# IS THE RESERVE POOL A REALISTIC SOURCE OF SUPPLY? 

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#### Abstract

Précis: These four authors are staff of the University of California, Berkeley's Project PACE (Policy Analysis for California Education). They state that an adequate supply of qualified teachers is central to improving education. Their supply and demand study indicates that teacher shortages will be concentrated in certain subject matter areas and certain geographical areas. These shortages will be severe enough to undermine recent educational improvements. If efforts to reduce class size and to raise standards for teacher certification are to be successful, additional incentives must be provided to recruit enough qualified teachers.


## INTRODUCTION

An adequate supply of qualified teachers is central to improving education. Supply and demand projections indicate that teacher shortages will be concentrated in certain subject areas and certain geographic areas. The shortages may undermine recent educational improvements. If substantial changes in pupil/teacher ratios and teacher certification requirements such as those evaluated in this report are seriously contemplated, strong incentives will be necessary to recruit enough qualified teachers.

If class sizes and teacher certification requirements remain unchanged, an average annual shortfall of between 4,000 and 7,000 teachers will occur over the next five years. The shortfall will be concentrated in the high demand areas of bilingual education, secondary math and science, and in geographic areas where large enrollments are increasing more than 20 percent in the ten year period. 1

In Section One, demand for teachers at the elementary and secondary levels is projected for five and ten year periods. Projections are made for demand due to enrollment growth and attrition. 2 Teachers needed to meet enrollment growth are projected separately for each county in California, since growth and pupil teacher ratios vary so much between counties. Two methods have been used to project replacements needed for retirements and attrition. The first uses the average annual rates of attrition from State Teachers' Retirement System (STRS) over the last seven years to project attrition from the teacher force. The second method is based on the projection of the trend of this same rate of attrition.

In Section Two, the supply of teachers is projected for five and ten year periods. Two supply projection methods were used. The first method estimates supply from newly credentialed teachers, teachers from out of state, emergency credentialed teachers, and the reserve pool (persons with valid credentials not now teaching).

The number of newly credentialed teachers is projected from enrollments in teacher preparing institutions. The likelihood that newly credentialed teachers actually will teach is calculated from the teaching rates of a random sample of first credential recipients. The supply of teachers from out of state and of emergency credential holders is projected using Commission on Teacher Credentialing (CTC) data. Reserve pool size and the likelihood that reserve pool members will be available for teaching is estimated. Finally, there is an estimate of the number of teachers who can be expected to re-enter teaching if incentives remain the same as they have been in the seven years for which there is re-entry data from STRS.

In Section Three, proposed educational improvements are evaluated for their effect on teacher supply and demand, as follows:
(1) decreasing pupil/teacher ratios from current levels to 20 to 1,
(2) eliminating emergency credentials,
(3) requiring teachers to teach only in their areas of expertise.

Section Four summarizes the expected demand and supply for the five and ten year periods for current pupil/teacher ratios and for the educational quality assumptions discussed in Section Three.

## SECTION ONE

Demand Projections
Keeping pupil/teacher ratios constant, demand is first calculated because of increased enrollment, based on State Department of Finance (DOF) projections to 1994-95. Next, demand is calculated on the basis of attrition and retirements by applying STRS rates to the total 1984-85 K-12 teacher force as determined from the California Basic Education Data System (CBEDS). Finally, the demand for math, science and bilingual teachers is examined.

Public school enrollment is projected to increase 26.5 percent by 1994-95.

For the ten year period to 1994-95, K-12 enrollment is expected to increase by $1,080,784$ students, a 26.5 percent increase over 1984-85. A 32 percent growth in elementary enrollment is projected ( 896,909 ); secondary enrollment will increase 14.4 percent or 183,875 , students (Table 1).

Enrollment is not increasing evenly throughout California. As Table 2 shows, the projected change ranges between an increase of 86.4 percent in Nevada County to a decrease of 8.8 percent in

Table 1

| California Public School Enrollment Projections (1985-86 to 1994-95) |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Year | Grades K-8 | Enrollment increase | Percent increase | Grades 9-12 | Enrollment increase | Percent increase | K-12 Total | Enrollment increase | Percent increase |
| 1984-85 | 2,800,296 |  |  | 1,278,447 |  |  | 4,078,743 |  |  |
| 1985-86 | 2,870,314 | 70,018 | 2.50\% | 1,299,559 | 21,112 | 1.65\% | 4,169,873 | 91,130 | 2.23\% |
| 1986-87 | 2,968,768 | 98,454 | 3.43\% | 1,293,804 | -5,755 | -0.44\% | 4,262,572 | 92,699 | 2.22\% |
| 1987-88 | 3,082,385 | 113,617 | 3.83\% | 1,267,982 | -25,822 | -2.00\% | 4,350,367 | 87,795 | 2.06\% |
| 1988-89 | 3,195,333 | 112,948 | 3.66\% | 1,243,084 | -24,898 | -1.96\% | 4,438,417 | 88,050 | 2.02\% |
| 1989-90 | 3,306,729 | 111,396 | 3.49\% | 1,236,793 | -6,291 | -0.51\% | 4,543,522 | 105,105 | 2.37\% |
| 1990-91 | 3,414,041 | 107,312 | 3.25\% | 1,255,563 | 18,770 | 1.52\% | 4,669,604 | 126,082 | 2.77\% |
| 1991-92 | 3,509,047 | 95,006 | 2.78\% | 1,294,090 | 38,527 | 3.07\% | 4,803,137 | 133,533 | 2.86\% |
| 1992-93 | 3,596,777 | 87,730 | 2.50\% | 1,333,122 | 39,032 | 3.02\% | 4,929,899 | 126,762 | 2.64\% |
| 1993-94 | 3,659,392 | 62,615 | 1.74\% | 1,389,946 | 56,824 | 4.26\% | 5,049,338 | 119,439 | 2.42\% |
| 1994-95 | 3,697,205 | 37,813 | 1.03\% | 1,462,322 | 72,376 | 5.21\% | 5,159,527 | 110,189 | 2.18\% |
| 1985-86 to 198 | 90: | 506,433 | 18.08\% |  | -41,654 | -3.26\% |  | 464,779 | 11.40\% |
| 1985-86 to 199 | 95: | 896,909 | 32.03\% |  | 183,875 | 14.38\% |  | 1,080,784 | 26.50\% |

Table 2: Enrollment Projections by County

| County | $\begin{array}{r} \text { K-12 } \\ \text { Enrollment } \\ 1984-85 \end{array}$ | Projected enrollment 1989-90 | 5-year projected enrollment increase (\%) | Projected enrollment 1994-95 | 10-year projected enrollment increase (\%) |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Alameda | 169,820 | 177,607 | 4.59\% | 195,566 | 15.16\% |
| Alpine | 221 | 248 | 12.22\% | r 250 | 13.12\% |
| Amador | 3,532 | 4,111 | 16.39\% | 5,177 | 46.57\% |
| Butte | 22,914 | 27,314 | 19.20\% | 33,412 | 45.81\% |
| Calaveras | 4,354 | 5,521 | 26.80\% | 7,505 | 72.37\% |
| Colusa | 2,883 | 3,346 | 16.06\% | 3,884 | 34.72\% |
| Contra Costa | 111,037 | 115,605 | 4.11\% | 129,980 | 17.06\% |
| Del Norte | 3,279 | 3,596 | 9.67\% | 3,789 | 15.55\% |
| El Dorado | 17,511 | 21,625 | 23.49\% | 27,217 | 55.43\% |
| Fresno | 109,506 | 127,282 | 16.23\% | 144,717 | 32.15\% |
| Glenn | 4,641 | 5,262 | 13.38\% | 5,883 | 26.76\% |
| Humbolth | 17,736 | 18,565 | 4.67\% | 19,572 | 10.35\% |
| Imperial | 23,277 | 26,267 | 12.85\% | 28,849 | 23.94\% |
| Inyo | 3,187 | 3.269 | 2.57\% | 3.539 | 11.04\% |
| Kern Kings | 87.834 16.488 | 107,638 | 22.55\% | 124.912 | 42.21\% |
| Kings Lake | 16,488 7,100 | 18,429 9,279 | $11.77 \%$ $30.69 \%$ | 20,533 12,812 | 24.53\% |
| Lassen | 4,300 | 4,849 | 12.77\% | 12,812 5,389 | 80.45\% |
| Los Angeies | 1,239,518 | 1,357,440 | 9.51\% | 1,488,187 | 20.06\% |
| Madera | 15,310 | 18,714 | 22.23\% | 22,408 | 46.36\% |
| Marin | 25,279 | 22,116 | -12.51\% | 23,061 | -8.77\% |
| Mariposa | 2,022 | 2,436 | 20.47\% | 3,321 | 64.24\% |
| Mendocino | 13,756 | 15,296 | 11.20\% | 17.128 | 24.51\% |
| Merced | 31.792 | 39,129 | 23.08\% | 46,242 | 45.45\% |
| Modoc | 1,939 | 2,210 | 13.98\% | 2.547 | 31.36\% |
| Mono | 1,246 50 | 1,496 57.130 | 20.06\% | 1.940 | 55.70\% |
| Monterey | 50,724 13,538 | 57,130 13,711 | 12.63\% | 62,344 15057 | 22.91\% |
| Nevada | 9,213 | 12,534 | 36.05\% | 15,057 17,177 | 11.22\% |


| Orange | 329,340 | 342,170 | 3.90\% | 380,780 | 15.62\% |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Placer | 24,593 | 29,293 | 19.11\% | 37,311 | 51.71\% |
| Plumas | 3,491 | 3,806 | 9.02\% | 4,139 | 18.56\% |
| Riverside | 134,678 | 170,245 | 26.41\% | 212,309 | 57.64\% |
| Sacramento | 142,920 | 166,307 | 16.36\% | 195,595 | 36.86\% |
| San Benito | 5,754 | 6,388 | 11.02\% | 7.154 | 24.33\% |
| San Bernardino | 189.632 | 239,100 | 26.09\% | 296,124 | 56.16\% |
| San Diego | 313,212 | 351,958 | 12.37\% | 404,239 | 29.06\% |
| San Francisco | 62,730 | 68,650 | 9.44\% | 74,168 | 18.23\% |
| San Joaquin | 72,308 | 90,206 | 24.75\% | 109,627 | 51.61\% |
| San Luis Obispo | 24,034 | 29.074 | 20.97\% | 36,115 | 50.27\% |
| San Mateo | 74,455 | 75,186 | 0.98\% | 81.453 | 9.40\% |
| Santa Barbara | 44,558 | 47.897 | 7.49\% | 53,984 | 21.15\% |
| Santa Clara | 215,640 | 220,258 | 2.14\% | 239,676 | 11.15\% |
| Santa Cruz | 30,366 | 34,377 | 13.21\% | 40,245 | 32.53\% |
| Shasta | 22,710 | 24,862 | 9.48\% | 28,560 | 25.76\% |
| Sierra | 679 | 724 | 6.63\% | 780 | 14.87\% |
| Siskiyou | 8,005 | 8.555 | 6.87\% | 9,442 | 17.95\% |
| Solano | 46,287 | 53,703 | 16.02\% | 62.768 | 35.61\% |
| Sonoma | 50,564 | 55.412 | 9.59\% | 63,838 | 26.25\% |
| Stanislais | 55,329 | 64,261 | 16.14\% | 74,714 | 35.04\% |
| Sutter | 10,212 | 11,190 | 9.58\% | 12,560 | 22.99\% |
| Tehama | 7,677 | 8.967 | 16.80\% | 10,558 | 37.53\% |
| Trinity | 2,244 | 2,596 | 15.69\% | 2,987 | 33.11\% |
| Tulare | 57,081 | 67.730 | 18.66\% | 78,344 | 37.25\% |
| Tuolumne | 6,173 | 6,929 | 12.25\% | 8,374 | 35.66\% |
| Ventura | 102,232 | 111.136 | 8.71\% | 127.127 | 24.35\% |
| Yolo | 17.598 | 19,301 | 9.68\% | 21,929 | 24.61\% |
| Yuba | 10,284 | 11,216 | 9.06\% | 12,229 | 18.91\% |
| State | 4,078,743 | 4,543,522 | 11.40\% | 5,159,527 | 26.50\% |

Marin. Nearly one-fourth of the total projected ten year growth will occur in Los Angeles County.

Pupil/teacher ratios are 23.89 to 1 for elementary (K-8) classrooms and 28.08 to 1 for secondary (9-12) classes.

Pupil/teacher ratios have been calculated using 1984-85 CBEDS data on teachers and Department of Finance (DOF) enrollment information. 3 The number of teachers is reported in full time equivalents (FTEs), rather than the actual number of individuals. Class size is held constant for demand projections in this section. Demand under the alternative class size assumption is reported in Section Three.

Elementary FTEs include teachers responsible for classroom instruction in grades $K-8$, but not their administrative, adult, or special education assignments. In 1984-85 there were 117,236 full time equivalent elementary positions. The elementary pupil/teacher ratio was 23.89 to 1 .

Similarly, secondary FTEs include classroom teaching responsibilities but exclude periods assigned for administration, adult, and special education. There were 45,526 secondary FTEs in 1984-85. The secondary pupil/teacher ratio was 28.08 to 1.

To project demand for teachers the number of teachers needed as a result of enrollment growth was estimated (maintaining current pupil/teacher ratios), and the number of teachers needed to replace those who leave teaching through attrition or retirement was estimated.

By 1994-95, California will need an additional 44,098 teachers for enrollment growth alone; 85 percent of the new teachers will work in elementary $(K-8)$ schools (Table 3).

For the ten year period of 1994-95, 37,550 new ( $896,992 / 23.89 \%$ ) elementary teachers will be needed for increased enrollment. Since secondary enrollment will begin to increase in 1990-91, 6,548 additional teachers ( $183,875 / 28.08 \%$ ) will be needed to maintain current pupil/teacher ratios over the ten year period. Thus, by 1994-95, California will need an additional 44,098 teachers for enrollment growth alone, 85 percent of whom will be elementary ( $\mathrm{K}-8$ ) teachers (Table 4).

Enrollment will increase as much as 86 percent in some counties, but Los Angeles will account for 22.8 percent of the state demand for new teachers due to enrollment growth.

Since enrollment growth and pupil/teacher ratios vary widely between counties, demand because of growth has been projected for each county, assuming constant pupil teacher ratios.

Eleven counties will experience enrollment growth greater than 50 percent in the next ten years. Three are in Southern California (San Bernardino, Riverside and San Luis Obispo). Enrollment growth in six counties in eastern California (Nevada, Placer, El Dorado, Calaveras, Mariposa and Mono), in one Central Valley county (San Joaquin), and in Lake County in the north will also exceed 50 percent.

Table 3
Teacher Demand Due to Elementary (K-8) Enrollment Growth

|  | Year | K-8 enrollment | Class size | K-8 enrollment growth | FTEs needed for enrollment growth | Cumulative new FTEs required for enrollment growth |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Actual | 1984-85 | 2,800,296 | 23.89 |  |  |  |
| Projected | 1985-86 | 2,870,314 | 23.89 | 70,018 | 2,931 | 2,931 |
|  | 1986-87 | 2,968,768 | 23.89 | 98,454 | 4,122 | 7,053 |
|  | 1987-88 | 3,082,385 | 23.89 | 113,617 | 4,757 | 11.810 |
|  | 1988-89 | 3,195,333 | 23.89 | 112,948 | 4.729 | 16,538 |
|  | 1989-90 | 3,306,729 | 23.89 | 111,396 | 4,664 | 21,202 |
|  | 1990-91 | 3,414,041 | 23.89 | 107,312 | 4,493 | 25,695 |
|  | 1991-92 | 3,509,047 | 23.89 | 95,006 | 3,977 | 29,672 |
|  | 1992-93 | 3,596,777 | 23.89 | 87,730 | 3,673 | 33,345 |
|  | 1993-94 | 3,659,392 | 23.89 | 62,615 | 2,621 | 35,967 |
|  | 1994-95 | 3,697,205 | 23.89 | 37,813 | 1,583 | 37.550 |
| Total 1985-86 to 1989-90: Total 1985-86 to 1994-95: |  |  |  | 506,433 | 21,202 |  |
|  |  |  |  | 896,909 | 37.550 |  |

Total 1985-86 to 1994-95:

896,909 37,550

Table 4

| Teacher Demand Due to Secondary (9-12) Enrollment Growth |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Year | Grade 9-12 enrollment | Class <br> size | Enrollment growth | FTEs needed for enrollment growth | Cumulative FTEs needed for enrollment growth |
| Actual | 1984-85 | 1,278,447 | 28.08 |  |  |  |
| Projected | 1985-86 | 1,299,559 | 28.08 | 21,112 | 752 | 752 |
|  | 1986-87 | 1,293,804 | 28.08 | -5,755 | -205 | 547 |
|  | 1987-88 | 1,267,982 | 28.08 | -25,822 | -920 | -373 |
|  | 1988-89 | 1,243,084 | 28.08 | -24,898 | -887 | -1,259 |
|  | 1989-90 | 1,236,793 | 28.08 | -6,291 | -224 | -1,483 |
|  | 1990-91 | 1,255,563 | 28.08 | 18,770 | 668 | -815 |
|  | $1991.92$ | $1,294,090$ | $28.08$ | 38,527 | 1,372 | 557 |
|  | $1992.93$ | $1,333,122$ | $28.08$ | 39,032 | 1,390 | 1.947 |
|  | 1993-94 | $1,389,946$ | $28.08$ | $56,824$ | $2,024$ | $3,971$ |
|  | 1994-95 | 1,462,322 | 28.08 | 72,376 | 2,577 | 6,548 |
| Projected | $1985-8$ | to 1989-90: |  | $-41,654$ | $-1,483$ |  |
| Projected | 1985-8 | to 1994-95: |  | $183,875$ | $6,548$ |  |

Enrollment in the seven Bay Area counties (Marin, San Francisco, Alameda, Contra Costa, San Mateo, Santa Clara and Napa) will grow less than 20 percent, as will Orange County, Plumas, Sierra, Yuba, Alpine, Inyo, Humboldt, Del Norte and Siskiyou. Enrollment in the remaining 31 counties is expected to grow between 20 percent and 50 percent.

Of course, the rate of growth alone does not indicate the magnitude of teacher demand faced by individual counties. Nevada County only will require an additional 332 teachers by 1994-95 to meet the demand from its 86 percent enrollment growth. Los Angeles County, with a projected enrollment increase of just over 20 percent, will require 10,050 new teachers by 1994-95. This amounts to 22.8 percent of total state teacher demand due to enrollment growth.

Between 58,000 and 67,000 teacherswill be needed by 1989-90 to replace teachers who leave or retire.

Teacher retirements are increasing both in absolute numbers and as a percentage of active teachers. In addition, teachers are retiring at a younger age and after fewer years in the teaching force than was previously the case. In 1971 the average teacher retired at 62.2 years of age while in 1983-84 the average age at retirement was 60.6 . The average years of service for all teachers in 1971 was 26.3. In 1984 the average was 24.1. In 1977-78, 1.5 percent of STRS members retired; in 1983-84, 2.3 percent retired.

In contrast, STRS records indicate that attrition has declined over the past seven years. Nonetheless, attrition accounts for 77.6 percent of total demand for the five year period. Attrition and retirements were projected by two methods:
(1) using the mean of the annual rates of attrition for the last seven years from STRS data base (Method 1)
(2) using the trend (from a linear regression) of these rates of attrition from STRS (Method 2).

Each method estimated attrition rates from STRS and applied these rates to the number of FTEs required to maintain current pupil/teacher ratios for the projection period. Method 1 used a constant attrition rate of 7.67 percent for the projection period. This is the average attrition rate for STRS during the years 1977-78 to 1983-84. Method 2 used a declining rate of attrition for the ten year period. The rate ranges from 7 percent in 1984-85 to 5.6 percent in 1994-95. Method 1 provides an upper bound and method 2 a lower bound for the rate of attrition.

Using the two methods, it is estimated that between 57,653 and 65,334 new teachers will be needed to replace those lost to attrition and retirement for the five year period to 1989-90. Three-fourths of this demand (between 42,226 FTEs and 47,900 FTEs) is at the elementary ( $\mathrm{K}-8$ ) level (Tables 5 and 6).

For the ten year period to 1994-95, between 115,645 and 139,262 teachers will be needed to replace teachers who left or

Teacher Demand Required for Attrition
(Method 1: average of STRS attrition rate 1977-78 to 1983-84 used)

|  |  | Elementary (grades K-8) |  |  | Secondary (grades 9-12) |  |  | Total (K-12) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Year | FTEs required for 23.89 class size | Attrition rate | FTEs needed to replace attrition | FTEs required for 28.08 class size | Altrition rate | FTEs needed to replace attrition | FTEs needed to replace attrition |
| Actual | 1984-85 | 117,236 | 7.67\% |  | 45,526 |  |  |  |
| Projected | 1985-86 | 120,167 | 7.67\% | 8.992 | 46,278 | 7.67\% | 3,492 | 12,484 |
|  | 1986-87 | 124,289 | 7.67\% | 9,217 | 46,073 | 7.67\% | 3,550 | 12,766 |
|  | 1987-88 | 129,046 | 7.67\% | 9,533 | 45,153 | 7.67\% | 3,534 | 13,067 |
|  | 1988-89 | 133,774 | 7.67\% | 9,898 | 44,267 | 7.67\% | 3,463 | 13,361 |
|  | 1989-90 | 138,438 | 7.67\% | 10,261 | 44,043 | 7.67\% | 3,395 | 13,656 |
|  | 1990-91 | 142,931 | 7.67\% | 10,618 | 44,711 | 7.67\% | 3,378 | 13,996 |
|  | 1991-92 | 146,908 | 7.67\% | 10,963 | 46,083 | 7.67\% | 3,429 | 14,392 |
|  | 1992-93 | 150,581 | 7.67\% | 11,268 | 47,473 | 7.67\% | 3,535 | 14,802 |
|  | 1993-94 | 153,203 | 7.67\% | 11.550 | 49,497 | 7.67\% | 3,641 | 15,191 |
|  | 1994-95 | 154,786 | 7.67\% | 11.751 | 52,074 | 7.67\% | 3,796 | 15,547 |
| Projected | 36 to 1989 | -90: |  | 47,900 |  |  | 17,434 | 65.334 |
| Projected | 86 to 1994 | -95: |  | 104,049 |  |  | 35,213 | 139,262 |

Table 6
Teacher Demand Required for Attrition
(Method 2: trend of STRS attrition rate 1977-78 to 1983-84 used)

|  |  | Elementary (grades K-8) |  |  | Secondary (grades 9-12) |  |  | Total (K-12) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Year | FTEs required for 23.89 class size | Attrition rate | FIEs needed to replace attrition | FTEs required for 28.08 class size | Attrition rate | FTEs needed to replace attrition | FTEs needed to replace attrition |
| Actual | 1984-85 | 117,236 | 7.07\% |  | 45,526 | 7.07\% |  |  |
| Projected | 1985-86 | 120,167 | 6.92\% | 8,287 | 46,278 | 6.92\% | 3,218 | 11,506 |
|  | 1986-87 | 124.289 | 6.77\% | 8,316 | 46,073 | 6.77\% | 3,203 | 11,518 |
|  | 1987-88 | 129,046 | 6.62\% | 8,416 | 45,153 | 6.62\% | 3,120 | 11,536 |
|  | 1988-89 | 133,774 | 6.47\% | 8,546 | 44.267 | 6.47\% | 2,990 | 11,537 |
|  | 1989-90 | 138.438 | 6.33\% | 8,660 | 44,043 | 6.33\% | 2,866 | 11,526 |
|  | 1990-91 | 142,931 | 6.18\% | 8,756 | 44,711 | 6.18\% | 2,786 | 11,542 |
|  | 1991-92 | 146,908 | 6.03\% | 8,828 | 46,083 | 6.03\% | 2,762 | 11,589 |
|  | 1992-93 | 150,581 | 5.88\% | 8,855 | 47,473 | 5.88\% | 2,778 | 11.633 |
|  | 1993-94 | 153,203 | 5.73\% | 8,852 | 49,497 | 5.73\% | 2,791 | 11,643 |
|  | 1994-95 | 154,786 | 5.58\% | 8,779 | 52,074 | 5.58\% | 2,836 | 11,615 |
| Projected | 86 to 1989 | 9-90: |  | 42,226 |  |  | 17,434 | 57,623 |
| Projected | 86 to 1994 | 4-95: |  | 86,296 |  |  | 35,213 | 115.645 |

retired. At the elementary level, between 86,296 and 104,049 FTEs will be needed. At the secondary level, between 29,349 and 35,213 FTEs will be needed to replace loss due to attrition for the ten year period (Tables 5 and 6 ).

Between 77,342 and 85,052 teachers will be needed by $1989-$ 90, and between 159,700 and 183,400 by 1994-95, for growth and attrition combined.

The total projected demand for growth and attrition combined, by method 1 , using the average attrition rate of 7.67 percent, is estimated to be 69,102 elementary teachers and 15,950 secondary teachers in the five year period to 1989-90. By method 2, the projected demand is somewhat lower: 63,428 elementary teachers and 13,914 secondary teachers (Table 7). Thus, the expected total ( $\mathrm{K}-12$ ) demand for the five years to 1989-90 is between 77,342 and 85,052 . The ten year $K-12$ demand for growth and attrition is between 159,743 and 183,360.

There is more demand for math, science, and Spanish bilingual teachers than for other specialties.

Every report on teacher shortages 4 indicates serious shortages for math and science teachers. Although accurate demand projections cannot be calculated from existing data, those reported by the Teacher Shortage Loan Assumption program probably are reasonably accurate.

Of 765 districts eligible 5 to participate in the program in 1985, 670 responded to a survey by the California Teacher Shortage Loan Assumption Program. Half reported shortages in secondary teaching fields (303 districts reported no shortages; the remainder did not respond). Between 1983-84 and 1984-85 increased shortages were reported in six subject matter areas (bilingual, English/language arts, mathematics, music, reading and science). Shortages were reported to have declined in ten areas and remained unchanged in two.

The most severe shortage was reported in mathematics, which had a total shortage of 965.6 teachers ( 885.2 teachers not holding certificates, 80.4 positions vacant) compared to 8351.7 teachers employed in the responding districts, or approximately 12 percent. Four hundred teachers without appropriate certificates and forty vacant positions, of a total of 5445.8 employed, added to an 8 percent shortage of science teachers. Altogether, 4.2 percent of secondary teachers did not hold appropriate certificates and 0.6 percent of secondary positions were vacant in the reporting districts.

Only 50.8 percent of Spanish bilingual teachers hold appropriate credentials.

Demand for bilingual teachers can be expected to increase as the proportion of limited English proficient (LEP) students increases. The number of LEP students has increased 6 percent or more in each of the last three years, after three years when growth was 13 percent or greater. 6 Bilingual teachers are required if ten or more students speaking the same language are in the same grade level in the same school. The State Department of

Table 7
Total Teacher Demand (FTEs) Due to Enrollment Growth and Attrition

## Demand Projection Method

|  | Demand Due to Enroliment Growth |  |  | Demand Due to Attrition |  |  | Total Demand (Due to Growth \& Attrition) |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | K-8 | $9-12$ | K-12 | K-8 | 9-12 | K-12 | K-8 | 9-12 | K-12 |
| 85-86 to 89-90: | 21.202 | -1,483 | 19,719 | 47,900 | 17,434 | 65,334 | 69,102 | 15,950 | 85,052 |
| 85-86 to 94-95: | 37,550 | 6,548 | 44,098 | 104,049 | 35,213 | 139,262 | 141,599 | 41.761 | 183,360 |

Demand Projection Method 2

|  | Demand Due io Enrolment Growth |  |  | Demand Due to Attrition |  |  | Total Demand (Due to Growth \& Altrition) |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | K-8 | 9-12 | K-12 | K-8 | 9-12 | K-12 | K-8 | 9-12 | K-12 |
| 85-86 to 89-90: | 21,202 | -1,483 | 19,719 | 42,226 | 15,397 | 57,623 | 63,428 | 13.914 | 77.342 |
| 85-86 to 94-95: | 37,550 | 6,548 | 44,098 | 86,296 | 29,349 | 115,645 | 123,846 | 35,897 | 159,743 |

Education (SDE) reported that 524,082 LEP students, 73 percent of whom were Spanish speaking, were enrolled in $K-12$ classes in Spring of 1985.

The total demand for Spanish bilingual teachers was 10,967 . Half of the demand was met by credentialed teachers, 41.5 percent by teachers with waivers ${ }^{8}$ and 7.7 percent of demand was unmet. For the next largest LEP group, Vietnamese, only 213 teachers were required, but 93 percent of demand was met by teachers with waivers. Mandarin Chinese was the only language for which supply of credentialed teachersexceeded demand.

LEP enrollment is concentrated in six counties (Los Angeles, Orange, San Diego, San Francisco, Alameda and Santa Clara) which contain 72 percent of Callfornia's LEP students. Nearly half of the state's LEP population is in Los Angeles County, where LEP students are 19.3 percent of the county's student population. The next highest number of LEP students is found in Orange County, which contains 8.3 percent of California's LEP population. Four counties (San Francisco, Monterey, Imperial and San Benito) have LEP enrollments larger than 20 percent of total county enrollment. In eleven other counties, LEP students are more than 10 percent of total county enrollment.

Another indication of shortage is the number of emergency, long term substitute and limited assignment. credentials issued. Summary statistics are not yet available. Partial information from the Commission on Teacher Credentialing (CTC) indicates that 290 limited assignment and 402 long term substitute mathematics credentials were issued in 1983-84, four times the number of single subject credentials issued in mathematics that year (1968). Only one in five new mathematics teachers is fully credentialed, even if all the newly credentialed mathematics teachers find teaching jobs.

## SECTION TWO

Supply Projections
It is much more difficult to develop a reasonable estimate of teacher supply than to project demand. Estimating supply requires more assumptions and more uncertainty. Not everyone who receives a first teaching credential is available to teach. Teachers also move in and out of the teaching force frequently. Even the rate of credential renewal cannot be a proxy for supply. Many people who have never taught keep their credentials up to date, as a kind of insurance policy.

## Given these constraints supply has been estimated in two ways:

Method 1: By estimating the likelihood that members of four supply groups actually will teach.

Method 2: By using information on entries and returns to the active teacher force from STRS records.

Method 1: Sources of new teachers
There are four sources of teacher supply:
(1) recent graduates of California credential programs
(2) credential holders from out of state
(3) college graduates who pass CBEST and obtain emergency credentials
(4) teachers returning after a period of time away from teaching (the reserve pool).

An estimate of the annual contribution to teacher supply of each of these four sources follows:

1. Recent graduates of California credential programs:

Enrollment in teacher education programs increased 48.5 percent between 1981-82 and 1983-84, but the number of credentials issued to those prepared by California teacher education programs decreased 22.9 percent in the same period.

Although enrollment in teacher preparation programs has increased, the number of credentials issued has decreased in the last three years. CTC issued 14,210 first single (secondary) and multiple subject (elementary) credentials between 1981-82 and 1983-84 to students from California teacher education institutions (Table 8).9 The number of first credentials issued to those who completed preparation programs in California declined 23 percent between 1981-82 and 1983-84.

In contrast to the decline in the number of credentials issued, first time enrollment in credential programs increased 10.8 percent between 1982-83 and 1983-84. Informal reports indicate that enrollment increased more than 11 percent in 1985-86. Yet more than two times as many people were first enrolled as received credentials from California colleges and universities in 1983-84 (Table 9). It is not clear why fewer credentials are being issued even though enrollment is increasing. The discrepancy may result from comparing different cohorts of credential candidates or from a declining rate of completion of teacher education programs. Available data do not distinguish among those possibilities. Despite the ambiguity, a larger pool of teacher candidates eventually will result in a larger number of credentials issued.

On average, 49.7 percent of newly credentialed teachers taught in 1984-85.

Although the number of first credentials issued indicates how many people might be available to teach, not all new teachers actually enter teaching. Some cannot find a job in their area of specialization or within commuting distance of their homes; others decide that teaching is not for them. We estimated the proportion of new teachers who actually taught from a stratified random sample of first credential recipients matched to STRS membership data.

## Table 8

First Credentials Recommended by California Training Institutions

|  | 1981-82 | 1982.83 | 1983-84 | Total | $\begin{array}{r} \text { \% change } \\ (81-82 \text { to } \\ 83-84) \end{array}$ | $\begin{aligned} & 3 \text { year } \\ & \text { average } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Single subject: | 2,174 | 1,950 | 1,534 | 5,658 | -29.4\% | 1,886 |
| Multiple subject: | 3,053 | 3,003 | 2,496 | 8,552 | - 18.2\% | 2,851 |
| Total: | 5,227 | 4,953 | 4,030 | 14,210 | - 22.9\% | 4,737 |
| Note: | Multiple and single subject credentials include bilingual emphasis. |  |  |  |  |  |
| Source: | Personal communication with Lee Huddy, CTC. September 18, 1985. |  |  |  |  |  |

Table 9
First-time Enrollment in Single \& Multiple Subject Credential Programs Compared to First Single \& Multiple Subject Credentials Issued

|  | 1981-82 | 1982-83 | 1983-84 | $\begin{gathered} \text { \%change } \\ (81-82 \text { to } 83-84) \end{gathered}$ |
| :---: | :---: | :---: | :---: | :---: |
| First-time enrollment | 5,857 | 7,854 | 8,699 | 48.5\% |
| First credentials issued | 5,227 | 4,953 | 4,030 | -22.9\% |
| Ratio of credentials issued to enrollment | 89.2\% | 63.1\% | 46.3\% |  |

## Sources:

1. 1981-82 enroliment extrapolated from CSU enrollment. Lazar, CSU, personal communication, September 1985.
2. Enrollment for 1982-83 to 1983-84 from Bernhardt, CTC, 1985.
3. Credentials issued from Huddy, CTC, 1985.

Table 10

## STRS status of teachers first credentialed in 1981-82 to 1984-85

(from a random sample of teachers credentialed by the CTC)

| STRS status | 1981-82 |  | 1982-83 |  | 1983-84 |  | 1984-85 |  | $\begin{gathered} \text { Total } \\ \text { 1981-82 to } 1984-85 \end{gathered}$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| Active | 75 | 49.7\% | 70 | 46.1\% | 89 | 57.8\% | 68 | 45.0\% | 302 | 49.7\% |
| Inactive | 4 | 2.6\% | 1 | 0.7\% | 0 | 0.0\% | 0 | 0.0\% | 5 | 0.8\% |
| Non-member | 32 | 21.2\% | 31 | 20.4\% | 39 | 25.3\% | 48 | 31.8\% | 150 | 24.7\% |
| Refunds | 10 | 6.6\% | 12 | 7.9\% | 2 | 1.3\% | 3 | 2.0\% | 27 | 4.4\% |
| Never a member | 30 | 19.9\% | 38 | 25.0\% | 24 | 15.6\% | 32 | 21.2\% | 124 | 20.4\% |
| Total | 151 | 100.0\% | 152 | 100.0\% | 154 | 100.0\% | 151 | 100.0\% | 608 | 100.0\% |

As shown in Table 10 , between 45 percent and 57.8 percent of credential recipients from the years 1981-82 to 1984-85 taught in 1984-85, and between 20 percent and 31.8 percent worked less than ten days per forty day pay period. In addition, some of these new credential holders already had resigned or had taken a leave without pay. Of all the 608 new credential holders in the random sample, half (49.7 percent) taught in 1984-85. Some earnings were reported to the retirement system for another fourth ( 24.7 percent) in 1984-85. A fifth never had worked for pay in a public school system. Based on this sample half of new credential recipients actually taught in 1984-85.

The age range of "first ever" credential recipients in this sample is as wide as that of the active teaching force. Teachers as young as 23 and as old as 67 obtained first credentials between 1981-82 and 1984-85. The average age was 31.8.

Enrollment in science credential programs increased 165 percent between 1981 and 1984. Enrollment in mathematics credential programs increased 117 percent.

Enrollment in programs for science and mathematics teachers increased much faster than the enrollment in all single subject programs between 1982-83 and 1983-84. Although the numbers still are very low, the rate of increased enrollments in teacher programs in science and mathematics is encouraging. Enrollment in science credential programs increased 165 percent between 1981-82 and 1983-84, from 184 to 487 (Table 11). Mathematics enrollments also increased more than 100 percent in the same time period, from 110 to 239.

CBEST has reduced teacher supply.
CBEST (Callfornia Basic Educational Skills Test) may explain the apparent contradiction between increasing enrollments in credential programs and declining numbers of credentials issued. This discrepancy should lessen now that CBEST is required for admission to credential programs.

CBEST was first required for new credential applicants in February 1983 and for enrollees in teacher education programs in Fall of 1983. CTC attributes some of the decline in the number of credentials issued between 1982-83 and 1983-84 to CBEST. This may continue to have a dampening effect on the supply of teachers in the absence of incentives to attract more academically skilled candidates or of remedial programs to help others avoid fallure.

In 1983-84 only 69 percent of 39,922 applicants for credentials passed CBEST the first time. Pass rates differ by race. Four-fifths of whites, half of Asians, a third of Mexican Americans/Chicanos and a third of Blacks passed on the first attempt. The pass rates for 1984-85 are expected to be about the same or a little higher than those of 1983-84.10

## Summary of supply from new graduates.

An average of 4,737 teachers earned first credentials in each of the last three years. Given the rapidly increasing enrollment in teacher education programs and the ambiguity of

Table 11

Sources: $\quad$ 1. 1981-82 data from Guthrie \& Zusman, 1982.
2. 1982-83 \& 1983-84 data from Lee Huddy, CTC, personal communication, September 19, 1985.
steadily decreasing numbers of first credentials issued, this average number of new credentials will continue to be issued each year. The average labor force participation rate for new credential holders is used to project actual number of teachers. An average of half of recent credential recipients were teaching in 1984-85. This translates into an annual average contribution to supply of 2,354 .

## 2. Credential holders from out of state:

The number of newly credentialed teachers from out of state declined 65.5 percent between 1981-82 and 1983-84.

Immigrants to California may apply directly to CTC for credentials after passing CBEST. Nine thousand teachers applied directly to CTC for first credentials in the past three years. Although the annual average number of credentials issued was 3,004, the number issued declined 65 percent in the three year period (Table 12). The decline primarily was caused by the recruit requirement that new out of state teachers complete a district-prepared competency test, in lieu of CBEST, for a oneyear, non-renewable (OYN) credential. Districts have not had the resources to prepare the tests; consequently, they have reduced out of state recruiting; ${ }^{11} 454$ OYN credentials were issued in 1983-84.

## 3. College graduates who pass CBEST and obtain emergency

 credentials:Approximately 3,200 emergency credentials were issued in each of the last three years.

The number of emergency credentials issued is one measure of teacher shortage because emergency credentials only can be issued if a school board formally finds that no fully credentialed candidates are available. The applicant must have a BA degree, pass CBEST, and be offered a job. Renewal (and re-employment) is contingent on the completion of another statement of need the following year and on completion of six units of teacher preparation courses during the year. CTC issued approximately 3,200 emergency credentials in each of the last three years.

Summary of supply from emergency credentials.
Emergency credentials are the stop gap between demand and available supply. About 3,200 were issued in each of the last four years. If past trends continue, about one-third of new teacher supply will come from emergency credential holders $(3,200)$.

## 4. The reserve pool:

The reserve pool contains at most 167,000 teachers with valid K-12 credentials who are not currently teaching.

Although teachers frequently take a year or more away from the classroom (the rate may be as high as 98 percent, based on the random sample discussed below), the estimates here are with

Table 12

First Credentials Issued Direct (Out of State) Application

1981-82 to 1983-84

| Type of Credential | 1981-82 | 1982-83 | 1983-84 | 3 Year Total | Annual Average | $\begin{array}{r} \text { \%Change } \\ 1981-82 \text { to } \\ 1983-84 \end{array}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Single Subject | 2,084 | 1,596 | 706 | 4,386 | 1,462 | 66.1\% |
| Multiple Subject | 2,214 | 1,665 | 778 | 4,657 | 1,552 | 64.9\% |
| Total | 4,298 | 3,261 | 1,484 | 9,043 | 3,014 | 65.5\% |

No single or multiple subject credentials with bilingual emphasis were issued to direct applicants in these years.

Source: Lee Huddy, CTC, personal communication, September 18, 1985.
teachers who have been out of the classroom for an exiended period of time--the so-called "reserve pool."

Faced with the likelihood of a severe teacher shortage, policy makers have looked to the reserve pool as a potential source of trained teachers. Schlechty and Vance ${ }^{12}$ suggest that members of the reserve pool may be better qualified to teach than the average current teacher. They reported that teachers with higher personal and social aspirations and academic ability were more likely to leave teaching. As desirable as it might be for these well educated, aspiring teachers to return to the classroom, how realistic is it to rely on the reserve pool to meet demand for teachers?

That question is approached by approximating the size of the reserve pool (the number of people with valid credentials available to teach) and by assessing the likelihood that reserve pool members would return to the classroom.

The size of the reserve pool was estimated by comparing a random sample of CTC records of valld credentials with membership files of STRS. An estimate of the likelihood that reserve pool members would return to teaching under present conditions from a focus groupl 3 was established and a follow-up telephone survey of former teachers was conducted.

The random sample of 907 CTC records indicated that half of those who obtained any kind of credential from CTC before 1981-82 still have valid credentials. of these, two-thirds also had records in STRS (Table 13). 14

Table 13

> STRS Status of Teachers Credentialed Before 1981-82 (from a random sample of 455 teachers with valid credentials in the microfiche files of the CTC)

| STRS Status | Number | Percent |
| :--- | ---: | :---: |
| Active |  |  |
| Inactive | 213 | 46.8 |
| Non-member | 20 | 4.4 |
| Retired | 37 | 8.1 |
| Refunds | 9 | 2.0 |
| Death | 17 | 3.7 |
| Disability | 1 | 0.2 |
| Other | 2 | 0.4 |
| Never a member | 155 | 0.2 |
|  | $\underline{34.1}$ |  |
| Total | 455 | $\underline{100.0}$ |

Of this half, 46.8 percent taught (were active) in the 1984 85 school year, 8.1 percent were non-members, 2.0 percent had retired, 3.7 percent had requested refunds and 0.2 percent had died; 4.4 percent were inactive and had not taught for from one to more than nine years. The remaining 34.1 percent did not have records in STRS.

The mean age of the sample was 43.7, and they ranged between 22 and 76 years of age. Ten percent of the sample was older than sixty, the average retirement age in California.

From CBEDS, 172,853 teachers taught in $K-12$ classrooms in 1984-85. Since approximately 46.8 percent of teachers with valid credentials are teaching, approximately 370,000 (172,853/.468) have valld $K-12$ credentials. The reserve pool is what remains after subtracting the following groups who are not available to be new teachers: current public school teachers, private school teachers with credentials and those who have retired, died, become disabled or emigrated from California. In 1984-85, 172,853 taught in public school. Perhaps 50 percent of private school teachers had credentials, or $14,000.15$ Based on the matched sample, 3,457 retired, 345 were deceased and 690 were disabled. The emigration rate of 7 percent for Callfornia was estimated from US Census emigration rates. 16 Assuming that teachers emigrate at the same rates as the general population, approximately 12,000 credentialed teachers left the state between 1980 and 1985. Undoubtedly more teachers left California prior to 1980. Thus, a conservative estimate of the total number of teachers with valid credentials unavallable for teaching is 203,345. This leaves the reserve pool containing, at most, 167,000 teachers with valld K-12 credentials.

No more than 30 percent of reserve pool members are likely to return to teaching.

Of this estimated reserve pool of 167,000 teachers, what proportion would be likely to return to teaching?

Based on the results of a focus group conducted in April 1985, former teachers would be unlikely to return to teaching under the present circumstances, i.e., current wages and working conditions. Each of the eleven participants felt that current salaries were too low. Large class sizes, outdated and inadequate materials and lack of auxiliary professional support discouraged the former teachers from resuming teaching. If focus group participants are representative of the reserve pool, 17 no reserve pool members could be expected to return to teaching under present conditions. Based on the focus group alone, the reserve pool is only a puddle!

Method 2: Estimating supply from STRS entry and re-entry rates
Based on STRS experience, 56,049 new and returning teachers can be expected by 1989-90.

As a profession, teaching is one of the easiest to re-enter. The matched sample of CTC and STRS records indicated nearly all ( 98.6 percent) of teachers credentialed before 1981-82 had been inactive for at least one full fiscal year during their career. Of the 20 teachers inactive in 1984-85, seven, or 35 percent, had been inactive more than five years. 18 Unpaid leaves of absence for maternity, personal growth or additional degrees increase the uncertainty in supply and demand projections.

From STRS matrices the number of teachers expected to enter active teaching from non-active categories was estimated. This
analysis includes both new and re-entering teachers from all sources. STRS data show changes from inactive (non-member, refund, inactive, retirement, new, disability) statuses to active status during a fiscal year.

In 1977-78, 17,701 teachers ( 6.4 percent of active teachers for the year) entered the active teaching force from the six STRS groups (including new teachers). In the most recent year for which information is available, fewer inactive members entered the active teaching force. Entries as a percentage of the active teaching force declined to 5.4 percent in 1983-84.

The teacher force is stabilizing. Fewer active members transfer to inactive status or seek refunds. Fewer non-members and inactive members return to teaching. Since retirements are increasing, new teachers will become a larger component of supply.

The reasons for the changes are unclear. Increasing female labor force participation may reduce turnover. The passage of Proposition 13 was followed by increased layoffs, so the amount of turnover in the last seven years may exaggerate long term trends. The general shortage of teaching jobs meant that fewer teachers were hired. As more jobs become available, experienced teachers may return.

The average rate of entry over the last seven years was 6.58 percent. Using that figure to project new supply, by 1989-90, 56,049 teachers can be expected to enter and return to the schools Table 14). Since the mean entry rate is only 1.09 percent below the mean rate of attrition, the teacher shortage may not be as severe as originally anticipated.

For the ten year period to $1994-95,119,472$ teachers can be expected to enter and return to teaching with current recruitment efforts (Table 14).

## SECTION THREE

## Demand from Three Educational Improvements

Three proposed educational improvements--reducing class size, eliminating emergency credentials, and requiring teachers to teach only in their field of expertise--will increase demand 70 to 75.9 percent in the five years to $1989-90$ and 45.8 to 49.7 percent for the ten year period (Table 15).

Reducing pupil/teacher ratios over five years to 20 to 1 at both the elementary and secondary levels would require an additional 49,658 to 50,461 teachers by 1989-90 (Table 15).

Approximately 3,200 emergency single and multiple subject credentials are issued each year in California. About one-third are renewed the next year. If emergency credentials are no longer allowed, then about 4,200 more fully credentialed teachers would beneeded.

Approximately 6 percent of teachers reported they were teaching outside their main area of expertise in 1984-85.19 If

Table 14
Teacher Supply Projections (using STRS average entry \& re-entry rate)

| Year | Total FTEs <br> required <br> (K-12) | STRS average <br>  | Projected <br> annual |
| ---: | ---: | ---: | ---: |
|  |  |  |  |
| re-entry rate |  |  |  |$\quad$| supply (FTEs) |
| ---: |


| Table 15 |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Teacher Demand With Educational Improvements |  |  |  |  |  |
| Demand Projection Method 1 |  |  |  |  |  |
|  | 5 year projection |  | 10 year projection |  | ${ }_{\sim}^{\text {c }}$ |
|  | increased demand (FTEs) | \% Increase Over Demand Without Improvements | Increased demand (FTEs) | \% Increase Over Demand Without Improvements | \% <br> 0 <br> 0 <br> 0 |
| Class size reduction to 20:1 | 50,461 | 59.3\% | 74,975 | 40.9\% | $\stackrel{\circ}{\stackrel{\circ}{-}}$ |
| Elimination of emergency credentials | 4,200 | 4.9\% | 4,200 | 2.3\% | \$ |
| Elimination of leaching out of field | 4.883 | 5.7\% | 4,883 | 2.7\% | $\stackrel{+}{\text { - }}$ |
| Total increased demand: | $\overline{59,544}$ | 70.0\% | $\overline{84,058}$ | 45.8\% | $\stackrel{\rightharpoonup}{\square}$ |
| Demand under Current practices: | 85,052 |  | 183,360 |  | $\stackrel{\sim}{6}$ |
| Total demand with improvements: | 144,596 |  | 267.418 |  |  |


|  | 5 year projection |  | 10 year projection |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Increased demand (FTEs) | \% Increase Over Demand Without Improvements | increased dermand (FTEs) | \% Increase Over Demand Without Improvements |
| Class size reduction to 20:1 | 49,658 | 64.2\% | 70,280 | 44.0\% |
| Elimination of emergency credentials | 4,200 | 5.4\% | 4,200 | 2.6\% |
| Elimination of teaching out of field | 4,883 | 6.3\% | 4.883 | 3.1\% |
| Total increased demand: | $\overline{58,741}$ | 75.9\% | 79.363 | 49.7\% |
| Demand under current practices: | 77,342 |  | 159,743 |  |
| Total demand with improvements: |  |  | 239,106 |  |

each teacher taught outside his or her area of expertise at least 50 percent of the time, then 4,883 more FTEs would be needed to meet the third standard for educational improvement.

The three proposed improvements would increase demand to between 136,083 and 144,596 for the five years to 1989-90 and to between 239,106 and 267,418 for the ten year period.

## SECTION FOUR

Projected Shortfall: Summary of Supply and Demand

Total Demand
Demand for teachers is expected to be between 77,342 and 85,052 for the five year period to 1989-90 and between 159,743 and 183,360 for the ten year period to 1994-95.

## Annual Demand

Between 15,000 and 17,000 new teachers will be needed each of the next five years to meet demand because of growth and attrition.

## Supply: Projection Method 1

The supply consists of 2,354 individuals with new credentials, 1,500 from out of state, about 3,200 emergency credentials per year, and the reserve pool of 50,000 members, of whom approximately 3,000 may return each year. This totals 10,054 new teachers per year and this rate is projected to remain constant for ten years. This may be considered a conservative (low) estimate because even though enrollments in teacher education programs are increasing, these projections assume a constant number of credentials over the next ten years.

Supply: Projection Method 2
From past STRS re-entry rates, 56,049 teachers can be expected to enter teaching in the next five years if current recruitment efforts and policies continue unchanged. Slightly more than half ( 58.7 percent) of these will be increasing the amount of time they work from occasional to more than half time. The remainder are new teachers ( 16.1 percent) or teachers who have taught in the past ( 25.2 percent). By 1994-95, 119,000 teachers can be expected to return with current recruitment efforts.

## Supply and Demand: Projected Shortages

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Demand will exceed the supply of teachers by 21,290 to 34,780 FTEs for the five year period to 1989-90.
```

Using the supply projection method 1 , the shortfall, the difference between demand ( 15,468 and 17,010 per year) and supply ( 10,054 per year) is between 5,414 and 6,956 teachers per year, or between 27,070 and 34,780 teachers for the five year period to 1989-90. Alternatively, if entries are projected from STRS rates
alone (supply projection method 2), an average of 11,210 FTEs may be expected to enter and return to teaching each year. This would result in a shortfall of between 4,258 and 5,800 teachers per year, or between 21,290 and 29,000 for the five year period. Using both methods of forecasting supply, the shortfall, then, can be expected to be between 4,000 and 7,000 per year for the five year period.

Demand will exceed the supply of teachers by 40,270 to 82,820 FTEs for the ten year period to 1994-95.

For the ten year period the shortfall is between 40,270 and 82,820. Average annual demand for the ten year period is projected to be between 15,974 and 18,336 teachers. If supply is projected conservatively to be 10,054 (method 1), the annual shortfall is between 5,920 and 8,282. Alternatively, if entries are projected from STRS rates (method 2), an average of 11,947 teachers per year may be expected to enter teaching. Under that assumption the annual shortfall is between 4,027 and 6,389. The annual shortfall, then, for the ten year projection period is between 4,027 and 8,282 FTEs.

If pupil/teacher ratios are lowered to 20 to 1 , teaching out of field is not permitted, and emergency credentials are eliminated, the shortage of teachers will increase dramatically.

The three proposed improvements--reducing pupil/teacher ratios to 20 to 1 , eliminating emergency credentials and requiring teachers to teach only in their field of expertise--would increase the shortfall to between 80,033 and 94,326 FTEs for the five year period and between 127,000 and 266,878 FTEs for the ten year period. These numbers represent a 70 to 75.9 percent increase in total demand for the five year period and a 171 to 276 percent increase in the projected shortfall. Clearly, if California education is seriously contemplating such reforms, strong incentives to recruit women and men to the teaching profession will be required.

## FOOTNOTES

${ }^{1}$ Since DOF projections exclude special education enrollment, supply and demand for special education have not been projected.
${ }^{2}$ Attrition is used for all types of separation from the teaching force except retirements.
${ }^{3}$ DOF projections excluded special education, adult and Regional Occupation Centers (ROC/ROP) enrollment. We have, therefore, excluded those teachers as well. Thus, our pupil/teacher ratios differ from previously published ratios which included these teachers, but not their pupils. We have also included teachers of departmentalized junior high schools in $\mathrm{K}-8$ ratios rather than in secondary ratios.

4 For example, Teacher Shortage Loan Assumption Program, 1984-85, and California Tax Foundation, 1985.

5elementary districts with departmentalized seventh and eighth grades, high school and unified districts were eligible.
${ }^{6}$ State Department of Education, 1985. DATA/BICAL Reports 85-2; 85-5C, Pailthorp and Gold, 1985.
${ }^{7}$ Ibid.
${ }^{8}$ Waivers allow teachers who agree to learn the language within 6 years to teach bilingual classes when certified bilingual teachers are not available.
${ }^{9}$ CTC. 9/18/85. CTC compiles statistics separately for "first ever" credentials (the first credential of any type received by an individual), new (the first of a particular type for an individual) and emergency credentials. Therefore, we can estimate the number of people who are first available in any one year for teaching.
$10_{\text {Watkins, }}$ CTC, $9 / 85$, personal communication.
11 Personal communication, Lee Huddy, 9/23/85.
12Schlechty and Vance, 1983.
13Cory, Canapary, McCullough, May, 1985.
14 Until 1984-85, STRS purged its files of people who had requested refunds three years before the current year. A portion of the sample who do not now have records in STRS is likely to contain some who requested refunds in the years prior to 1981-82. Therefore, the unmatched group probably over-estimates the number who never taught.
${ }^{15}$ Private school enrollment was 540,127 in 1984 (State Department of Finance); pupil teacher ratio was 19.1 to 1 (NCES, 1985).
${ }^{16}$ Statistical Abstract of the United States, 1985, Table 15. Also, series P-26, No. 82-5-C,2/84. Local Population Estimates. Bureau of the Census.

17 Focus group members were chosen to represent the teacher population in that 2 were minority, 9 female, 2 male, 6 former elementary teachers and 5 former high school teachers.

18 This underestimates the number of people who had taught because STRS does not maintain records of teachers inactive more than nine years because the likelihood of their returning to teaching is so small. As mentioned before, they also purged files of refunds issued prior to 1981.
${ }^{19}$ Koppich, Gerritz, and Guthrie, 1985.

## BIBLIOGRAPHY

Bernhardt, Victoria L. Enrollments and Recommendations of California College and University Teacher Credentialing Programs: 1982-83,1983-84. Sacramento: Commission on Teacher Credentialing, September 1985.

California Round Table on Educational Opportunity. Improving the Attractiveness of the K-12 Teaching Profession in California. Sacramento: State Department of Education, 1983.

California State Teachers' Retirement System. 63 rd Annual Report. Sacramento, June 30, 1976.

- 67th Annual Administrative and Financial Report. Sacramento, June 30, 1980.
- 68th Annual Administrative and Financial Report. Sacramento, June 30, 1981 .
- 69th Annual Administrative and Financial Report. Sacramento, June 30, 1982.
- 70th Annual Administrative and Financial Report. Sacramento: 1983.

Commission for Teacher Preparation and Licensing. Credential Profiles 1980-81. Sacramento, n.d.

Commission on Teacher Credentialing. The Chalienges of Teacher Preparation, Thirteenth Annual Report: 1983-84. Sacramento, n.d.

Connecticut State Department of Education. Office of Research and Education. Teacher Supply and Demand in Connecticut: A Report Prepared for the Governor's Commission on Equity and Excellence in Education. April 4, 1985. Advance copy.

Cory, Canapary, McCullough. Focus Group Report Concerning the Teaching Profession. San Francisco: The California Commission on the Teaching Profession, May 1985.

Fulton, James A. Teacher Salaries: A Preliminary Analysis. Sacramento: California State Department of Education, Program Evaluation and Research Division, October 1984.

Guthrie, James W. and Zusman, Ami. Mathematics and Science Teacher Shortages: What Can California Do? Berkeley: University of California, Institute of Governmental Studies, 1982.

Schlechty, Phillip C. and Vance, Victor S. "Recruitment, Selection and Retention: The Shape of the Teaching Force." Elementary School Journal, 83 (March 1983), pp. 469-487.

State Department of Education. California Basic Education Data System. Sacramento,1983-84.

- California Basic Education Data System. Sacramento, 1984-85.
, Planning, Evaluation and Research Division. "The Teacher Shortage in California: A Preliminary Analysis." n.d., mimeographed.

