Eggeman, Justyn Foth, Adam Janke, Richard M. Kaminski, Shaun Oldenburger, Kevin M. Ringelman, Christian Roy, Lisa Webb. Includes important contributions from Lauren Hernandez-Rubio Senn of Clemson University.*

May 2022

## Abstract

We report on capacity and needs for professionals in the field of waterfowl science, management, and conservation in Canada, Mexico, and the United States. This effort stemmed from a concern over a documented decline in waterfowl-centric university programs (Kaminski 2002, 2013; *Wildlife Society Bulletin* and *The Wildlife Professional*). We estimated employment needs, the number of graduates required to fill these needs, and the historical and contemporary training capacity of university faculty to produce them. We used 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 and a survey of public- and private-sector employers to assess current and future (by 2025) personnel needs. These results allowed us to compare needs to capacities for training and employment. Since 2000, about 10 waterfowl-wetlands post-graduate students acquired employment per year in the profession. Individual waterfowl professors graduated about 0.62 M.S. or Ph.D. students on average per year over the 1980–2020 period. Based on current numbers of waterfowl-focused faculty, we might expect 142 graduates to enter waterfowl or wetlands careers during 2022–2025. However, this may be an over-prediction considering (1) some portion of the 142 graduates would likely enter careers unrelated to waterfowl conservation and (2) the looming retirements of many of the current waterfowl professors with their replacement being uncertain. Sixty-five percent of employers indicated they were likely to hire graduates with specific training or experience in waterfowl science, management, or conservation by the end of 2025. Employers reported a current workforce of 949 waterfowl-specific employees, of which 346 (36%) hold positions where a graduate degree is either required or preferred. Employers expected more than 350 employees across the 3 countries would be needed to fill waterfowl-related positions by the end of 2025, and 34% (or 118) would require a graduate degree. We conclude that there remains a valid concern about a potential shortage of graduate-degree level persons for expected employment demand.

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 educate 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 programs 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).

Considering 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 employment needs, the number of graduates required to fill these needs, and the historical and contemporary training capacity of university faculty to produce them. Here, we report on our efforts to quantify these needs using 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 and a survey of public- and private-sector employers to assess their current and future personnel needs. These results allowed us to compare needs to capacities for training and employment.

## METHODS

### Professors survey

We developed a list of 64 known living university faculty (current and retired) in the United States and Canada who led or now lead waterfowl-centric programs from 1980–2020 and could be contacted via email. We developed this list from known colleagues at colleges and universities. 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 missed several important cohorts.

We developed an anonymous survey in Qualtrics, which was emailed to the 64 waterfowl faculty (with two subsequent reminders). The survey included 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

## Employers survey

The NAWPEP team conducted another survey of public- and private-sector NAWMP-related employers to determine numbers of employees with B.S. and post-graduate degrees expected to be needed for positions between now and 2025. We developed a list of 101 recipients for the employer survey, contacting state and provincial wildlife agencies; federal government wildlife agencies of U.S., Canada, and Mexico; migratory bird Joint Ventures; and non-governmental organizations. These entities were selected because they were known to be responsible specifically and explicitly for waterfowl science, management, or conservation. The survey invitation and link were sent by email, and the survey was available for response online via Microsoft Forms. After the initial survey invitation, we followed up with nonrespondents by emails and phone calls to encourage additional responses. The invitations were sent in June 2021 and the survey was closed in January 2022. The survey consisted of the following questions:

1. Name of the agency/organization/ for which you are responding.
2. Contact information for responding individual (name, title, email address)
3. On a scale of 1–5 (1 = unlikely, 2 = some likelihood, 3 = average likelihood, 4 = good likelihood, and 5 = great likelihood), how likely is your employer to hire a college or university graduate(s) between now and the end of 2025 with specific training or experience in waterfowl-related science, management, or conservation?
4. Approximately how many permanent or nonseasonal positions does your agency/organization/JV currently employ with job responsibilities primarily related to the science, management, or conservation of waterfowl for which an associate, bachelor's or graduate degree meets the preferred requirements?

Associate degree (number)

Bachelor's degree (number)

Graduate degree (Master's or Ph.D.) (number)

5. Approximately how many permanent or nonseasonal positions does your agency/organization/JV anticipate filling by the end of 2025 through replacing or hiring new employees with job responsibilities primarily related to the science, management, or conservation of waterfowl for which an associate, bachelor's or graduate degree meets the preferred requirements?

Associate degree (number)

Bachelor's degree (number)

Graduate degree (Master's or Ph.D.) (number)

6. Please provide any additional insights or recommendations you may have regarding future professional demand or opportunities for persons with waterfowl-specific expertise.

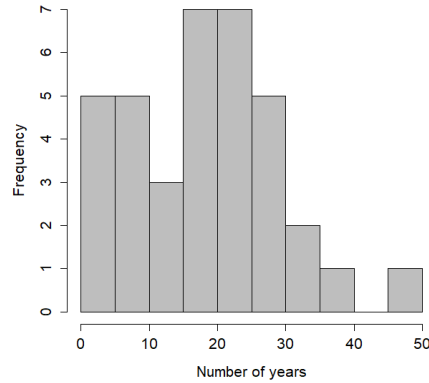
## RESULTS AND DISCUSSION

### Professors survey

Thirty-six (56% of those contacted) faculty members provided the number of years they taught, which ranged from <5 to 50 years. As expected, there appeared to be a positive relationship between the number of years taught and the number of students graduated who earned 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 the degree total ( $n = 254$ ) by an assumed 25-year career suggests about 10 waterfowl-wetlands post-graduate students acquired employment per year in the profession over the past two decades.

We found it encouraging that 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 availability 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 emerged (Fig. 1). First, the distribution is skewed toward faculty who teach or have taught  $\geq 20$  years. If an average academic career is 25 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 and 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. Other disciplines in the wildlife profession are encouraged to conduct surveys similar to ours to assess needed recruitment of wildlife ecologists with certain traditional and novel specialties.



**Figure 1.** Number of years in teaching by responding waterfowl and wetlands faculty.

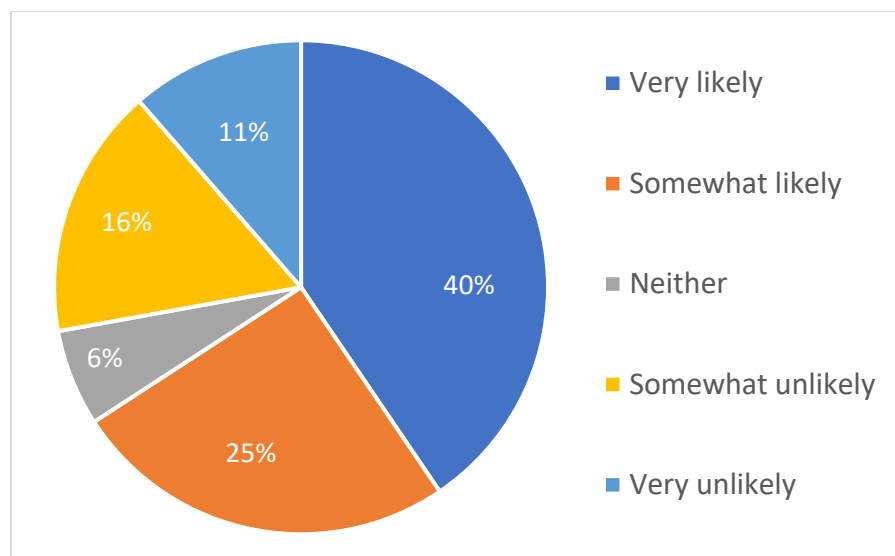
### Employers survey

Eighty-one employers (80% of those contacted) provided information to our survey (Table 1). The survey invitees and respondents do not represent every employer of waterfowl-specific professionals across the 3 countries, and thus, our results likely underestimate the current employment and future demand.

**Table 1.** Number of respondents to employer survey by category.

	<b>Respondents</b>
<b>Total</b>	<b>81</b>
<b>Canada total</b>	<b>7</b>
Provincial government	3
Joint ventures	2
Federal government	1
Non-governmental	1
<b>U.S. total</b>	<b>71</b>
State government	43
Joint ventures	18
Federal government	6
Non-governmental	4
<b>Mexico total</b>	<b>3</b>
Federal government	1
Non-governmental	2

In terms of the likelihood of hiring graduates with specific training or experience in waterfowl-related science, management, or conservation by the end of 2025, 65% of respondents indicated they were likely to do so. Approximately 27% were unlikely to hire such candidates.



**Figure 2.** Expressed likelihood for survey respondents to hire candidates with waterfowl-specific training or experience.

To provide additional context for the anticipated future demand for waterfowl professionals, we asked employers how many current positions existed where the job responsibilities primarily related to the science, management, or conservation of waterfowl, according to type of degree required. About 80% of the positions required a Bachelor’s or graduate degree, and 36% required a Master’s or Doctorate.

**Table 2.** Current waterfowl employees by degree type and category.

Category (number of respondents)	Associates	Bachelor’s	Graduate
<b>Grand total</b>	<b>207 (22%)</b>	<b>396 (42%)</b>	<b>346 (36%)</b>
<b>Canada total</b>	<b>85</b>	<b>162</b>	<b>46</b>
Provinces (3)	0	1	1
Federal (1, includes 2 Joint Ventures)	5	11	15
NGO (1)	80	150	30
<b>US total</b>	<b>100</b>	<b>220</b>	<b>285</b>
States (43)	65	106	104
JVs (18)	21	76	39
Federal (6)	0	7	57
NGOs (4)	14	31	85
<b>Mexico total</b>	<b>22</b>	<b>14</b>	<b>15</b>
Federal (1)	0	0	3
NGOs (2)	22	14	12

Respondents expected more than 350 employees across the 3 countries would be needed to fill waterfowl-related positions by the end of 2025, and 34% (or 118) would require a graduate degree (Table 3).

**Table 3.** Employees needed by degree type and category.

Category (number of respondents)	Associates	Bachelor's	Graduate
<b>Grand total</b>	<b>90 (26%)</b>	<b>137.5 (40%)</b>	<b>118 (34%)</b>
<b>Canada total</b>	<b>22</b>	<b>44</b>	<b>16</b>
Provinces (3)	0	1	1
Federal (1, includes 2 Joint Ventures)	2	3	5
NGO (1)	20	40	10
<b>US total</b>	<b>60</b>	<b>83.5</b>	<b>97</b>
States (43)	29	52.5	45
Joint Ventures (18)	11	15	12
Federal (6)	0	3	19
NGOs (4)	20	13	21
<b>Mexico total</b>	<b>8</b>	<b>10</b>	<b>5</b>
Federal (1)	0	0	0
NGOs (2)	8	10	5

To assess whether the waterfowl community will soon face a shortage of adequately trained graduates to fill the expected demand, we assumed a graduation rate of 0.62 graduate students (Masters or Ph.D.) per year per professor. Based on our knowledge of professors who currently mentor waterfowl students, 57 professors may be available to lead waterfowl-centric programs. Thus, during 2022-2025, we might expect 142 graduates ( $0.62 \times 57 \times 4$ ) to enter waterfowl or wetlands careers. Given that some portion of the 142 graduates would likely enter wetlands-related careers unrelated to waterfowl conservation, that some portion of these graduates will choose unrelated careers, that some of the 57 professors will retire and not be replaced during 2022-2025, and that more than 118 waterfowl-specific hires are predicted needed, we conclude that there is a valid concern about a potential shortage of graduate-degree level persons for expected employment demand.

About 30 waterfowl-centric university programs remained 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. These results pertain only to numbers of graduates and job candidates and do not address the need and capacity for a diverse workforce. Further, these results point to a need for adequately trained graduates with Associates and Bachelor's degrees, as these are the required degrees of the majority of employees. As NAWPEP is able, a better understanding of the needs and capacities for producing and adequately training these new professionals also will be important.