Office of the Chief Science Advisor of Canada
Bureau du conseiller scientifique en chef du Canada
Canada

# The Federal Science Workforce: An Overview

A report presented by the Office of the Chief Science Advisor of Canada







# the Chief Science Advisor of Canada (2023)

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Cover image: Selected pictures showing Government of Canada scientists in action. Thanks to the contributors: Agriculture and Agri-Food Canada, Defence Research and Development Canada, Environment and Climate Change Canada, National Research Council Canada, Parks Canada, and Public Health Agency of Canada.

The purpose of this report from the Office of the Chief Science Advisor of Canada on the state of the federal science workforce, the first in a series, is to provide an update based on previous reports, highlight their main observations, provide an overview of available statistics, and share some reflections and recommendations. The subsequent reports will take a more detailed look at some of the themes, statistics and issues raised in this initial report and will provide recommendations to ensure the vitality of science and of the scientific workforce within the federal government.

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# Goal of this report

Science plays an important role in the federal government. The latter must ensure that decisions regarding the activities, programs and policies it implements are evidence-based. In this sense, it is important for the federal government to obtain informed, cutting-edge advice in a variety of disciplines. To this end, it employs a significant number of scientists, who carry out research necessary to the well-being, safety, security and prosperity of Canadians. These scientists play a crucial role in shaping the public policies Canada chooses to deploy in response to current and future challenges, such as an aging population, food security issues and the fight against climate change and its effects. They are also a valuable resource when responding to national emergencies.

Thousands of federal employees, spread across dozens of departments and agencies with distinct missions, are involved in research and development (R&D) activities, the administration of scientific programs, and related scientific activities such as data collection and analysis. Managing a heterogeneous scientific workforce is a major challenge. The government must ensure that it has the necessary personnel to meet all its growing needs in terms of scientific knowledge and research.

The federal government must also encourage the contribution of all Canadians to science and scientific activities, and ensure that the federal science workforce is diverse and representative of the Canadian population.

The management of such a critically important workforce must itself be evidence-based. It is essential to know whether the federal government has the human, technical and scientific resources needed to meet the challenges of today and tomorrow, and whether it reflects the country's population.

The mandate of Canada's Chief Science Advisor includes assessing the federal government's current scientific capabilities and recommending ways to strengthen support for the production of quality scientific research. In order to tackle this task, we first need to draw up a portrait of the current federal science workforce.

This first report from the Office of the Chief Science Advisor of Canada on the federal science workforce presents an overview based on available statistics and some previous studies. It describes the composition of the federal government's scientific workforce and details the diversity of the expertise and disciplinary fields represented.

This document is structured as follows. Section 2 briefly describes studies that have examined similar issues in recent decades, and identifies the main themes and issues for the federal science workforce. Section 3 lists the main sources of data available to assess the current situation and defines the target population. Section 4 presents a brief statistical portrait of the federal science workforce as defined in this study. A review of the questions of interest is presented in Section 5, followed by our conclusions and reflections. The last section briefly describes the next steps.

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# History of federal science workforce analysis

Over the past five decades, a number of studies have examined the various issues and concerns affecting federal scientific personnel, and many of them used methodologies that are still valid. The most important reports were produced during two specific periods[1].

First, several reports were produced between 1994 and 2003 by the Office of the Auditor General (the 1994 OAG report included a chapter on "Science and Technology: The Management of Scientific Personnel in Federal Research Establishments"), Industry Canada (a series of documents entitled A Report on Federal Science and Technology published between 1997 and 2003) and the Council of Science and Technology Advisors (the BEST and SAGE reports in 1999; the 2001 STEPS Report; the 2002 EDGE Report).

The Science, Technology and Innovation Council (STIC) then published periodic reports between 2008 and 2014 on the state of science, technology and innovation in Canada, based on international standards of excellence. These were supplemented by the 2013 One HR for Government Science Report produced by seven science-based departments and agencies,[2] and a 2014 report from the Expert Advisory Group (chaired by Ken Knox) entitled ScienceCan: Enhancing the Value of Government Science, Engineering and Technology in Canada's Science and Innovation Ecosystem. In addition, the Professional Institute of the Public Service of Canada (PIPSC) surveyed its scientist members (the majority of them federal employees) and published two reports: The Big Chill (2013) and Defrosting Public Science (2017). More recently, in 2022, the Institute on Governance published Government Science and Innovation in the New Normal, examining the changing role and expectations of government science across nine specific themes, including skills, knowledge and diversity.

To our knowledge, there have been no other public reports on the federal science workforce since.

1 See Appendix A (Bibliography) for the complete list of reports.

2 More precisely: Agriculture and Agri-Food Canada (AAFC), Health Canada (HC), Canadian Food Inspection Agency (CFIA), Natural Resources Canada (NRCan), Environment and Climate Change Canada (ECCC), Public Health Agency of Canada (PHAC) and Fisheries and Oceans Canada (DFO).

DRDC staff are deploying the Drifting Arctic Monitoring System off Devon Island, August 2019

## MAIN OBSERVATIONS AND RECOMMENDATIONS MADE

In essence, these reports concluded that the federal government must understand the characteristics of the federal science workforce and its importance in order to effectively fulfill its role as a vital player in the national innovation system. In fact, several reports have attempted to describe this workforce. It was observed that science and technology (S&T) workers are stimulated by interesting and challenging work, competitive salaries, the opportunity to interact with high-calibre colleagues, creative rewards frameworks, opportunities for learning, career advancement potential and world-class scientific equipment and facilities. These reports also mention that scientists view merit and recognition in a slightly different way than other employees. For example, they place a much higher value on the pursuit of knowledge, the development of expertise in one's field, national and international recognition, the opportunity to conduct research and publish scientific articles, and collaboration with colleagues and peers, including those outside government. In addition, scientists often consider attendance at conferences, symposia and workshops as the primary means of professional development. Lastly, federal scientists want to be able to speak freely about their scientific work to the media and the public.

These reports also identified more than five decades (since the 1960s) of often recurring issues related to the management of scientific personnel in the public service, leaving federal research institutions unprepared to deal with the rapidly changing research environment.

More specifically, these reports mentioned shortcomings in the following areas:

- recruitment processes and hiring of new graduates;
- management of training and development activities;
- talent management, including career advancement, assignments and horizontal mobility;
- collaboration, both within government and with industry and academia;
- guidelines for and enabling of public communication by federal scientists;
- existing data and statistics on the federal science workforce.

## MAIN THEMES AND RECOMMENDATIONS FOR THE FEDERAL SCIENCE WORKFORCE

The reports contain recommendations to ensure that the federal S&T workforce is highly skilled, connected, mobile, adaptable and responsive to changing S&T. These issues and recommendations concerning the federal science workforce can be grouped under four main themes.

The **first theme is the profile of the scientific workforce**. We do not know the precise number and distribution of scientists employed by the federal government, or who they are, or whether they are representative of the Canadian population. This theme echoes recommendations concerning the need, among other things, to maintain a centralized and accessible data system; to monitor and analyze S&T labour market conditions in order to better plan the expertise and human resources required; and to benchmark the federal government's research capacity against other countries and R&D sectors.

The **second theme is the career path of federal scientists**. It includes important issues related to hiring, mobility, promotions, opportunities and satisfaction for federal scientists. It also touches on several recruitment recommendations, including the need to shorten the time it takes to hire new employees; to target young S&T workers while they are still students and research trainees; to implement bridging plans across the federal science workforce; and to review the proportion of permanent (i.e., indeterminate) versus temporary (i.e., term) S&T employees. This theme also refers to recommendations for the professional advancement of federal scientists, including offering them the opportunity to attend international conferences, collaborate with other researchers, publish their research results in scientific journals and acquire individual skills through ongoing training or participation in scientific organizations.

The **third theme concerns the management of scientific activities and the science workforce** within the federal government, an issue that raises questions of interdepartmental collaboration, material resources and senior management's ability to adequately supervise scientific activities. These recommendations include the clarity of departmental R&D mandates, the competence of science managers, the use of evidence in decision-making, the dissemination of federal scientific knowledge to the public and the scientific workforce, and the need to promote a science culture in the various government sectors.

The **fourth and final theme is the federal government's ability to anticipate and respond to scientific challenges**. It is linked to issues of the renewal and availability of skilled workers, training and hiring processes. This theme touches on several important questions raised in various reports, namely, whether federal scientific expertise is adequate in the areas that will meet tomorrow's challenges, and whether there are mechanisms in place to identify gaps and fill them quickly.

While some issues were frequently raised and many recommendations were made in these reports, it seems that few of these recommendations have been implemented. At the very least, it is difficult to assess progress without consistent information and data.

Chief Science Advisor M. Nemer visiting the DFO Pacific Science Enterprise Centre (PSEC) in West Vancouver, BC, March 2019

# Existing statistics on the federal science workforce

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Several questions of interest require, as a starting point, a good statistical portrait of the federal science workforce. Such a portrait would present its numbers, distribution and main characteristics. The available data allow us to explore some of these aspects. The first difficulty, however, is to define this population precisely, as there is no consensus in previous reports as to which inclusion criteria should be used: postsecondary training, diplomas, position held, function or work performed. Furthermore, no single institution is currently responsible for systematically collecting data on this workforce as a whole.

Various data sources can be used to analyze the federal science workforce, but none of them is sufficient to cover all the issues identified. For example:

- Statistics Canada offers data from the Federal Science Expenditures and Personnel Survey (FSEP), Activities in the Social Sciences and Natural Sciences,[3] the Canadian Census of Population and selected data linkages;
- The Public Service Commission maintains a database of candidates for federal public service competitions;
- The Treasury Board Secretariat's (TBS's) Executive Talent Management System provides statistical information about the academic training of senior federal employees.

3 Statistics Canada's Federal Science Expenditures and Personnel Survey, Activities in the Social Sciences and Natural Sciences, is an important source of statistical information on federal government scientific activity. It measures expenditures on science activities and the federal personnel involved in those activities. Statistics Canada collects and disseminates the data in accordance with international OECD standards. Published statistics on personnel engaged in R&D activities are not limited to science personnel; they also include all personnel (e.g., administrative and clerical staff) who support S&T activities and other related scientific activities, in social sciences, humanities and the arts, and in natural sciences and engineering. They do not provide any details on the composition or characteristics of the science workforce and are not directly comparable with the statistics presented in this report.

However, the most relevant source of data right now for building a portrait of the federal science workforce is the TBS's pay system, which includes a number of important indicators (age, membership in an employment equity designated group, tenure, seniority, etc.). The science workforce is not specifically marked in the database, but it can be identified indirectly from the employee's occupational group. This provides a common definition of the federal scientific workforce for all departments and agencies of the central public administration, thus establishing a basis for correspondence with other relevant federal bodies concerned (see Boxes 1 and 2). However, this definition may not include all persons engaged in scientific activities in a given department or agency.

Therefore, this report provides a brief statistical profile of the federal science workforce, pragmatically defined on the basis of the position held (occupational group).

NRCan staff of the Canadian Forest Service's Cumulative Effects Program prepares a demonstration site in Northern Alberta.

## BOX 1

### WHO ARE THE SCIENTISTS CONSIDERED IN THIS REPORT?

For the purposes of this report, the **federal science workforce** is defined as employees in science, technology, engineering and mathematics (STEM) fields, employees in science and technology support positions, and selected health occupational groups. The term “scientist” refers, with some exceptions, to all employees who make up the federal science workforce, or a subset of it when specified.

This definition is based on the classification of occupational groups in the core public administration (see Box 2), which includes the following groups: AC (Actuarial Science), AG (Agriculture), BI (Biological Sciences), CH (Chemistry), DE (Dentistry), DS (Defence Scientific Services), EG (Engineering and Scientific Support), EN-ENG (Engineering), FO (Forestry), HR (Historical Research), MA (Mathematics), MD (Medicine), MT (Meteorology), ND-DIT (Dietitian), PC (Physical Sciences), PH (Pharmacy), SE (Scientific Research), SG (Scientific Regulation) and VM (Veterinary Medicine). In this report, the definition of the federal science workforce also includes the SR (Regulatory Science) group for the Canadian Food Inspection Agency, and the CS (Computer Systems Administration), RCO (Research Council Officers), RO (Research Officers) and TO (Technical Category) groups for the National Research Council of Canada. These two organizations use a classification that is partially or entirely different from that of the core public administration (CPA). The SR, RCO and RO groups have been included in the “STEM - Other” category, and the CS and TO groups have been included in the “Support - Other” category.

In this report, the definition of the federal science workforce excludes several occupational groups, including the EC (Economics and Social Science Services) and EX (Executive) groups. The definition of the federal science workforce also excludes certain federal employees who occupy positions in support of the federal government’s scientific activities (e.g., administrative positions).

The decision to include or exclude certain occupational groups from the definition of the federal science workforce is based on methodological considerations and the limits imposed by the available data.

# BOX 2

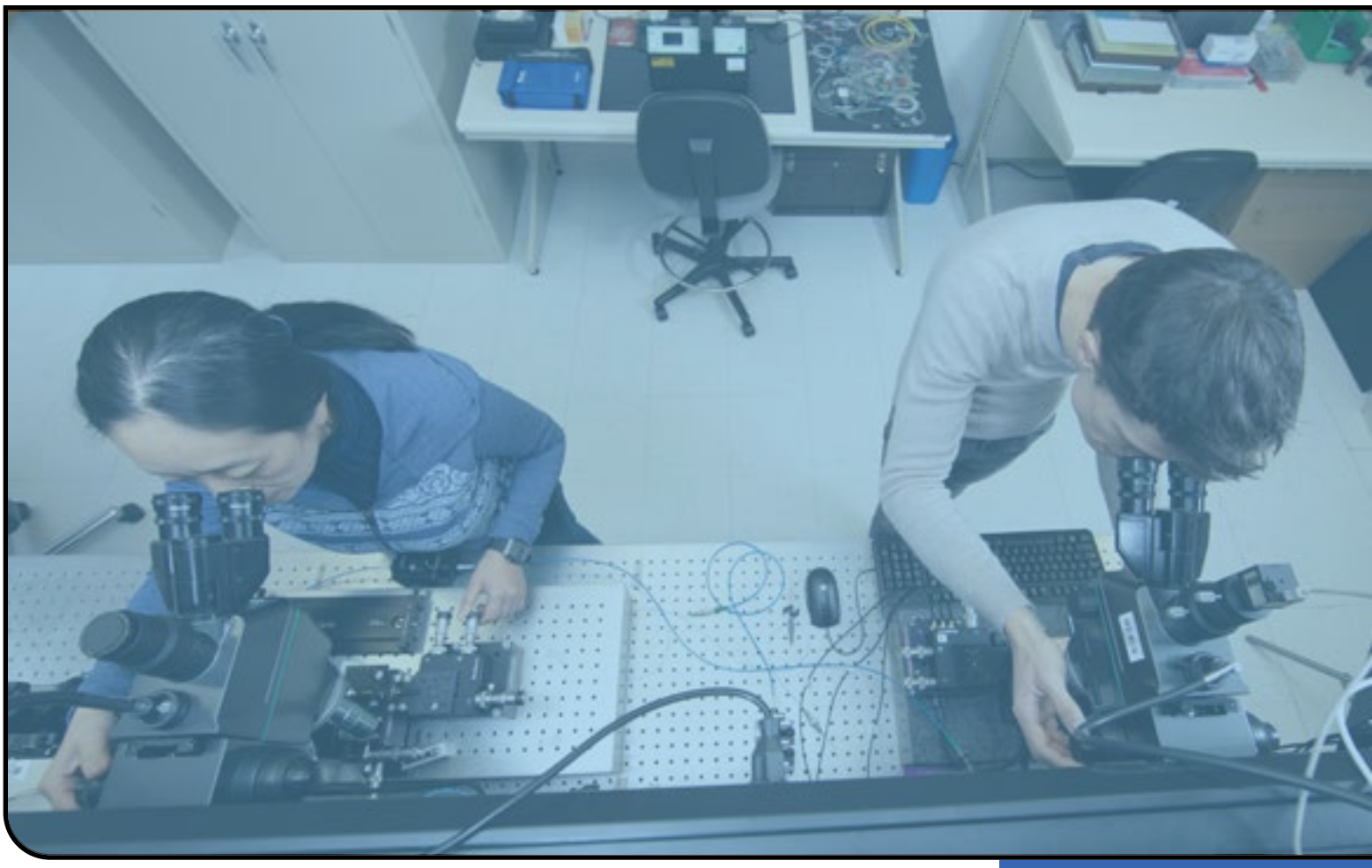
## DEPARTMENTS AND AGENCIES INCLUDED IN THIS REPORT

For the purposes of this report, the **federal science workforce** consists of employees in scientific positions (as defined in Box 1) in departments and agencies of the core public administration (CPA), the Canadian Food Inspection Agency (CFIA), the National Research Council of Canada (NRC) and Parks Canada (PC).

The **core public administration** refers to the departments listed in Schedule I and the other sectors of the federal public administration listed in Schedule IV of the Financial Administration Act. In March 2022, there were 70 departments and agencies, including the central agencies (Privy Council Office, Treasury Board Secretariat and Department of Finance).

The federal government's pay system database provides consistent information for the CPA only. It also provides data for separate agencies (listed in Schedule V of the Financial Administration Act; note that the classification of occupational groups in these agencies may differ from that of the CPA), but the information is not necessarily homogeneous, and it excludes federal institutions that are part of neither the CPA nor the separate agencies. Three federal agencies that have significant science mandates or a substantial number of scientists on staff (CFIA, NRC and PC) were therefore contacted separately for this report.

Thus, for the purposes of this report, the term "**federal government**" refers to CFIA, NRC, PC and the 70 departments and agencies of the CPA (see appendices C and D). The term "**federal employees**" (or any equivalent expression) refers to employees of these 73 departments and agencies.



NRC Staff at the Advanced Electronics and Photonics Research Center, Ottawa, ON

# Preliminary portrait of the federal science workforce

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In March 2022, the federal science workforce consisted of 31,157 people, representing 11.4% of federal government employees at that time. Of these, 19,257 employees were in STEM positions, 10,879 were in Engineering and Scientific Support positions (EG or equivalent), and 1,021 were health scientists (see Table 1).

Scientists working in STEM fields therefore represented 61.8% of the federal science workforce in March 2022, compared with 34.9% for Engineering and Scientific Support staff (EG or equivalent) and 3.3% for health scientists (e.g., physicians, veterinarians, dentists, pharmacists).

# TABLE 1: NUMBER OF FEDERAL SCIENTISTS BY OCCUPATIONAL GROUP IN MARCH 2022

| Code | | | Title | CPA[1] | OA[2] | Total |
|---|---|---|---|---|---|---|
| **STEM** | | | **Science, Technology, Engineering and Mathematics** | **16,582** | **2,675** | **19,257** |
| **RE** | | | **Research** | **2,747** | **125** | **2,872** |
| | DS | | Defense Scientific Service | 587 | 0 | 587 |
| | HR | | Historical Research | 110 | 66 | 176 |
| | MA | | Mathematics | 344 | 0 | 344 |
| | SE | | Scientific Research | 1,706 | 59 | 1,765 |
| | | SE-REM | Research Manager | 174 | 18 | 192 |
| | | SE-RES | Research Scientist | 1,532 | 41 | 1,573 |
| **SP** | | | **Applied Science and Patent Examination** | **9,880** | **208** | **10,088** |
| | AC | | Actuarial Science | 7 | 0 | 7 |
| | AG | | Agriculture | 3 | 0 | 3 |
| | BI | | Biological Sciences | 3,349 | 1 | 3,350 |
| | CH | | Chemistry | 644 | 0 | 644 |
| | FO | | Forestry | 48 | 1 | 49 |
| | MT | | Meteorology | 498 | 0 | 498 |
| | PC | | Physical Sciences | 3,366 | 206 | 3,572 |
| | SG | | Scientific Regulation | 1,965 | 0 | 1,965 |
| | | SG-SRE | Scientific Regulation | 1,518 | 0 | 1,518 |
| | | SG-PAT | Patent Examination | 447 | 0 | 447 |
| **EN-ENG** | | | **Engineering** | **3,955** | **61** | **4,016** |
| Other [3] | | | | N/A | 2,281 | 2,281 |
| **Support** | | | **Engineering and Scientific Support** | **6,519** | **4,360** | **10,879** |
| | EG | | Engineering and Scientific Support | 6,519 | 3,310 | 9,829 |
| Other [3] | | | | N/A | 1,050 | 1,050 |
| **Health** | | | **Health Scientists** | **418** | **603** | **1,021** |
| | DE | | Dentistry | 12 | 0 | 12 |
| | MD | | Medecine | 271 | 0 | 271 |
| | | MD-MOF | Medical Officer | 230 | 0 | 230 |
| | | MD-MSP | Medical Specialist | 41 | 0 | 41 |
| | DIT | | Dietitian | 11 | 0 | 11 |
| | PH | | Pharmacy | 86 | 0 | 86 |
| | VM | | Veterinary Medicine | 38 | 603 | 641 |
| Other [3] | | | | N/A | 0 | 0 |
| **Grand total** | | | **Scientists** | **23,519** | **7,638** | **31,157** |

ECCC staff sampling freshwater ice in Alert, Nunavut, 2023. Credits: Alexandra Steffen

Table 1 shows that there are significant differences in the size of the various scientific occupational groups. There were 9,829 employees, nearly one-third of all federal scientists, in the Engineering and Scientific Support (EG) group. The Biological Sciences group (10.8%), the Physical Sciences group (11.5%) and the Engineering group (12.9%) each accounted for more than 10% of federal scientists. Two out of three federal scientists belonged to one of these four occupational groups, while the nine occupational groups with the fewest employees (AC, AG, DE, FO, HR, MD-MSP, ND-DIT, PH and SE-REM) together accounted for just 1.9% of federal scientists.

**NOTES**

**1** Core public administration.
**2** Other agencies (Canadian Food Inspection Agency, National Research Council of Canada, Parks Canada).
**3** Occupational groups specific to other agencies (OA) that do not correspond directly to a CPA occupational group. See Box 1.

**SOURCES**

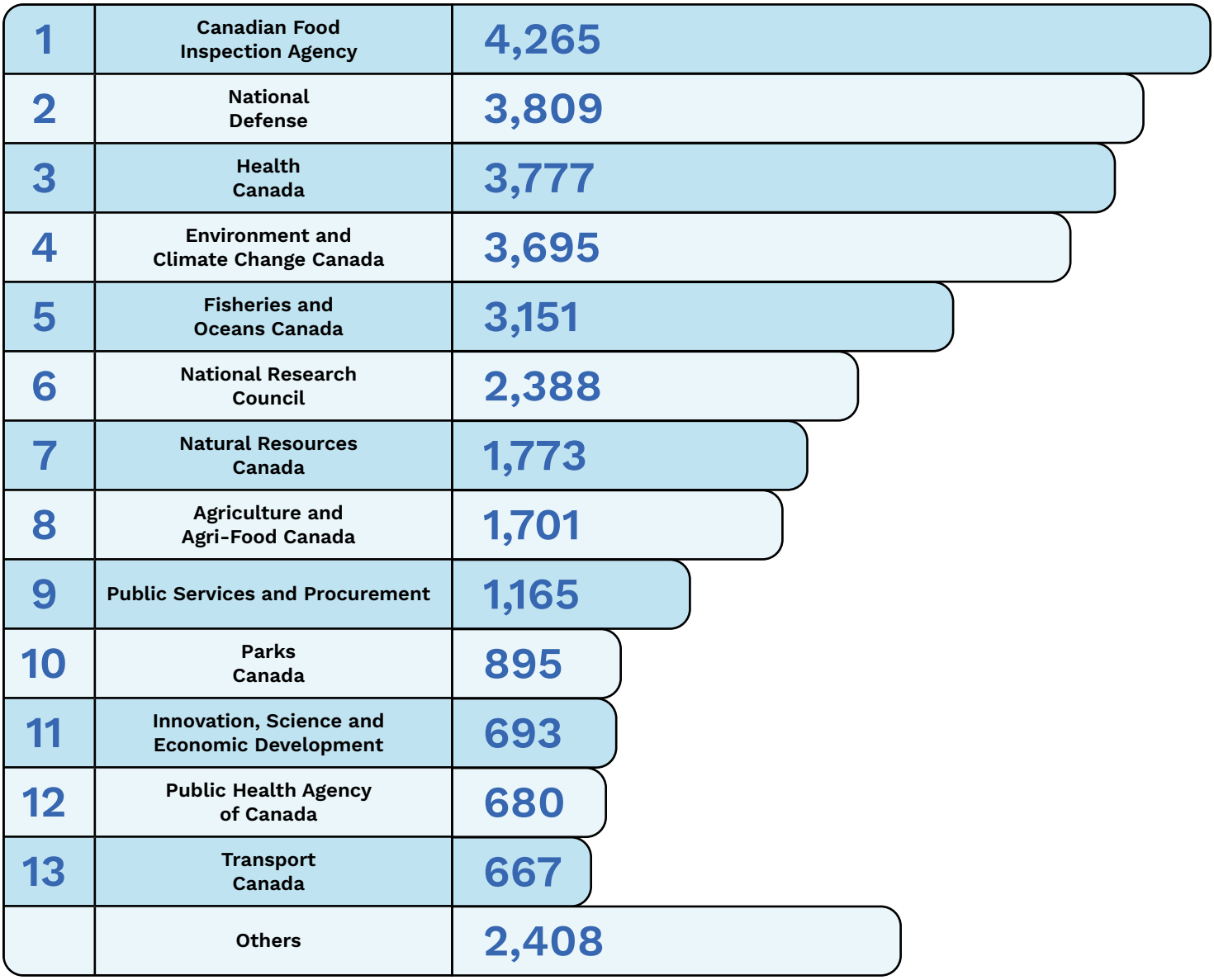
Treasury Board Secretariat (TBS), Pay System; CFIA, NRC, and PC.

## WHERE DO MEMBERS OF THE FEDERAL SCIENCE WORKFORCE WORK?

Interestingly, four federal departments and one federal agency each employed more than 3,000 scientists in March 2022 (see Chart 1). Together, these institutions account for 60.0% of federal scientists. The 10 departments and agencies that employ the largest number of scientists accounted for 85.7% of federal scientists, reflecting a concentration of science activity within the federal government. Furthermore, nearly half (33) of the 70 departments and agencies in the CPA have no scientists at all according to the definition used (see complete list in Appendix C).

Health Canada staff at the Microbiology Laboratory of the Regulatory Operations and Enforcement Branch, Longueuil, QC

## CHART 1: NUMBER OF SCIENTISTS IN CERTAIN FEDERAL DEPARTMENTS AND AGENCIES IN MARCH 2022




**INTERPRETATION**

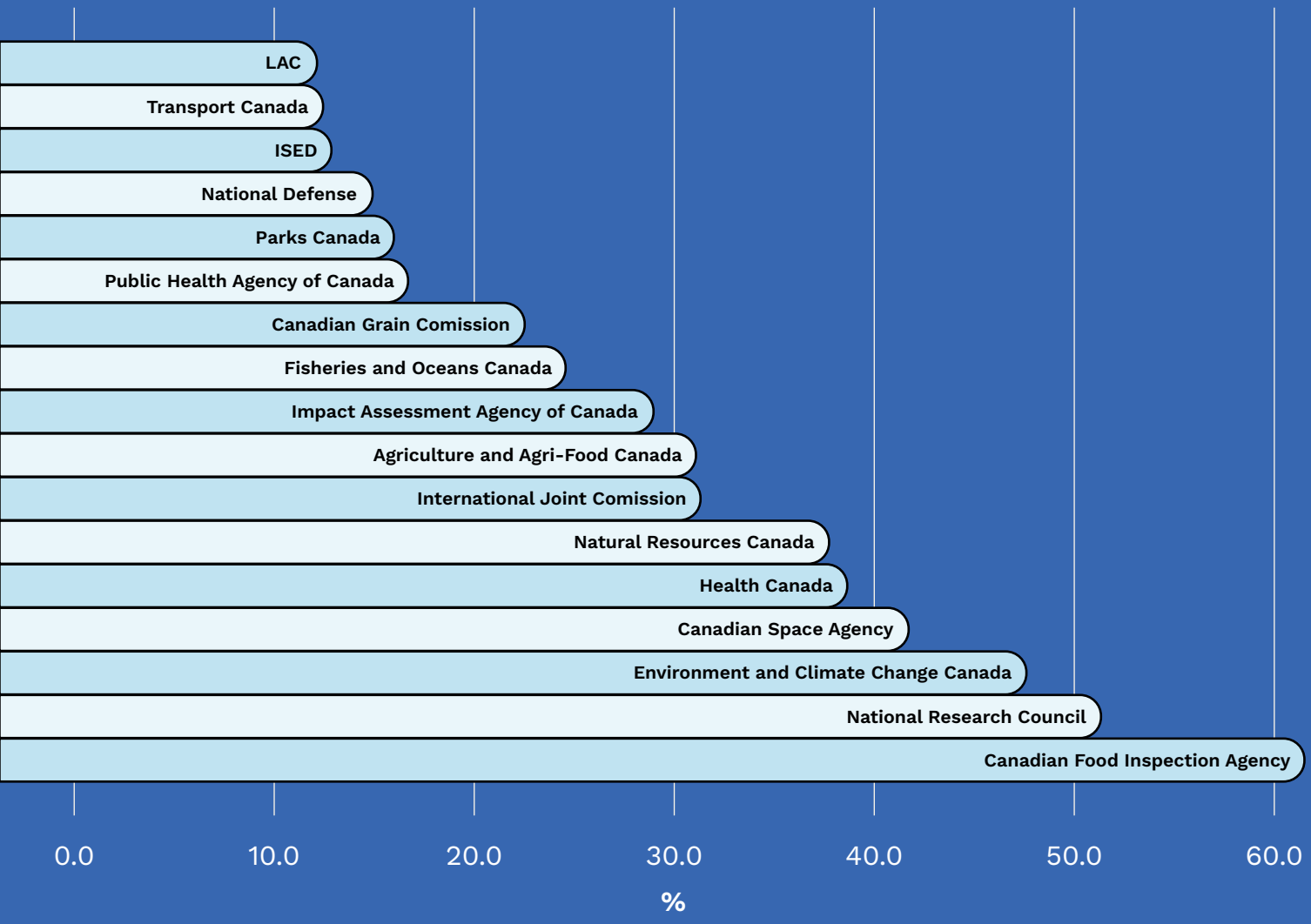
The chart shows the number of scientists, as defined in this report, by department or agency. For example, there were 1,773 scientists at Natural Resources Canada in March 2022.

**SOURCES**

TBS, Pay System; CFIA, NRC and PC.

Furthermore, in no fewer than 17 departments and agencies, at least 1 employee in 10 was in a scientific position in March 2022 (see Chart 2). In particular, almost two out of every three employees at the Canadian Food Inspection Agency are scientists; this proportion rises to almost 50% at the National Research Council of Canada and at Environment and Climate Change Canada.

## CHART 2: PROPORTION OF SCIENTISTS IN FEDERAL DEPARTMENTS AND AGENCIES IN MARCH 2022




**INTERPRETATION**

Each bar indicates the proportion of scientists, as defined in this report, among all employees of certain federal departments and agencies. For example, 38.2% of Health Canada employees were scientists in March 2022.

LAC: Library and Archives Canada

ISED: Innovation, Science and Economic Development Canada

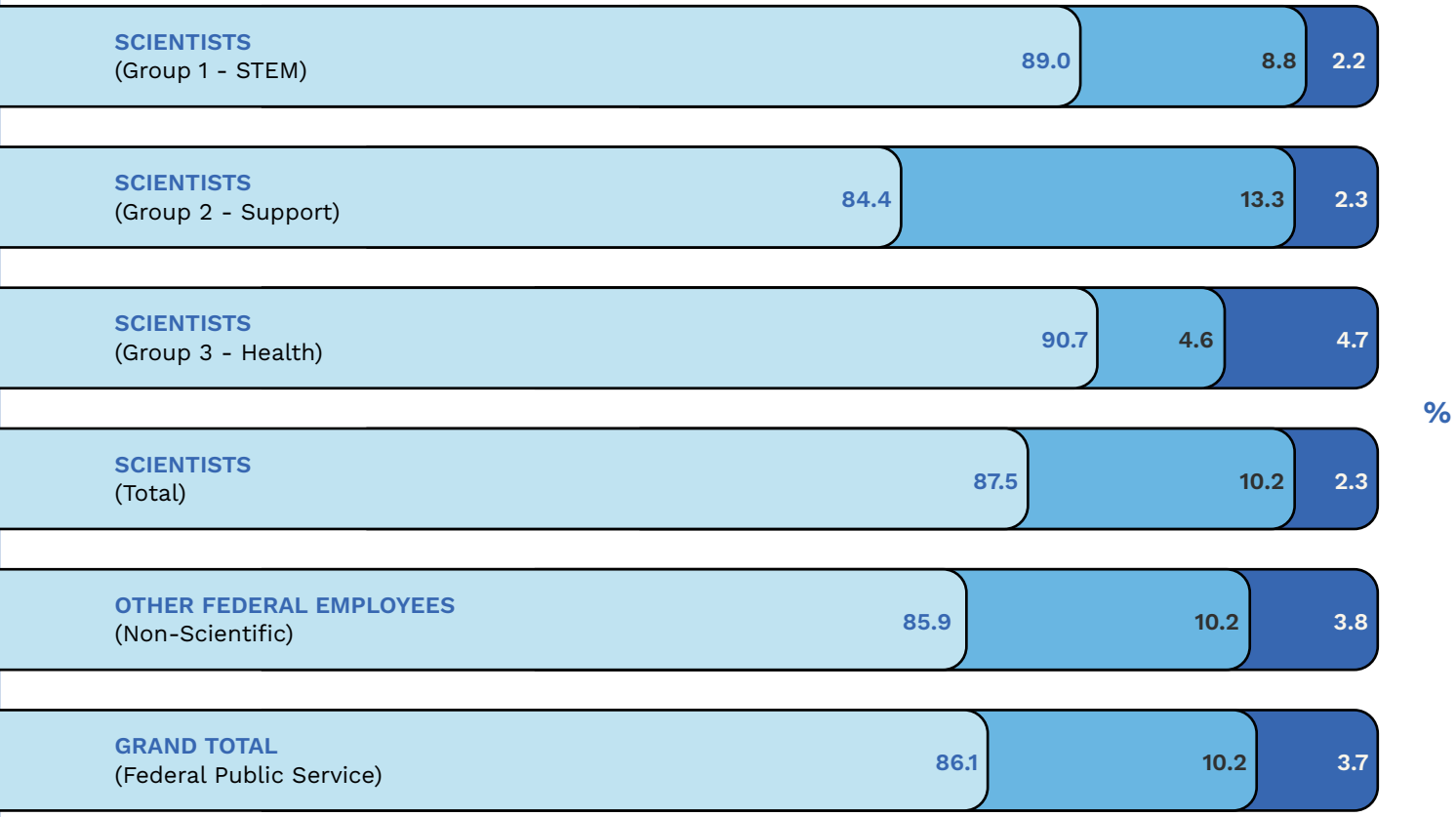
**SOURCES**

TBS, Pay System; CFIA, NRC and PC.

## TYPE OF POSITION HELD BY MEMBERS OF THE FEDERAL SCIENCE WORKFORCE

The vast majority of federal scientists are indeterminate employees; in other words, they have a permanent position in the public service. The EDGE report (2002) mentioned in Section 2 noted the considerable use of term appointments for scientists within the federal government. Therefore, it is notable that in March 2022, 87.5% of scientists held permanent positions, compared with 85.9% of other federal employees (see Chart 3). These data suggest that the recommendations made in the EDGE report to increase the proportion of permanent employees among scientists have been followed.

## CHART 3: TYPE OF POSITION HELD[1] BY SCIENTISTS AND OTHER FEDERAL EMPLOYEES IN MARCH 2022




**INTERPRETATION**

Each bar shows the proportion of permanent (indeterminate), term contract and casual employees for scientists and other federal (non-scientific) employees. The first three bars show data for subgroups of scientists (see Table 1). For example, 87.5% of federal scientists were permanent employees in March 2022.

**NOTE**

1 Calculations include only permanent (indeterminate) employees, contract (term) employees and casual employees. Students and other types of employees are excluded from the calculations

**SOURCES**

TBS, Pay System; CFIA, NRC and PC.

## AGE DISTRIBUTION OF FEDERAL SCIENTISTS

Considering only permanent employees, scientists tend to be slightly older than other federal employees. In fact, 24.5% of scientists are aged 55 and over, compared with 20.2% of other permanent employees of the federal government (see Chart 4).

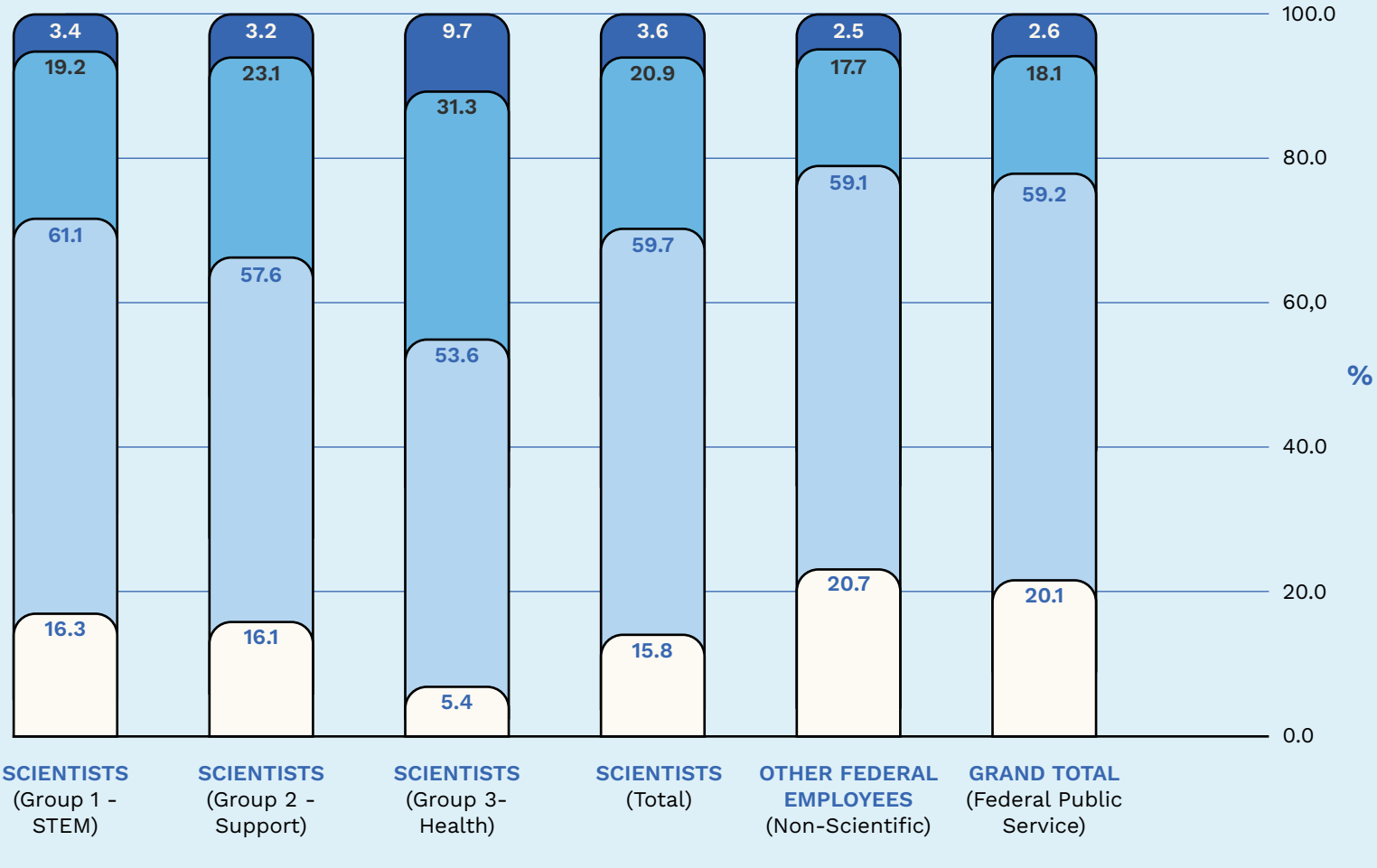
This difference is due in part to the group of health scientists: 41.0% of them were aged 55 or older in March 2022. On the other hand, they have on average fewer years of pensionable service.[4]

In fact, these differences are not surprising. These could be partly explained by the fact that the career paths of scientists, particularly physicians, are different in some respects from those of other employees in the federal public service. The length of study, and the fact that scientists' careers are not necessarily linear, mean that they are more likely to start a career in the federal public service later (e.g., as a result of a career change) and remain in their position beyond the age of 65.

4 According to core public administration data (see Box 2).

Chief Science Advisor M. Nemer and Deputy Minister C. Forbes visiting the AAFC Saskatoon Research and Development Center, July 2019

# CHART 4: AGE GROUPS OF SCIENTISTS AND OTHER FEDERAL EMPLOYEES IN PERMANENT POSITIONS IN MARCH 2022




**INTERPRETATION**

Each bar indicates the age group for scientists and other federal (non-scientific) employees. The first three bars show data for subgroups of scientists (see Table 1). For example, 59.7% of federal scientists were between 35 and 54 years old in March 2022.

**SOURCES**

TBS, Pay System; CFIA, NRC and PC.

## EMPLOYMENT EQUITY DESIGNATED GROUPS IN THE FEDERAL SCIENCE WORKFORCE

In 2021, the Clerk of the Privy Council published a call to action[5] reiterating the importance of equity, diversity and inclusion in the federal public service and the need for federal departments to adopt a proactive, systemic approach to recognizing, eliminating and preventing barriers to accessibility.[6] It is possible to examine the presence of these groups within the federal science workforce using existing data.

In 2022, women accounted for 42.6% of federal scientists (see Chart 5). There were more women than men in the health scientist group (54.1%), but the opposite was true in the Engineering and Scientific Support group (40.6%) and the STEM group (43.1%). Women made up 53.3% of the available Canadian workforce according to 2016 Census data,[7] based on certain factors related to federal government positions, though this is not necessarily representative of the proportion of women in S&T. For comparison, 39.3% of STEM graduates from Canadian universities in 2020 were women, according to Statistics Canada.[8] The proportion of faculty members at Canadian universities who identified themselves as women was 49.0% for 2019.[9] In addition, the representation of women among scientists in the federal government (42.6% in 2022) was slightly higher than the target of 38.6% set for June 2021 for the representation of women and gender minorities among Tier 1 and Tier 2 Canada Research Chairs. Based on Canada's population according to the 2016 Census, this target will be 50.9% of research chairs by 2029.[10]

In March 2022, 2.5% of federal scientists were Indigenous people. That is half the proportion of Indigenous people in the federal public service as a whole (5.1%). For comparison, the target for Indigenous representation among Tier 1 and Tier 2 Canada Research Chairs was 3.2% for June 2021 and 4.9% for 2029.[11] The proportion of faculty members at Canadian universities who identified themselves as Indigenous was 2.0% for 2019.[12] According to the 2021 Census, 5.0% of the Canadian population were Indigenous people.[13]

Persons with disabilities were also underrepresented among federal scientists (3.5% of scientists, compared with 6.0% of federal employees). For comparison, the target for the representation of persons with disabilities among Tier 1 and Tier 2 Canada Research Chairs was 5.5% for June 2021 and 7.5% for 2029.[14] Meanwhile, the proportion of Canadian university faculty members who self-identified as having a disability was 6.7% for 2019.[15]

Conversely, members of visible minorities (22.2%) had a higher representation among scientists, compared with all federal employees (20.0%) in March 2022. This is due to the proportions of members of visible minorities in the STEM group (25.3%) and the health scientist group (26.2%), which are significantly higher than in the Engineering and Scientific Support group (16.4%). For comparison, members of visible minorities made up 17.2% of the available Canadian workforce in 2016 according to the Treasury

5 https://www.canada.ca/en/privy-council/corporate/clerk/call-to-action-anti-racism-equity-inclusion-federal-public-service.html

6 Summary of the Accessible Canada Act – Canada.ca

7 See Treasury Board Secretariat (2023), based on the most recent data available at the time of writing. The Treasury Board Secretariat uses the workforce availability (WFA) indicator, which takes into account certain factors related to federal government positions (citizenship, age, training), but which does not specifically correspond to scientific positions.

8 Source: Statistics Canada, table 37-10-0164-01. These data were the most recent available at the time of writing. This includes short-cycle tertiary education, as well as bachelor's degrees or higher degrees.

9 Proportion of faculty and researchers identifying with selected socio-demographic characteristics, by academic role

10 Establishing equity targets for 2021 to 2029 (chairs-chaires.gc.ca)

11 Ibidem

12 Proportion of faculty and researchers identifying with selected socio-demographic characteristics, by academic role

13 See Statistics Canada (2022).

14 Establishing equity targets for 2021 to 2029 (chairs-chaires.gc.ca)

15 Proportion of faculty and researchers identifying with selected socio-demographic characteristics, by academic role

Board Secretariat,[16] based on certain factors related to federal government positions. However, members of visible minorities accounted for 43.2% of university STEM graduates in the Canadian workforce in 2016, and 50.8% in 2021.[17] The proportion of faculty members at Canadian universities who identified themselves as members of visible minorities was 19.4% for 2019.[18] In addition, the representation of federal scientists identifying themselves as members of visible minorities (22.2% in 2022) slightly exceeded the target of 21.4% set for June 2021 for the representation of members of racialized minorities among Tier 1 and Tier 2 Canada Research Chairs.[19] This target will be 22.0% of research chairs by 2029.

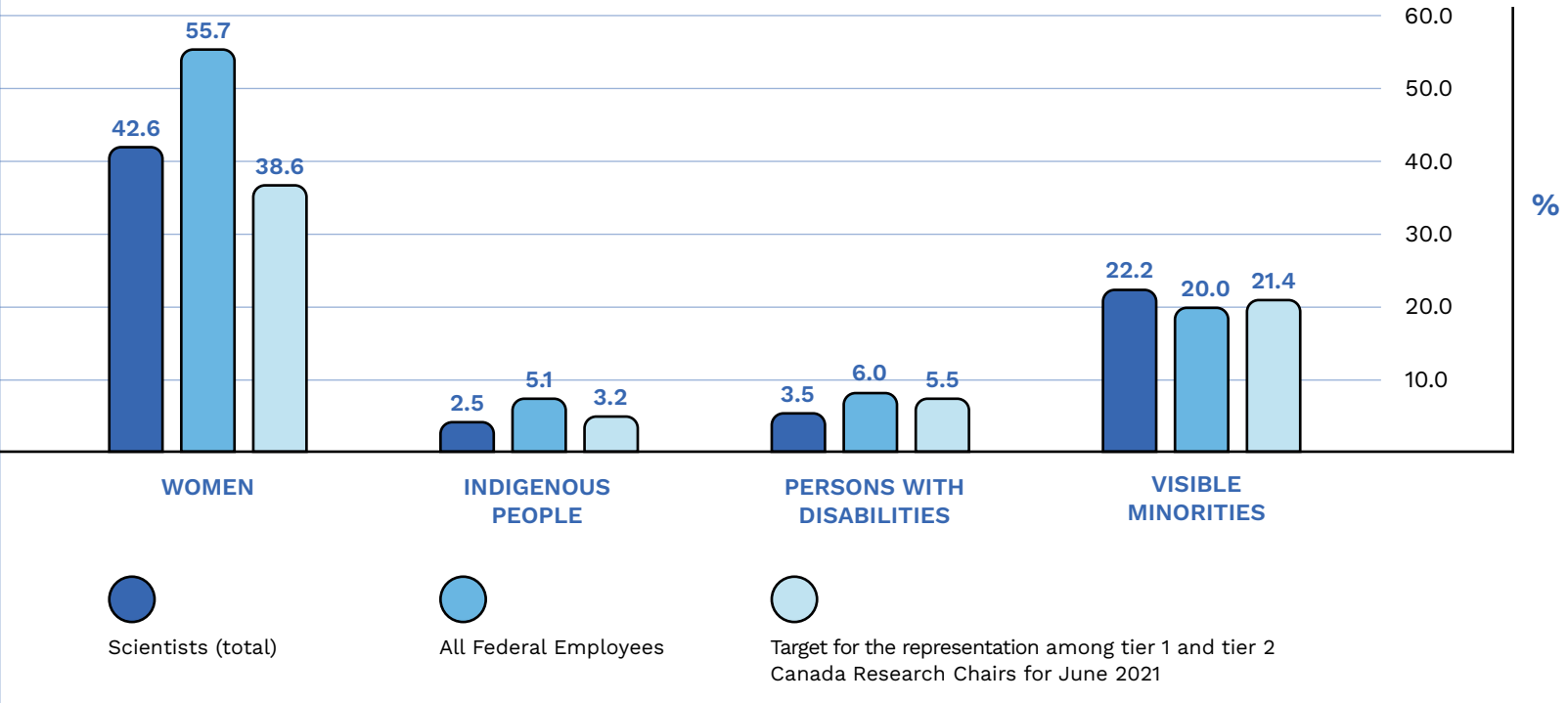
16 See Treasury Board Secretariat (2023). At the time of writing, these data had not been updated by the Treasury Board Secretariat, to our knowledge. Statistics Canada's Census of Population data indicate that members of visible minorities made up 21.6% of the workforce in 2016 (source: Statistics Canada, 2016 Census of Population, Statistics Canada catalogue number 98-400-X2016276) and 27.2% in 2021 (source: Statistics Canada, 2021 Census of Population, Statistics Canada catalogue number 98-10-0453-01).

17 Statistics Canada, 2016 Census of Population, Statistics Canada Catalogue number 98-400-X2016276 and Statistics Canada, 2021 Census of Population, Catalogue no. 98-10-0435-01. This includes university certificates or diplomas below the bachelor's degree, as well as bachelor's degrees or higher degrees. Census data on field of study refer only to the highest certificate, diploma or degree obtained by the respondent.

18 Proportion of faculty and researchers identifying with selected socio-demographic characteristics, by academic role

19 Establishing equity targets for 2021 to 2029 (chairs-chaires.gc.ca)

## CHART 5: REPRESENTATION OF EMPLOYMENT EQUITY DESIGNATED GROUPS IN THE FEDERAL GOVERNMENT IN MARCH 2022




**INTERPRETATION:**

Each vertical bar indicates the proportion of each employment equity designated group among federal scientists (left bars, in blue) and all federal employees (right bars, in light blue). For example, women accounted for 42.6% of federal scientists in March 2022.

**SOURCES**

TBS, Pay System; CFIA, NRC and PC; Canada Research Chairs.

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# Other topics of interest

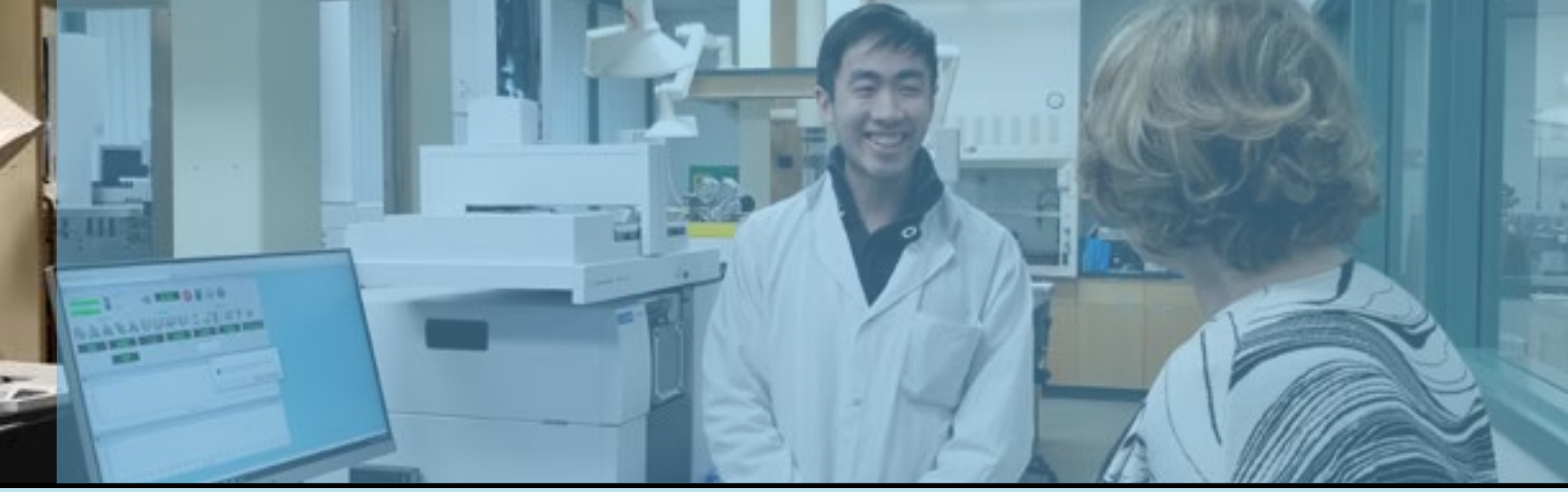
Existing data allow us to examine several questions or concerns about the federal science workforce, but for some questions additional data would be required. For example, data on the educational background (level and field of study) of federal employees would allow us to know how many people with science degrees work in non-science and/or management positions in the federal government. It would be useful, in this sense, to identify variables of interest and key information that could be added to existing databases to complement the information currently available.

Special attention could be paid to scientists in the social sciences and humanities. It is worth noting that the EC (Economics and Social Science Services) group, which includes a large proportion of federal employees in the social sciences and humanities, numbered 23,270 people in the core public administration in March 2022, nearly as many as all other scientists who were working there at the time (23,519 people). This group is divided into two main areas (Economics, Sociology and Statistics; Social Science Support) which include, in addition to scientific responsibilities, editing of legislation, provision of advice, and application of practical knowledge. It would be useful to be able to identify, within this occupational group, employees who are primarily engaged in scientific activities. For example, epidemiologists at the Public Health Agency of Canada fall into the EC group.

Other data sources could be used to analyze questions of interest for which we currently have only partial answers. For example, data from Statistics Canada's Postsecondary Student Information System (PSIS) provide information on the next generation of science and technology graduates. The Public Service Commission of Canada has data on applications for various positions to be filled, which can help identify certain recruitment issues. Finally, the Public Service Employee Survey (PSES) tracks the perceptions, attitudes and job satisfaction of science employees with regard to their employment in the public service.

Certain issues related to hiring or career pathways could be investigated in greater depth, in order to better assess the impact, if any, of variables such as language or membership in employment equity designated groups, or to compare science and non-science career paths.

Generally speaking, improvement would be needed in a number of areas to address the issue of the lack of data in order to conduct a more accurate assessment of real needs. Reliable evidence would help to better direct efforts to recruit, support and retain scientists within the federal public



Chief Science Advisor M. Nemer visiting ECCC's Pacific Environmental Science Centre facility in North Vancouver, BC, March 2019

service. The following shortcomings, among others, need to be addressed:

- Administrative data on scientists are not collected systematically;
- TBS data do not include information on the academic training or qualifications of federal employees;
  - The Public Service Commission collects this information for competitions, but the information is not comprehensive;[20]
  - It is not possible to systematically identify the level (bachelor's, master's, doctorate) or field of academic training of current employees;
  - The number of scientifically trained federal government employees in non-science positions is not known;
- It is difficult to compare the federal government's science workforce with that of other sectors, such as academia or industry, or with that of other countries, since its occupational groups are very specific to Canada's federal public service;
- Since TBS data do not include information on the previous employment or experience of federal employees, we are not able to assess the diversity and sectoral mobility of scientists;
- It is very difficult to conduct an in-depth analysis of scientists in the social sciences and humanities;
- Data on current employees provide little relevant information about recruitment. Other sources would therefore be necessary in order to estimate:
  - current vacancies in the federal public service;
  - future graduates who will join the labour market (for example, by consulting Statistics Canada data on student enrolment in colleges and universities);
  - the current available workforce; in this respect, it would be interesting to calculate an indicator such as workforce availability (WFA)[21] specifically for scientists;
- Statistics on mobility within the public service report on actual movements but do not offer information on intentions, reasons, constraints and difficulties in terms of mobility;
- With regard to mobility and departures (resignations, retirements, etc.), the current analytical potential of available data is limited to making comparisons with the rest of the federal public service;

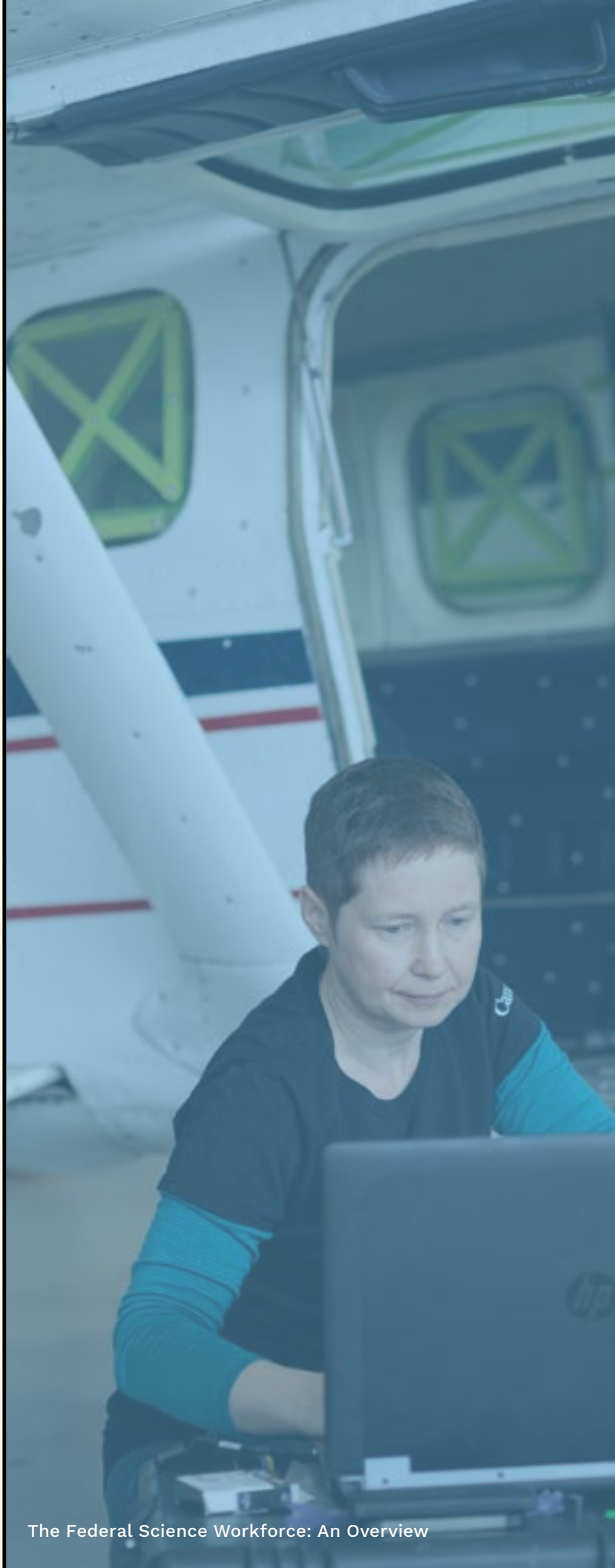
20 Only information on relevant (required) degrees for the position is compiled, and it is not subsequently updated in the employee file.

21 See Employment Equity in the Public Service of Canada for Fiscal Year 2021 to 2022 - Canada.ca.

- Without sufficiently detailed information on the Canadian government's scientific programs and activities, it is difficult to judge whether the federal science workforce is adequately meeting the government's needs;
- There should be further exploration of the analytical potential of the Executive Talent Management System (ETMS) database, with the aim of gaining a better understanding of the profiles and career pathways of senior executives managing the scientific community. This would also serve to gain a better understanding of the diversity of senior management education, for example to identify those with a scientific background. According to the Treasury Board Secretariat, which manages this administrative database, 22% of federal government executives had a STEM degree (based on voluntary self-identification) in March 2021. However, the ETMS has certain limitations that could affect the quality of the data,[22] notably, that it is based on a self-administered questionnaire intended to allow managers to be assessed.

It would also be useful to systematically collect qualitative data on the measures taken by departments to address the concerns expressed in the various reports cited in Section 2, concerning the management of science activities in science-based departments.

**22** For more information on these limitations, see the TBS's Evaluation of the Performance Management Program for Executives – Canada.ca.



NRC staff at the Aerospace Research Center, Ottawa, ON

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# Conclusion, reflections and next steps

Numerous reports over the last few decades have produced various observations and recommendations regarding the recruitment, management and career development of federal scientists. The review and synthesis presented in these pages show that action is needed to collect data from the scientific workforce and to follow up on the many analyses and recommendations made in previous reports.

In this respect, it is important to be able to objectively gauge the effects of the measures taken and the efforts made. With better integrated information and well-planned data collection, we could determine whether significant progress has been made and what concrete steps have been taken to this end. This information would also enable us to identify any issues related to scientific activity within the federal government, for example in terms of equity, diversity and inclusion. It may also be interesting to document immigration's contribution to the federal science workforce, or to assess the impact of COVID-19 and climate change on the federal government's scientific workforce and activities.

Compiling statistical data from different sources presents some logistical and conceptual challenges, including obtaining consistent data in a timely manner from institutions that may not have the required information or the operational capacity to extract and provide the requested data.

DRDC staff studying the effects of hypoxia on pilots in the CAF.

The Office of the Chief Science Advisor of Canada proposes to work with all relevant players in this project, including Statistics Canada, the Public Service Commission and the Treasury Board Secretariat, to address this important need. The aim is to develop tools that will enable the federal government to ensure the vitality of its scientific workforce, and thus guarantee its ability to act in the face of the challenges of today and tomorrow. This process involves a number of steps:

1. Adopt a long-term data collection strategy to gather the information needed to monitor the evolution of the federal science workforce;
2. Review the definition of the science workforce, to ensure that it includes all functional categories involved in scientific activities (e.g., the creation of new knowledge, technology transfer, regulatory work, etc.);
3. Identify the type and source of data needed to document the career paths of federal scientists to support the development of their leadership skills;
4. Develop indicators targeting issues that are specific to the federal science workforce;
5. Determine which federal institution should be in charge of collecting data on the federal science workforce and ensuring regular updates, following the FAIR principles recommended by Statistics Canada,[23] which aim to make data easy to find, accessible, interoperable and reusable.

The statistical analyses presented in this report give only a glimpse of the federal science workforce and the potential of the data currently available. The Office of the Chief Science Advisor of Canada intends to produce complementary reports on various themes. Priority themes include the evolution of the federal science workforce over the past two decades, including the representation of employment equity designated groups, particularly women; and hiring, promotions and departures among federal scientists. These data are essential for the federal government in supporting long-term planning for its science workforce, in updating its human resources practices and policies, and more generally, in guiding its overall scientific activities.

The federal science workforce plays a key role in Canadian society through the quality of its research, the depth of its analyses and the insight of its advice. Its creativity, professionalism and desire to act for the well-being of all Canadians make it a source of national pride.

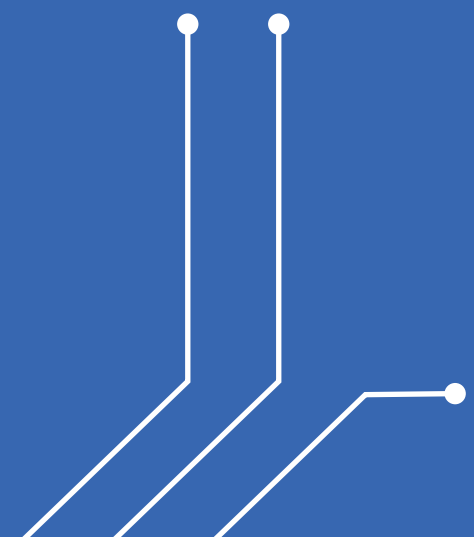
23 Statistics Canada Open Science Action Plan (statcan.gc.ca)

## NOTE ON DEFINITIONS AND DATA

The definition of the federal science workforce proposed in this report (see Box 1) is based on a number of methodological choices. This definition has been selected solely for the purposes of the analyses proposed in this report, and it is neither official nor definitive.

For the sake of simplicity, the Office of the Chief Science Advisor of Canada (OCSA) has chosen to conduct this study solely on the basis of existing data. The federal government has administrative data on its workforce. Since these data are not collated specifically for the study of the federal science workforce, they have a number of limitations that have guided methodological choices and restricted options for defining the federal science workforce. However, the benefits of using existing administrative data clearly outweighed these limitations.

The definition of the federal science workforce proposed in this report is the sole responsibility of OCSA. The Treasury Board Secretariat and other institutions have produced the data according to the specifications provided by the OCSA and are in no way responsible for the choices made in relation to this definition. The number of scientists and the statistical portrait of the federal science workforce presented in this report might have been slightly different if another definition had been used.



## DATA SOURCES

Data for all departments and agencies of the core public administration (CPA) come from the Treasury Board Secretariat (TBS) Regional Pay System, using the People Information Management Automated Request Tracker (PIMART), as of March 31, 2022.

Information provided by TBS on employment equity designated groups comes from the Regional Pay System and the Employment Equity Data Bank. These data concern employees identified for employment equity purposes in the Employment Equity Regulations. Data on the representation of Indigenous people, members of visible minorities and persons with disabilities are based on self-identification (voluntary declaration). Employees can choose whether or not to self-identify; it is not mandatory. As a result, it is possible that the data do not accurately reflect the total number of employees belonging to each of the employment equity designated groups. The sum of the designated groups does not equal the total because employees can self-identify in more than one designated group.

The core public administration consists of the departments and agencies named in schedules I and IV of the Financial Administration Act (FAA). Treasury Board is the employer for this segment of the federal public service.

Information concerning other separate agencies and institutions, such as the Canadian Food Inspection Agency (CFIA), the National Research Council of Canada (NRC) and Parks Canada (PC), was obtained directly from these organizations. The TBS regional pay system includes some CFIA and PC workforce data, but these are not necessarily homogeneous with CPA data.

For further details concerning the data, please contact us directly at data.donnees@ocsa-bcsc.gc.ca.

Appendices

# Appendix A – Bibliography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xvii. Statistics Canada. Table 37-10-0164-01: Postsecondary graduates (Canada, 2022).

xviii. Statistics Canada. Table 98-10-0435-01: 2021 Census of Population (Canada, 2022).

xix. Statistics Canada. Statistics Canada's Open Science Action Plan (Canada, 2022).

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xxi. Statistics Canada (2023). The Daily – Number and salaries of full-time teaching staff at Canadian universities, 2021/2022.

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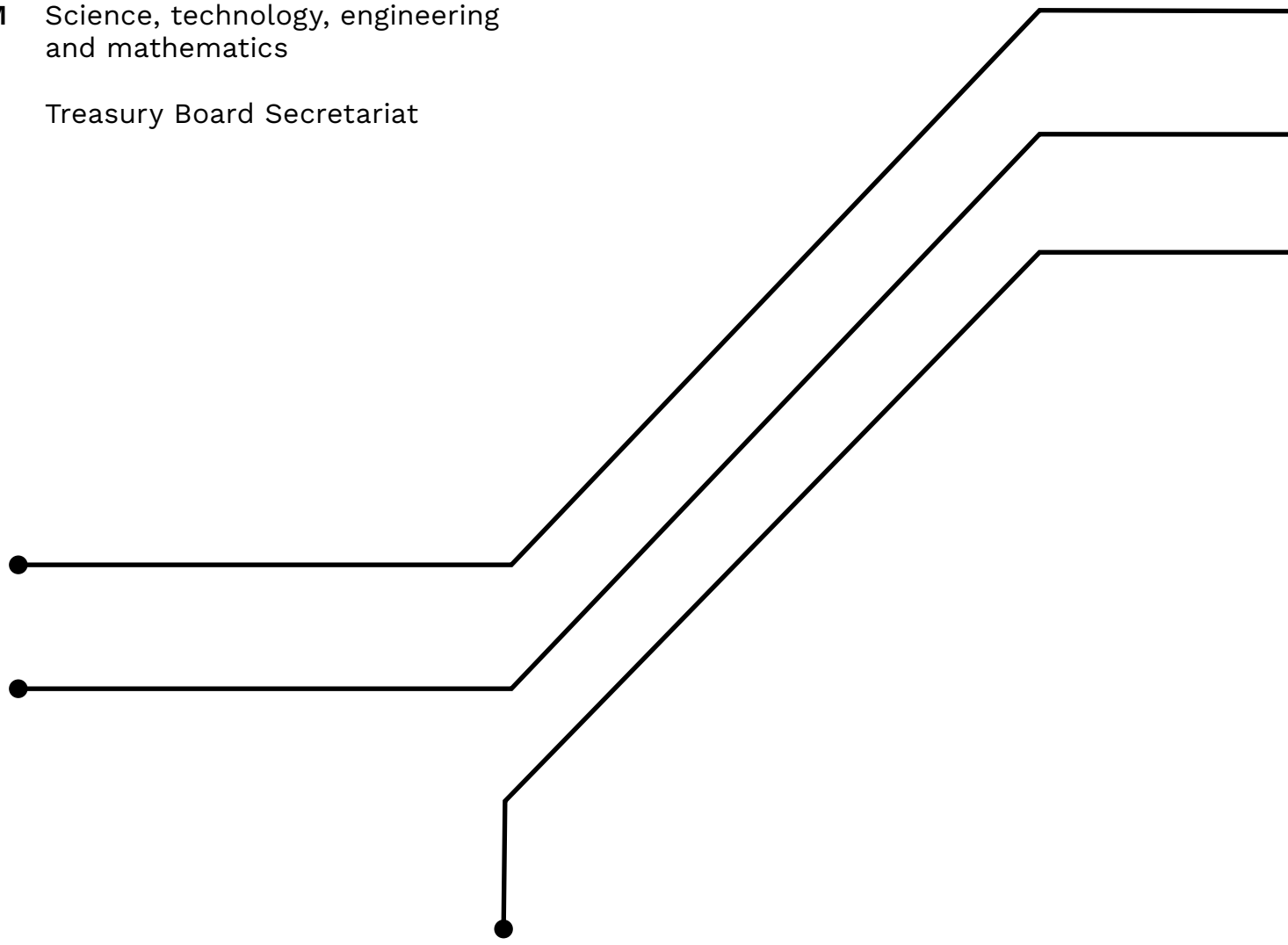
xxiii. Treasury Board Secretariat (2023). Employment Equity in the Public Service of Canada for Fiscal Year 2021 to 2022.

# Appendix B – Acronyms

| | |
|---|---|
| **CFIA** | Canadian Food Inspection Agency |
| **CPA** | Core public administration |
| **NRC** | National Research Council of Canada |
| **PC** | Parks Canada |
| **R&D** | Research and development |
| **S&T** | Science and technology |
| **STEM** | Science, technology, engineering and mathematics |
| **TBS** | Treasury Board Secretariat |



# Appendix C – Core public administration departments and agencies

## DEPARTMENTS AND ORGANIZATIONS WITH AT LEAST ONE SCIENTIST (IN MARCH 2022)

- Administrative Tribunals Support Service of Canada
- Agriculture and Agri-Food Canada
- Canada Border Services Agency
- Canadian Grain Commission
- Canadian Heritage
- Canadian Radio-Television and Telecommunications Commission
- Canadian Space Agency
- Canadian Transportation Agency
- Correctional Service of Canada
- Crown-Indigenous Relations and Northern Affairs Canada
- Department of Justice
- Department of National Defence
- Elections Canada
- Employment and Social Development Canada
- Environment and Climate Change Canada
- Fisheries and Oceans Canada
- Global Affairs Canada
- Health Canada
- Immigration, Refugees and Citizenship Canada
- Impact Assessment Agency of Canada
- Indigenous Services Canada
- Infrastructure Canada
- Innovation, Science and Economic Development Canada
- International Joint Commission
- Library and Archives Canada
- Natural Resources Canada
- Patented Medicine Prices Review Board Canada
- Public Health Agency of Canada
- Public Safety Canada
- Public Services and Procurement Canada
- Royal Canadian Mounted Police (Civilian Staff)
- Shared Services Canada
- Statistics Canada
- Transport Canada
- Transportation Safety Board of Canada
- Treasury Board of Canada Secretariat
- Veterans Affairs Canada

# Appendix C – Core public administration departments and agencies (continued)

## DEPARTMENTS AND ORGANIZATIONS WITH NO SCIENTISTS (IN MARCH 2022)

- Accessibility Standards Canada
- Atlantic Canada Opportunities Agency
- Canada Economic Development for Quebec Regions
- Canada Human Rights Commission
- Canada School of Public Service
- Canadian Dairy Commission
- Canadian Intergovernmental Conference Secretariat
- Canadian Northern Economic Development Agency
- Civilian Review and Complaints Commission for the RCMP
- Copyright Board Canada
- Courts Administration Service
- Department of Finance Canada
- Federal Economic Development Agency for Southern Ontario
- Federal judges who are not part of any government department
- Immigration and Refugee Board of Canada
- Military Grievances External Review Committee
- Military Police Complaints Commission of Canada
- Office of the Commissioner for Federal Judicial Affairs Canada
- Office of the Commissioner of Lobbying of Canada
- Office of the Commissioner of Official Languages
- Office of the Public Sector Integrity Commissioner of Canada
- Office of the Secretary to the Governor General
- Offices of the Information and Privacy Commissioners of Canada
- Parole Board of Canada
- Privy Council Office
- Public Prosecution Service of Canada
- Public Service Commission of Canada
- RCMP External Review Committee
- Registrar of the Supreme Court of Canada
- Secretariat of the National Security and Intelligence Committee of Parliamentarians
- Veterans Review and Appeal Board
- Western Economic Diversification Canada
- Women and Gender Equality Canada

# Appendix D – Organizations outside the core public administration included in this report

- Canadian Food Inspection Agency
- National Research Council of Canada
- Parks Canada