Conference on Personnel Trends, Education Policy, and Evolving Roles of Federal and State Natural Resource Agencies

American Association for the Advancement of Science
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How Are Federal and State Agencies Responding to the Trends?

Robert W. Ridky
National Education Coordinator
Office of the Director
U.S. Geological Survey
USGS Mission

Providing the Nation with reliable scientific information and analysis.
USGS Funding in Constant Dollars
FY 1996 to FY 2004

- Biology
- Water
- Geology
- Mapping
- Science Support
- Facilities
<table>
<thead>
<tr>
<th></th>
<th>Count of Active Employees</th>
<th>% Change from Yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY1990</td>
<td>10,480</td>
<td>-1.05%</td>
</tr>
<tr>
<td>FY1991</td>
<td>10,845</td>
<td>3.37%</td>
</tr>
<tr>
<td>FY1992</td>
<td>10,956</td>
<td>1.01%</td>
</tr>
<tr>
<td>FY1993</td>
<td>10,788</td>
<td>-1.56%</td>
</tr>
<tr>
<td>FY1994</td>
<td>9,888</td>
<td>-9.10%</td>
</tr>
<tr>
<td>FY1995</td>
<td>9,220</td>
<td>-7.25%</td>
</tr>
<tr>
<td>FY1996 *</td>
<td>10,624</td>
<td>13.22%</td>
</tr>
<tr>
<td>FY1997</td>
<td>10,682</td>
<td>0.54%</td>
</tr>
<tr>
<td>FY1998</td>
<td>10,485</td>
<td>-1.88%</td>
</tr>
<tr>
<td>FY1999</td>
<td>9,952</td>
<td>-5.36%</td>
</tr>
<tr>
<td>FY2000</td>
<td>11,193</td>
<td>11.09%</td>
</tr>
<tr>
<td>FY2001</td>
<td>10,279</td>
<td>-8.89%</td>
</tr>
<tr>
<td>FY2002</td>
<td>10,441</td>
<td>1.55%</td>
</tr>
<tr>
<td>10 Year Average</td>
<td>10,355</td>
<td>-0.76%</td>
</tr>
</tbody>
</table>

Data from Federal Personnel and Payroll System (FPPS).

* Addition of Bureau of Mines and National Biological Survey
Retirements

Currently, 10.7% of all USGS employees are eligible for optional/voluntary retirement in FY 2003. Number of employees eligible to retire will rise from FY 2003 to FY 2008:

- Science staff: 11.9% to 20.6%
- Science Technical staff: 8.2% to 15.7%
- Administrative staff: 12.7% to 23.6%
- Information Technology Staff: 8.7% to 17.8%
<table>
<thead>
<tr>
<th>AVERAGE RATE Last 2 FY</th>
<th>All</th>
<th>Research</th>
<th>Development</th>
<th>Science Managers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13.97%</td>
<td>10.82%</td>
<td>10.42%</td>
<td>20.13%</td>
</tr>
</tbody>
</table>
Long Term Retirement Projections

Optional-Voluntary Retirement in the USGS
Eligibles, Actuals, & Projected - by Fiscal Year

Fiscal Year
Number of Employees
0 500 1,000 1,500 2,000 2,500
Eligibles
Actual and Projected Retirements
Rate of Eligibles who Retire

0% 5% 10% 15% 20% 25% 30% 35% 40%
Factors Working Against Developing the Scientific Workforce

- Weak national literacy base in the discipline
- Cultural emphasis; cost-benefit of grad education in STEM
- Strong Foreign Student Presence in STEM Departments
- Diminishing Government focus on Earth and Environmental R&D
Table 292.—Earned degrees in chemistry, geology, and physics conferred by degree-granting institutions,

<table>
<thead>
<tr>
<th>Year</th>
<th>CHEMISTRY</th>
<th>GEOLOGY</th>
<th>PHYSICS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bachelor’s</td>
<td>Master’s</td>
<td>Doctor’s</td>
</tr>
<tr>
<td>1970–71</td>
<td>11,063</td>
<td>2,275</td>
<td>2,159</td>
</tr>
<tr>
<td>1975–76</td>
<td>11,022</td>
<td>1,783</td>
<td>1,621</td>
</tr>
<tr>
<td>1980–81</td>
<td>11,347</td>
<td>1,654</td>
<td>1,622</td>
</tr>
<tr>
<td>1985–86</td>
<td>10,116</td>
<td>1,754</td>
<td>1,908</td>
</tr>
<tr>
<td>1990–91</td>
<td>8,321</td>
<td>1,665</td>
<td>2,238</td>
</tr>
<tr>
<td>1995–96</td>
<td>10,415</td>
<td>2,254</td>
<td>2,287</td>
</tr>
<tr>
<td>1998–99</td>
<td>10,120</td>
<td>2,037</td>
<td>2,191</td>
</tr>
<tr>
<td>2000–01</td>
<td>9,526</td>
<td>1,985</td>
<td>2,121</td>
</tr>
</tbody>
</table>

NOTE: Geology includes geology, geochemistry, and geophysics and seismology. Beginning in 1982–83, also includes other geological sciences. This table prepared Sept.’02

Source: National Center for Education Statistics Pubs.# 2003168
# Table 172: Total fall enrollments, 1970 - 2003

<table>
<thead>
<tr>
<th>Year</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>8,580,887</td>
</tr>
<tr>
<td>1975</td>
<td>11,184,859</td>
</tr>
<tr>
<td>1980</td>
<td>12,096,895</td>
</tr>
<tr>
<td>1985</td>
<td>12,247,055</td>
</tr>
<tr>
<td>1990</td>
<td>13,818,637</td>
</tr>
<tr>
<td>1995</td>
<td>15,312,289</td>
</tr>
<tr>
<td>2003</td>
<td>15,756,000</td>
</tr>
</tbody>
</table>

Source: NCES Digest of Educational Statistics, pubs 2003
High correlation btw. Federal R&D investments and STEM Bachelor Degree production

The graph illustrates the correlation between Federal R&D investments in non-biomedical fields, measured in constant 1996 dollars, and the number of Bachelor's Degrees awarded in the physical sciences, math, and engineering. The data shows a strong positive correlation, with both federal R&D investments and STEM degree production increasing and decreasing together over the years from 1955 to 2000.
Cost-Benefit factor working against growing science workforce

Registered Time from Baccalaureate to Doctorate
for Physical Sciences, Engineering, and Life Sciences, 2001

- Physical Sciences: Median Age 30.6 years
- Engineering: Median Age 31.2 years
- Life Sciences: Median Age 31.8 years
- Law School: Median Age 6 years
- MBA: Median Age 3 years

Medians are calculated every 5 years.
Share of U.S. Degrees Earned By Non-Resident Aliens in 2000, by Degree Level

Source: NCES
In general, the Administration will favor investments in Federal R&D programs that:

• strengthen science, mathematics, and engineering education by enhancing access and broad availability of excellent educational programs, establishing and encouraging best educational practices, and integrating research and education.
Mission and Strategic Goals of the USGS

“Education and research are always in the public service and therefore are inextricably bound at all levels”
RECOMMENDATION: In partnership with other stakeholders, the Federal Government should act now to attract and retain an adequate cadre of well-qualified precollege teachers of mathematics, science and technology.
National Science Standards: “what students should know and be able to do”

Earth Science
Physical Science
Life Science
(No) Earth Science in Texas
Edward C. Roy Jr.

Geoscientists Defend Earth Science in Texas
And from the California School Board...

- *California Science Framework for K-12 Public Schools* -- implementation guidelines failed to live up to standards’ treatment of earth science

- AGU, GSA & SSA sent alerts to their California members.
- AGI alert sent to California department chairs, local geoscience society presidents & member society leadership.
The K-12 Consumer Market…

- School districts - 14,571
- Schools - 92,012
- K-12 Enrollment - 46.9 million
- 9-12 Enrollment - 13.1 million
- K-12 Teachers - 2.9 million
- 7-12 Teachers - 1.03 million
Geotimes
NEWSMAGAZINE OF THE EARTH SCIENCES
PUBLISHED BY THE AMERICAN GEOLOGICAL INSTITUTE
SEPTEMBER 2002

TEACHING EARTH SCIENCE

Why We Need a Corps of Earth Science Educators Returning Earth Science to the Classroom

www.geotimes.org
Schools Working to Design Teacher Preparation Programs

University of Washington
University of Arizona
University of Oklahoma
Northern Arizona Univ.
Michigan Tech
Montana State University
New Mexico State University
San Diego State University
University of Maryland
Work with universities, professional organizations to more effectively deliver our science.
Vision:

USGS is a world leader in its ability to integrate its educational activities with its ongoing research programs.