USGS
science for a changing world

USGS Leadership 201, July 2014

Women in the work force: trends in USGS and beyond

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Climate and Land Use Change

Outline

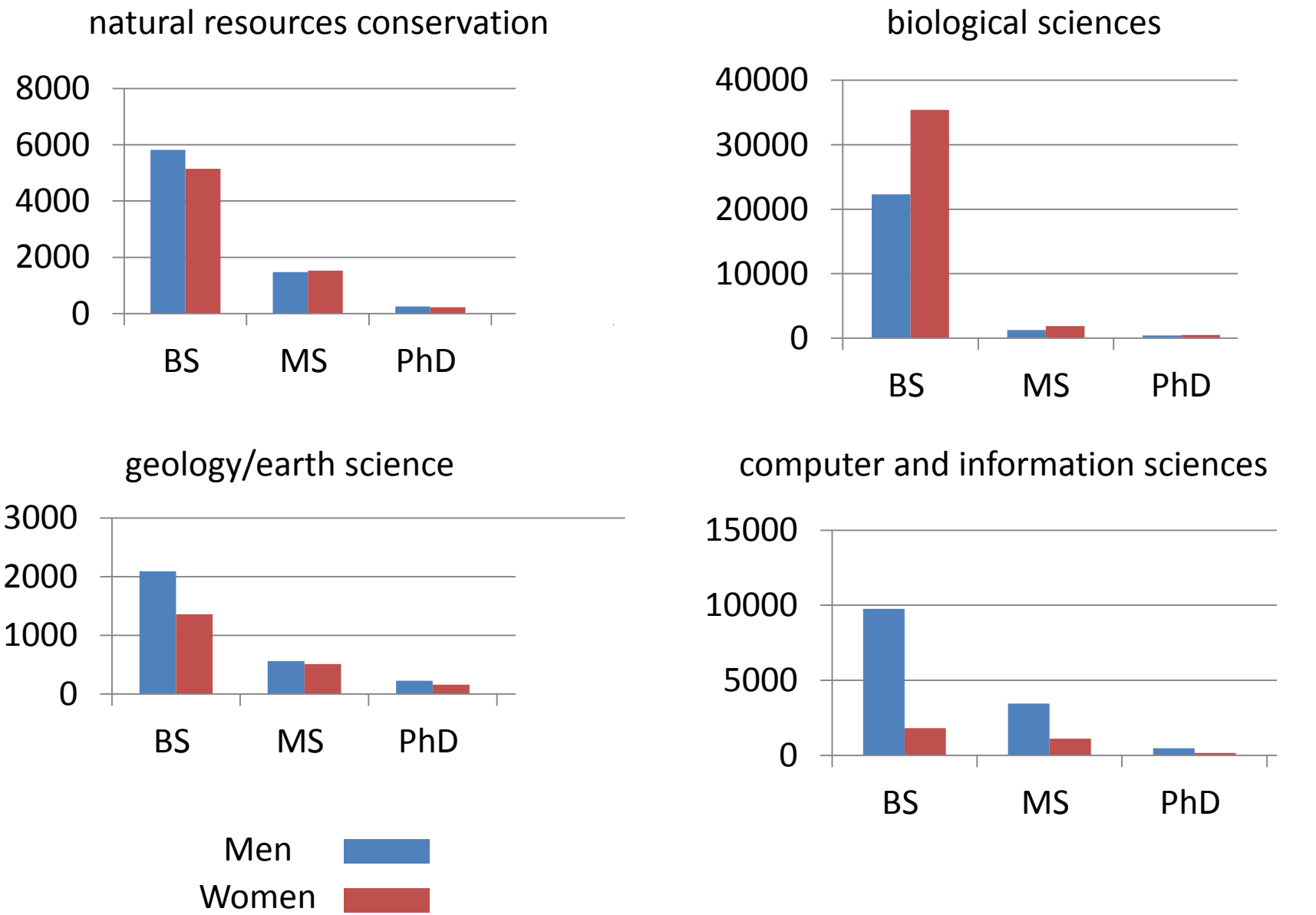
- trends in the number of trained men and women in science and engineering fields
- assimilation of these graduates into the U.S. workforce
- problems universities face in recruiting, retaining and advancing women in science and engineering
- status of women scientific professionals in the Federal workforce and within the USGS
- some initial dialogue about ways to enhance the success of women in science roles at the USGS

Some recent statistics from the National Academy of Sciences

- In 2004, 50.4 percent of all science and engineering bachelor's degrees went to women. Women received the majority of bachelor's degrees in the agricultural sciences, biological sciences, oceanography, and chemistry, and they were awarded more than 40 percent of the bachelor's degrees in the earth sciences, mathematics and statistics, and atmospheric and other physical sciences, excluding physics.
- The number of women receiving Ph.D.s in science and engineering increased from 31.7 percent (in 1996) to 37.7 percent (in 2005).
- The percentage of women among doctoral scientists and engineers employed full-time, rose from 17 percent in 1995 to 22 percent in 2003.
- However, women continued to be underrepresented among academic faculty relative to the number receiving S&E degrees. In 2003, women comprised between 18 and 45 percent of assistant professors in S&E and between 6 and 29 percent of associate and full professors.

National Academies Press, 2010

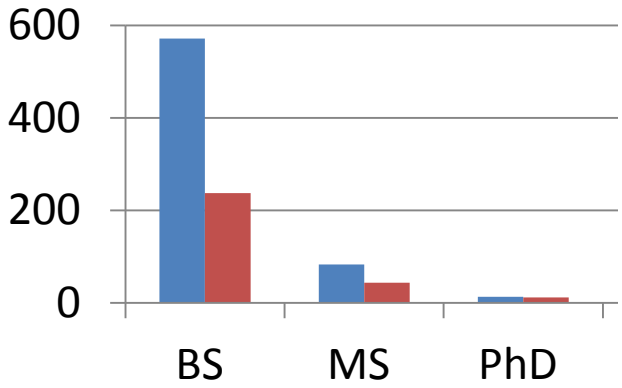
U.S. College Degrees Awarded, 2009-2010, in a few fields relevant to the USGS mission



U.S. College Degrees Awarded

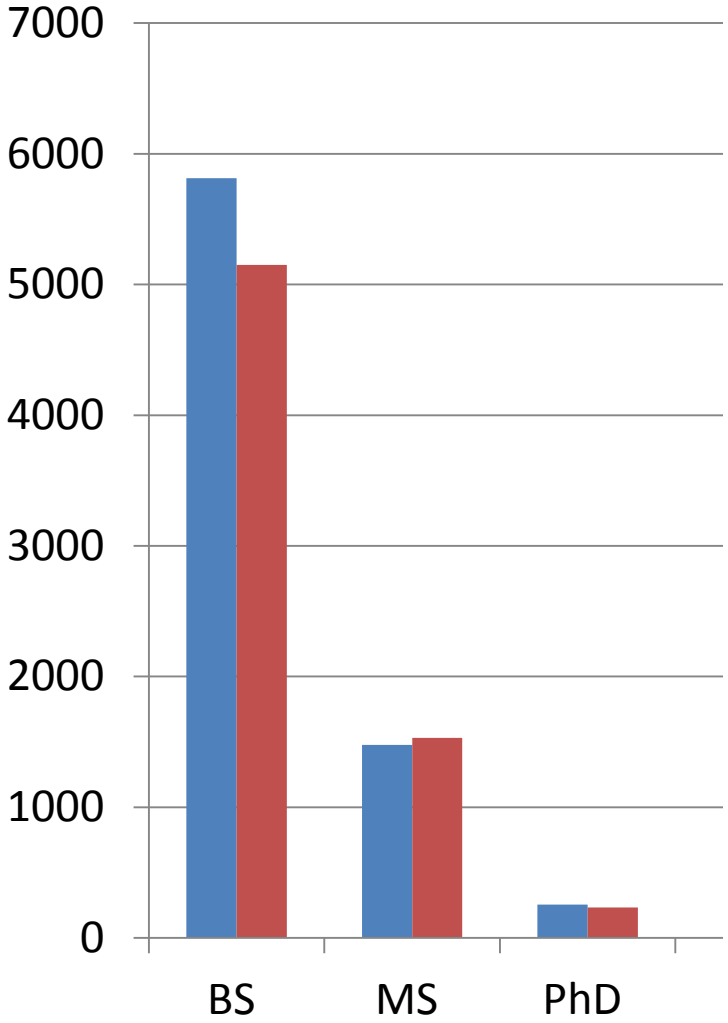
1991-1992

natural resources conservation

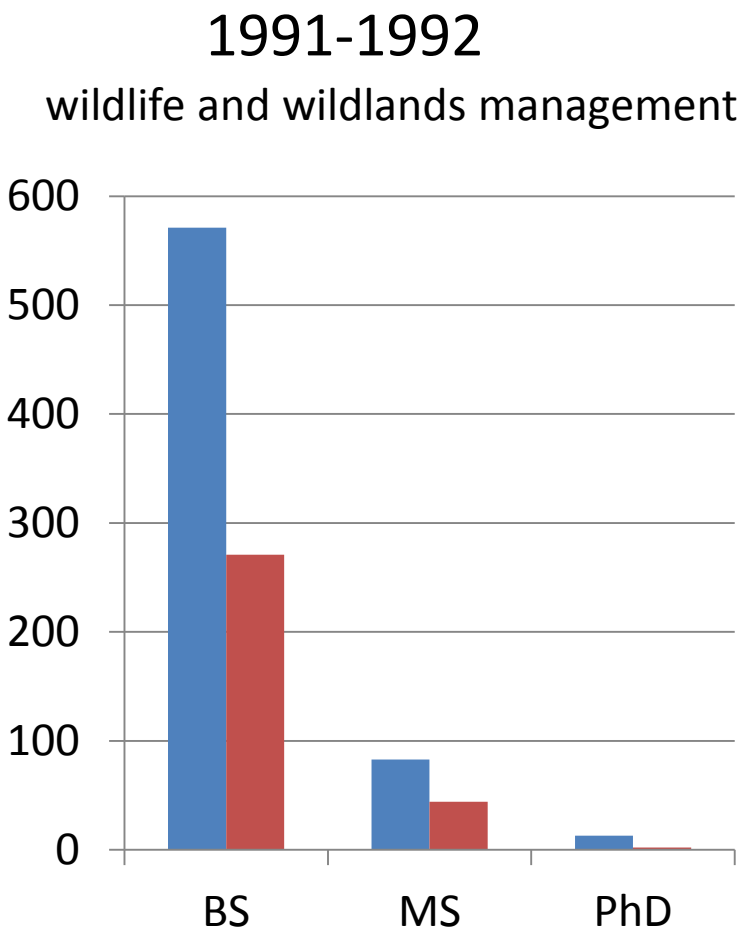


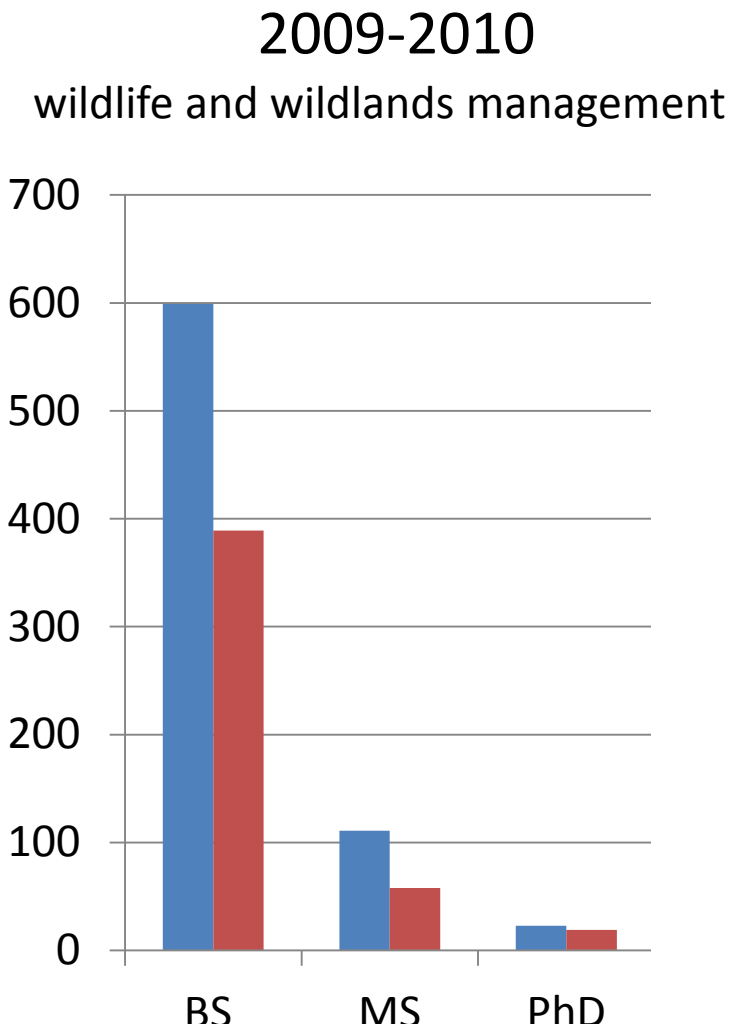
2009-2010

natural resources conservation



U.S. College Degrees Awarded





Men
Women

The U.S. Labor Force in 2008, for select scientific fields

Total holding BS degree or higher	men	women
Biological sciences	1,019,000	939,000
Earth/atmosphere/ocean sciences	156,000	141,000
Computer/information sciences	900,000	379,000

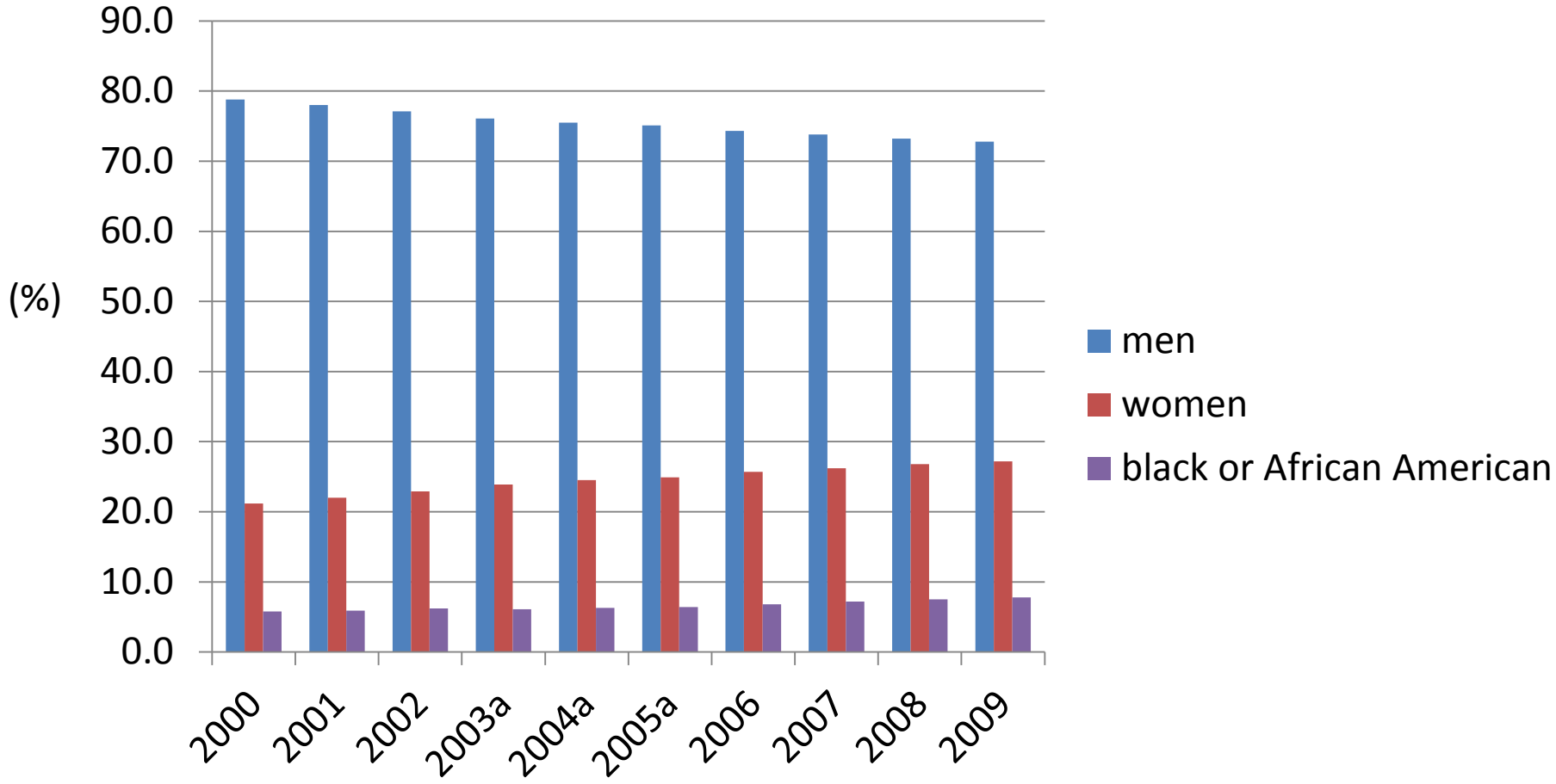
Holding Doctoral degree	men	women
Biological sciences	130,000	74,000
Earth/atmosphere/ocean sciences	18,000	4,000
Computer/information sciences	21,000	3,000

Median Annual Workforce Salary (2008)

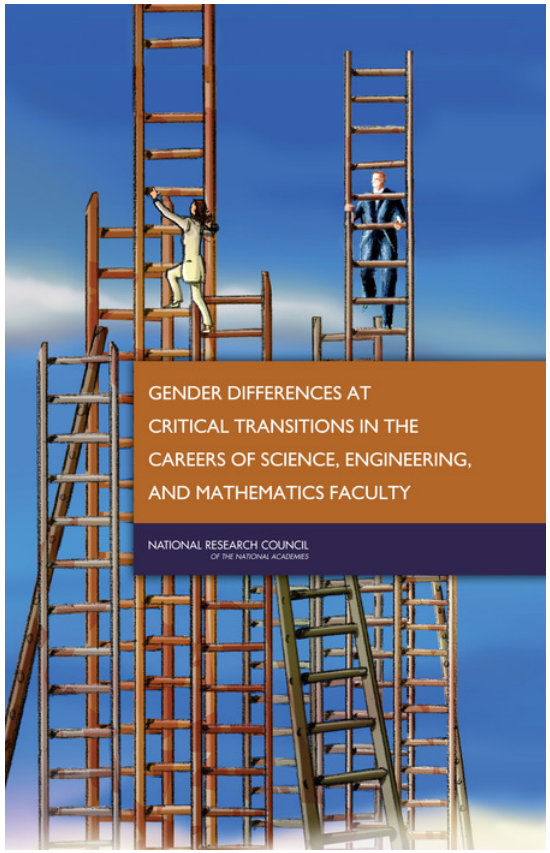
All employees, BS degree and above	men	women
Biological sciences	$ 65,000	$ 45,000
Earth/atmosphere/ocean sciences	76,000	53,000
Computer/information sciences	82,000	68,000

Holding Doctoral degree	men	women
Biological sciences	$ 95,000	$ 71,000
Earth/atmosphere/ocean sciences	89,000	53,000
Computer/information sciences	103,000	99,000

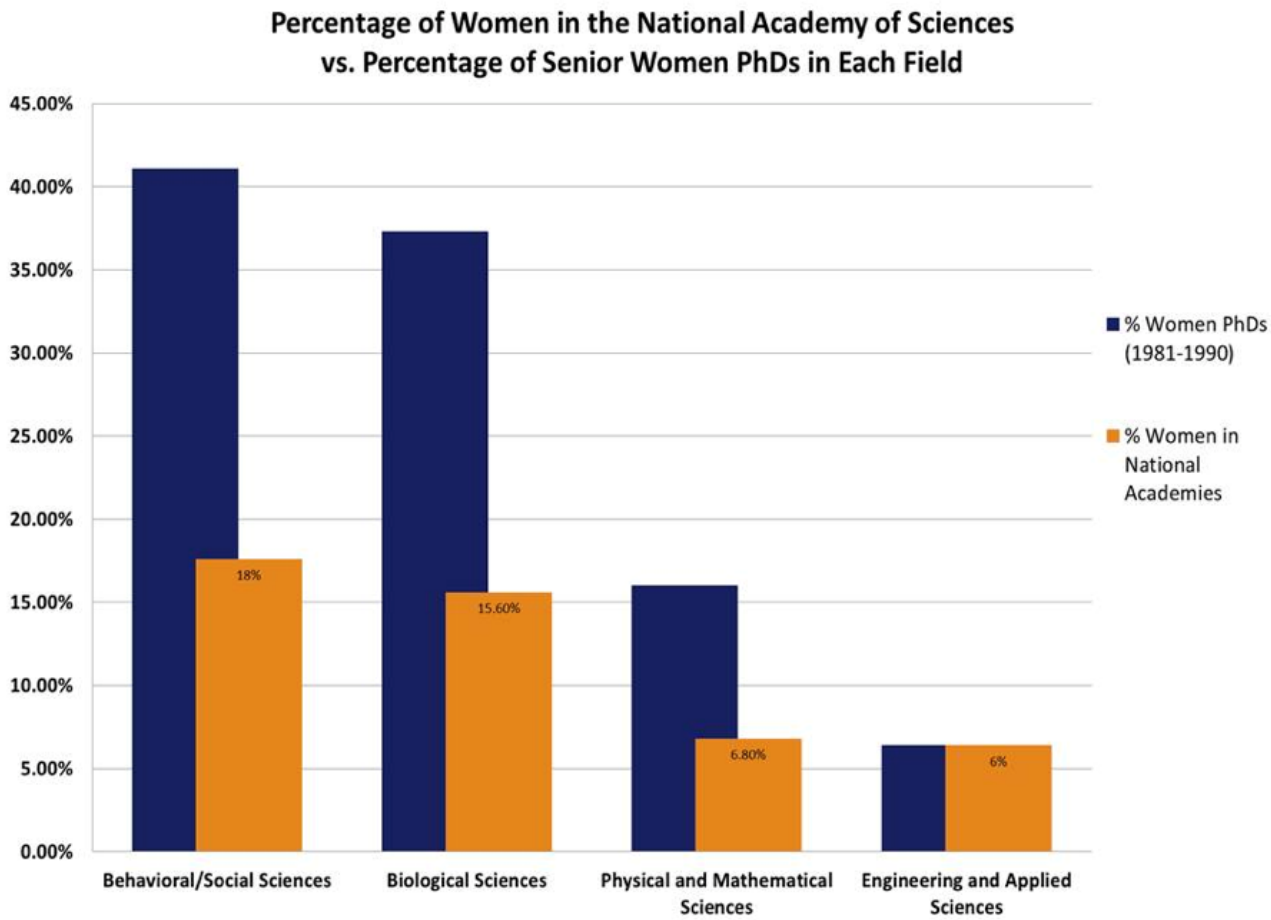
Federal scientists and engineers, by sex and race/ethnicity: 2000–09



SOURCE: National Science Foundation/Division of Science Resources Statistics, 2011, tabulations from data provided by the Office of Personnel Management.

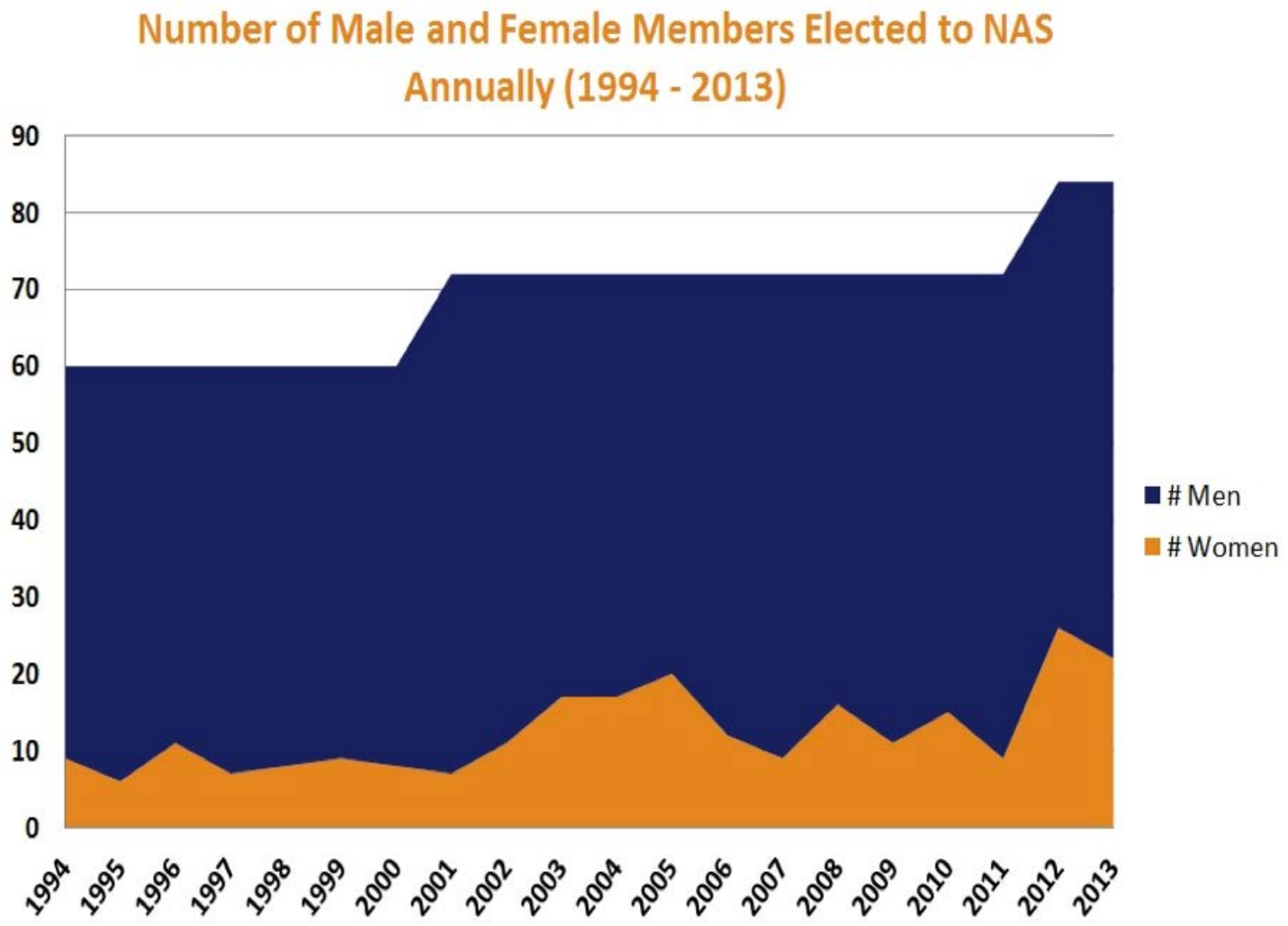


National Academies Press, 2010



Percentage of Women Elected to the National Academies 2002-2012 vs. Percentage of Senior Women PhDs in Each Field 1981-1990

National Academy of Sciences (NAS) - Annual Record of Elections:



National Academies Press, 2010

Highlights from "**Gender Differences at Critical Transitions in the Careers of Science, Engineering and Mathematics Faculty**", (NRC, 2010)

- In every field, women were underrepresented among candidates for tenure relative to the number of female assistant professors. Most strikingly, women were most likely to be underrepresented in the fields in which they accounted for the largest share of the faculty—biology and chemistry.
- Although time in rank as an assistant professor has increased over time for both men and women, women showed significantly longer durations than men.
- It is difficult to determine whether these apparent differences may be explained, at least in part, by individual and departmental characteristics such as length of postdoctoral experience and stopping-the-tenure-clock for family leave. Both male and female faculty spent more time in the assistant professor ranks at institutions of higher prestige. Women comprised a particularly small percentage of tenured scientists and engineers in universities and 4-year colleges in 2001 (NSF, 2006).
- Several studies found women had higher attrition rates than men both prior to and after tenure was granted (August, 2006; August and Waltman, 2004; Carter et al., 2003; Trower and Chait, 2002).

Percentage of women faculty in 2004 (based on a survey of 500 college and university departments, 85% response rate)	
Biological and agricultural sciences	21.7%
Engineering	6.2%
Computer and information science	17.7%
Mathematics and statistics	11.9%

- We do not know, for example, what happens to the significant percentage of female Ph.D.s in science and engineering who do not apply for regular faculty positions at RI institutions, or what happens to women faculty members who are hired and subsequently leave the university.

- Male and female faculty who stopped the tenure clock spent significantly more time as assistant professors than those who did not (an average of 74 months compared to 57 months). They had a lower chance of promotion to associate professor (about 80 percent) at any time (given that they had not been promoted until then) than those who did not stop the clock. Everything else being equal, however, stopping the tenure clock did not affect the probability of promotion and tenure; it just delayed it by about 1.5 years.
  - 19.7 percent of female assistant professors in the NAS survey sample availed themselves of this policy compared to 7.4 percent of male assistant professors.

TABLE S-1 Representation of Women in Faculty Positions at Research I Institutions by Rank and Field (percent), 1995-2003

	Assistant Professor					Associate Professor					Full Professor				
	1995	1997	1999	2001	2003	1995	1997	1999	2001	2003	1995	1997	1999	2001	2003
Agriculture	17.8	18.6	19.6	18.1	27.2	12.7	12.5	10.7	17.6	13.9	4.9	5.2	6.1	6.6	8.0
Biology	35.6	38.2	36.0	37.0	38.8	26.0	24.3	26.3	30.2	31.2	14.0	14.7	15.8	18.0	20.8
Engineering	14.2	12.7	12.8	14.8	16.6	4.8	6.4	9.6	9.3	11.7	1.8	1.4	2.3	2.7	3.8
Health Sciences	69.1	66.9	64.0	64.7	66.5	65.6	65.1	64.9	64.5	59.1	35.1	38.9	45.3	48.0	59.0
Mathematics	18.7	22.0	26.5	25.2	26.6	10.4	14.4	14.9	15.8	16.3	7.6	5.9	9.9	10.0	9.7
Physics	25.1	25.6	24.6	25.4	24.1	9.5	13.4	14.8	16.7	19.5	4.3	4.6	5.9	6.8	7.6

SOURCE: National Science Foundation, Survey of Doctorate Recipients, 1995-2003. Tabulated by the National Research Council.

Women in STEM fields spend significantly longer time in rank as assistant professors.

TABLE 3-10 Number of Policy Steps Taken by Departments

Number of Departments	Number of Steps Reported Taken
96 (23)	0
178 (43)	1
98 (24)	2
34 (8)	3
10 (2)	4
0 (0)	5
1 (0)	6

NOTES: Numbers in parentheses are the percentage of all responding departments; 417 departments responded. Of these, 98 (24 percent) took two policy steps to increase the gender diversity of the candidate pool.
SOURCE: Survey of departments carried out by the Committee on Gender Differences in Careers of Science, Engineering, and Mathematics Faculty.

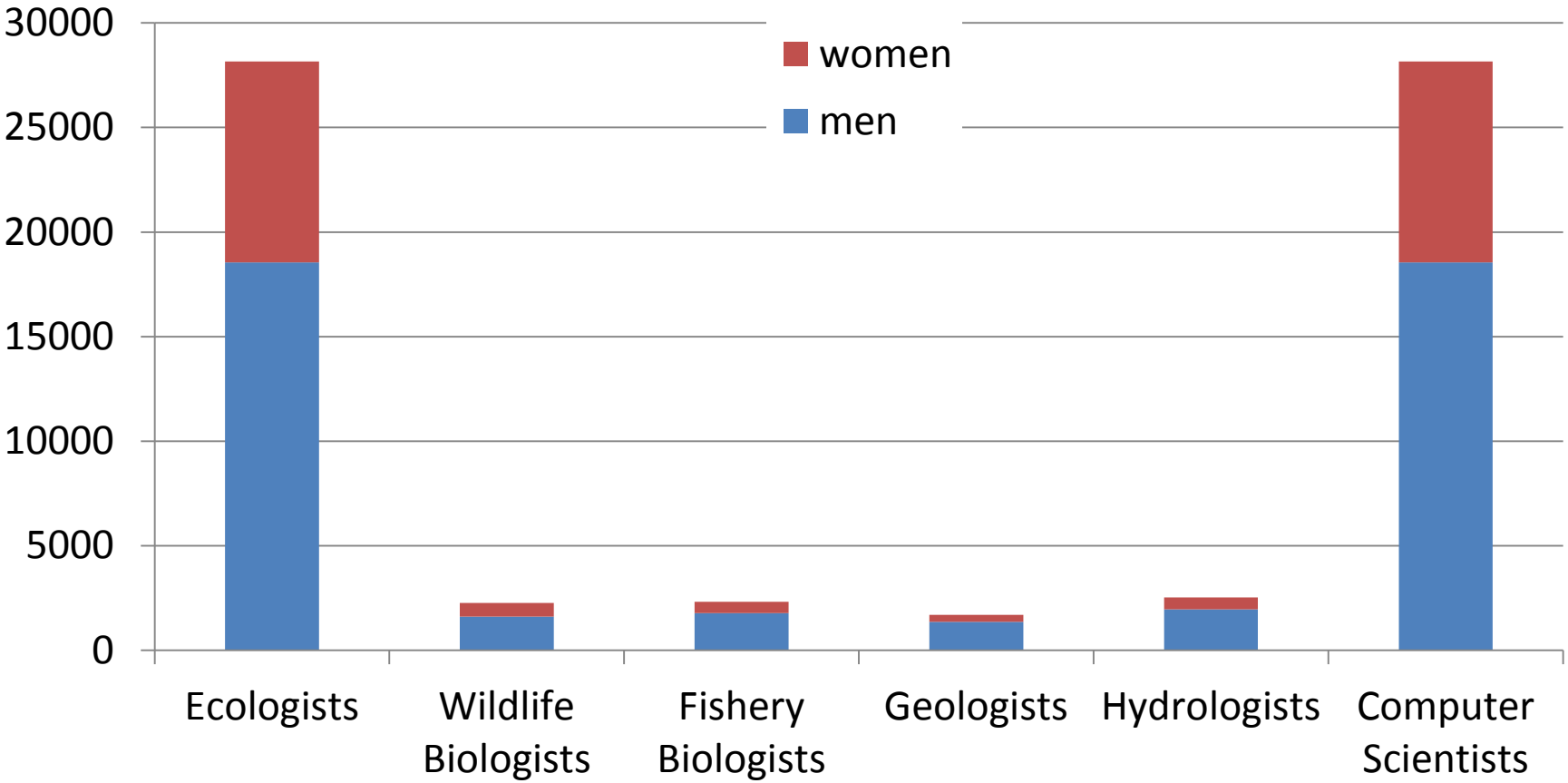
NRC, National Academies Press, 2010

Post-Docs at federally funded R&D centers, Fall, 2010

	Total
Men	2052
Women	673
Black or African American	16
Temporary visa holders	1,820
U.S. citizens	1,191

NSF, 2012

Federal Scientists by OPM Series, 2005



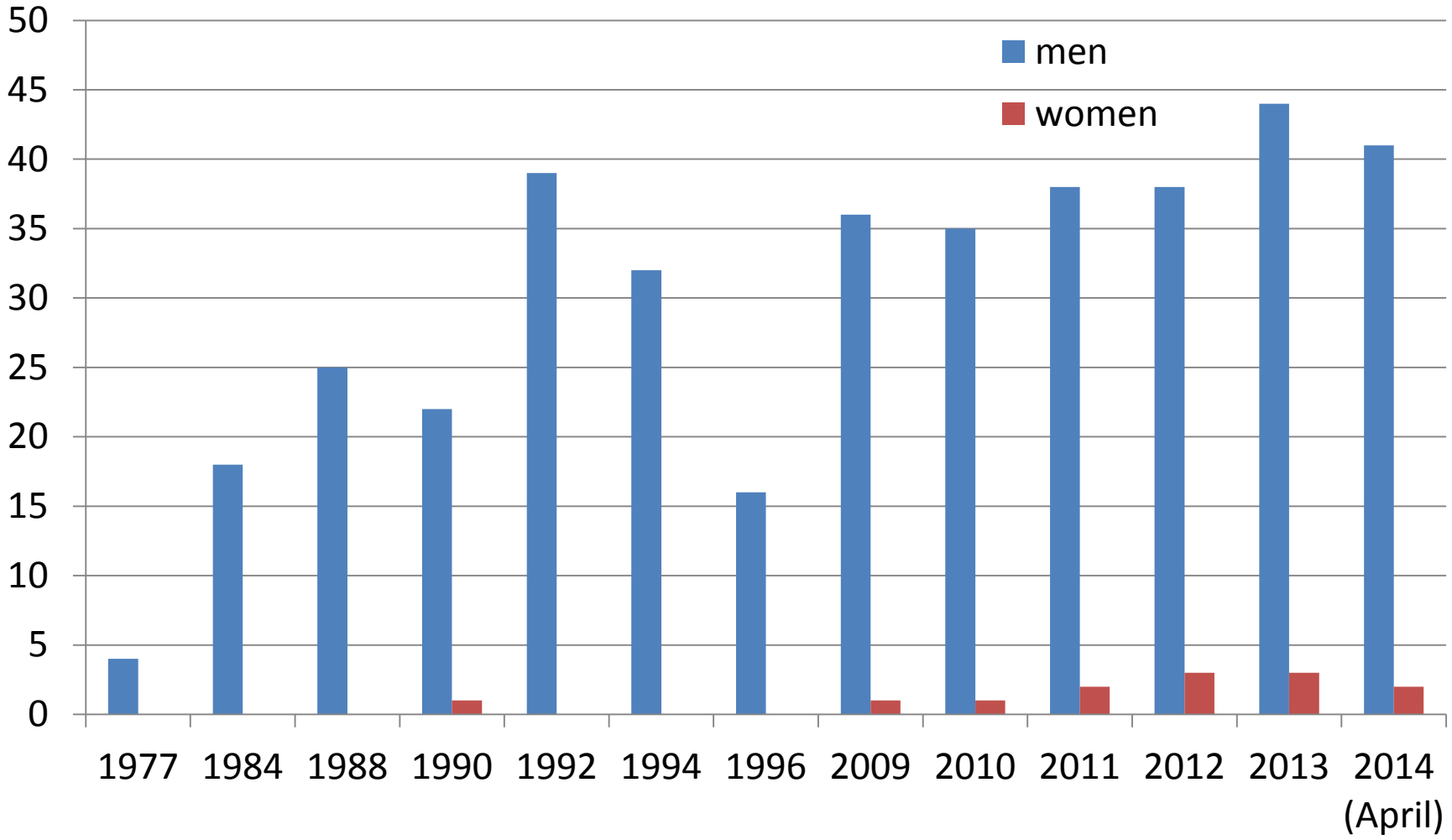
www.nsf.gov/statistics/nsf093002/pdf/tab4.pdf

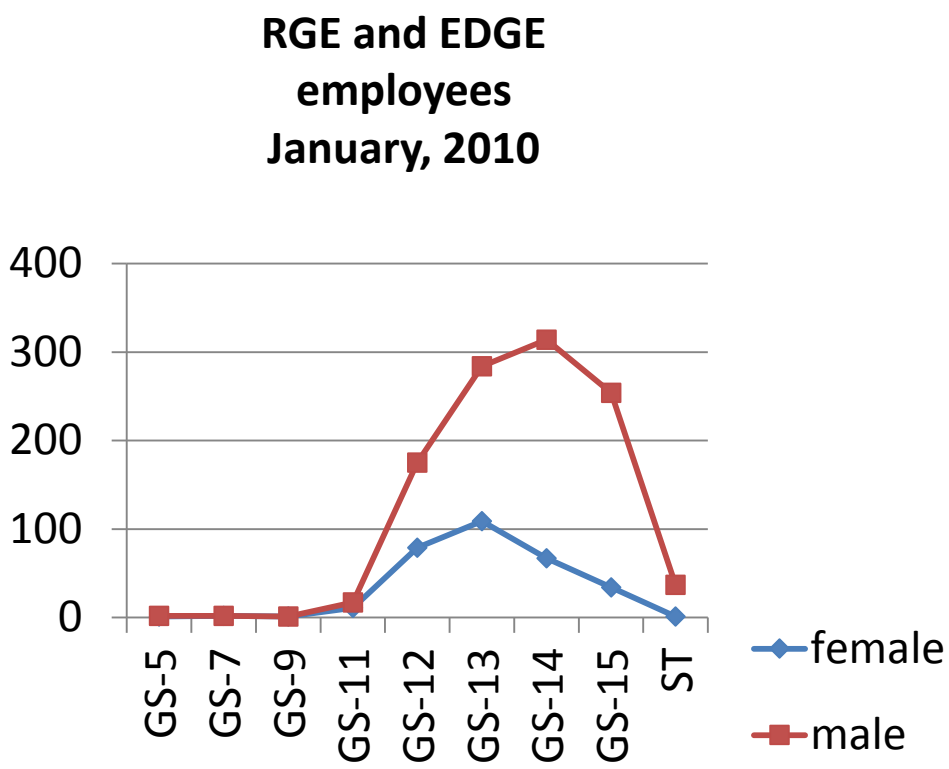
Women in the USGS

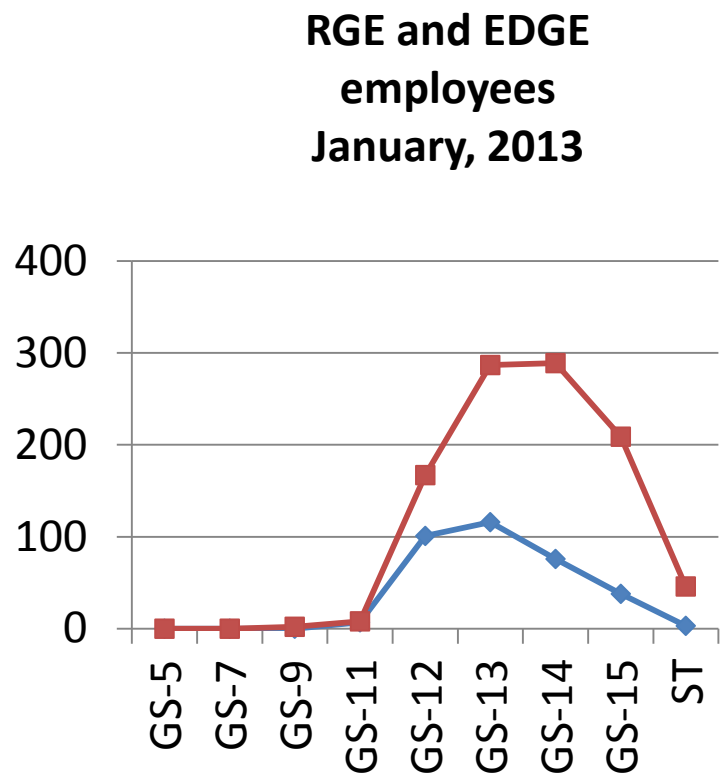
changes between 1977 and 1996:

- the percentage of women employees in the USGS increased from 28% to 35%
- the number of full-time women employees increased from 57% to 89%
- all but 1 of the senior ST positions were held by men during this 20-year period

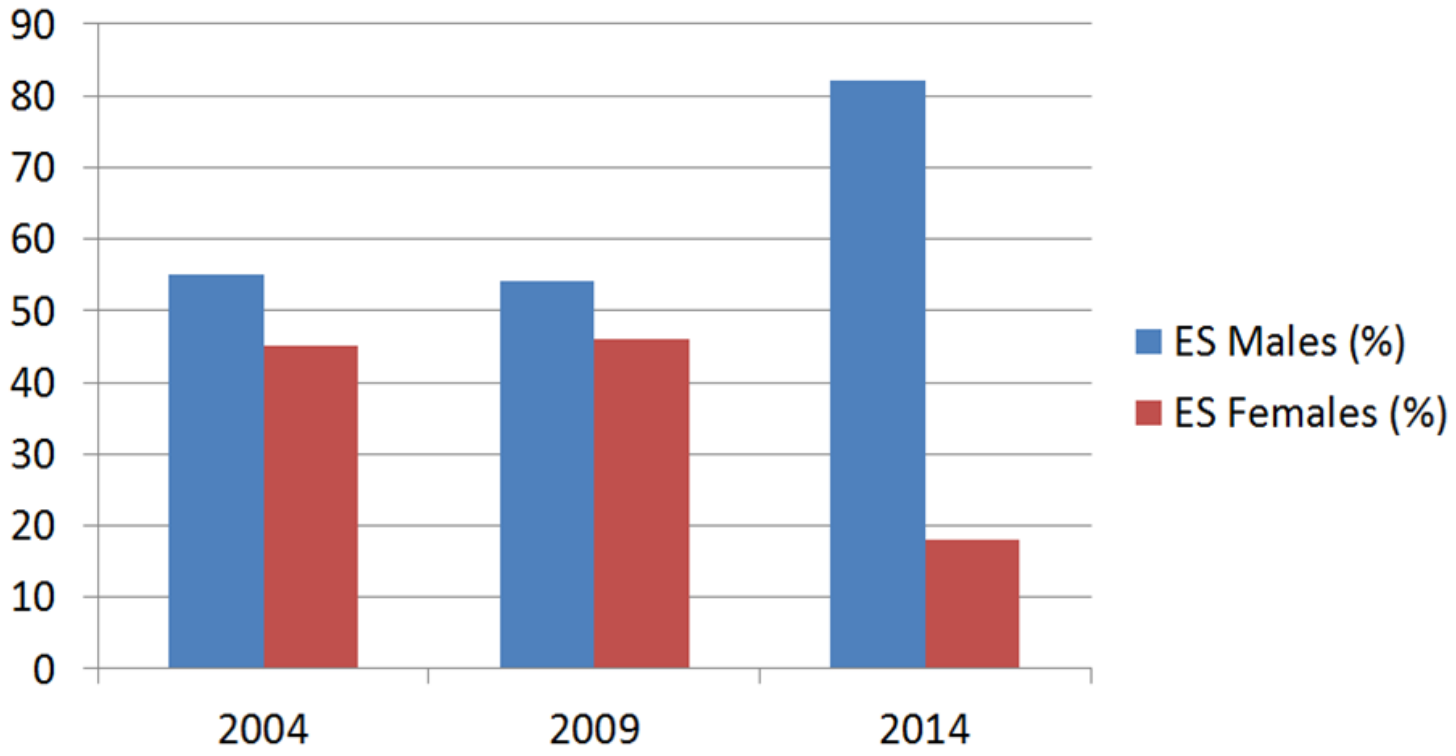
USGS Senior Scientists (STs)




RGE and EDGE employees January, 2010
400
300
200
100
0
GS-5
GS-7
GS-9
GS-11
GS-12
GS-13
GS-14
GS-15
ST
female
male

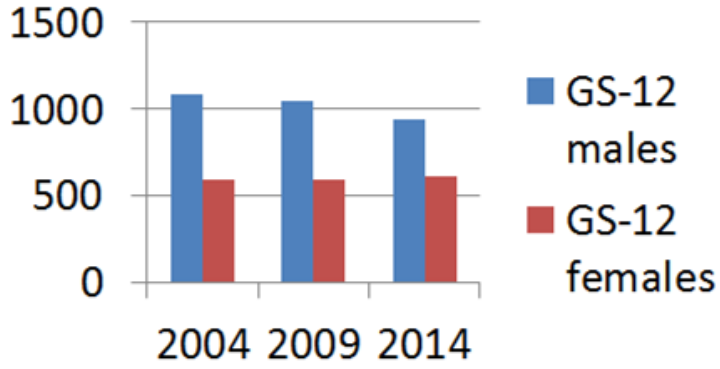

RGE and EDGE employees January, 2013
400
300
200
100
0
GS-5
GS-7
GS-9
GS-11
GS-12
GS-13
GS-14
GS-15
ST

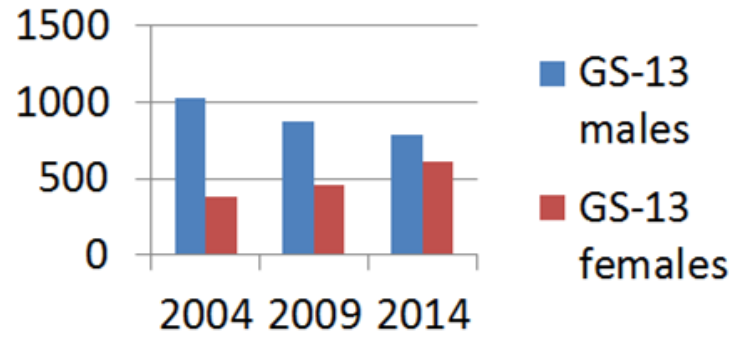
Currently a gender imbalance is also evident in our ES series….

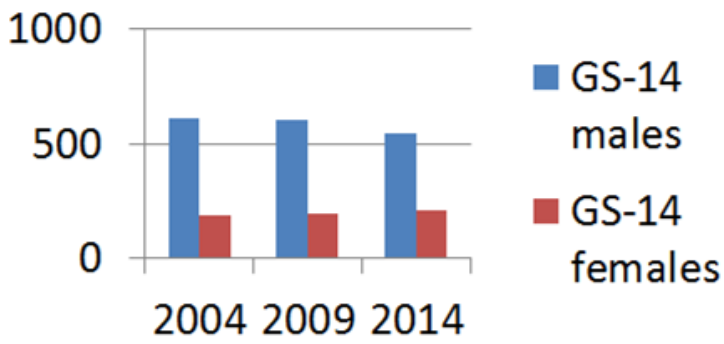


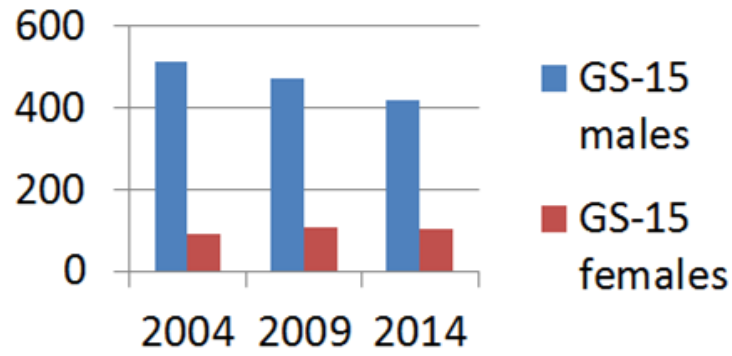
Data is for pay-period 12 for each of the three years.

… and for our regular (non-RGE series) GS series as well









Data is for pay period 12 for each of the three years.

In June, 2014, the percentage of females at USGS employed at the GS-12, -13, -14 and -15 level (non-RGE levels) was 39%, 36%, 27% and 19%, respectively.

In 1993 the NBS was created, and in October, 1996 those employees (including NWRC) were transferred to the USGS

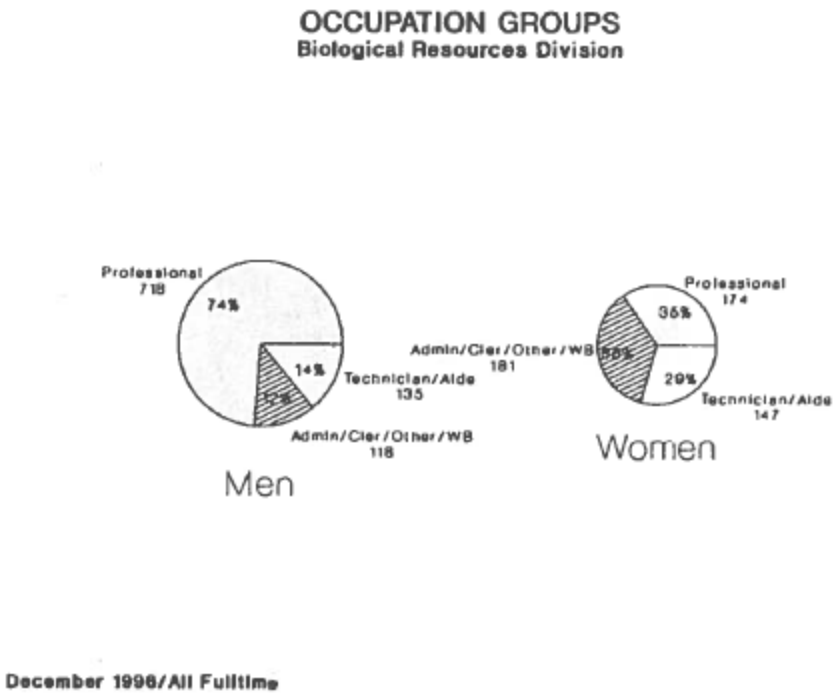
STATUS OF WOMEN
IN THE U.S. GEOLOGICAL SURVEY
June 1996

Jane H. Wallace
June 1997

Grade Structure. For purposes of comparison of grade structure, computations were made for both men and women employees in **fulltime permanent (FT/P) positions**, as of December 1996. The average grade for men in BRD was 11.77 and in GD was 12.81. The average grade for women in BRD was 9.01 and in GD was 9.84.

Occupational Groups. Perhaps the most striking similarity between the two research-oriented divisions is the make up of the work force and the distribution among occupation groups. The charts (Figure 15) shows the composition of the two organizations and that they are almost identical in makeup. If the plan for the organization of the BRD had been to model it after the USGS - with perhaps the Geologic Division in mind - these charts would indicate that essentially the same composition of professional, technician/aide, and all other (clerical, administrative, other, and wage board) occupation groups was, in fact achieved.

The entities that comprised the NBS had very similar proportions of men and women in occupational groups to that of the USGS, long before BRD was created



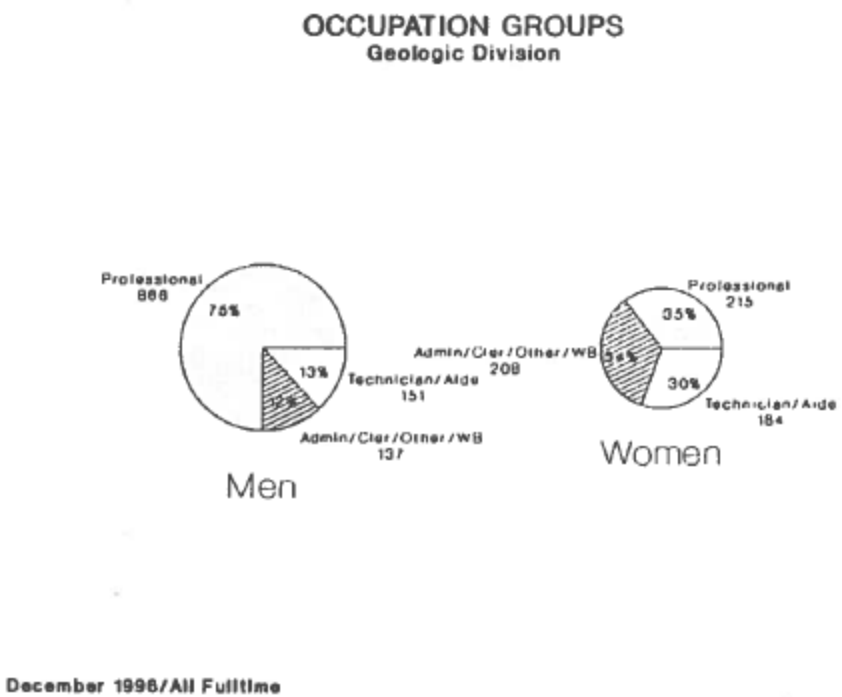


Figure 15. USGS: Occupation groups for Biological Resources and Geologic Divisions, by sex. December 1996.

Why disparities matter – some reasons cited by NSF, 2010

- The Hart-Rudman Commission on National Security to 2025 warned that America's failure to invest in science and to reform math and science education was the second biggest threat to our national security, greater than that from any conceivable conventional war.
- A more inclusive workforce may be more innovative and productive than one which is less so.

  "*Year by year, the economic imperative grows for broadening, empowering, and sharpening the skills of the entire U.S. workforce—just to remain competitive in the global community. This fresh talent is our most potent mechanism for technology transfer to our systems of innovation. Fortunately, we have a fount of untapped talent in our women, underrepresented minorities and persons with disabilities*" (former NSF Director Arden L. Bement, 2005)

  "We simply need people with the best minds and skills, and many of those are women." former Assistant to the President for Science and Technology, Neal Lane, 1999)

  "Institutions of higher education have an obligation, both for themselves and for the nation, to fully develop and utilize all creative talent available. We recognize that barriers still exist to the full participation of women in science and engineering", joint statement issued by nine top research universities in a meeting at MIT (2001).
- Finally, there are legal prescriptions prohibiting discrimination and questioning the propriety of disparities

examples of policy options discussed at the first WISdom event
(hosted by Director McNutt in 2012)

1. ***Provide formal training to managers and employees in options that enhance work-life flexibility, such as:***
   a. ***More use and training in use of part-time status and flexi-place – remote stations.***
   b. ***Family leave***
   c. ***Revisit job descriptions to reflect the flexibility for telework, flexible hours, no flexible hours, etc.***
2. ***Make school and work schedules match – set schedule for employees who want to participate at the beginning of each school year, in advance plan for part-time status so employees do not have to make the decision for each holiday and school break.***
3. ***Encourage the setting of standard meeting times to avoid conflict with school hours; avoid weekend travel if possible.***
4. ***Allow deferment of RGE evaluation due to pregnancy or other family leave.***
5. ***Enhance RGE and ST opportunities for women scientists:***
   a. ***Review our current career advancement process from end to end and identify measures that would increase nominations of women***
   b. ***Share examples of successful RSDR packages (RGE, EDGE and ST)***
   c. ***Set up a mentoring program that matches women and men who have attained ST and senior RG positions with women in the pipeline***
   d. ***Be sure women scientists have the chance to serve on peer groups***