

Acknowledgements

The State Laboratory Program and all the state metrologists associated with it would like to acknowledge Henry Oppermann and the many contributions he has made to legal metrology in the United States. Along with John Taylor, Henry literally wrote the book on metrology. Nearly twenty years after its publication, NBS Handbook 145, *Handbook for the Quality Assurance of Metrological Measurements*, remains inarguably the most important reference to legal metrology in the United States. Henry trained many of us in the State Laboratory Program and shaped the programs we manage today. We owe much to his patient explanations, clear derivations, and quest to always want to know more. Even after leaving the management of the State Laboratory Program, his continuing support has allowed Georgia Harris to push our laboratories to ever higher standards. He has never lost sight of the importance of the metrology laboratory as the foundation of both legal metrology and industrial measurement. We wish him the very best in his retirement. Henry, thanks for the support and guidance you have given to the State Laboratory Program throughout the years. You have touched us all and improved the lives of everybody who has ever bought, sold, or manufactured a product based on weight or other measure in the United States. Your work is and will continue to be truly appreciated.

The committee would like to extend a special Thank You to Ken Fraley, Oklahoma Bureau of Standards, for his work in assembling the massive amount of data into the form before you. Without his dedication to this work the State Laboratory Survey would not have the clarity of form that enables the reader to understand the content so effortlessly.

We would also like to give our appreciation to Craig Gulka, Business Manager, NCSL International for automating the data collection through the NCSLI web site, truly pushing the survey into the twenty first century. It made this year's data collection much easier and more efficient than in past surveys.

Thanks to the NCSLI Legal Metrology Committee, (Georgia Harris, NIST; Val Miller, NIST; L.F. Eason, North Carolina; Steve Sumner, New Mexico and Elizabeth Gentry, Oklahoma) for their perceptive review in the development of this report.

*Dedicated to the Memory of
Joe Rothleder
(1939-2005)
(California Principal State Metrologist, 1979 - 2003)*

*Joe, You always made us think
and
Often helped us to see what otherwise we would have missed.*

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2005 NCSLI Legal Metrology Committee State Laboratory Program Workload Survey

Objectives and History of the Survey

In 1996, the National Conference on Weights and Measures (NCWM) Metrology Subcommittee surveyed the State Laboratory participants to quantify the workload of the State Laboratory Program (SLP) and document its impact on the United States economy. From the survey analysis, it was clear that the workload statistics were dynamic and only provided a snapshot of the workload at the time. Therefore, the Metrology Subcommittee circulated a revised survey April 16, 1999 to update program statistics and to investigate trends in the National workload. The subcommittee has since recommended that the survey be conducted on a biennial basis and that the core survey be kept standardized in order for state labs to develop databases that could automatically generate the information for the survey. The 2005 survey is the first survey sponsored by the National Conference of Standards Laboratories International (NCSLI) Legal Metrology Committee. NCSLI created space on their website by which participants could complete the survey on-line.

Survey data will be used not only to quantify the impact of the State Laboratory Program on the United States economy, but also to plan and maximize its effectiveness. Training and inter-laboratory comparisons will be designed to meet real needs of the workload. Ultimately, the survey information will increase the efficiency of the entire State Laboratory Program and maximize the benefits to the National Economy. The results of previous surveys have been used extensively at NIST to gain support and attention for the State Laboratories and have been helpful in putting together budget proposals. The information from the survey is also useful in identifying the diversities of the workload on a national level.

Standardization of Future Surveys

Since it is the intention to conduct this survey on a biennial basis, the survey has been standardized in a format very similar to the 1999 survey. Future surveys will continue to be standardized in this format. This facilitates the reporting information from the individual laboratories, since the laboratories are always aware of what information must be tracked during any reporting period. From time to time there have been (and will continue to be) instances that another questionnaire is attached to the survey to collect additional information of timely importance. For example, the 1999 survey had an attachment that asked for information regarding weight carts. This was a very efficient method for collecting data that was used in the drafting of the new NIST Handbook 105-8 that addresses the specifications and tolerances for weight carts. The 2001 survey had a few special requests for information. One was job title and salary ranges of metrologists. Another special request was fee information. The 2003 survey was also accompanied with a questionnaire concerning technical specification standards and regulations. However, the basic format of the survey will be standardized from year to year.

The reporting period has also been standardized. The title of the survey report reflects the year in which the report was created. For example, the 2003 survey requested information

based on activities performed by each laboratory during the period of January 1, 2002 through December 31, 2002.

Presentation and Analysis of Data

Thanks in large part to the efforts of Craig Gulka, Business Manager, NCSL International, this was the first year that the survey was completed on-line. The NCSLI developed a program that automatically compiled the data into an Access database. Queries were developed to access the data that was then copied into Excel spreadsheets. The Excel spreadsheets were used to present the information in graphical form for the different types of standards. The first graph at the top of each page is a map graph in which shading is used to indicate the number of standards each state tested. Also included is a pie graph that provides a further breakdown of the data. The pie graph is automatically placed as an overlay on the map graph and associated with the appropriate State. The bar graph uses the same data as the map graph and provides a further breakdown of the data. The bar graph displays the total number of standards tested above each bar and an average is calculated and plotted.

Note: Extreme caution should be used when comparing one state's data with data from another state. It was determined in the 1996 survey that laboratory workload is based somewhat on industrial and population densities that vary by geographical location. Laboratories generally attempt to meet the needs of their customers equally. For this and additional reasons listed elsewhere in this report, variance between individual laboratories concerning the number of devices tested, staffing, and laboratory facility are normal and cannot legitimately be used to rate the quality of any laboratory program.

Also presented are some comparisons between the calculated laboratory averages from the 1996, 1999, 2000, 2001, 2003, and 2005 surveys. No attempt was made to compare increases or decreases in the workload of individual laboratories due to the fact that laboratories may use different calibration intervals for different standards and their annual workload will fluctuate accordingly. For example, a state may have their volumetric glassware on a two-year calibration interval with the majority of these standards calibrated in one twelve month period with very few that are tested in the following twelve-month period. This does not indicate that the workload is decreasing in that state; it is just a reflection of the calibration interval assigned to those standards.

Participants

The State Laboratory Program (SLP) is comprised of 55 metrology laboratories. There are 50 state laboratories and 5 other government laboratories (Puerto Rico, Washington DC, Los Angeles County, USDA-GIPSA (identified as 'DA' in the survey), and U.S.-Virgin Islands). Of these 55 laboratories, 4 are not active and 4 were temporarily inactive at the time of this survey. The Washington DC, Delaware, U.S.-Virgin Islands, and Rhode Island metrology laboratories were not operational. The Kentucky, Tennessee, and North Dakota state metrology laboratories, and Los Angeles County metrology laboratory were inactive during the reporting period of the 2005 survey. Forty-seven laboratories (100% of active laboratories) responded to the survey.

The following is a list of the SLP laboratories and their participation status in the 1996, 1999, 2000, 2001, 2003, and 2005 surveys.

	1996 Survey Participant	1999 Survey Participant	2000 Survey Participant	2001 Survey Participant	2003 Survey Participant	2005 Survey Participant
AK	Yes		Yes	Yes	Yes	Yes
AL	Yes				Yes	Yes
AR	Yes	Yes	Yes	Yes	Yes	Yes
AZ	Yes	Yes	Yes	Yes	Yes	Yes
CA	Yes	Yes	Yes	Yes	Yes	Yes
CO	Yes		Yes	Yes	Yes	Yes
CT	Yes	Yes	Yes	Yes	Yes	Yes
DE	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)
FL	Yes	Yes	Yes	Yes	Yes	Yes
GA	Yes	Yes	Yes	Yes	Yes	Yes
HI	Yes	Yes	Yes	(inactive)	Yes	Yes
IA	Yes	Yes	Yes		(inactive)	Yes
ID	Yes	Yes	Yes	Yes	Yes	Yes
IL	Yes	Yes	Yes	Yes	Yes	Yes
IN	Yes	Yes	Yes	Yes	Yes	Yes
KS	Yes	Yes	Yes	Yes	Yes	Yes
KY	Yes	Yes	Yes	Yes	Yes	(inactive)
LA	Yes	Yes	Yes	Yes	Yes	Yes
MA	Yes		Yes	Yes	Yes	Yes
MD	Yes	Yes	Yes	Yes	Yes	Yes
ME	Yes	Yes	Yes	Yes	Yes	Yes
MI	Yes	Yes	Yes	Yes	Yes	Yes
MN	Yes	Yes	Yes	Yes	Yes	Yes
MO	Yes	Yes	Yes	Yes	Yes	Yes
MS	Yes	Yes		(inactive)	Yes	Yes
MT	Yes	Yes	Yes	Yes	Yes	Yes
NC	Yes	Yes	Yes	Yes	Yes	Yes
ND	Yes	Yes	Yes	Yes	Yes	(inactive)
NE	Yes	Yes		Yes	Yes	Yes
NH	Yes	Yes	Yes	Yes	Yes	Yes
NJ	Yes	Yes	Yes	Yes	Yes	Yes
NM	Yes	Yes	Yes	Yes	Yes	Yes
NV	Yes	Yes		Yes	Yes	Yes
NY	Yes	Yes	Yes	Yes	Yes	Yes
OH	Yes	Yes	Yes	Yes	Yes	Yes
OK	Yes	Yes	Yes	Yes	Yes	Yes
OR	Yes	Yes	Yes	Yes	Yes	Yes
PA	Yes	Yes	Yes	Yes	Yes	Yes
RI	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)
SC	Yes	Yes	Yes	Yes	Yes	Yes
SD	Yes	Yes			(inactive)	Yes
TN	Yes	Yes	Yes	Yes	Yes	(inactive)
TX	Yes	Yes	Yes	Yes	Yes	Yes
UT	Yes	Yes	Yes	Yes	Yes	Yes
VA	Yes	Yes	Yes	Yes	Yes	Yes
VT	Yes	Yes	Yes	Yes	Yes	Yes
WA	Yes	Yes	Yes	Yes	Yes	Yes
WI	Yes	Yes	Yes	Yes	Yes	Yes
WV	Yes	Yes	Yes	Yes	Yes	Yes
WY	Yes	Yes	Yes	Yes	Yes	Yes
USDA-GIPSA	Yes					Yes
Washington DC	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)
Virgin Islands	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)
Puerto Rico	Yes	Yes	Yes	Yes	Yes	Yes
LA County	Yes	Yes	Yes	Yes	Yes	(inactive)
TOTAL	51	46	45	45	48	47

Summary of All Standards {Total Number of Standards or Devices Tested}

Description

The graphs on the following page are a summary of the total number of standards or devices tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices being tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the categories of mass, volume, length, temperature, time/frequency, wheel load weighers, lottery balls, and other. The bar graph at the bottom of the page shows the same breakdown in categories along with the total number of devices tested by each laboratory. There is also a smaller line graph indicating the totals from the 1996, 1999, 2000, 2001, 2003, and 2005 surveys.

Findings

The 47 reporting laboratories tested a total of 355,986 standards.

Comparison of the 2005, 2003, 2001, 2000, 1999, and 1996 Surveys

	# Reporting Labs	Total Devices	Lab Average
1996	51	332,587	6,521
1999	46	320,950	6,977
2000	45	352,274	7,828
2001	45	361,600	8,036
2003	48	375,411	7,821
2005	47	355,986	7,574

Using the lab averages:

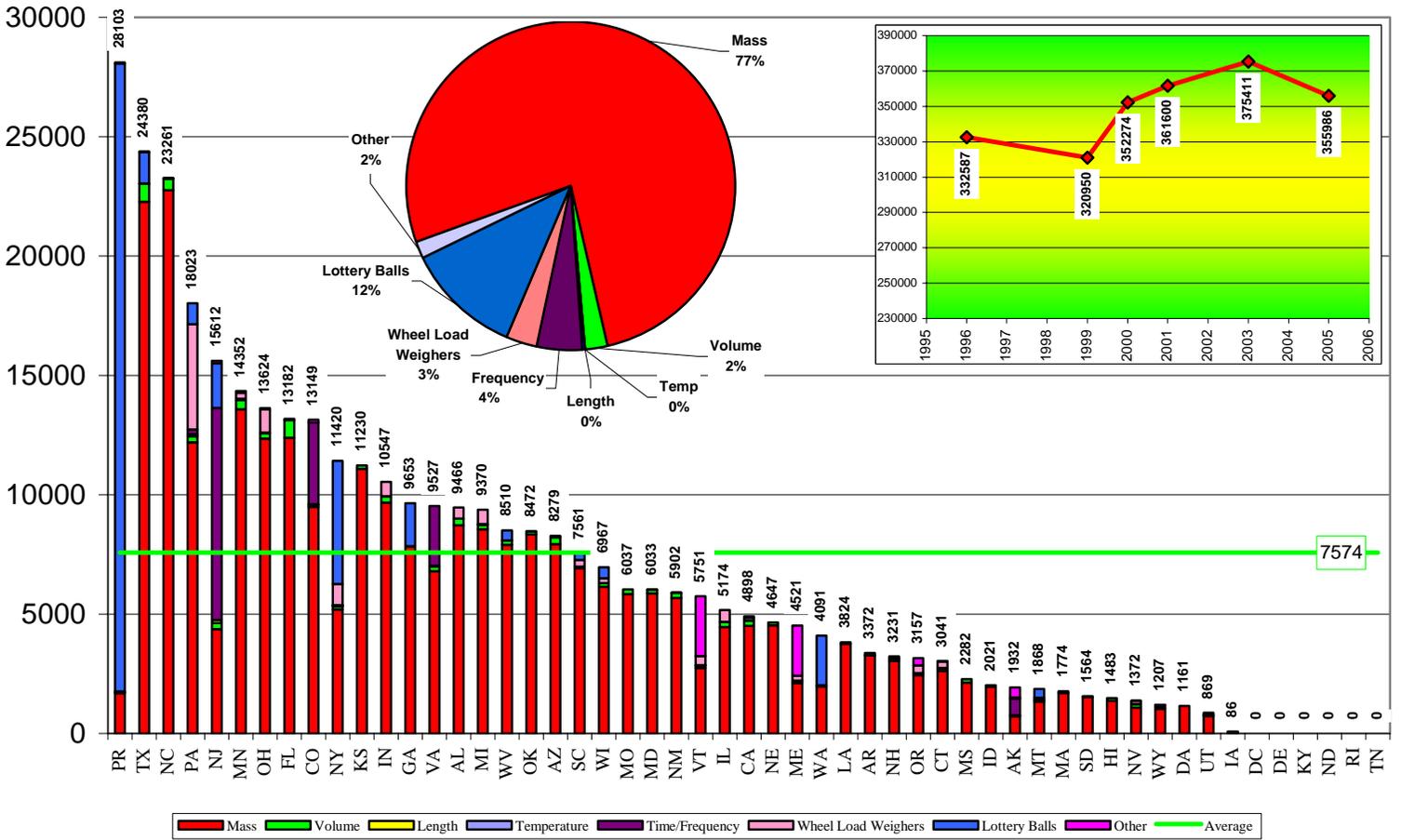
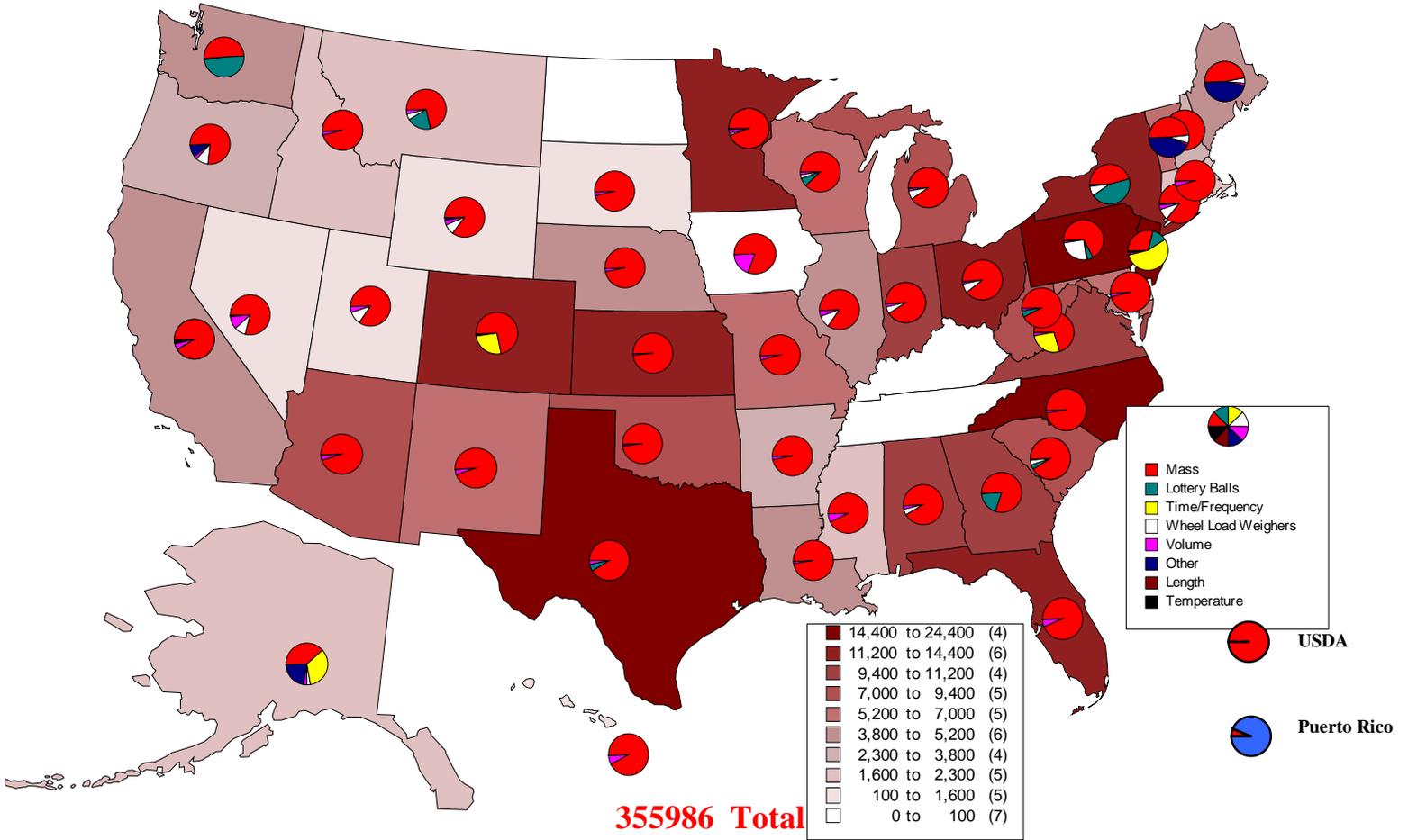
- 1996 to 1999 -- An increase of 7 %
- 1999 to 2000 -- An increase of 12 %*
- 2000 to 2001 -- An increase of 3 %
- 2001 to 2003 -- A decrease of 3 %
- 2003 to 2005 -- A decrease of 3%

Notes and Comments

*Part of the 12 % increase from 1999 to 2000 may be attributed to a new category that was called "Other". These are calibrations done by the laboratory, which did not fall into any of the pre-defined categories of the survey. This category was new for the 2000 survey and was not available for the 1996 and 1999 surveys. There were 25,350 devices reported as "Other" in the 2000 survey, when these are removed from the total it indicates an increase of 4 % over the 1999 survey.

Mass standards accounted for 77 % of the total number of devices tested.

Summary of All Standards (By Device Type)



Summary of All Standards (by customer type) {Lab, W&M, and External}

Description

The graphs on the following page represent the total number of all mass standards tested by the 47 reporting laboratories. The pie graph provides a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

Lab – work done for the metrology laboratory.

W&M – work done for the weights and measures program.

External – work done for customers who do not fall into any of the above categories.

Findings

The 47 reporting laboratories tested a total of 355,986 standards.

Notes and Comments

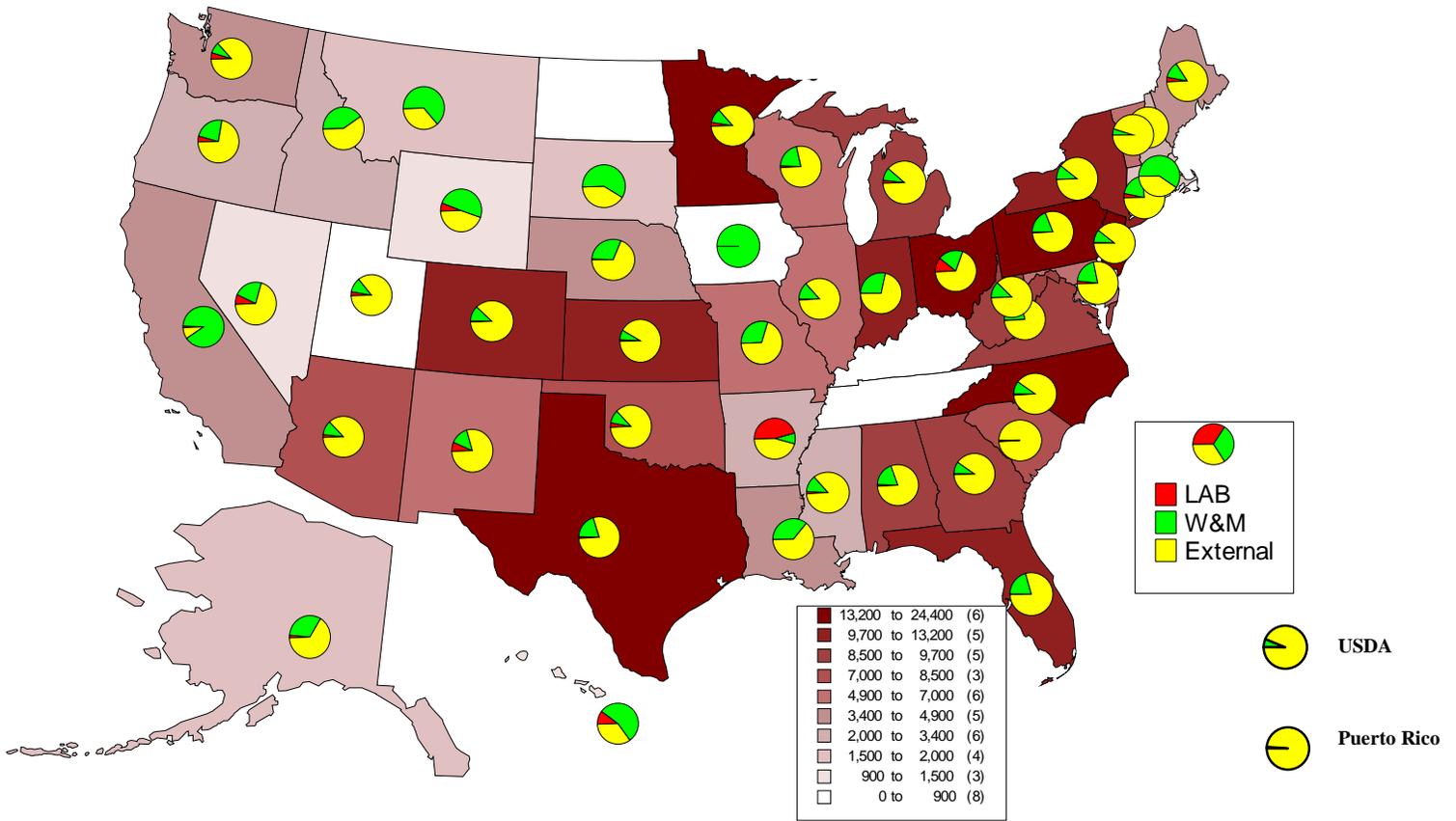
2 % of all standards were calibrated for internal use of the laboratory.

16 % of all standards were calibrated for “Weights & Measures Program”.

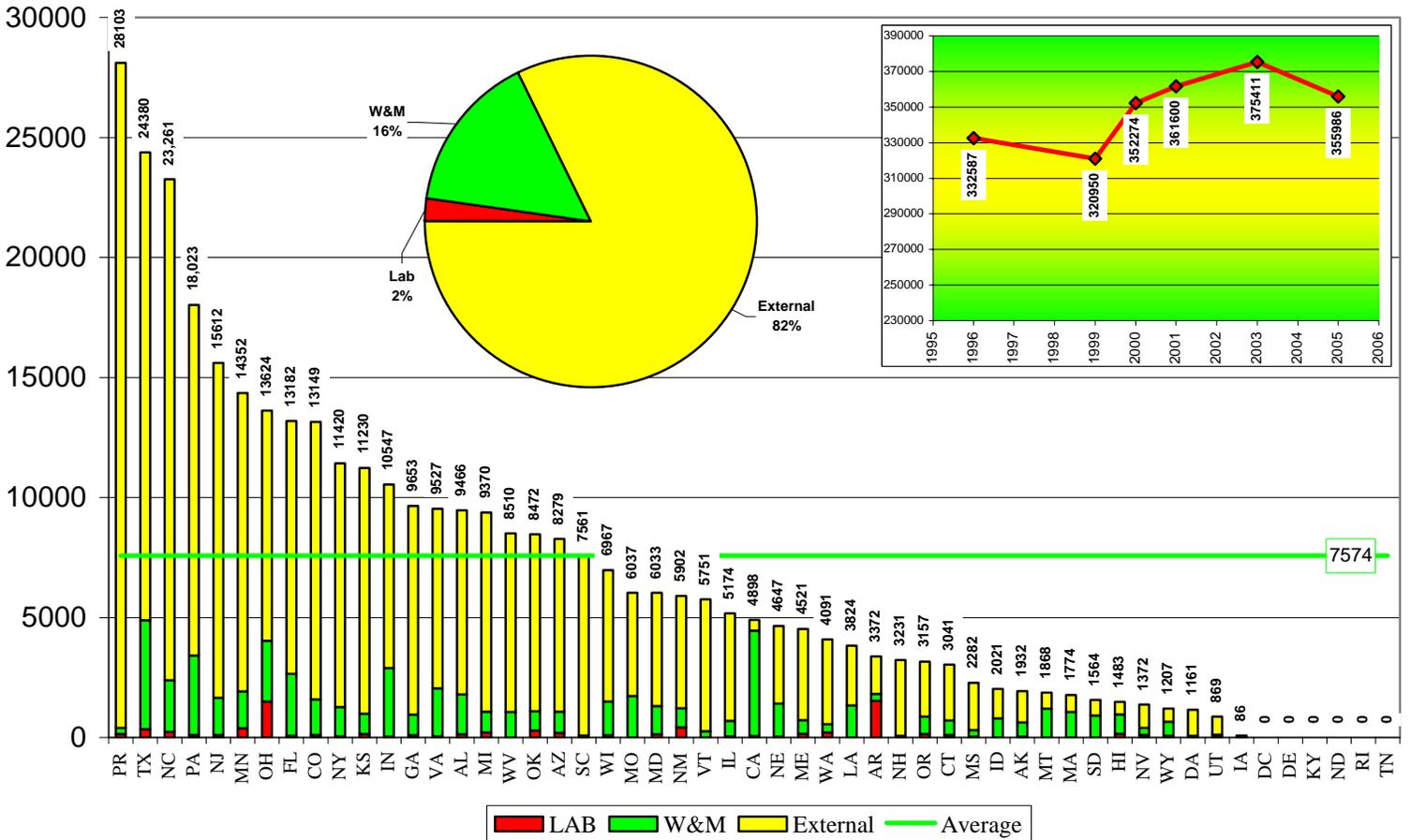
82 % of all standards were calibrated for ‘External’ customers.

This 2 % / 16 % / 82 % pattern is very representative of the breakdown of customers. However, it can be noted that the smaller the entire workload of the lab, the greater percentage “Lab” becomes. This reflects the ‘basic maintenance’ workload necessary to make a metrology laboratory operational.

Summary of All Standards (By Customer Type)



355986 Total Devices



Mass Total (by customer type) & (by accuracy type)

Description

The pie graphs on the following page are for the total of number mass standards tested by the 47 reporting laboratories. The top pie graph provides a breakdown into the customer categories of Lab, W&M, and External.

Lab – work done for the metrology laboratory.

W&M – work done for the weights and measures program.

External – work done for customers who do not fall into any of the above categories.

The bottom pie graph provides a breakdown in the accuracy echelons of Mass I, Mass II, and Mass III.

Mass I – Precision mass standards that are calibrated using Advanced Weighing Designs and Mass Code Data Reduction regardless of class.

Mass II – Precision mass standards that are usually calibrated using 3-1 weighing designs or double substitutions.

Mass III – Mass standards that are usually calibrated using modified or single substitution procedures.

Notes and Comments

Mass By Customer Type

2.7 % of all mass standards were calibrated for internal use by the laboratory.

18.8 % of all mass standards were calibrated for the Weights & Measures Program.

78.5 % of all mass standards were calibrated for 'Other' customers.

Mass By Echelon Category

1.4 % (3,707) of all mass standards were calibrated as Mass Echelon I.

(compared to 0.9 % in 1999, 2.1 % in 2000, 1.8 % in 2001, and 1.8 % in 2003)

7.9 % (21,714) of all mass standards were calibrated as Mass Echelon II.

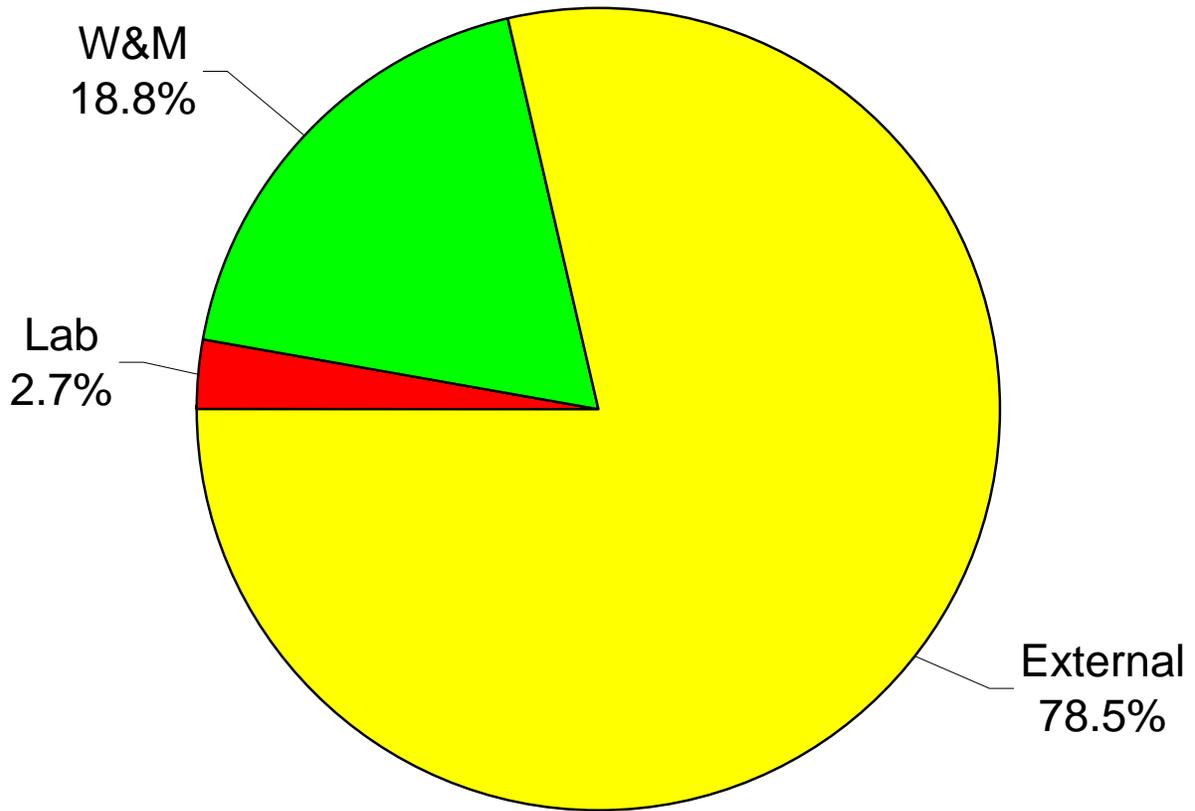
(compared to 8.7 % in 1999, 8.9 % in 2000, 9.1 % in 2001, and 8.7 % in 2003)

90.7 % (248,117) of all mass standards were calibrated as Mass Echelon III.

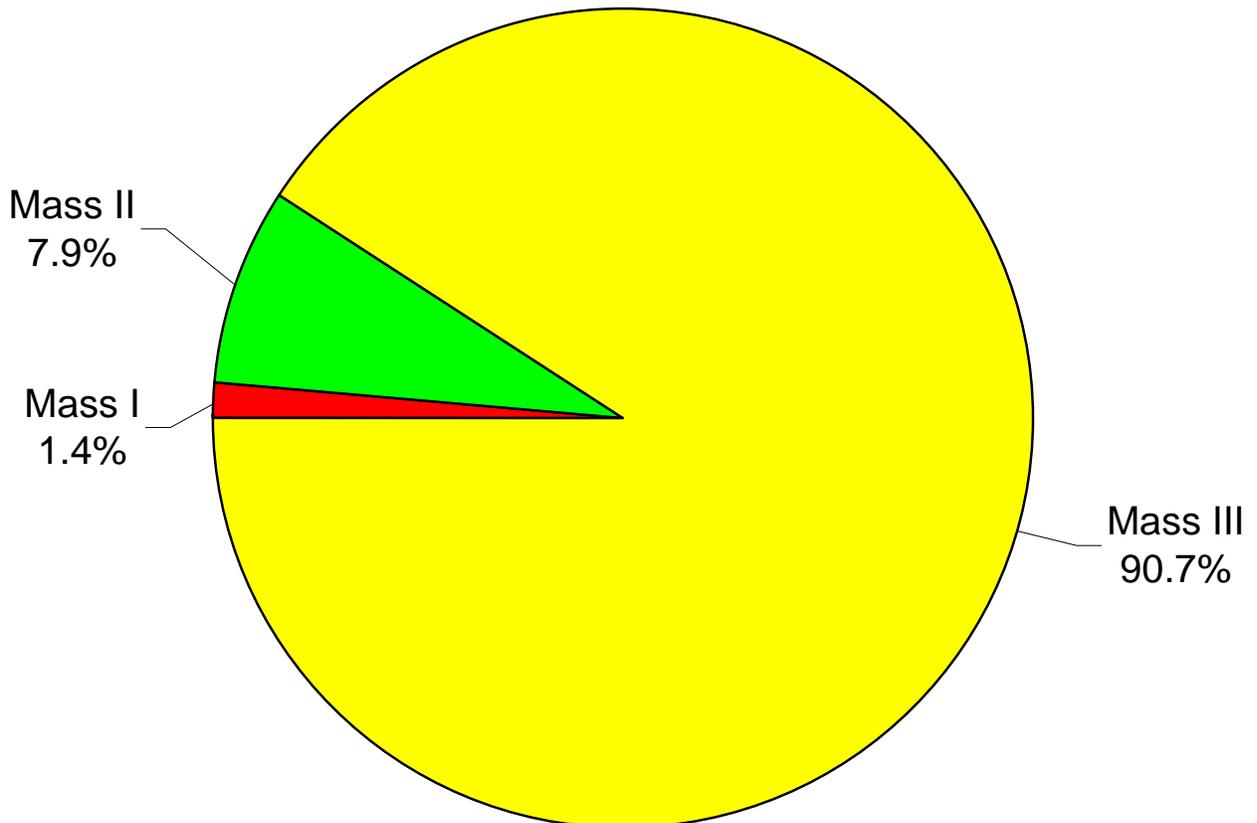
(compared to 90.4 % in 1999, 89.0 % in 2000, 89.1 % in 2001, and 89.6 % in 2003)

It has been estimated that it takes ten times the number of labor hours to calibrate an Echelon I or II weight as compared to an Echelon III weight. When this is taken into consideration, the same total number of labor hours is probably spent on Echelon I & II calibrations as is spent on Echelon III calibrations.

Total Mass (by Customer Type)



Total Mass (by Accuracy Type)



Mass Echelon I

Description

The graphs on the following page represent the total number of Mass Echelon I standards tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph indicating the totals from the 1999, 2000, 2001, 2003, and 2005 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 14 labs tested a total of 3,707 Mass I standards.

Comparison of the 2005, 2003, 2001, 2000, and 1999 Surveys

The number of laboratories performing Mass I calibrations appears to have stabilized in the range of 14 to 16. There were 10 labs in 1999, 15 labs in 2000, 16 labs in 2001, 15 in 2003, and 14 in 2005.

	# Labs Reporting Mass Echelon I	Total Devices	Lab Average	Change using lab averages
1999	10	2,667	267	--
2000	15	5,985	399	+ 50 %
2001	16	5,227	327	- 18 %
2003	15	5,288	353	+ 8 %
2005	14	3,707	265	- 25 %

Results for Mass I cannot be compared to the 1996 survey. The 1996 survey did not use Mass Echelon I as a category. It used 'Precision Mass' as the category that included both Mass Echelon I and Mass Echelon II calibrations.

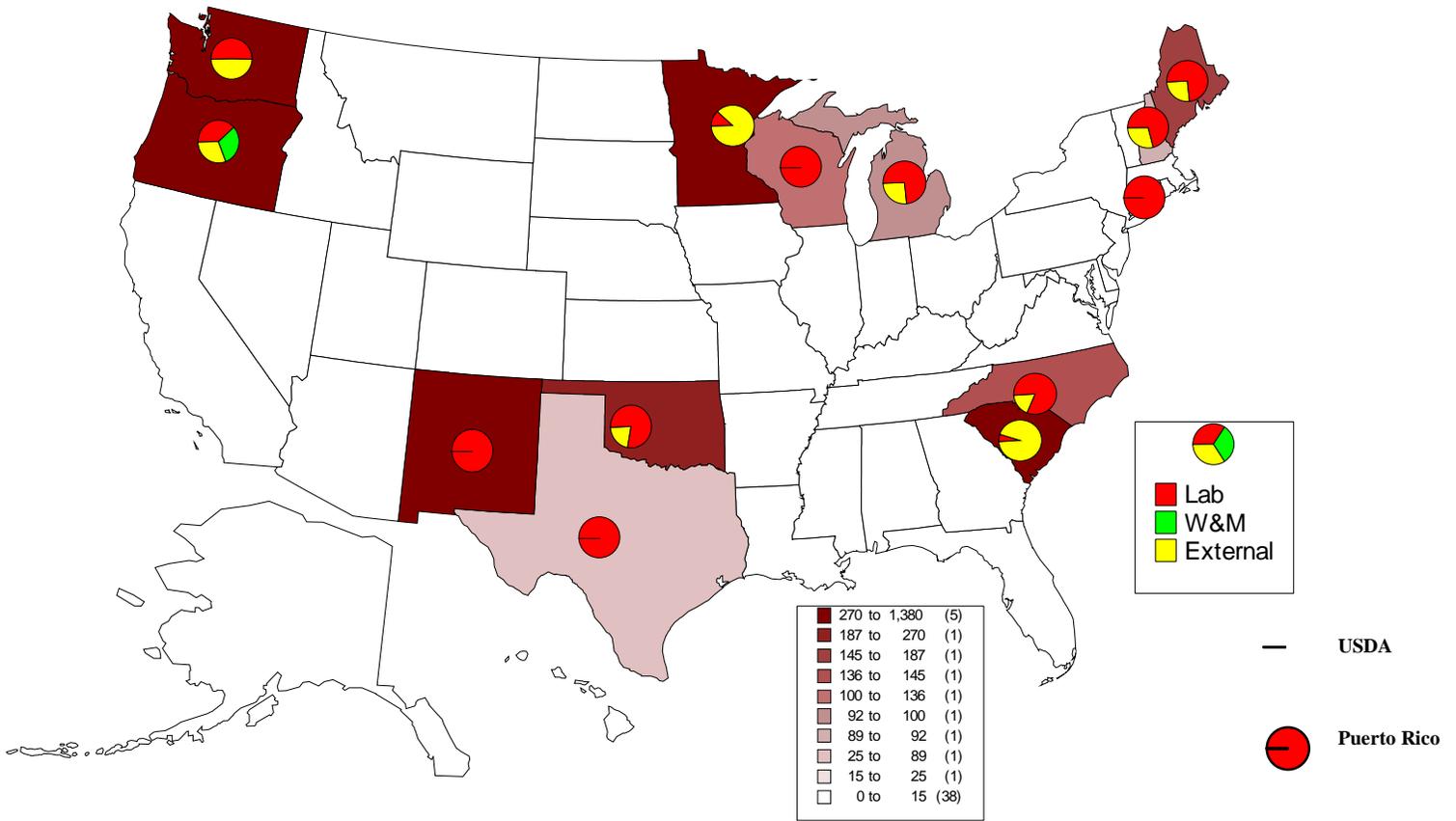
Notes and Comments

38 % of all Mass I standards were calibrated for internal use by the laboratory.

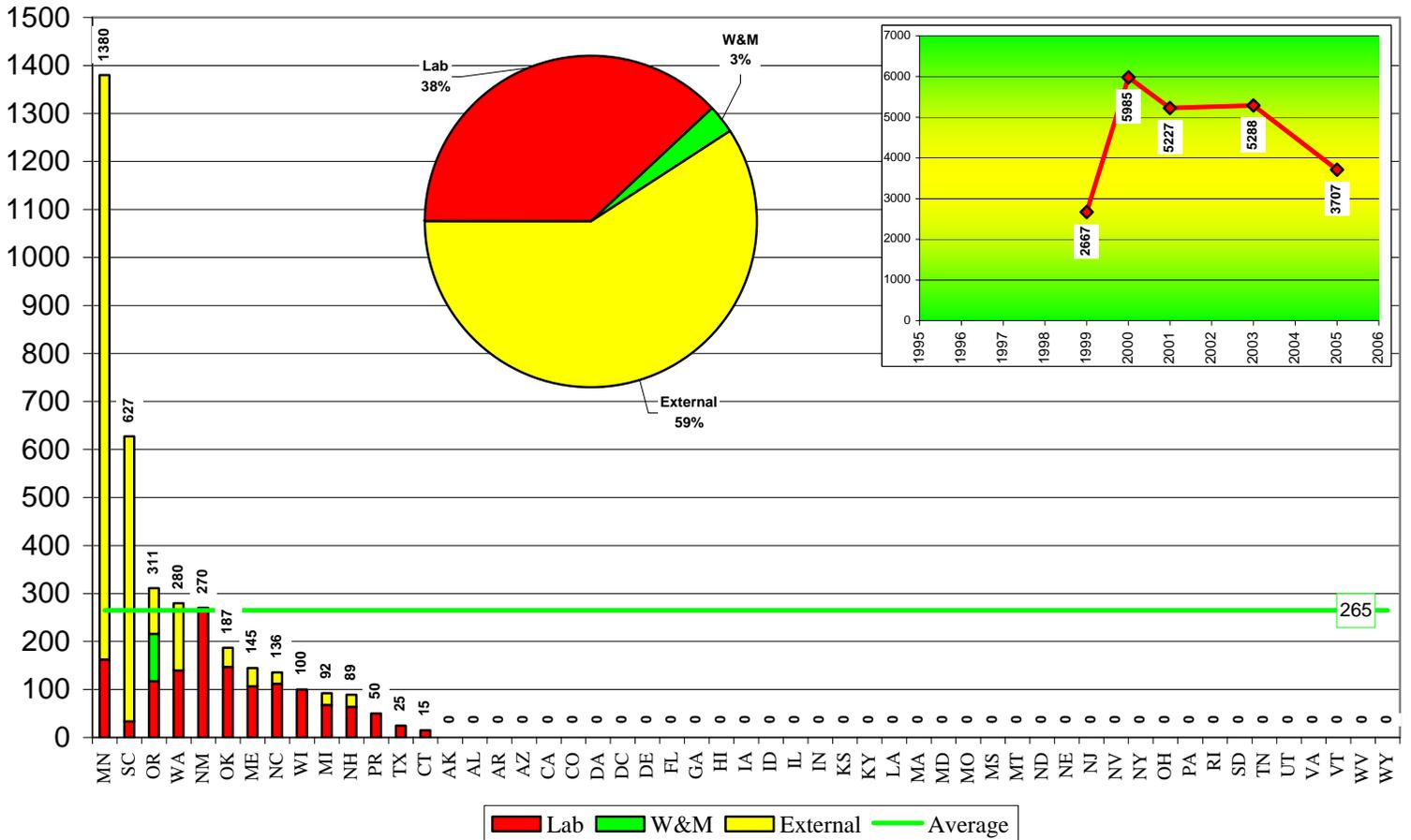
3 % of all Mass I standards were calibrated for the weight and measures program.

59 % of all Mass I standards were calibrated for external customers.

Mass Echelon I



3707 Total Devices



Mass Echelon II

Description

The graphs on the following page represent the total number of Mass Echelon II standards tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested above each laboratory. There is also a smaller line graph indicating the totals from the 1999, 2000, 2001, 2003, and 2005 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 32 labs tested a total of 21,714 Mass II standards.

Comparison of the 2005, 2003, 2001, 2000, and 1999 Surveys

	# Labs Reporting Mass Echelon II	Total Devices	Lab Average	Change using lab averages
1999	36	24,926	692	--
2000	35	25,807	737	+ 6 %
2001	38	26,428	695	- 6 %
2003	37	25,847	699	+ 0 %
2005	32	21,714	679	- 3 %

Results for Mass II cannot be compared to the 1996 survey. The 1996 survey did not use Mass Echelon II as a category. It used 'Precision Mass' as the category that included both Mass Echelon I and Mass Echelon II calibrations.

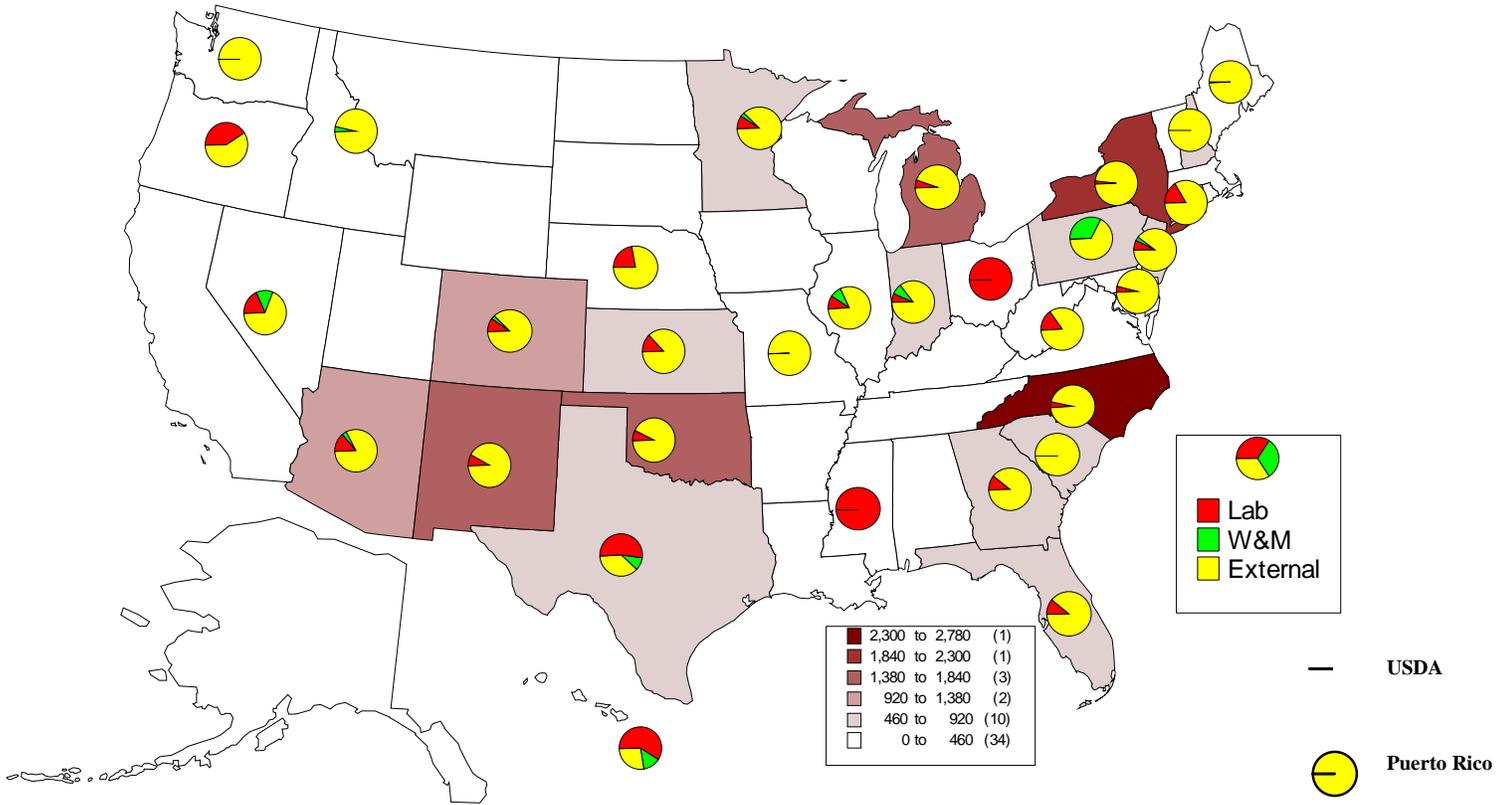
Notes and Comments

9 % of all Mass II standards were calibrated for the internal use of the laboratory.

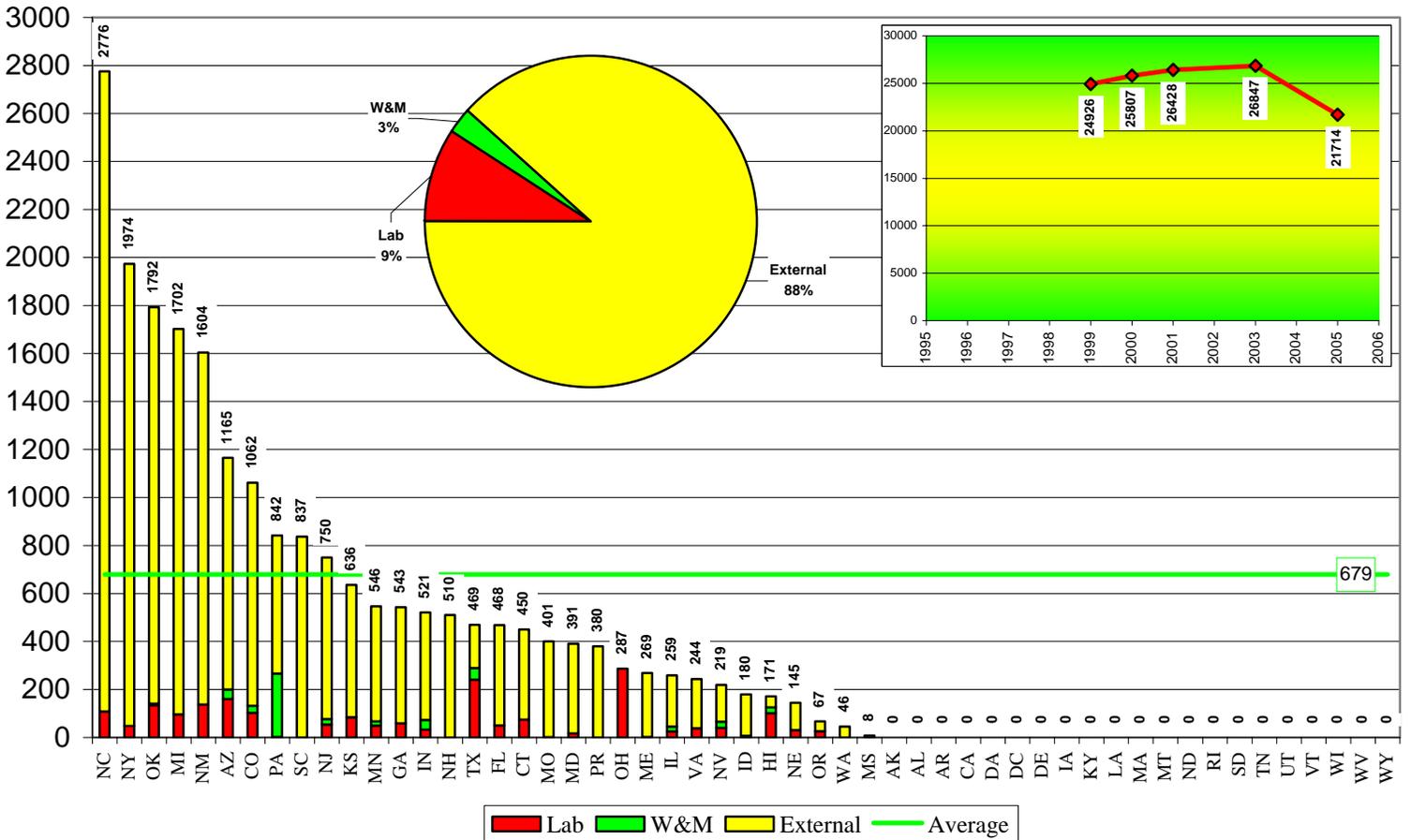
3 % of all Mass II standards were calibrated for the weights and measures program.

88 % of all Mass II standards were calibrated for external customers.

Mass Echelon II



21714 Total Devices



Precision Mass (Mass Echelon I & II)

Description

The graphs on the following page represent the total number of all Precision Mass (includes both Mass Echelon I and Mass Echelon II) standards tested by the 47 reporting laboratories. The graphs combine the data Mass Echelon I and Mass Echelon II so that they may be compared to the 1996 survey data. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph indicating the totals from the 1996, 1999, 2000, 2001, 2003, and 2005 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 33 labs tested a total of 25,421 Precision Mass standards (Mass I and Mass II standards combined).

Comparison of the 2005, 2003, 2001, 2000, 1999, and 1996 Surveys

	# Labs Reporting Mass I & II	Total Devices	Lab Average	Change from previous survey
1996	50	37,662	753	--
1999	36	27,593	766	+ 2 %
2000	36	31,792	883	+ 15 %
2001	38	31,655	833	- 6 %
2003	38	31,135	819	- 2 %
2005	33	25,421	770	- 6 %

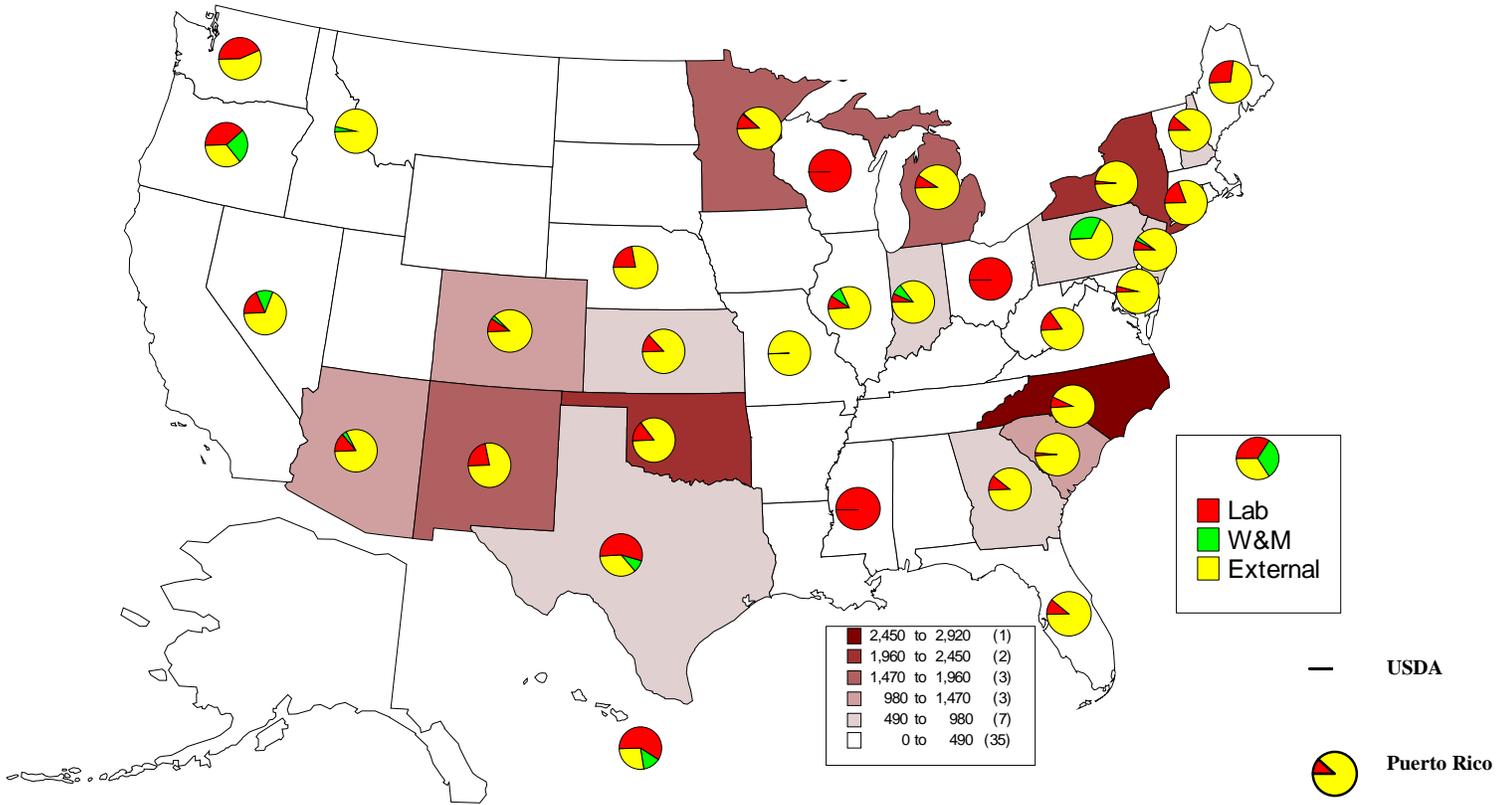
Comparing later surveys with the 1996 Survey

*The data shows an apparent decrease of 27 % in the total number of Precision Mass standards calibrated from 1996 to 1999. However, because there was not a clear definitive separation between “precision calibrations” and “tolerance testing”, in 1996, some labs may have shown some of their “tolerance testing” as “precision testing”, which would inflate the value for the number of precision mass standards tested in 1996.

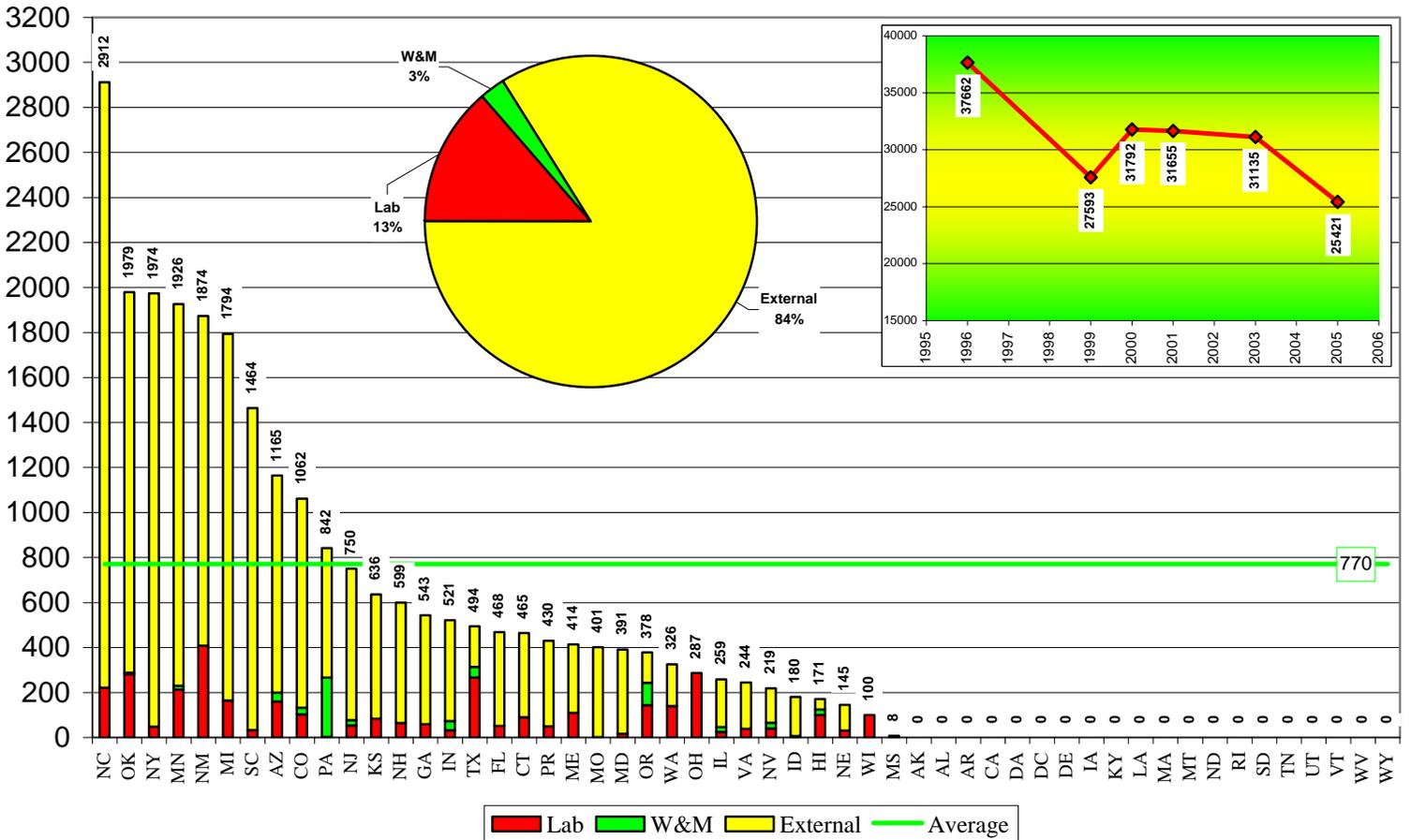
Notes and Comments

13 % of all Precision Mass standards were calibrated for the internal use of the laboratory.
3 % of all Precision Mass standards were calibrated for the weights and measures program.
84 % of all Precision Mass standards were calibrated for external customers.

Precision Mass (Echelon I & II)



25421 Total Devices



Mass Echelon III

Description

The graphs on the following page represent the total number of Mass Echelon III standards tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph indicating the totals from the 1996, 1999, 2000, 2001, 2003, and 2005 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 47 labs tested a total of 248,117 Mass III standards.

Comparison of the 2005, 2003, 2001, 2000, 1999, and 1996 Surveys

	# Labs Reporting Mass III	Total Devices	Lab Average	Change from previous survey
1996	51	259,713	5,092	--
1999	46	259,463	5,640	+ 11 %
2000	45	257,938	5,732	+ 2 %
2001	45	260,072	5,779	+ 1 %
2003	47	267,240	5,686	- 2 %
2005	47	248,117	5,279	- 7 %

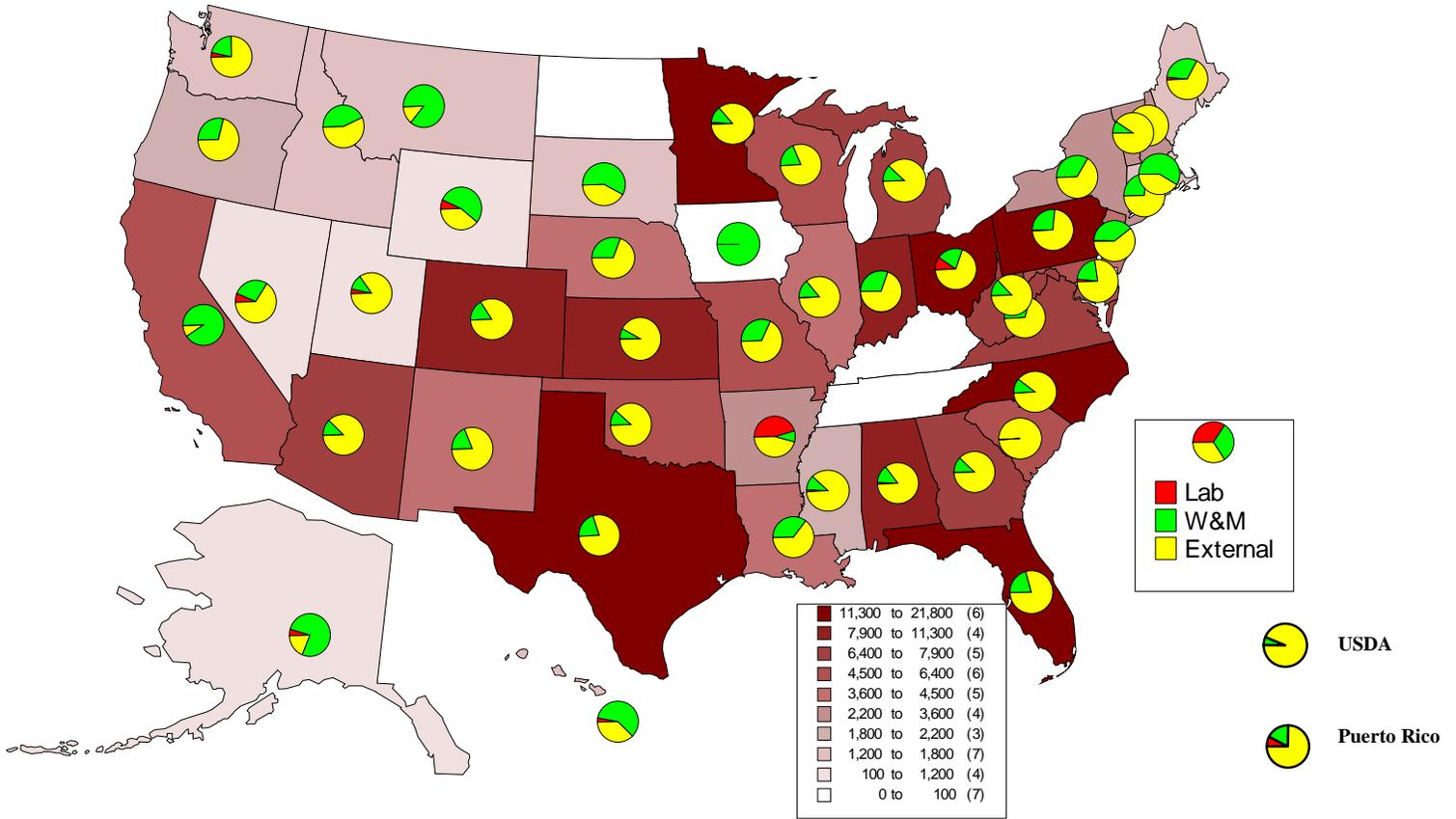
Notes and Comments

2 % of all Mass III standards were calibrated for the internal use of the laboratory.

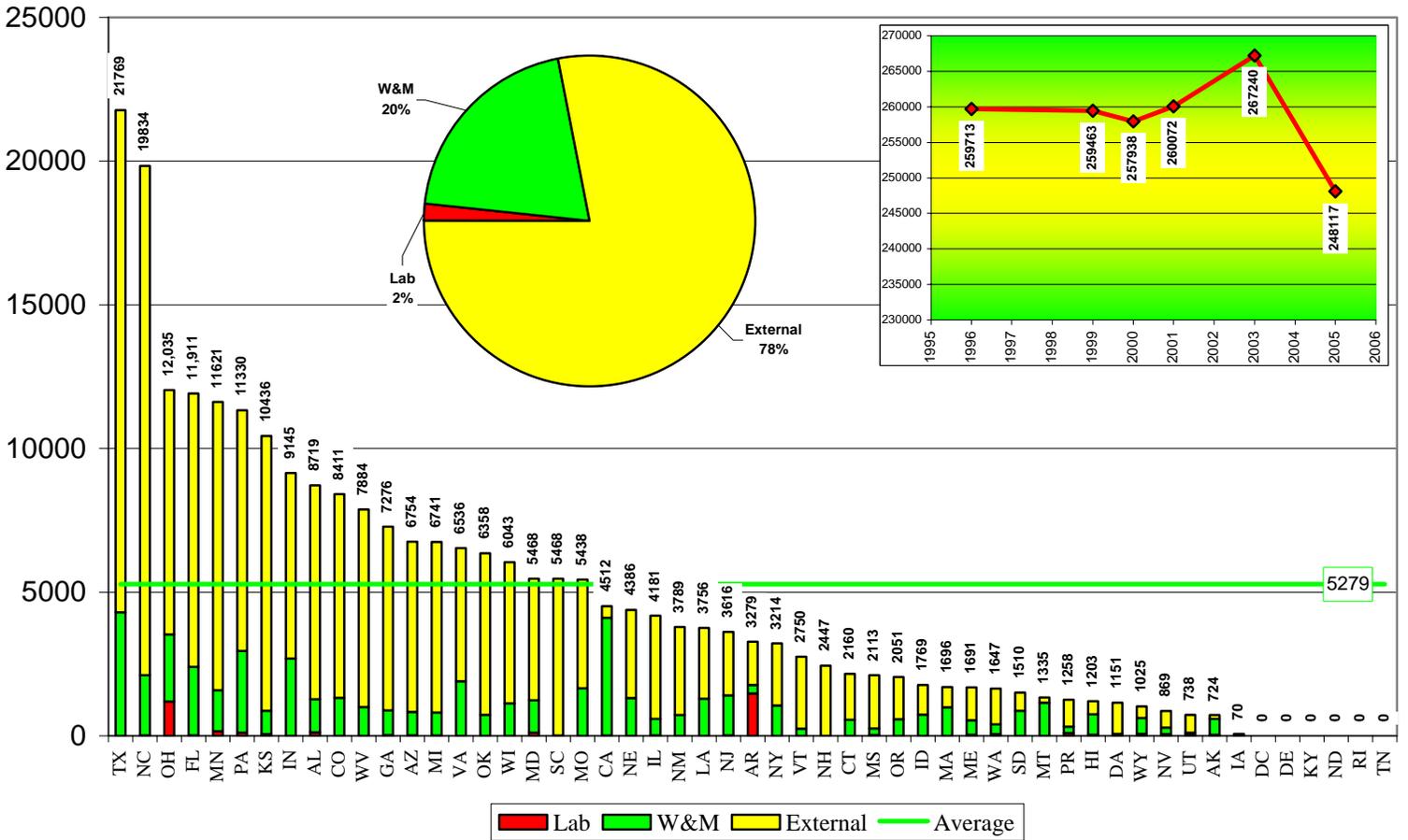
20 % of all Mass III standards were calibrated for the weights and measures program.

78 % of all Mass III standards were calibrated for external customers.

Mass Echelon III



248117 Total Devices



Weight Carts

Description

The graphs on the following page represent the total number of weight cart mass standards tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 1999, 2001, 2003, and 2005 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 33 labs tested a total of 365 weight cart mass standards.

Comparison of the 2005, 2003, 2001, and 1999 Surveys

	# Labs Reporting Weight Cart Tests	Total Devices	Lab Average	Change from previous survey
1999	30	297	9.9	--
2001	27	344	12.7	+ 29 %
2003	29	388	13.4	+ 5 %
2005	33	365	11.1	- 17 %

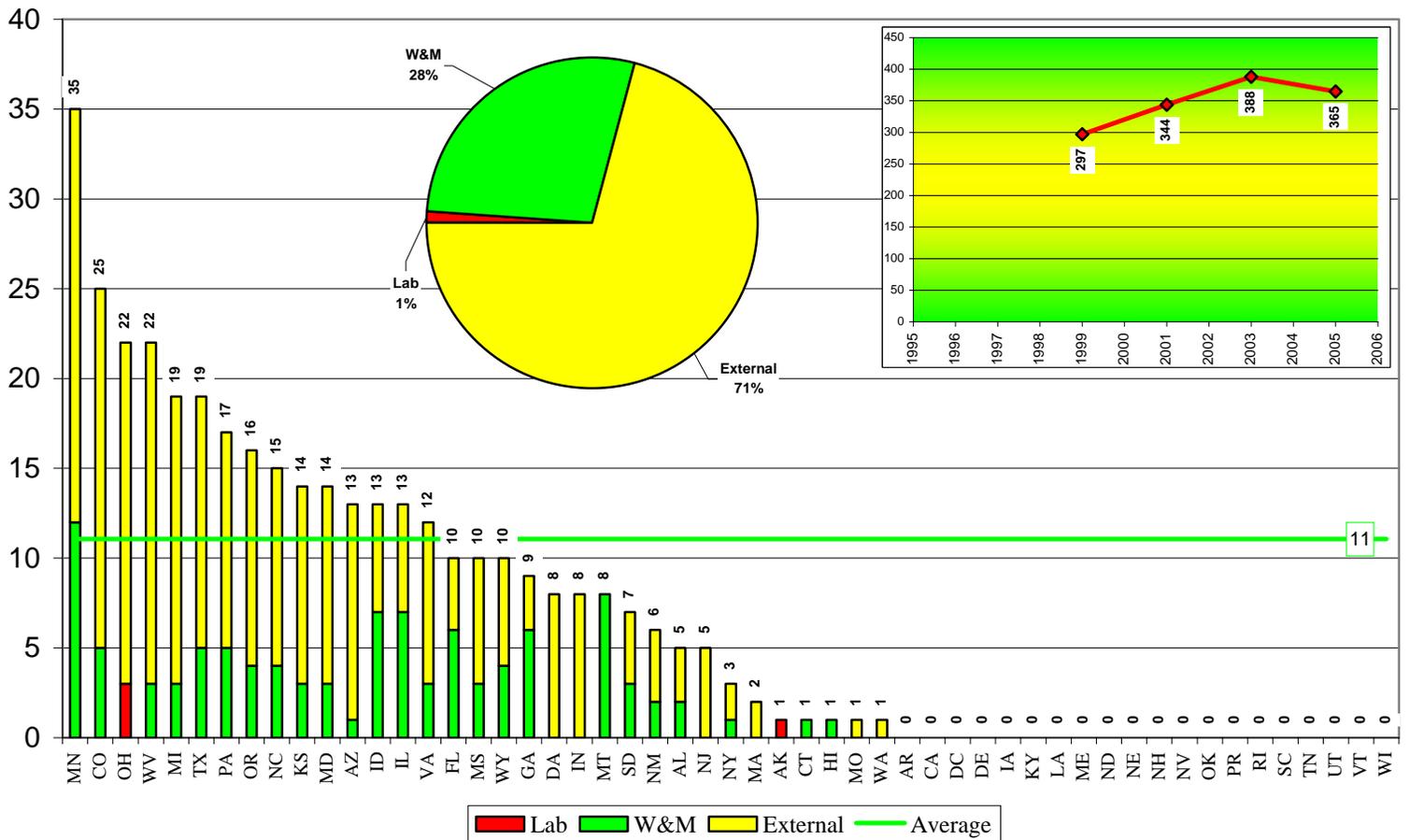
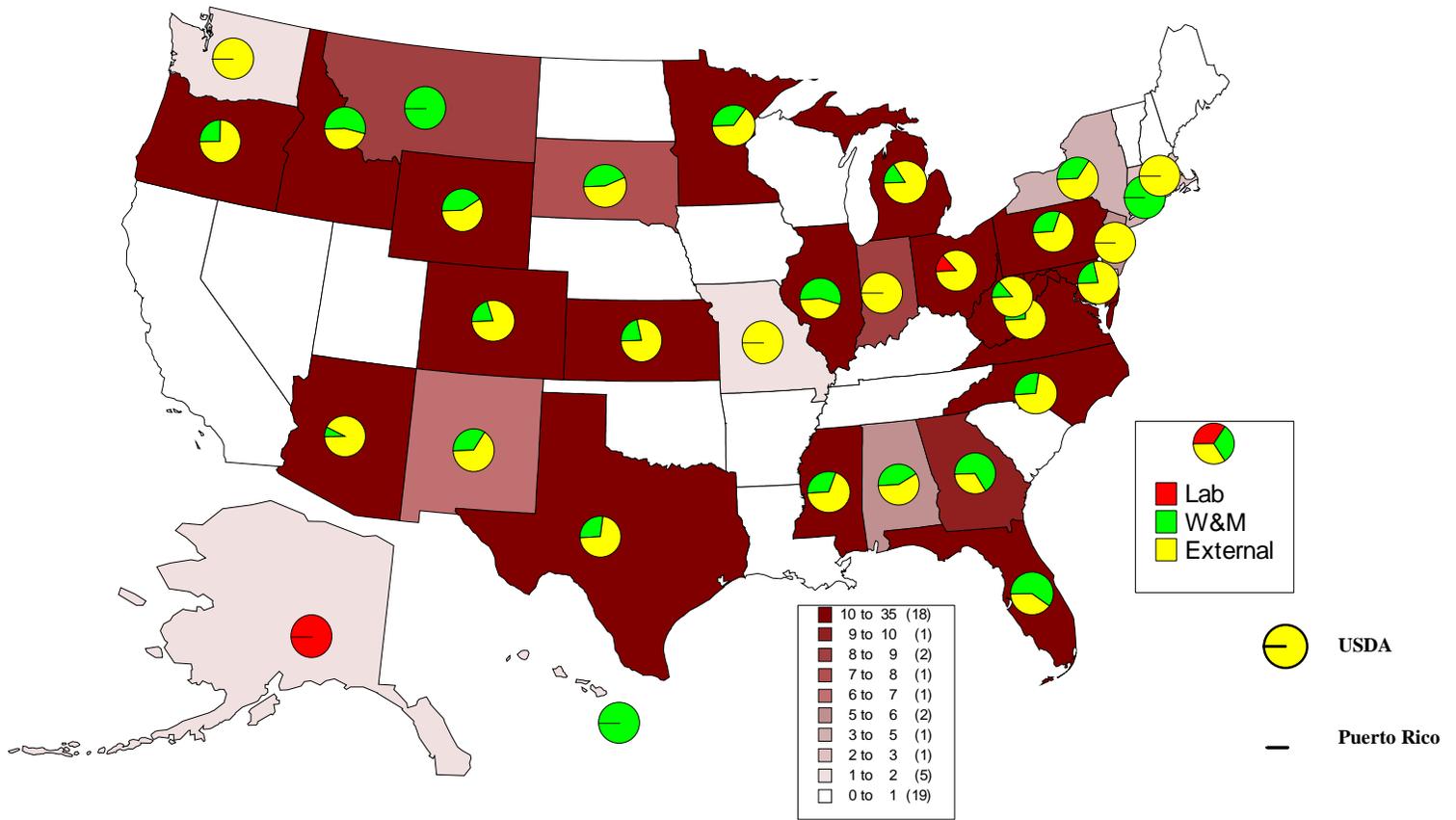
Notes and Comments

1 % of all weight cart standards were calibrated for the internal use of the laboratory.

28 % of all weight cart standards were calibrated for the weights and measures program.

71 % of all weight cart standards were calibrated for external customers.

Weight Carts



Length -- Tapes

Description

The graphs on the following page represent the total number of length (tapes) standards tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 1996, 1999, 2000, 2001, 2003, and 2005 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 21 labs tested a total of 319 length (tape) standards.

Comparison of the 2005, 2003, 2001, 2000, 1999, and 1996 Surveys

	# Labs Reporting Length Tape Tests	Total Devices	Lab Average	Change from previous survey
1996	27	707	26	--
1999	29	537	19	- 29 %
2000	21	566	27	+ 46 %
2001	22	487	22	- 18 %
2003	21	584	28	+ 26 %
2005	21	319	15	- 46 %

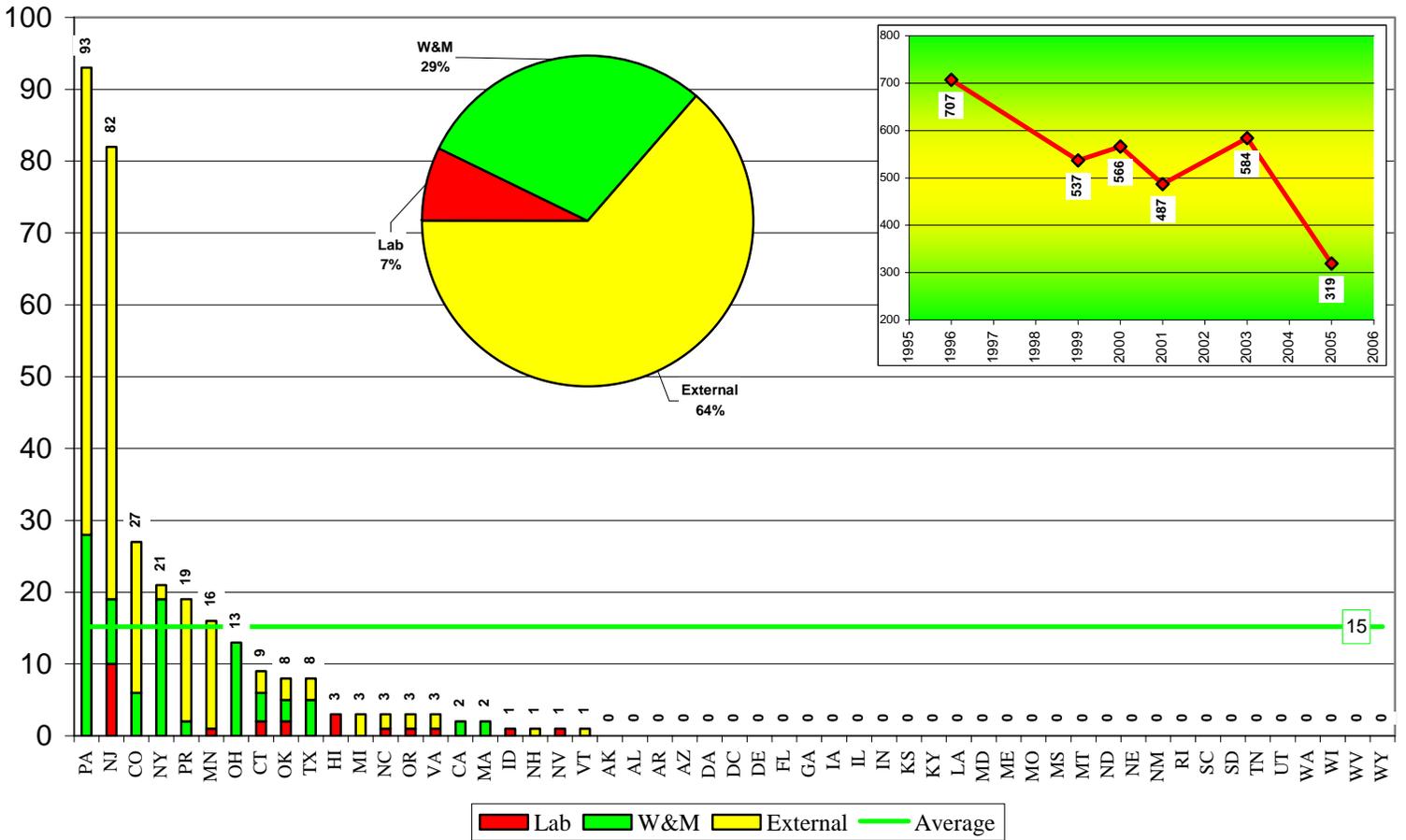
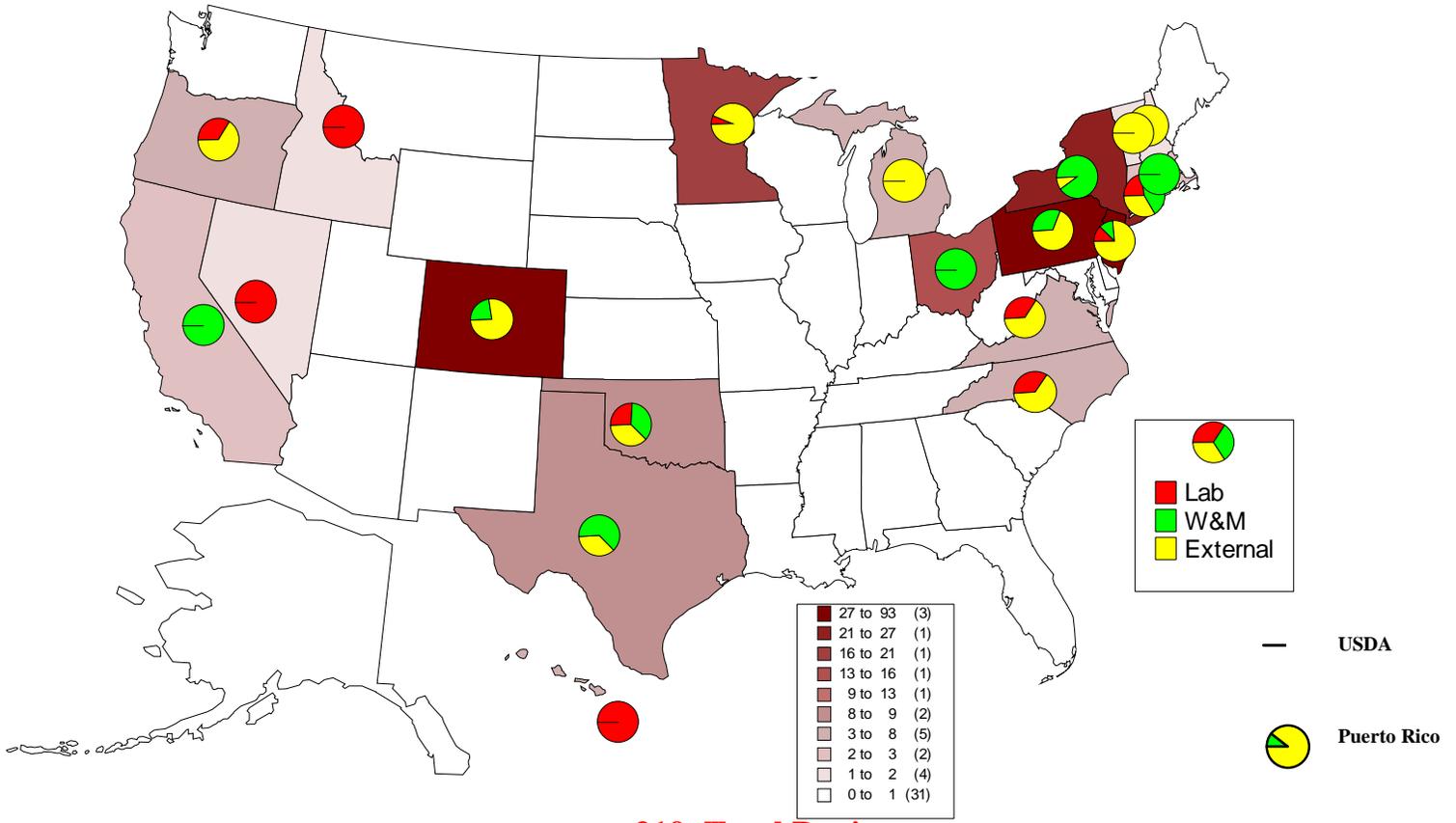
Notes and Comments

7 % of all length (tape) standards were calibrated for the internal use of the laboratory.

29 % of all length (tape) standards were calibrated for the weights and measures program.

64 % of all length (tape) standards were calibrated for external customers.

Length Tape



Length – Rigid Rules

Description

The graphs on the following page represent the total number of length (rigid rules) standards tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 1996, 1999, 2000, 2001, 2003, and 2005 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 12 labs tested a total of 98 length (rigid rule) standards.

Comparison of the 2005, 2003, 2001, 2000, 1999, and 1996 Surveys

	# Labs Reporting Rigid Rule Tests	Total Devices	Lab Average	Change from previous survey
1996	26	582	22.4	--
1999	29	269	9.3	- 59 %
2000	20	413	20.6	+ 123 %
2001	16	164	10.2	- 50 %
2003	14	138	9.9	- 4 %
2005	12	98	8.2	- 17 %

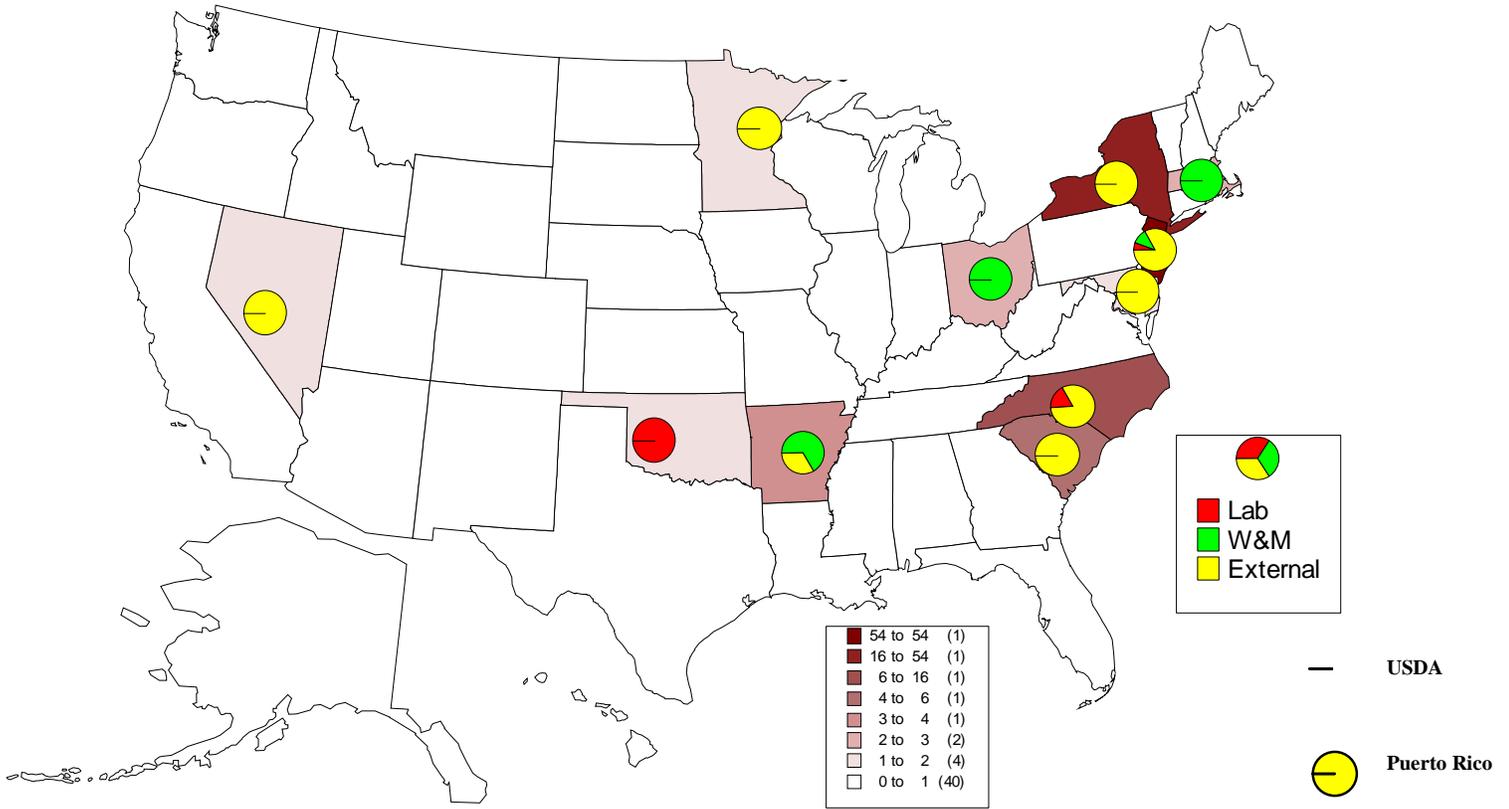
Notes and Comments

5 % of all length (rigid rule) standards were calibrated for the internal use of the laboratory.

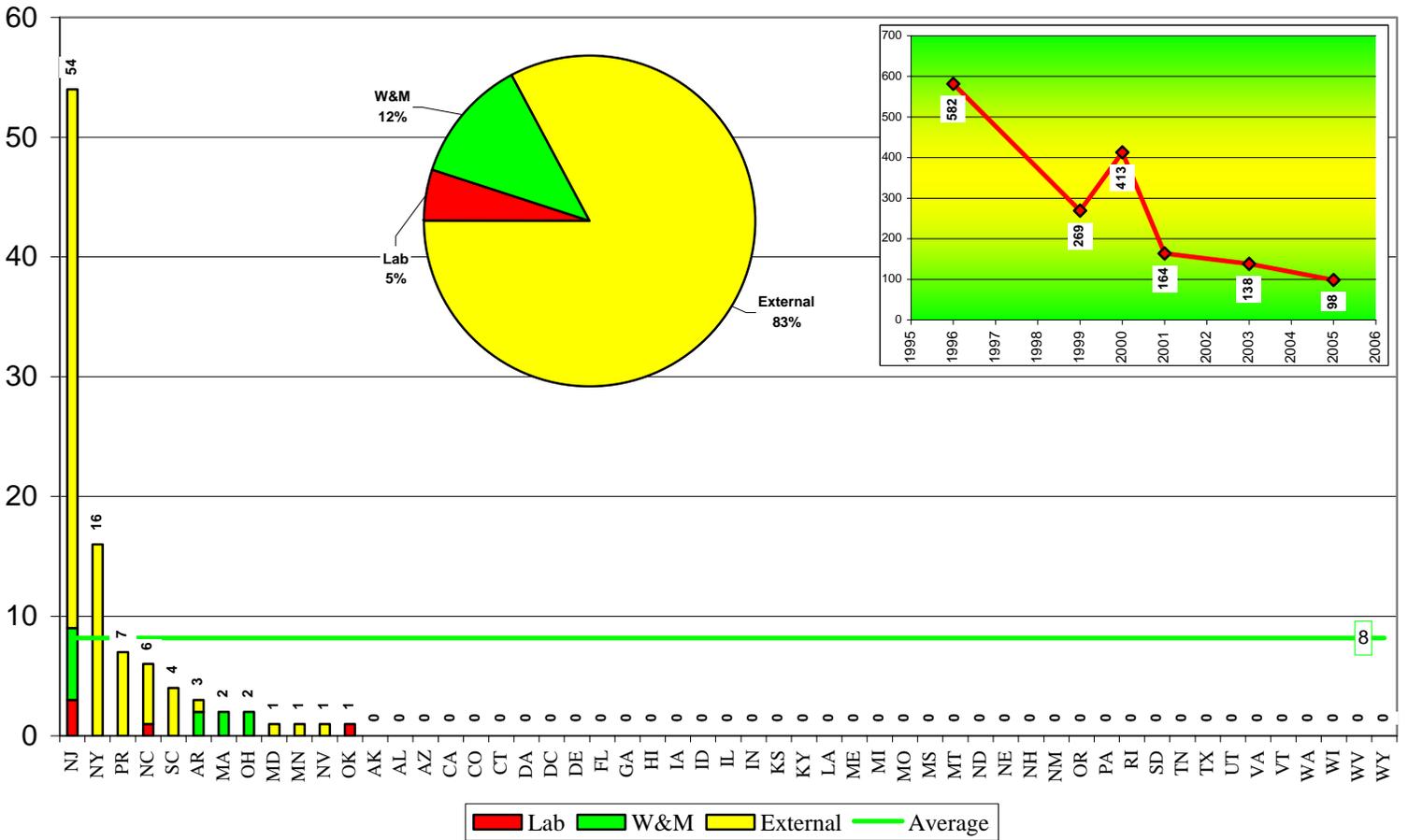
12 % of all length (rigid rule) standards were calibrated for the weights and measures program.

83 % of all length (rigid rule) standards were calibrated for external customers.

Length Rule



98 Total Devices



Volume -- Glassware

Description

The graphs on the following page represent the total number of volume (glassware) standards tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 1996, 1999, 2000, 2001, 2003, and 2005 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

External – work done for customers who do not fall into any of the above categories.

Volume Categories:

- Glassware – most glassware are kits that contain volumetric standards from 1 gallon to 2 fluid ounces.
- Test Measures – most are metal volumetric standards nominally 5 gallons or less.
- Provers – most are metal volumetric standards nominally larger than 5 gallons.

Findings

Of the 47 reporting laboratories, 17 labs tested a total of 332 volumetric glassware standards.

Comparison of the 2005, 2003, 2001, 2000, 1999, and 1996 Surveys

	# Labs Reporting Glassware Tests	Total Devices	Lab Average	Change from previous survey
1996	29	1,205	41.55	--
1999	24	844	35.17	- 15 %
2000	25	853	34.12	- 3 %
2001	27	668	24.74	- 27 %
2003	24	555	23.12	- 7 %
2005	17	332	19.53	- 16 %

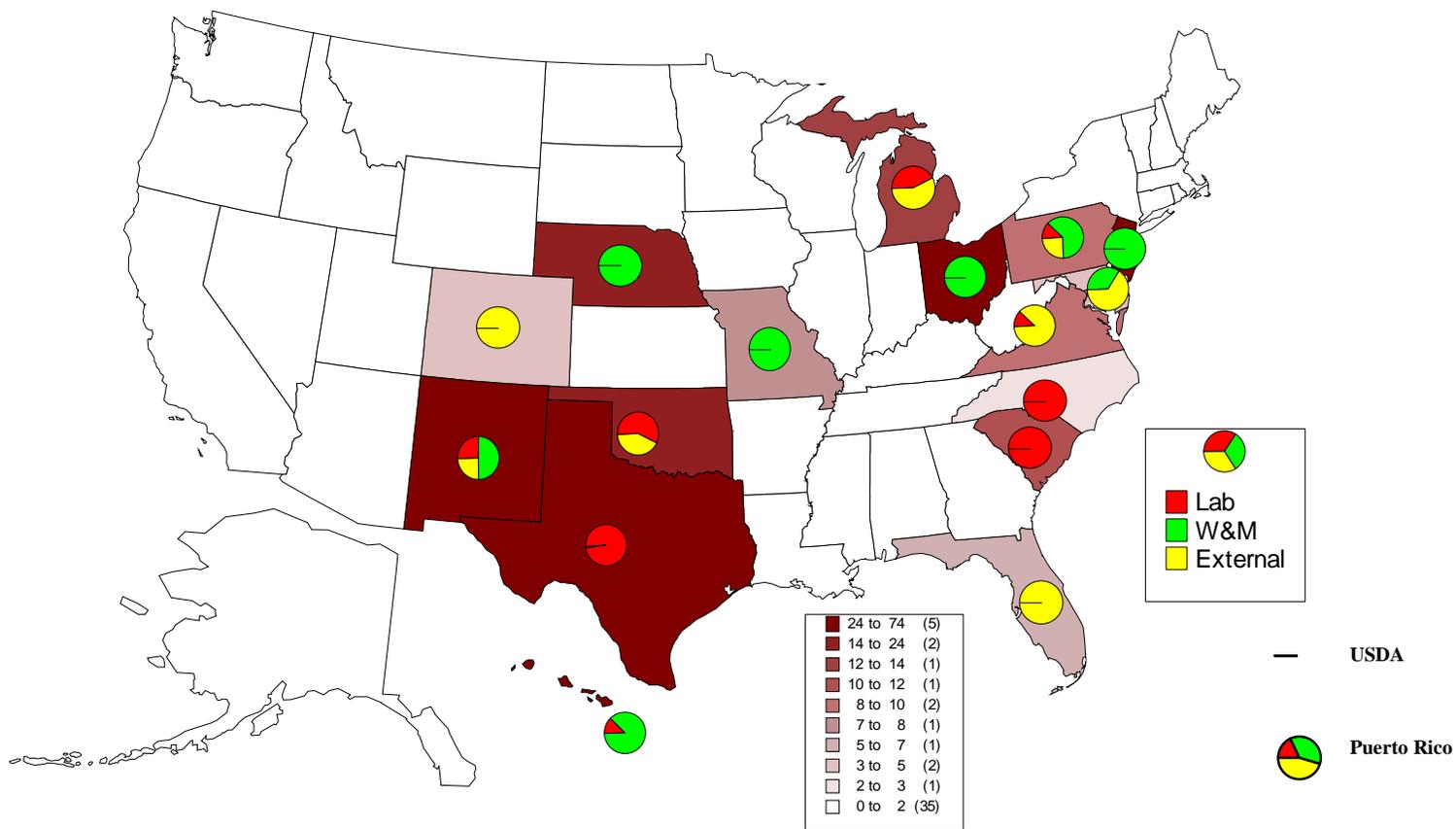
Notes and Comments

35 % of all volume (glassware) standards were calibrated for the laboratory.

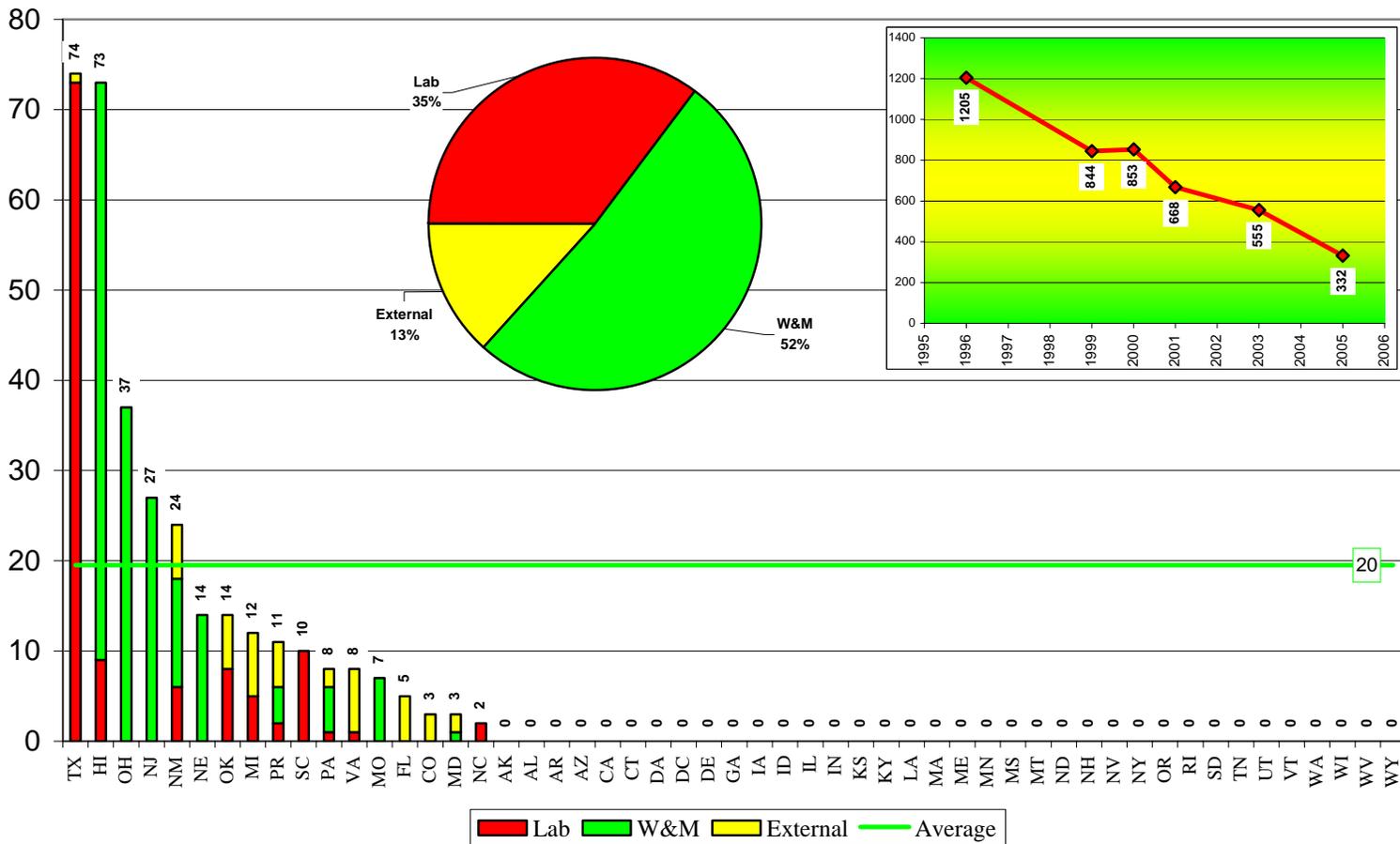
52 % of all volume (glassware) standards were calibrated for weights and measures program.

13 % of all volume (glassware) standards were calibrated for external customers.

Volume Glassware



332 Total Devices



Volume – Test Measures

Description

The graphs on the following page represent the total number of volume (test measure) standards tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 1996, 1999, 2000, 2001, 2003, and 2005 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

External – work done for customers who do not fall into any of the above categories.

Volume Categories:

- Glassware – most glassware are kits that contain volumetric standards from 1 gallon to 2 fluid ounces.
- Test Measures – most are metal volumetric standards nominally 5 gallons or less.
- Provers – most are metal volumetric standards nominally larger than 5 gallons.

Findings

The 47 reporting laboratories, 45 labs tested a total of 6,400 volume (test measure) standards.

Comparison of the 2005, 2003, 2001, 2000, 1999, and 1996 Surveys

	# Labs Reporting Test Measures	Total Devices	Lab Average	Change from previous survey
1996	48	8,290	173	--
1999	46	6,861	149	- 14 %
2000	45	6,986	155	+ 4 %
2001	45	7,368	164	+ 5 %
2003	48	6,966	145	- 11 %
2005	45	6,400	142	- 2 %

Notes and Comments

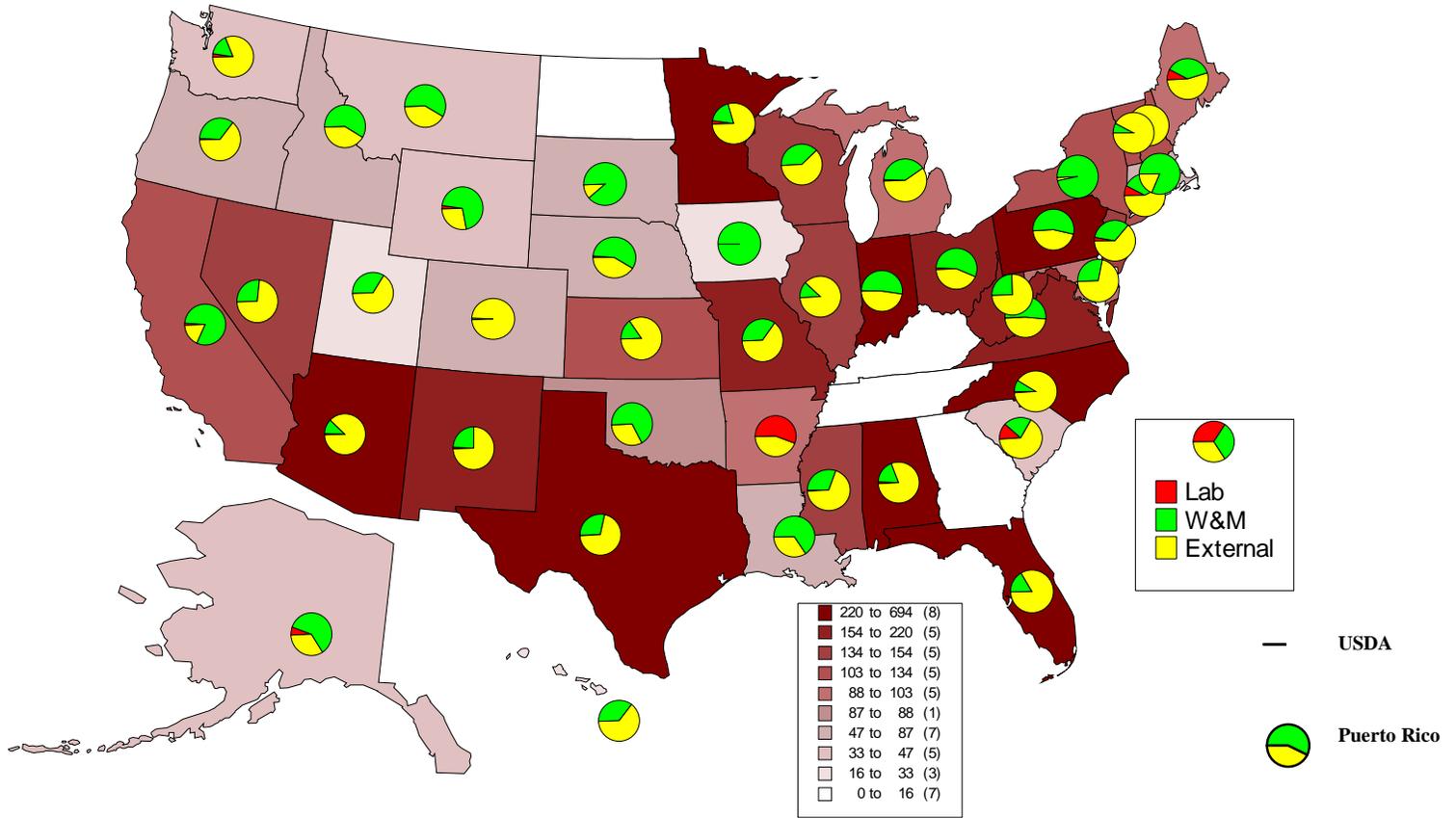
2 % of all volume (test measure) standards were calibrated for the laboratory.

31 % of all volume (test measure) standards were calibrated for weights and measures program.

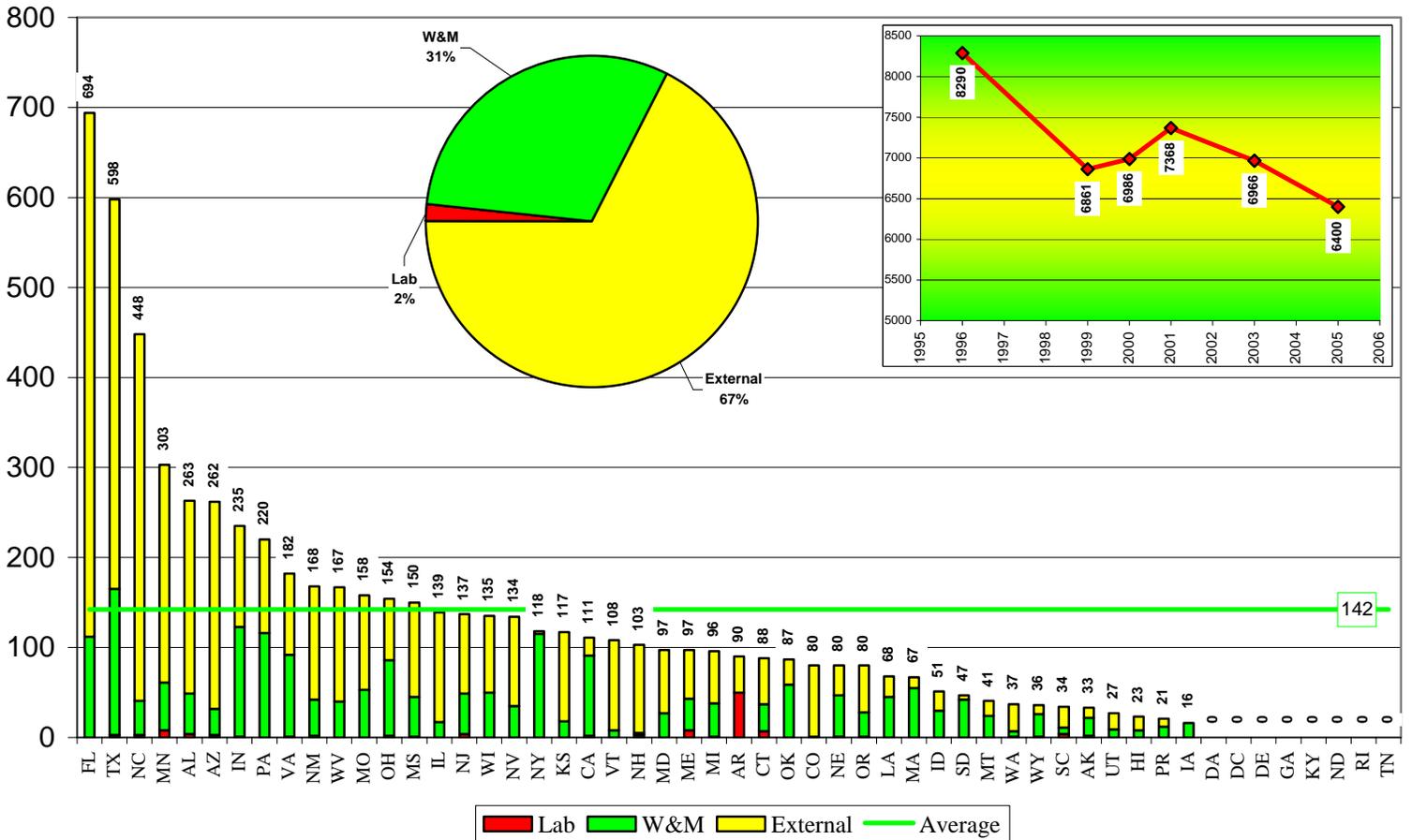
67 % of all volume (test measure) standards were calibrated for external customers.

The Georgia State Fuel Oil Laboratory tests all volumetric test measures associated with petroleum product enforcement.

Volume Test Measures



6400 Total Devices



Volume -- Provers

Description

The graphs on the following page represent the total number of volume (provers) standards tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 1996, 1999, 2000, 2001, 2003, and 2005 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

External – work done for customers who do not fall into any of the above categories.

Volume Categories:

- Glassware – most glassware are kits that contain volumetric standards from 1 gallon to 2 fluid ounces.
- Test Measures – most are metal volumetric standards nominally 5 gallons or less.
- Provers – most are metal volumetric standards nominally larger than 5 gallons.

Findings

Of the 47 reporting laboratories, 39 labs tested a total of 1,067 volume (prover) standards.

Comparison of the 2005, 2003, 2001, 2000, 1999, and 1996 Surveys

	# Labs Reporting Prover Tests	Total Devices	Lab Average	Change from previous survey
1996	48	1,187	25	--
1999	46	867	19	- 24 %
2000	42	1,112	26	+ 40 %
2001	43	1,260	29	+ 11 %
2003	43	1,053	24	- 17 %
2005	39	1,067	27	+ 12 %

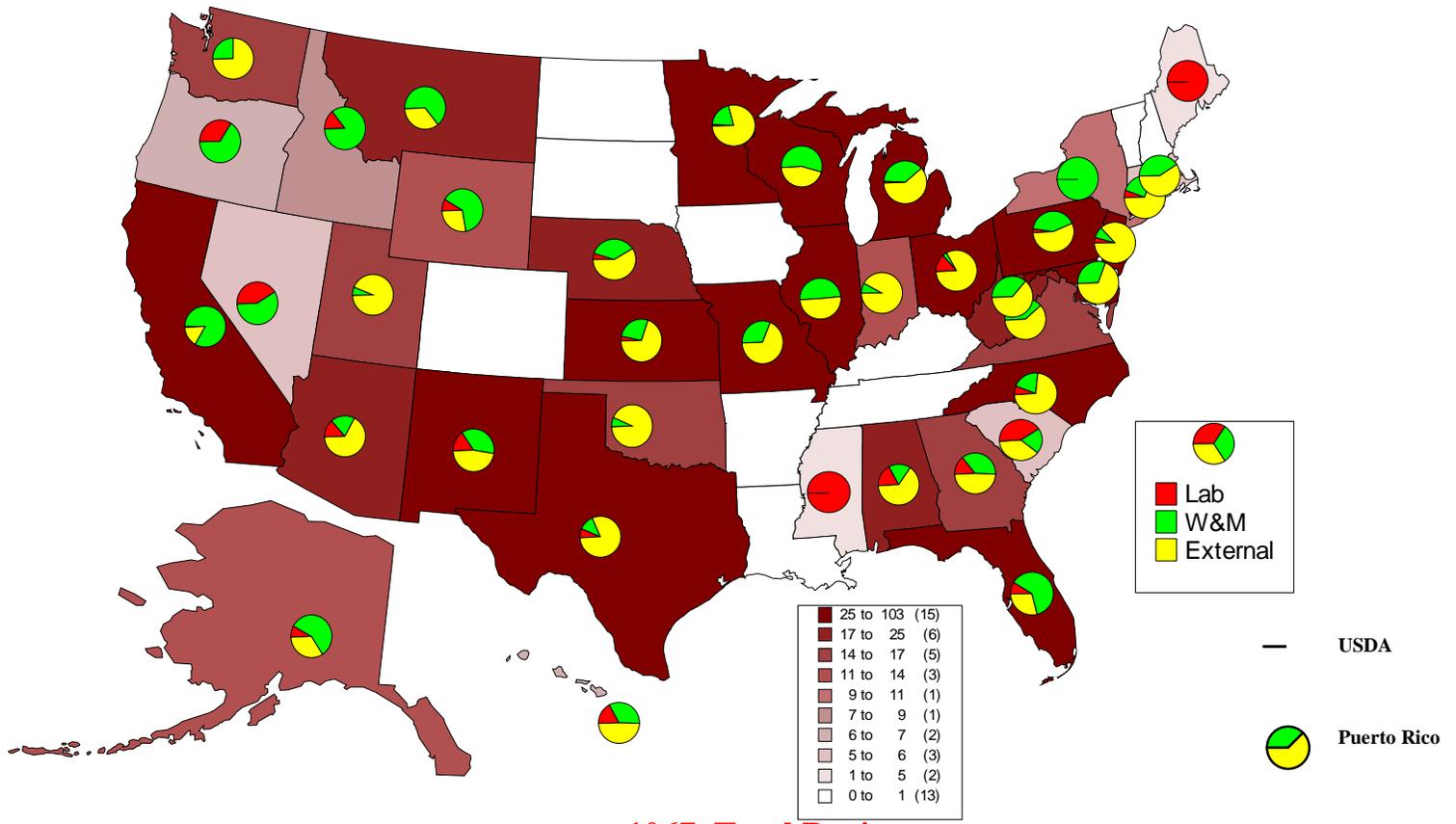
Notes and Comments

5 % of all volume (prover) standards were calibrated for the laboratory.

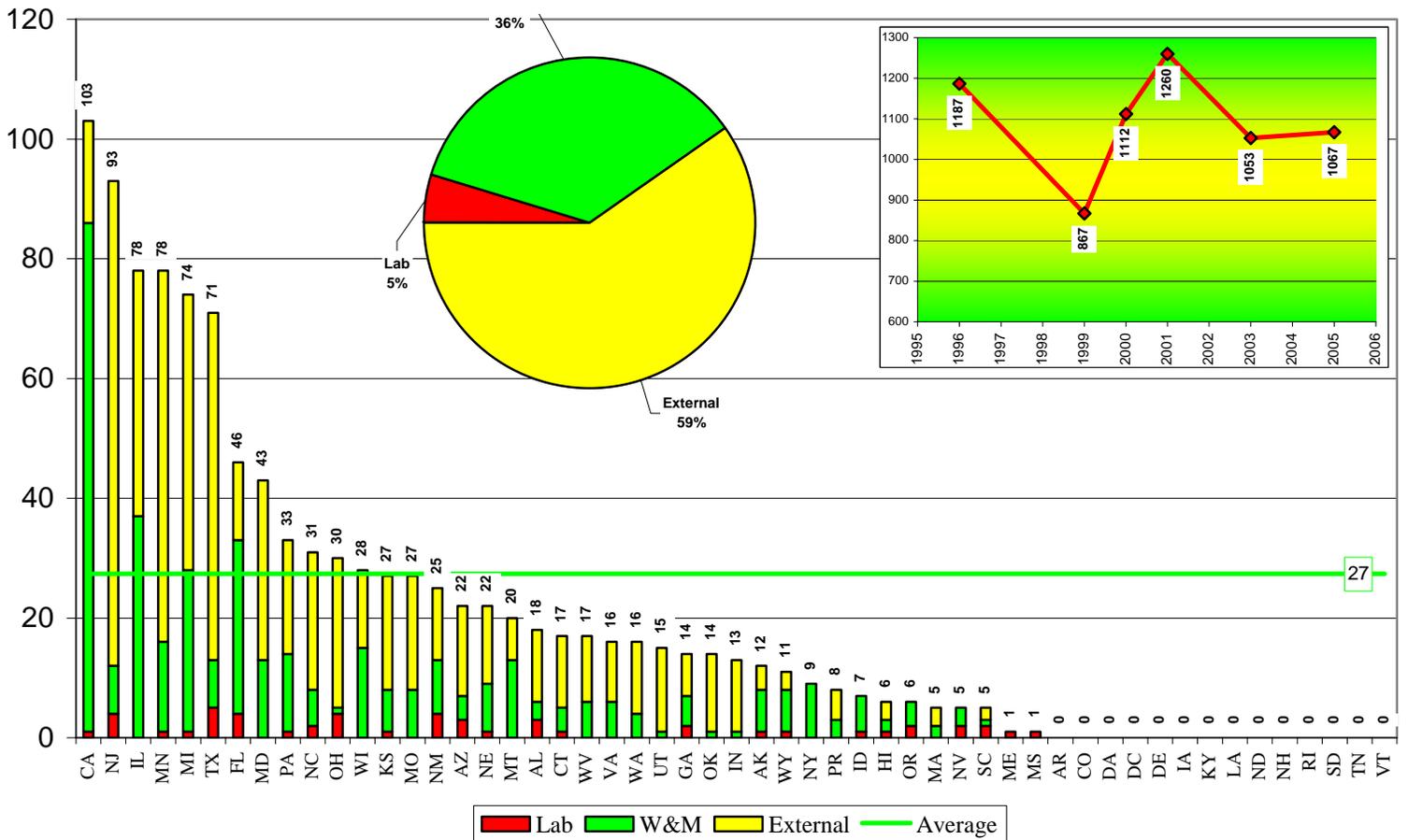
36 % of all volume (prover) standards were calibrated for weights and measures program.

59 % of all volume (prover) standards were calibrated for external customers.

Volume Provers



1067 Total Devices



Temperature

Description

The graphs on the following page represent the total number of temperature standards tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 1996, 1999, 2000, 2001, 2003, and 2005 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 12 labs tested a total of 315 temperature standards.

Comparison of the 2005, 2003, 2001, 2000, 1999, and 1996 Surveys

	# Labs Reporting Temperature tests	Total Devices	Lab Average	Change from previous survey
1996	20	447	22	--
1999	11	378	34	+ 54 %
2000	12	514	43	+ 25 %
2001	16	460	29	- 33 %
2003	13	456	35	+ 22 %
2005	12	315	26	- 26 %

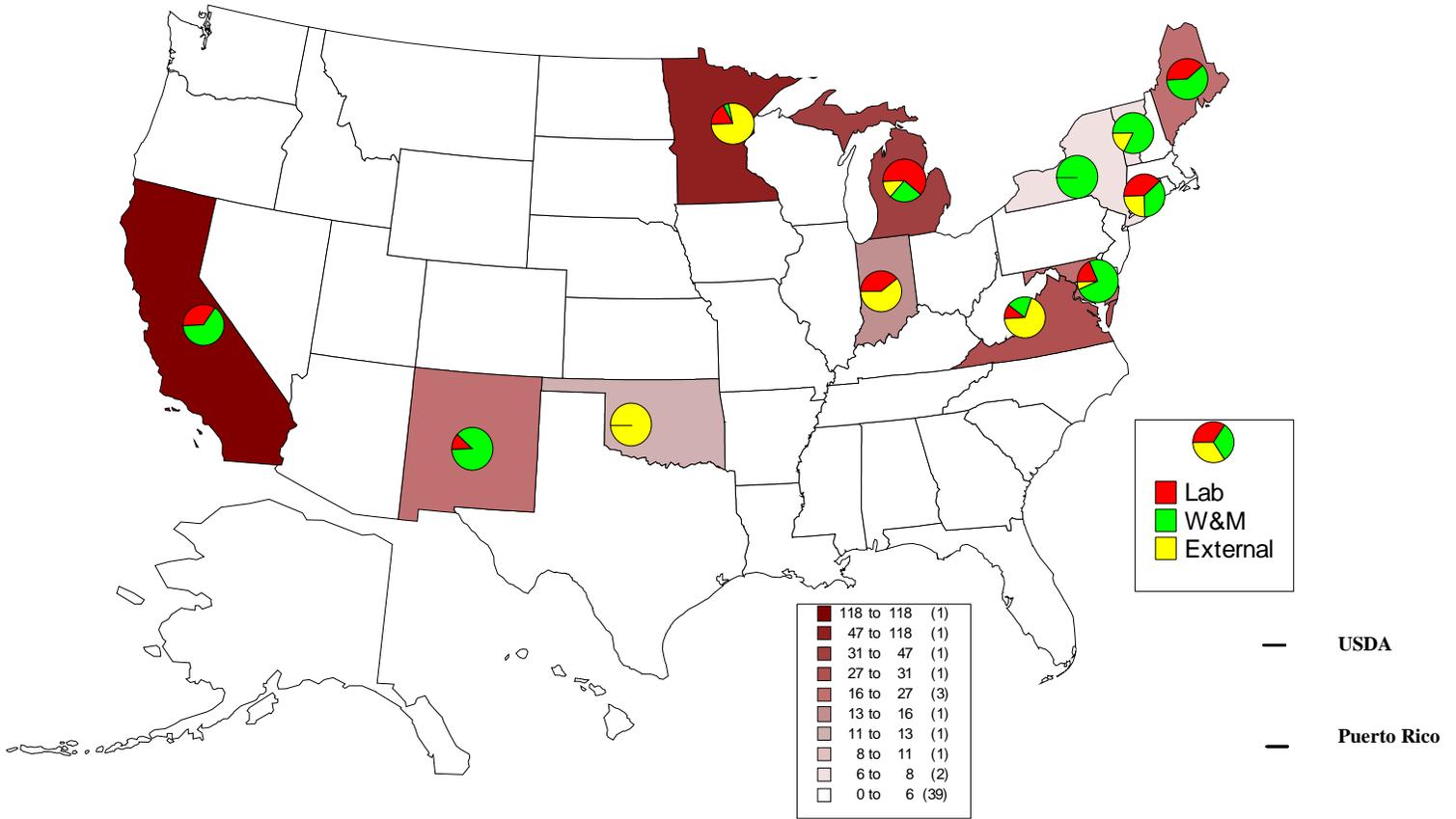
Notes and Comments

28 % of all temperature standards were calibrated for the laboratory.

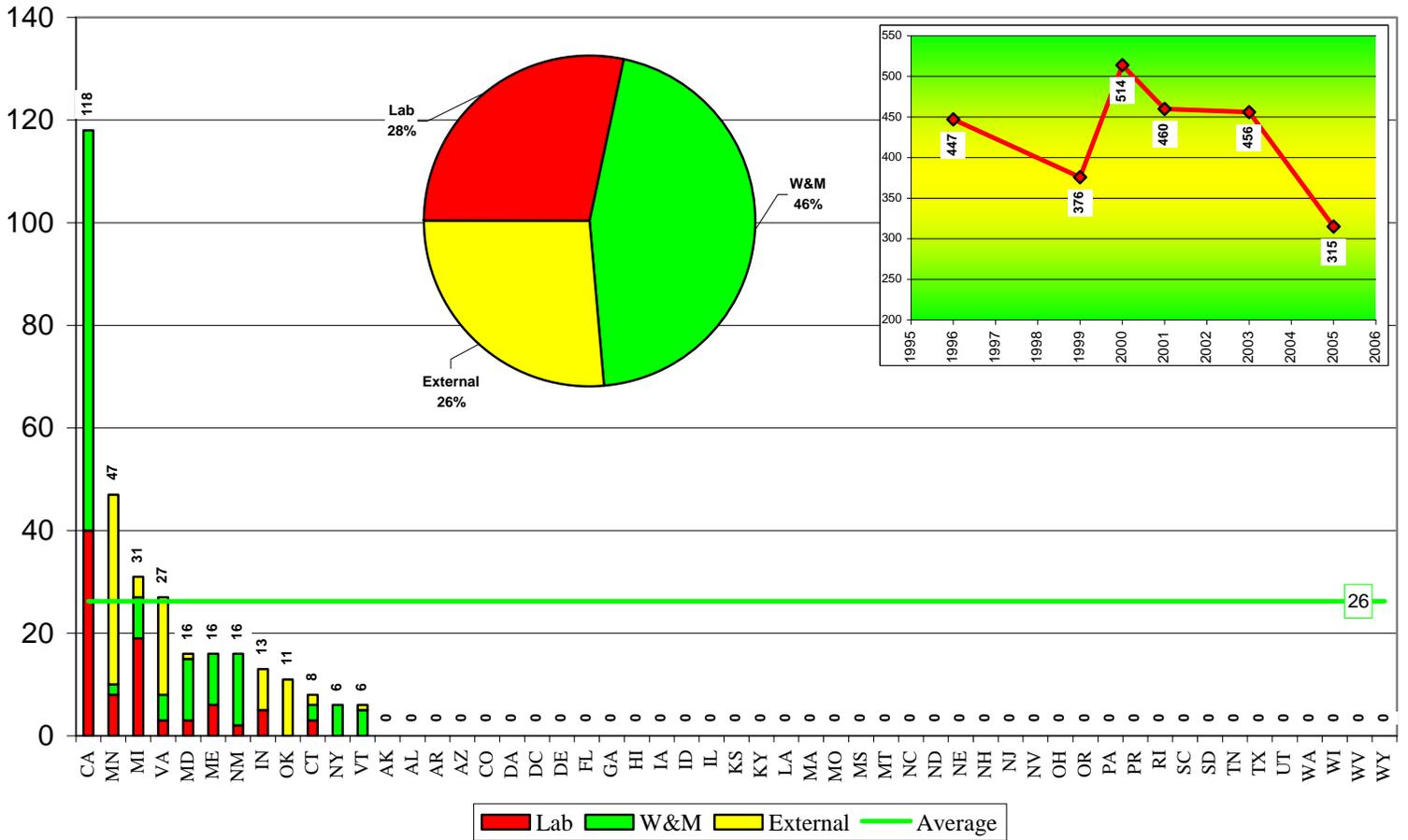
46 % of all temperature standards were calibrated for weights and measures program.

26 % of all temperature standards were calibrated for external customers.

Temperature



315 Total Devices



Frequency

Description

The graphs on the following page represent the total number of frequency standards tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 1996, 1999, 2000, 2001, 2003, and 2005 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 3 labs tested a total of 14,772 frequency standards.

Comparison of the 2005, 2003, 2001, 2000, 1999, and 1996 Surveys

	# Labs Reporting Frequency Tests	Total Devices	Lab Average	Change from previous survey
1996	6	12,518	2,086	--
1999	4	11,561	2,890	+ 39 %
2000	5	13,518	2,704	- 6 %
2001	7	14,670	2,096	- 22 %
2003	6	13,785	2,298	+ 10 %
2005	3	14,772	4,924	+ 114 %

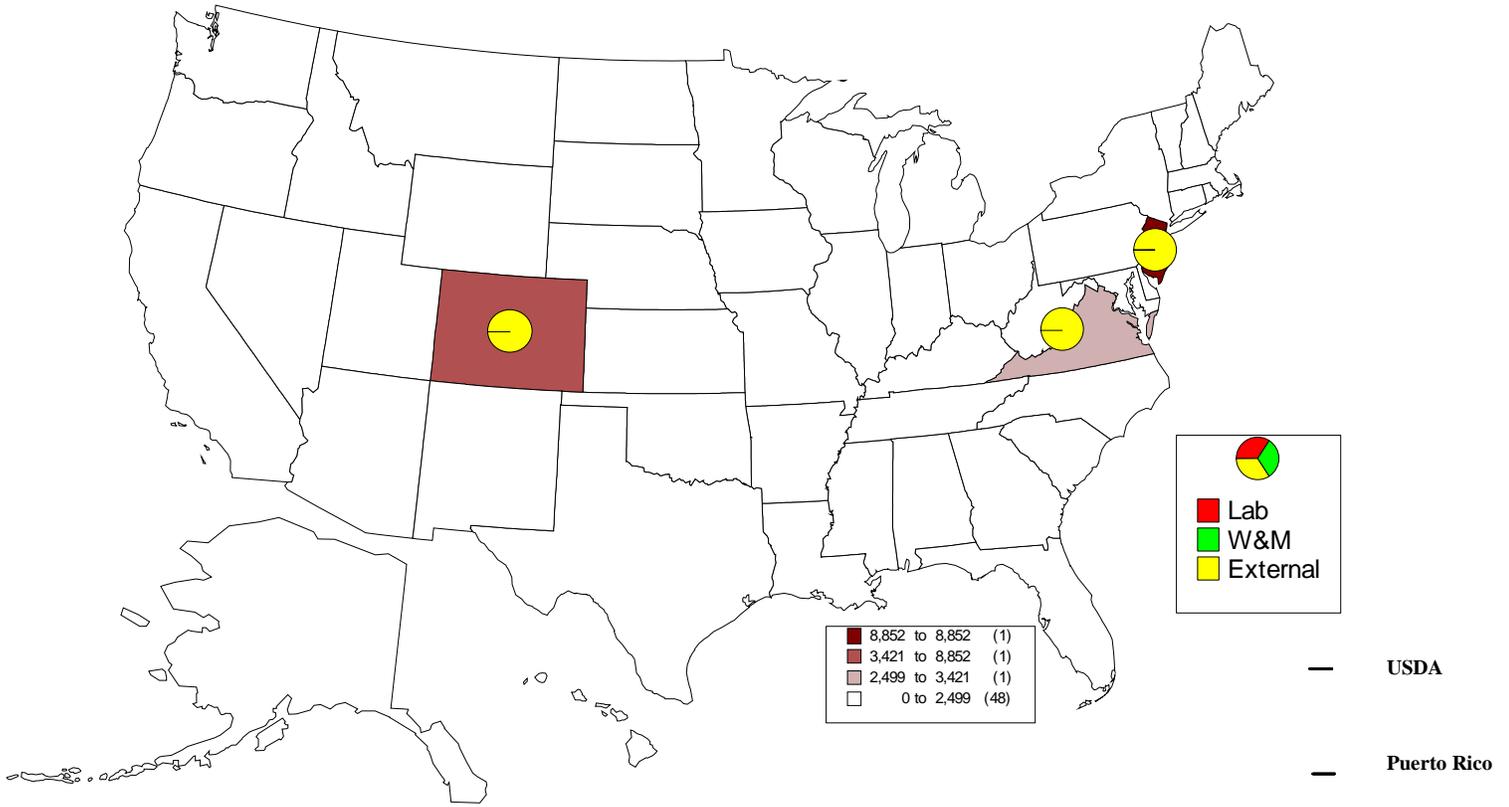
Notes and Comments

0 % of all frequency standards were calibrated for the laboratory.

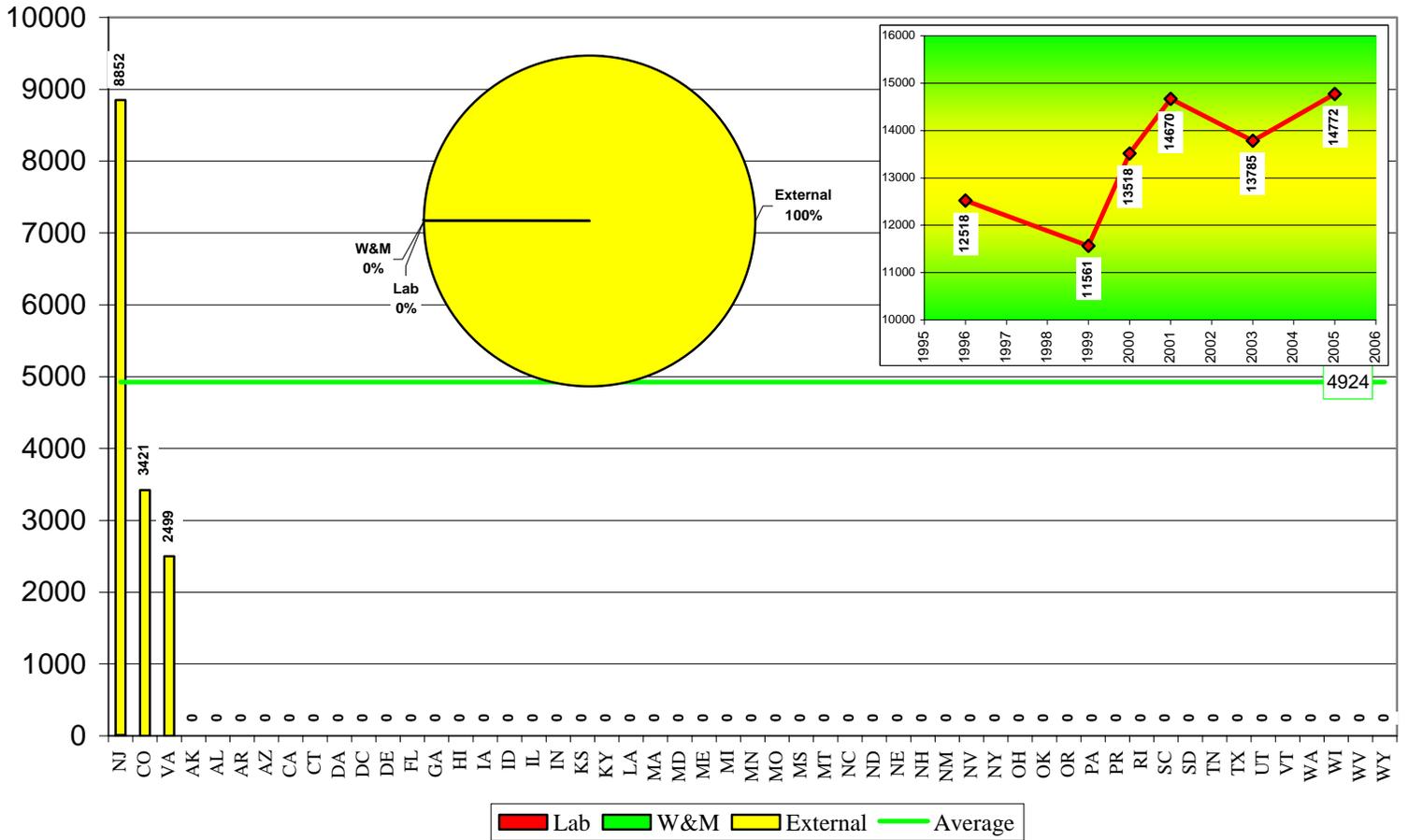
0 % of all frequency standards were calibrated for weights and measures program.

100 % of all frequency standards were calibrated for external customers.

Frequency



14772 Total Devices



Time

Description

The graphs on the following page represent the total number of timing devices tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 1996, 1999, 2000, 2001, 2003, and 2005 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 9 labs tested a total of 951 timing devices.

Comparison of the 2005, 2003, 2001, 2000, 1999, and 1996 Surveys

	# Labs Reporting Time Tests	Total Devices	Lab Average	Change from previous survey
1996	13	161	12	--
1999	11	380	35	+ 179 %
2000	14	451	32	- 7 %
2001	13	554	43	+ 32 %
2003	11	479	44	+ 2 %
2005	9	951	106	+ 141 %

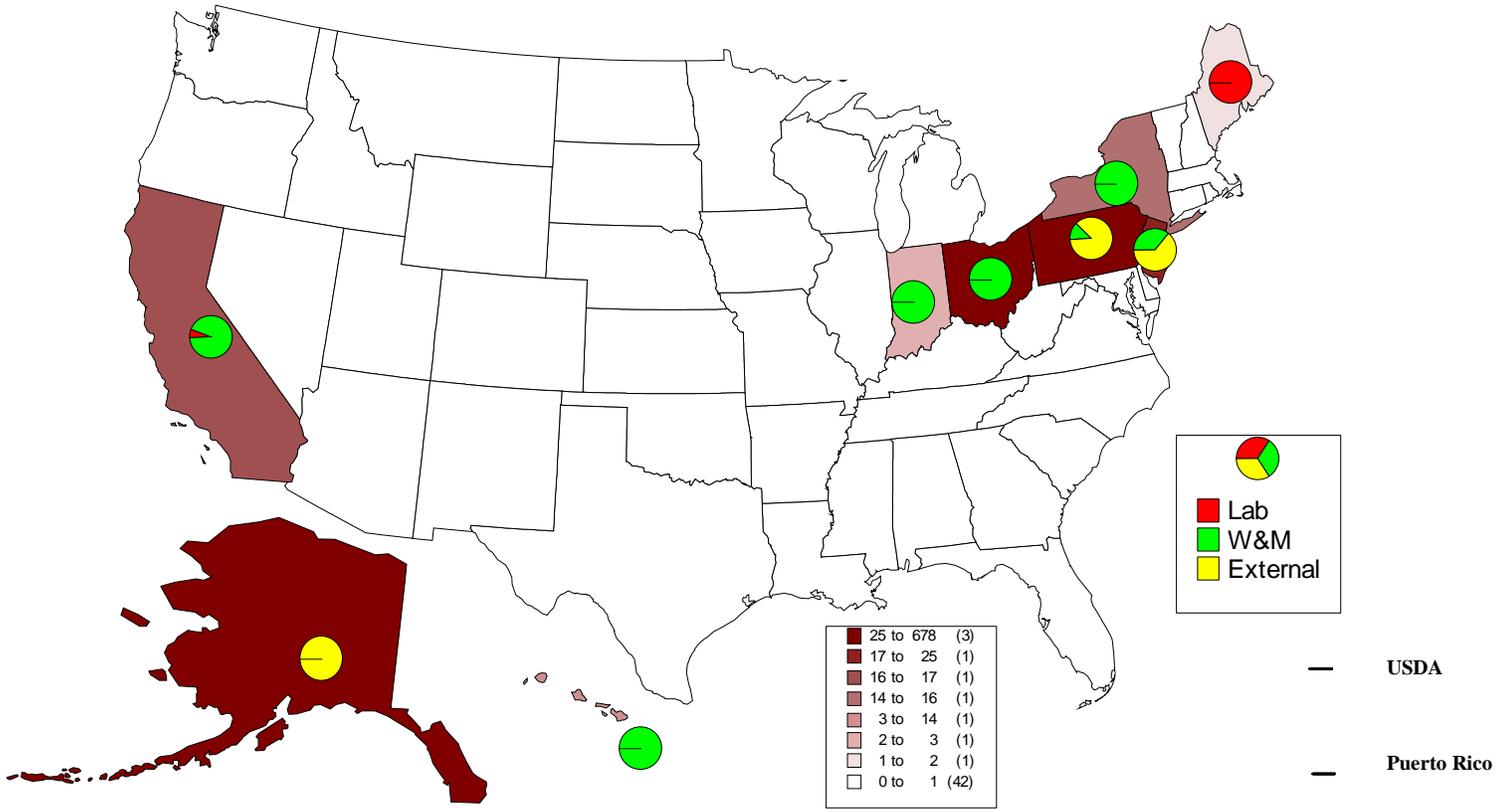
Notes and Comments

0 % of all timing devices were calibrated for the laboratory.

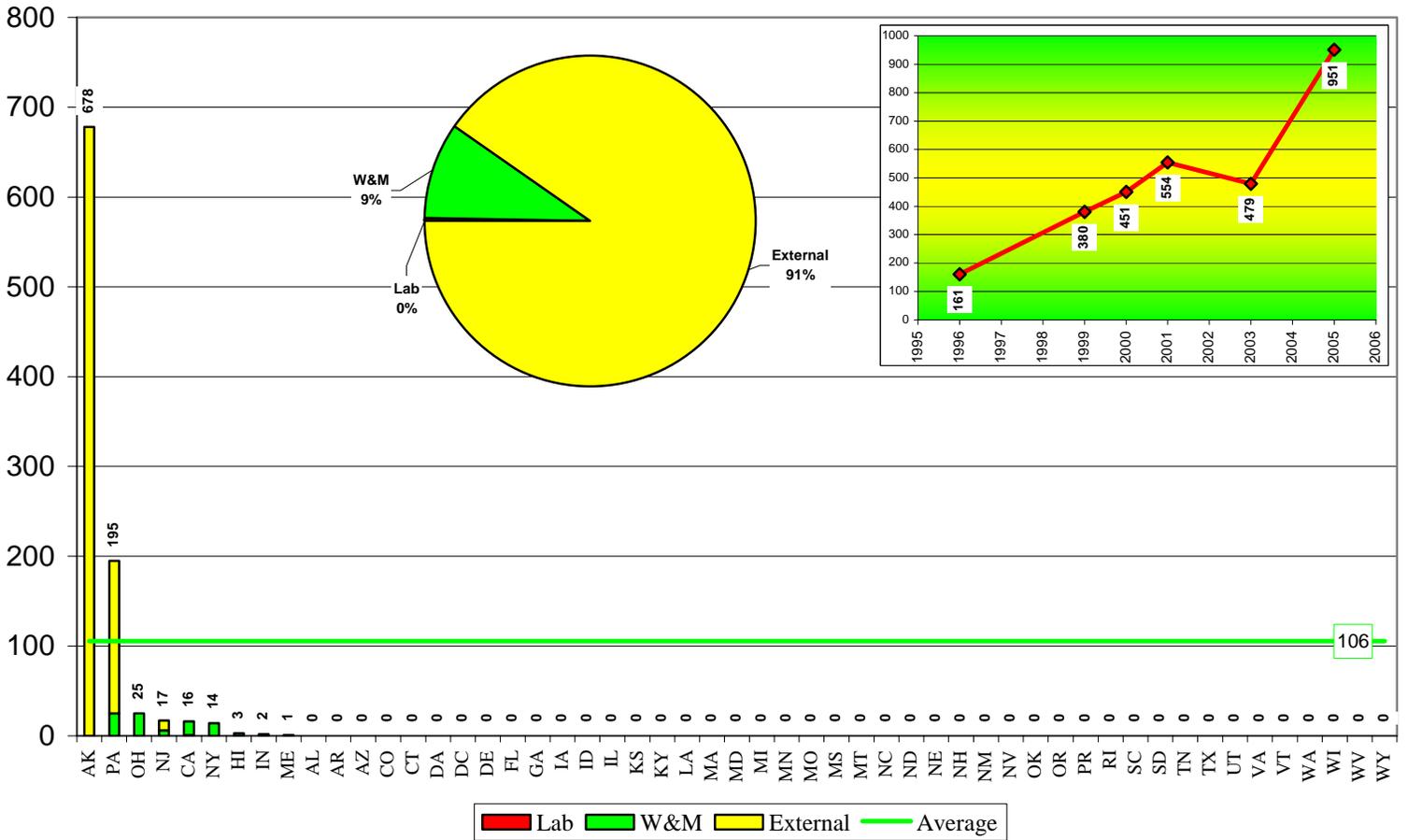
9 % of all timing devices were calibrated for weights and measures program.

91 % of all timing devices were calibrated for external customers.

Time



951 Total Devices



Wheel Load Weighers

Description

The graphs on the following page represent the total number of wheel load weighers tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 1999, 2000, 2001, 2003, and 2005 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 21 labs tested a total of 10,884 wheel load weighers.

Comparison of the 2005, 2003, 2001, 2000, and 1999 Surveys

	# Labs Reporting Wheel Load Weigher Tests	Total Devices	Lab Average	Change from previous survey
1999	19	12,178	641	--
2000	20	12,781	639	0 %
2001	22	13,699	623	- 3 %
2003	23	10,350	450	- 28 %
2005	21	10,884	518	+ 15 %

Notes and Comments

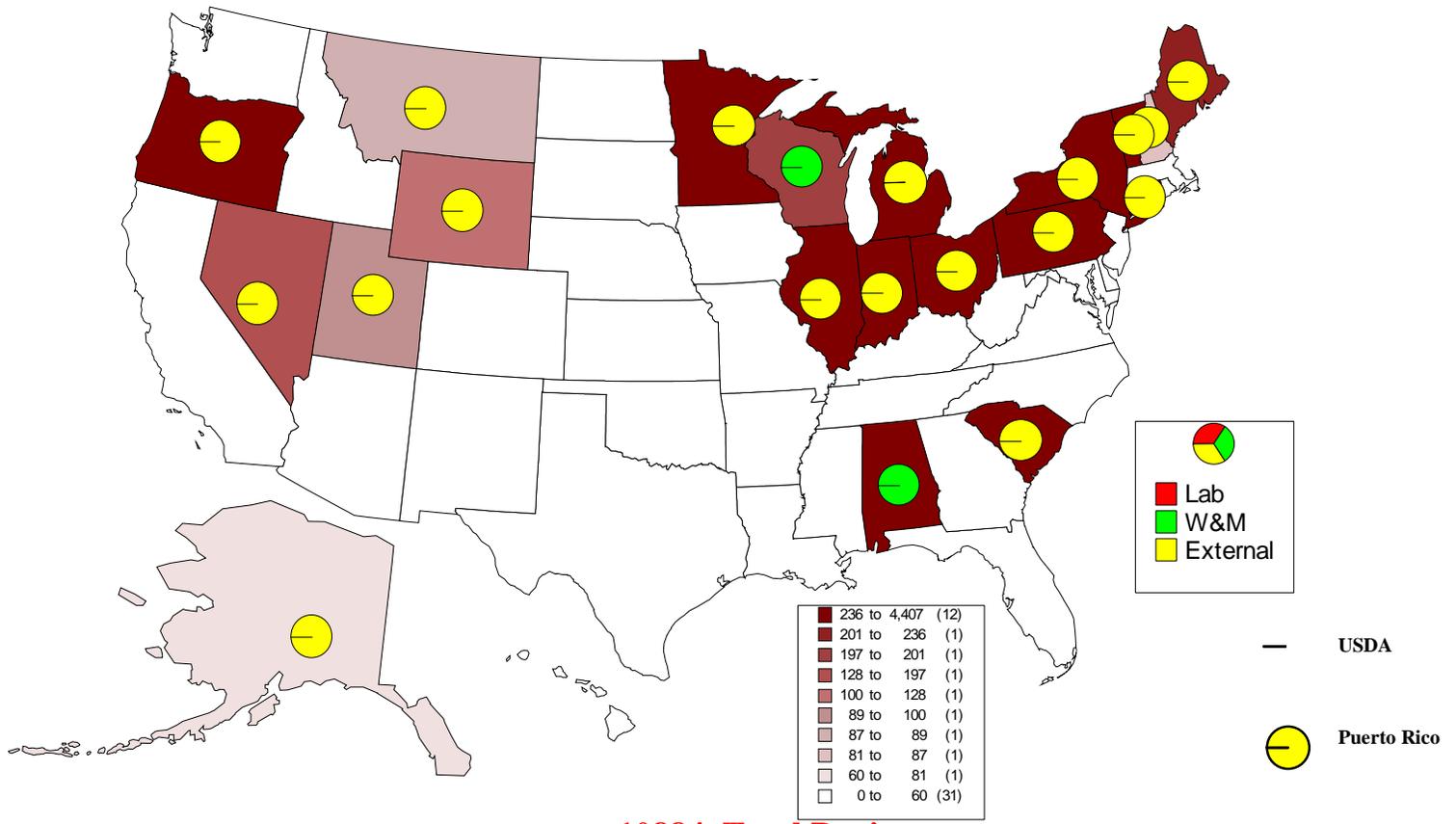
0 % of all wheel load weighers were calibrated for the laboratory.

6 % of all wheel load weighers were calibrated for weights and measures program.

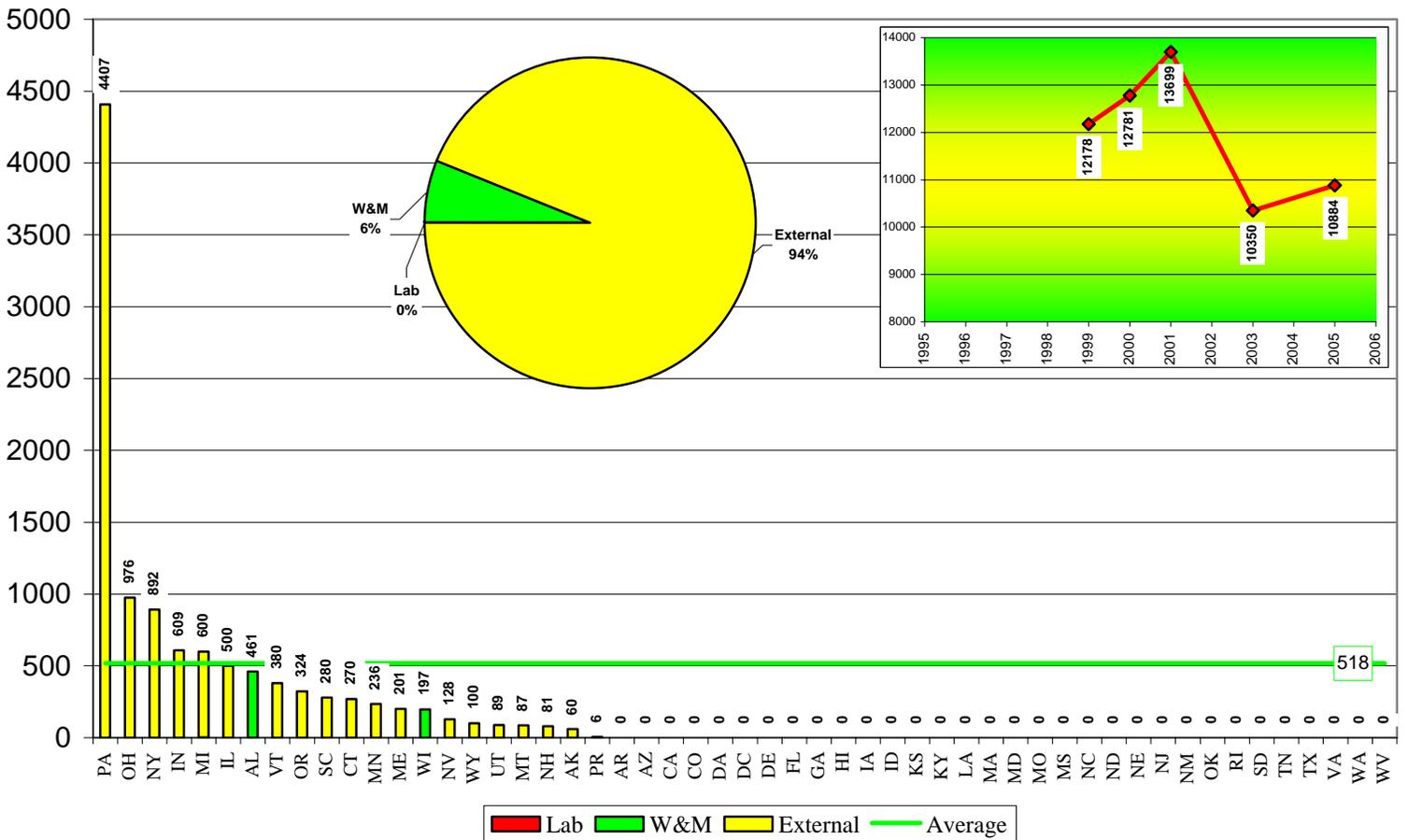
94 % of all wheel load weighers were calibrated for external customers.

Pennsylvania laboratory performed 4,407 tests on wheel load weighers (40 % of the national total).

Wheel Load Weighers



10884 Total Devices



Lottery Balls

Description

The graphs on the following page represent the total number of lottery balls tested by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 2000, 2001, 2003, and 2005 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

External – work done for customers who do not fall into any of the above categories.

Findings

Of the 47 reporting laboratories, 11 labs tested a total of 40,939 lottery balls.

Comparison of the 2005, 2003, 2001, 2000, 1999, and 1996 Surveys

	# Labs Reporting Tests on Lottery Balls	Total Devices	Lab Average	Change from previous survey
2000	9	19,982	2,220	--
2001	13	24,702	1,900	- 14 %
2003	11	35,818	3,256	+ 71 %
2005	11	40,939	3,722	+ 14 %

Notes and Comments

0 % of all lottery balls were calibrated for the laboratory.

0 % of all lottery balls were calibrated for weights and measures program.

100 % of all lottery balls were calibrated for external customers.

Puerto Rico laboratory performed 26,304 tests on lottery balls (64 % of the national total).

This is a new survey category starting in 2005. In previous surveys, laboratories reported lottery balls under the category of 'other tests'.

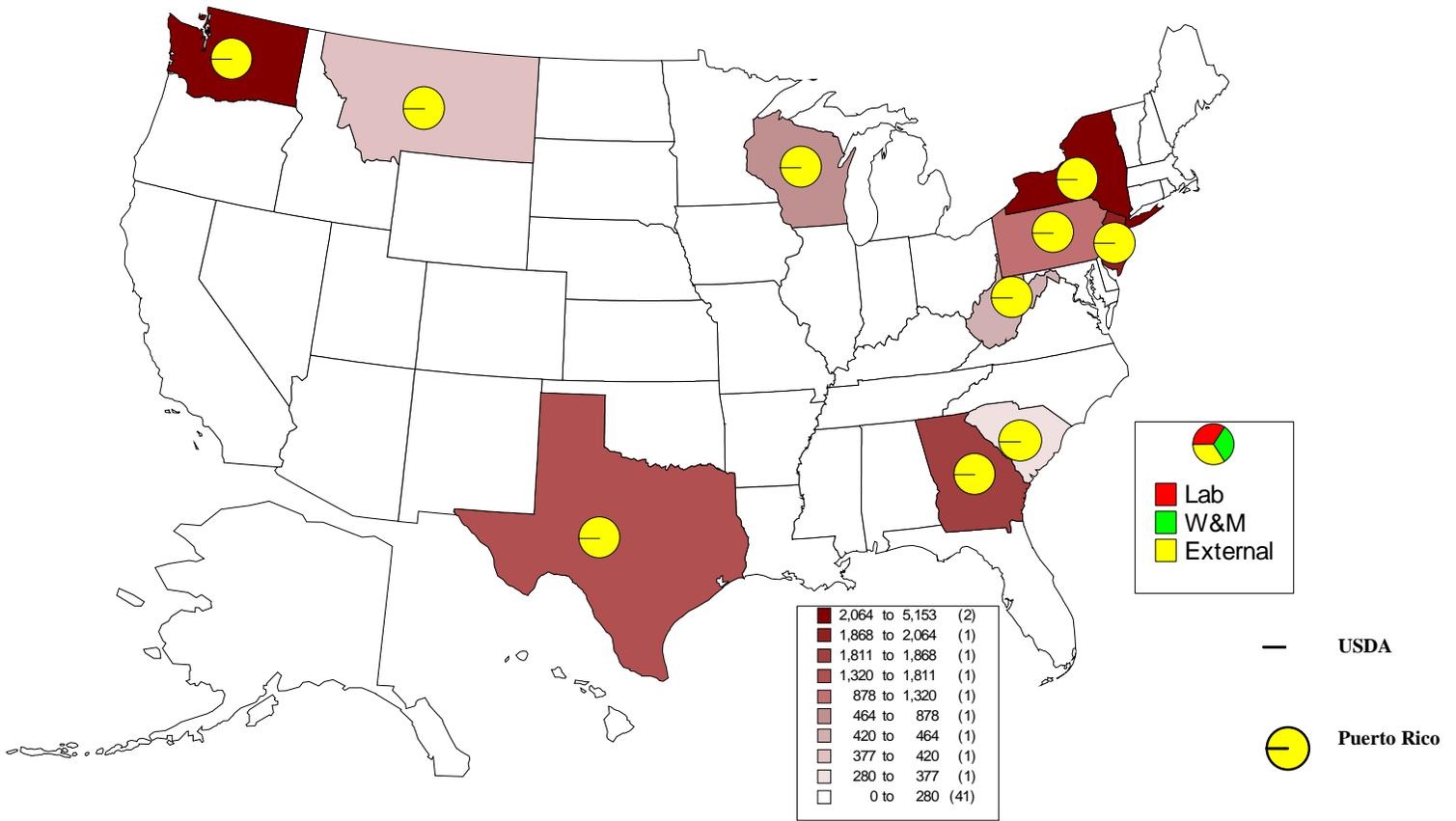
A supplemental question on lottery balls asked what characteristics were tested.

1 laboratory tested diameters only.

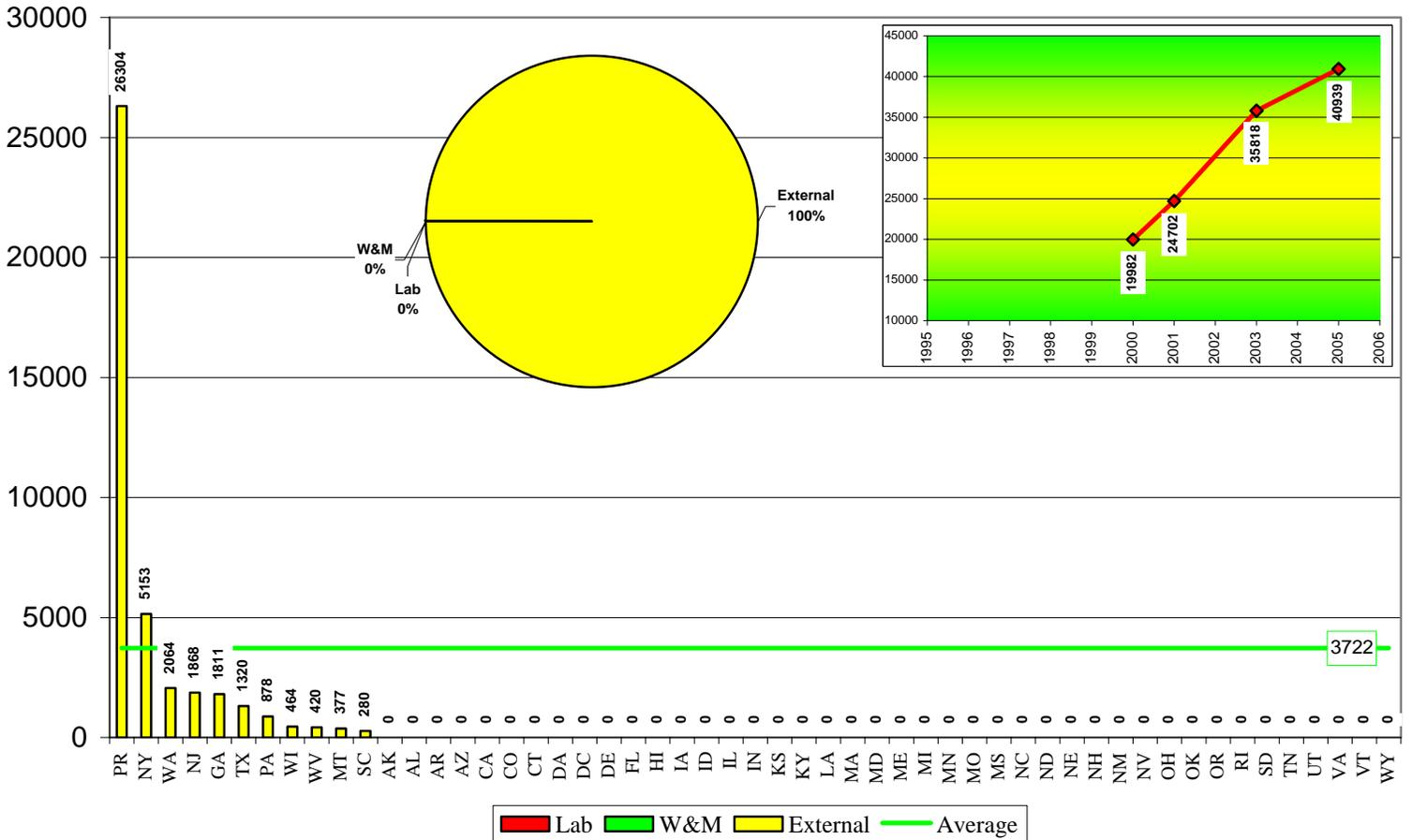
6 laboratories tested mass only.

4 laboratories tested the diameters and mass.

Lottery Balls



40939 Total Devices



Summary of “Other Tests”

Description

The category “Other Tests” was for tests performed by the metrology laboratory that did not fit into any of the listed categories in the survey.

The graphs on the following page represent the total number of “Other Tests” performed by 22 reporting laboratories. The pie graph provides a further breakdown into the following categories:

Hydrometers	(1 laboratory)	(2,505 tests)
Filters-EPA	(1 laboratory)	(2,044 tests)
Speed Detection †	(1 laboratory)	(424 tests)
Special Volume *	(6 laboratories)	(383 tests)
Grain Moisture	(3 laboratories)	(176 tests)
Scales *	(5 laboratories)	(136 tests)
Special Linear/Dimensional *	(5 laboratories)	(133 tests)
LPG Provers	(3 laboratories)	(59 tests)
Density	(1 laboratory)	(52 tests)
Railroad Test Cars *	(4 laboratories)	(41 tests)
Electrical	(1 laboratory)	(36 tests)
Special Mass	(2 laboratories)	(17 tests)

* (Individual graphs are presented for these categories)

† (Includes electronic testing of the radar unit, not just calibration of the tuning forks)

The bar graph at the bottom of the page shows the same breakdown in categories along with the total number of “Other Tests” performed above each laboratory.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

External – work done for customers who do not fall into any of the above categories.

Findings

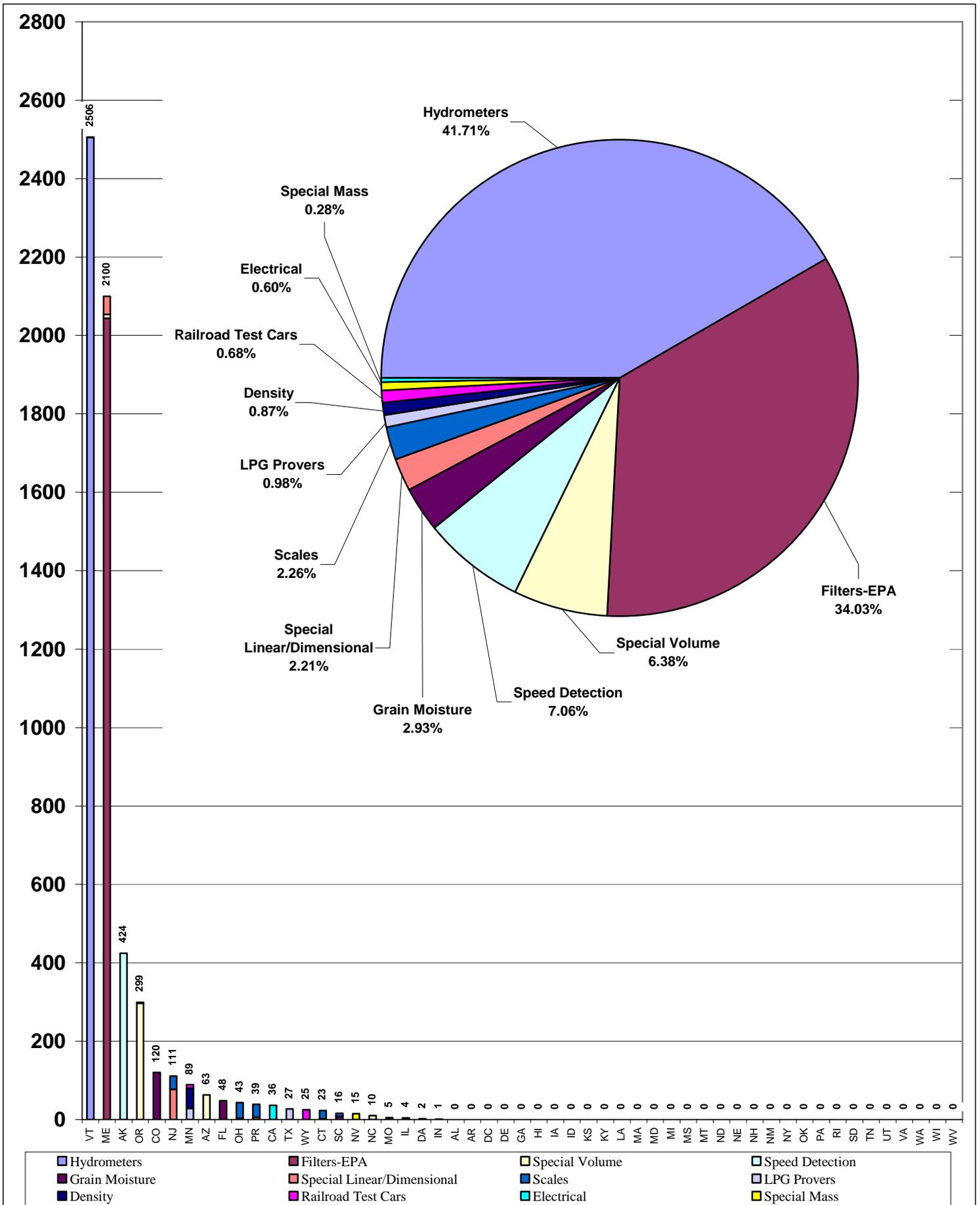
Comparison of the 2005, 2003, 2001, and 2000 Surveys

	# Labs Reporting Other Tests	Total Devices Tested	Lab Average	Change from previous survey
2000	24	25,350	1,056	--
2001	26	30,199	1,162	+ 10 %
2003	24	42,282	1,762	+ 52 %
2005	22	6,006	273	- 85 %

The 22 reporting laboratories performed a total of 6,006 ‘Other Tests’, which is a decrease of 85 % from the 42,282 other tests from 2003. The main reason for the decrease in the number of ‘Other Tests’ is that ‘Lottery Balls’ were moved to a separate category beginning with the 2005 survey.

Summary of Other Tests

6006 Total Devices



“Other Tests” -- Special Volume

Description

The graphs on the following page represent the total number of special volume tests performed by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

Findings

Of the 47 reporting laboratories, 6 labs tested a total of 383 special volume devices.

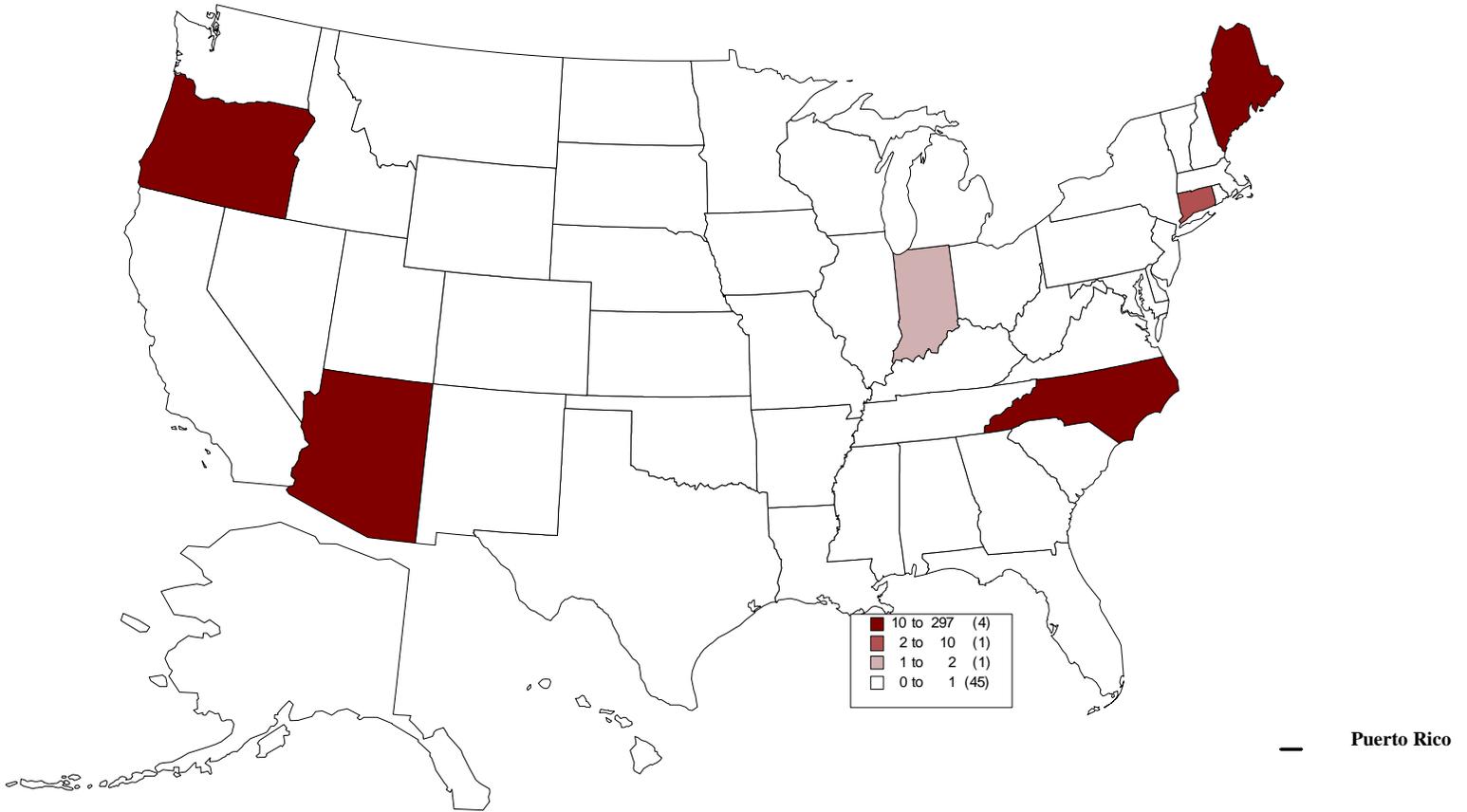
Comparison of the 2005, 2003, 2001, and 2000 Surveys

	# Labs Reporting Special Volume Tests	Total Tested	Lab Average	Change from previous survey
2000	2	43	21.50	--
2001	2	45	22.50	+ 5 %
2003	8	266	33.25	+ 48 %
2005	6	383	63.83	+ 92 %

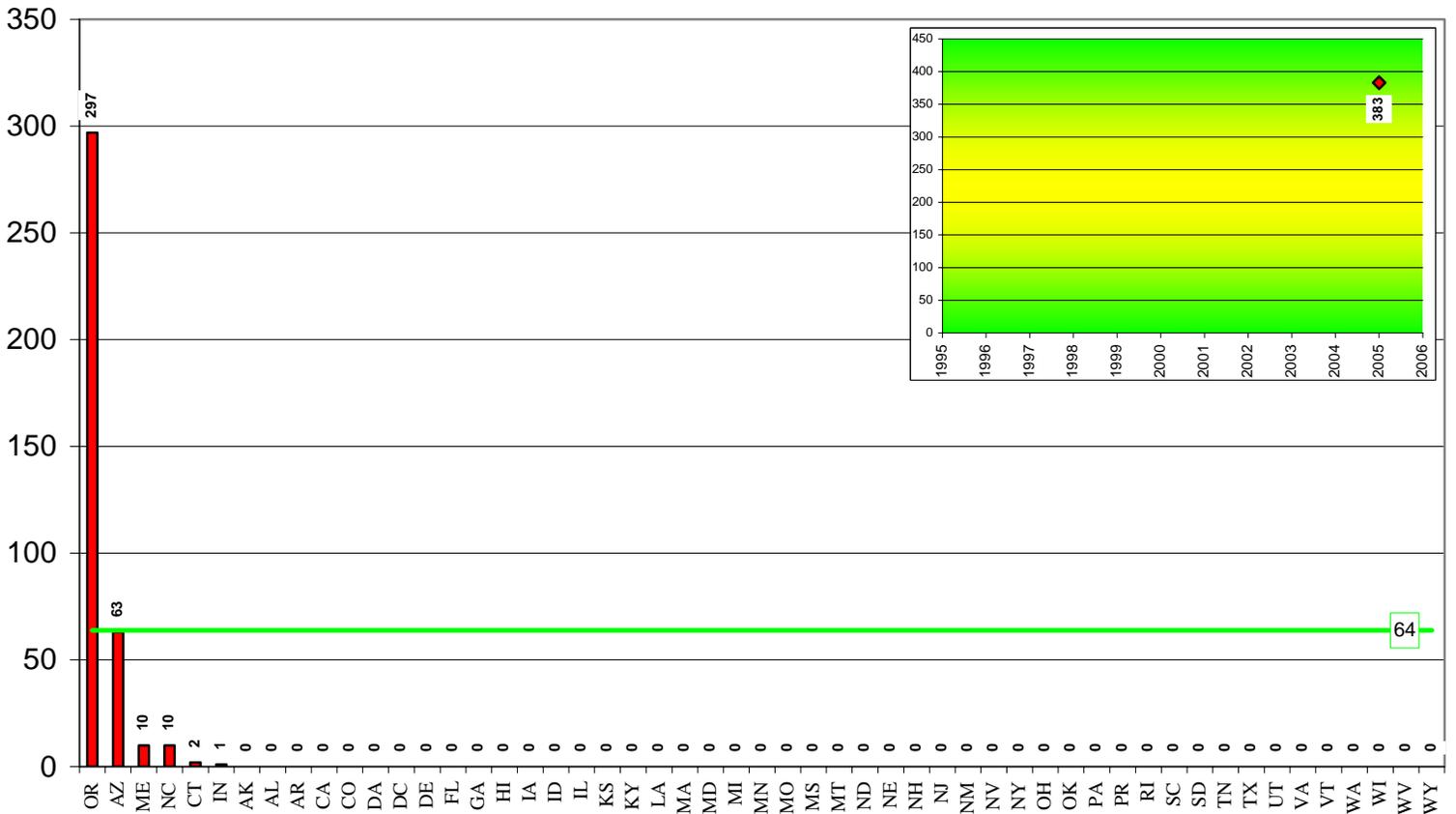
Notes and Comments

Examples of ‘special volume’ include farm milk tanks, compact provers, and LPG vapor meters.

Special Volume



383 Total Devices



“Other Tests” -- Scales

Description

The graphs on the following page represent the total number of scale tests performed by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

Findings

Of the 47 reporting laboratories, 5 labs tested a total of 136 scales.

Comparison of the 2005, 2003, 2001, and 2000 Surveys

	# Labs Reporting Scale Tests	Total Tests	Lab Average	Change from previous survey
2000	5	92	18	--
2001	9	189	21	+ 14 %
2003	7	180	26	+ 24 %
2005	5	136	27	+ 4 %

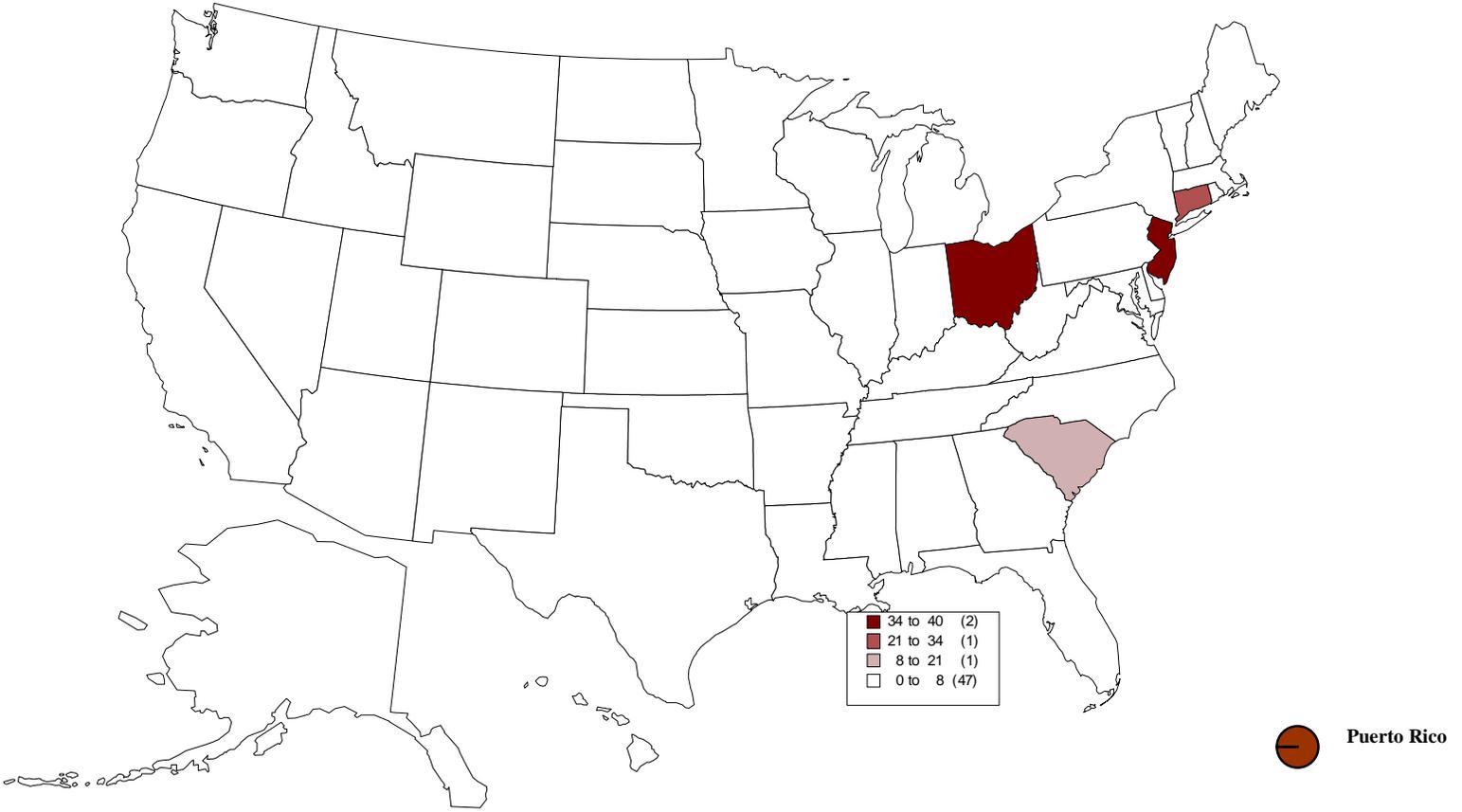
Notes and Comments

There were 5 laboratories that reported the testing of scales.

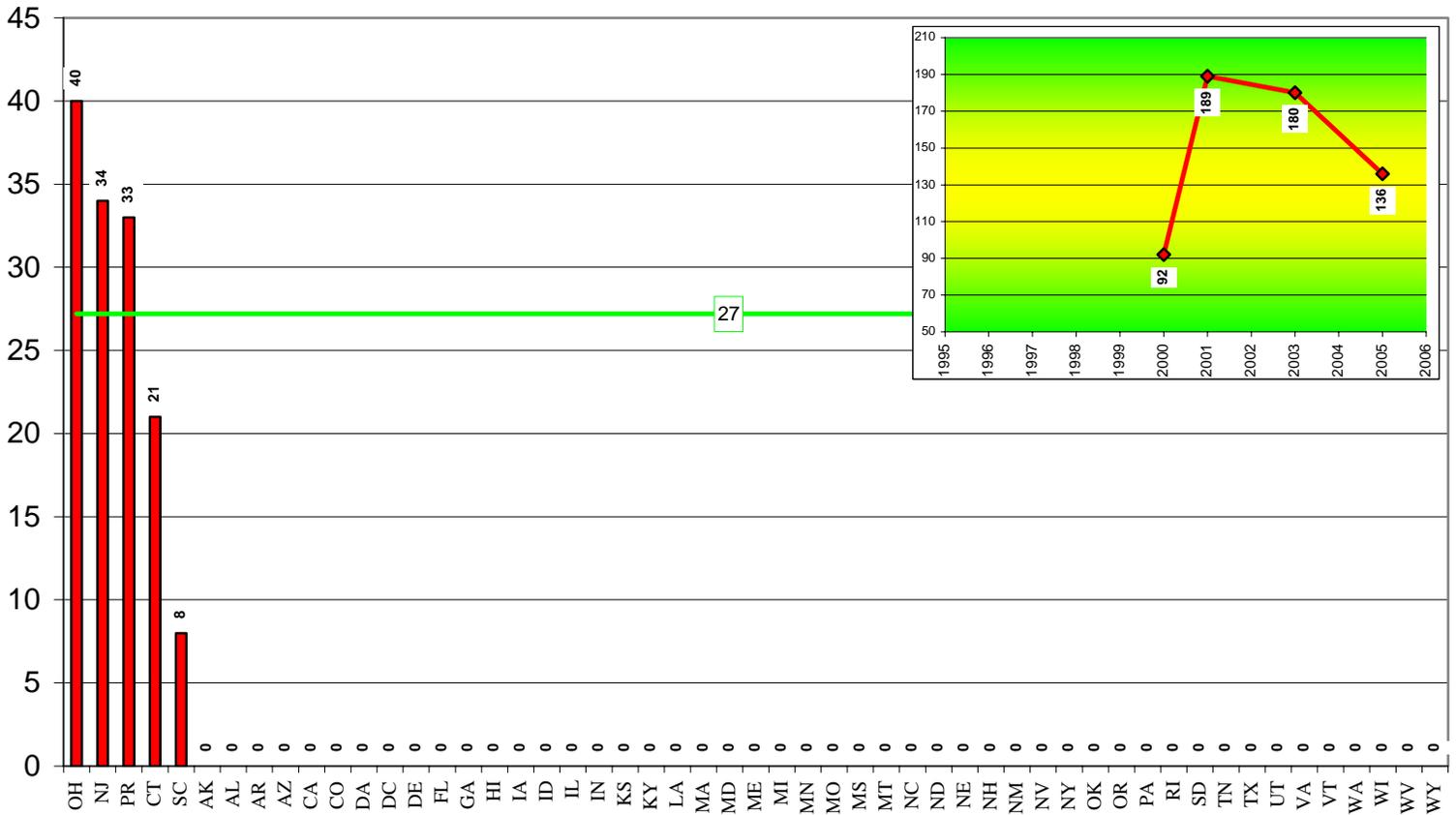
The type of scales tested by these metrology labs included:

- Package checking scales
- Force gauges
- Fish scales
- Produce scales
- Doctor-Type Scales
- Assorted electronic/mechanical/spring scales

Scales



136 Total Devices



“Other Tests” -- Special Linear/Dimensional

Description

The graphs on the following page represent the total number of special linear/dimensional tests performed by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

Findings

Of the 47 reporting laboratories, 5 labs performed a total of 133 special linear/dimensional tests.

Comparison of the 2005, 2003, 2001, and 2000 Surveys

	# Labs Reporting Special Linear Tests	Total Tests	Lab Average	Change from previous survey
2000	3	209	70	--
2001	4	258	64	- 7 %
2003	4	83	21	- 68 %
2005	5	133	27	+ 29 %

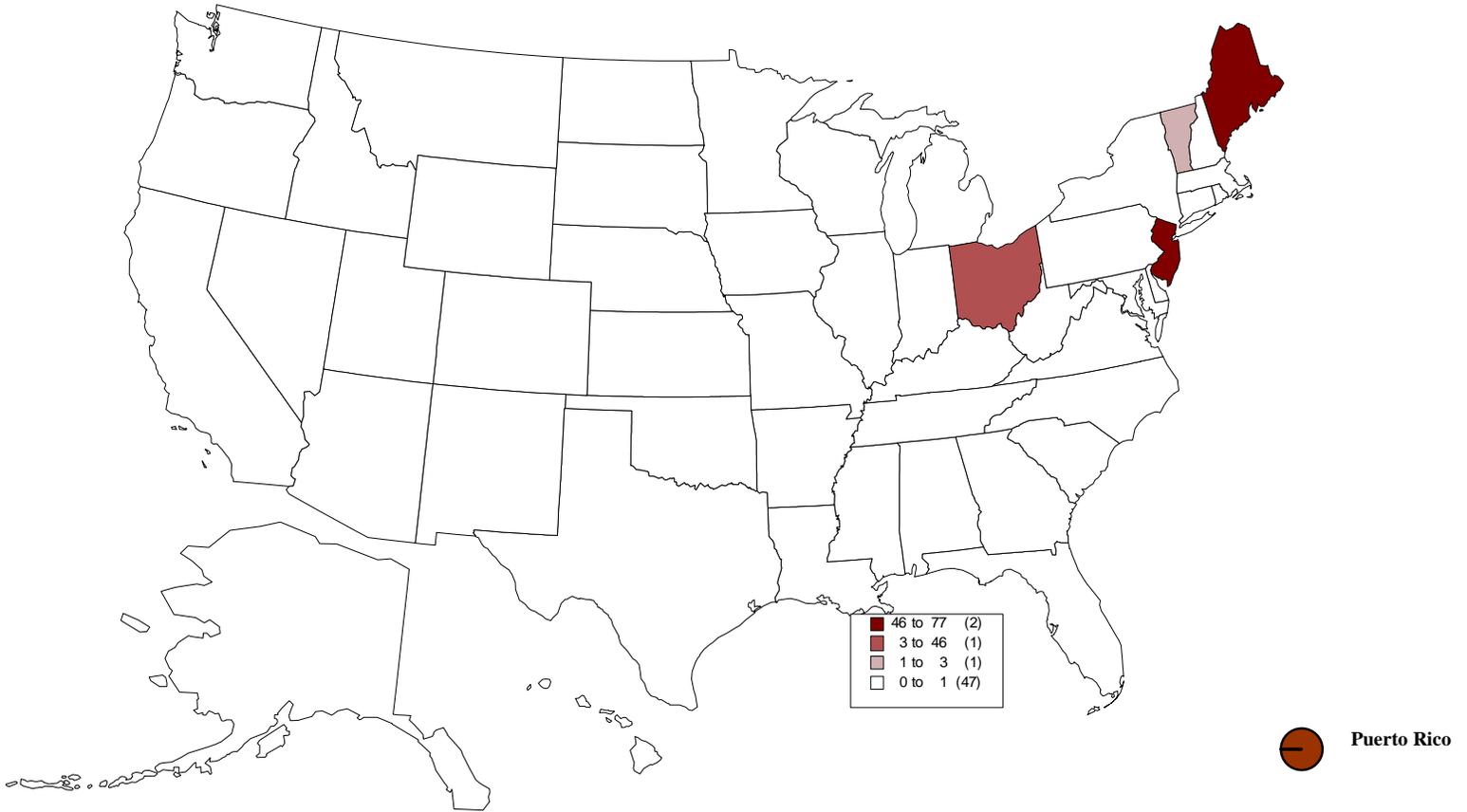
Notes and Comments

There were 5 laboratories that reported the testing of special linear/dimensional devices.

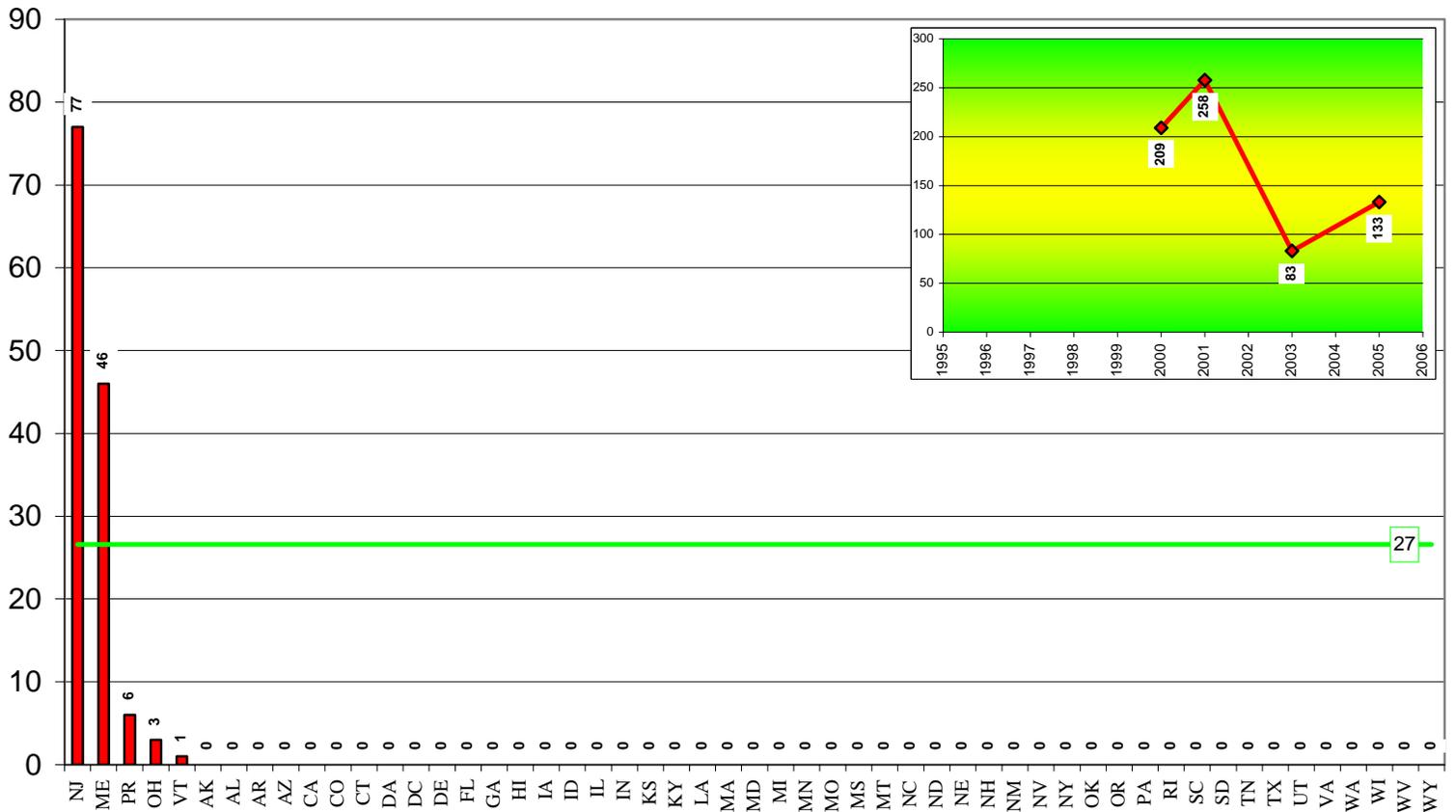
The Special Linear/Dimensional devices consisted of the following types:

- Vent Gage & Lobster Plugs
- Fish/Lobster/Shellfish linear standards
- Apple sizing rings

Special Linear / Dimensional



133 Total Devices



“Other Tests” -- Railroad Test Cars

Description

The graphs on the following page represent the total number of railroad test car calibrations performed by the 47 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

Findings

Of the 47 reporting laboratories, 4 labs performed a total of 41 railroad test car calibrations.

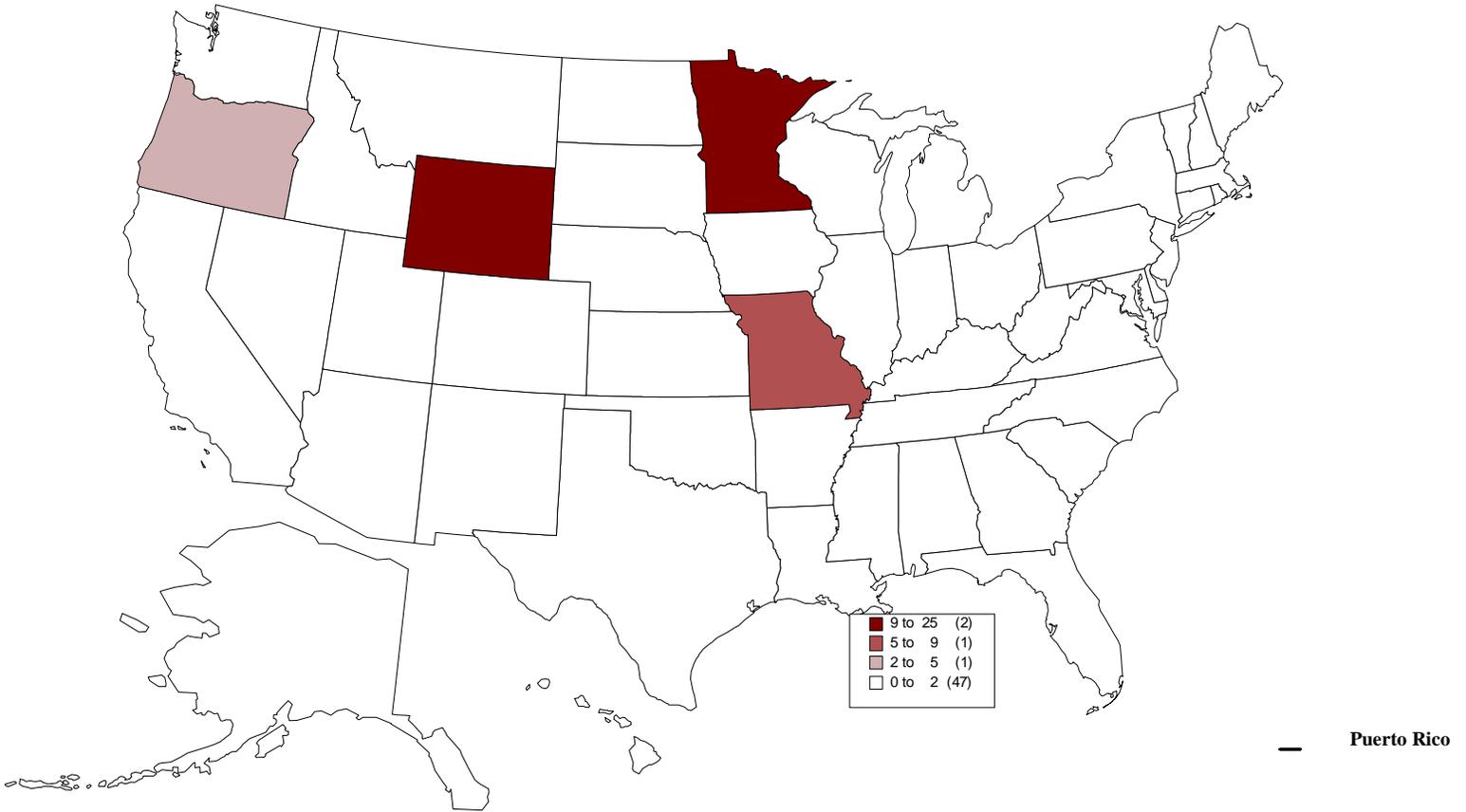
Comparison of the 2005, 2003, 2001, and 2000 Surveys

	# Labs Reporting Railroad Test Car Tests	Total Tests	Lab Average	Change from previous survey
2000	1	6	6.00	--
2001	2	12	6.00	0 %
2003	2	3	1.50	- 75 %
2005	4	41	10.25	+ 583 %

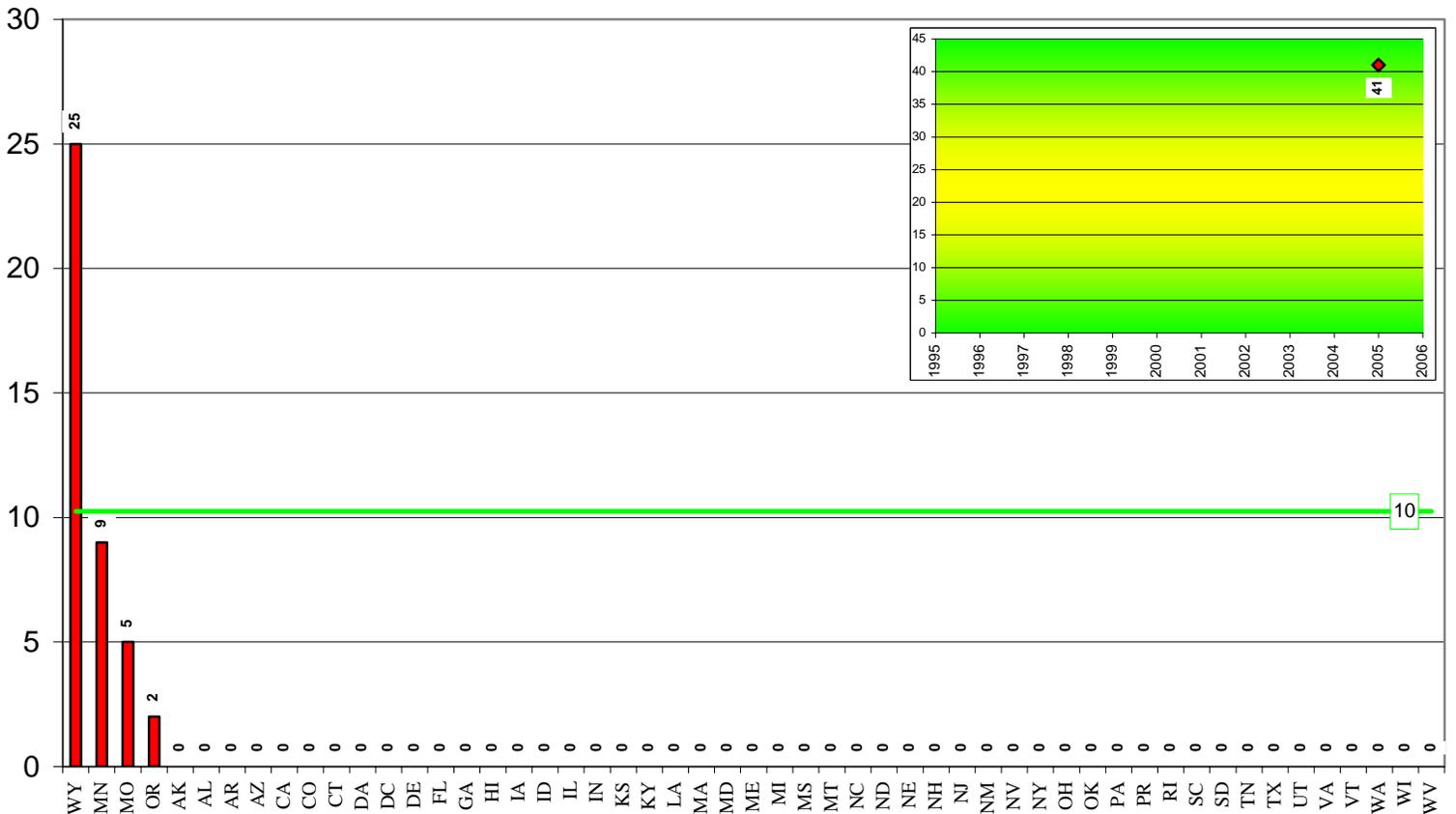
Notes and Comments

There were 4 laboratories that reported the testing of railroad test cars.

Railroad Test Cars



41 Total Devices



Laboratory Facilities

Description

Size of Laboratory Facility:

The top graph on the next page represents the size of the laboratory facility in square feet as reported by each laboratory.

Age of Laboratory Facility:

The bottom graph on the next page represents the age of the laboratory facility as reported by each laboratory.

Notes and Comments

Size of Laboratory Facility:

Average 4,114 sq ft
 Maximum 14,806 sq ft
 Minimum 605 sq ft

Age of Laboratory Facility:

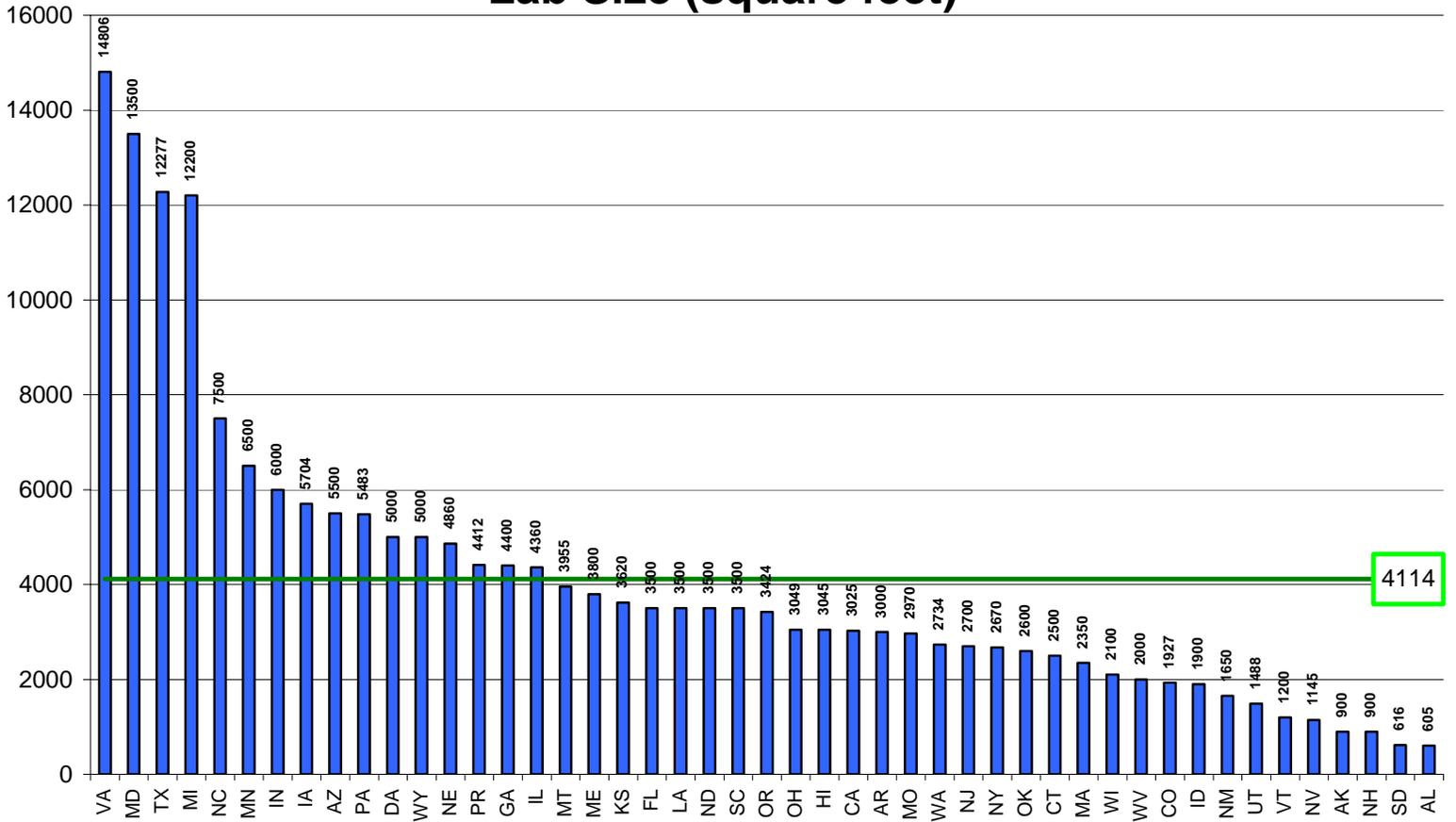
Average 22 years
 Maximum 77 years
 Minimum 0 years

Laboratory Renovations:

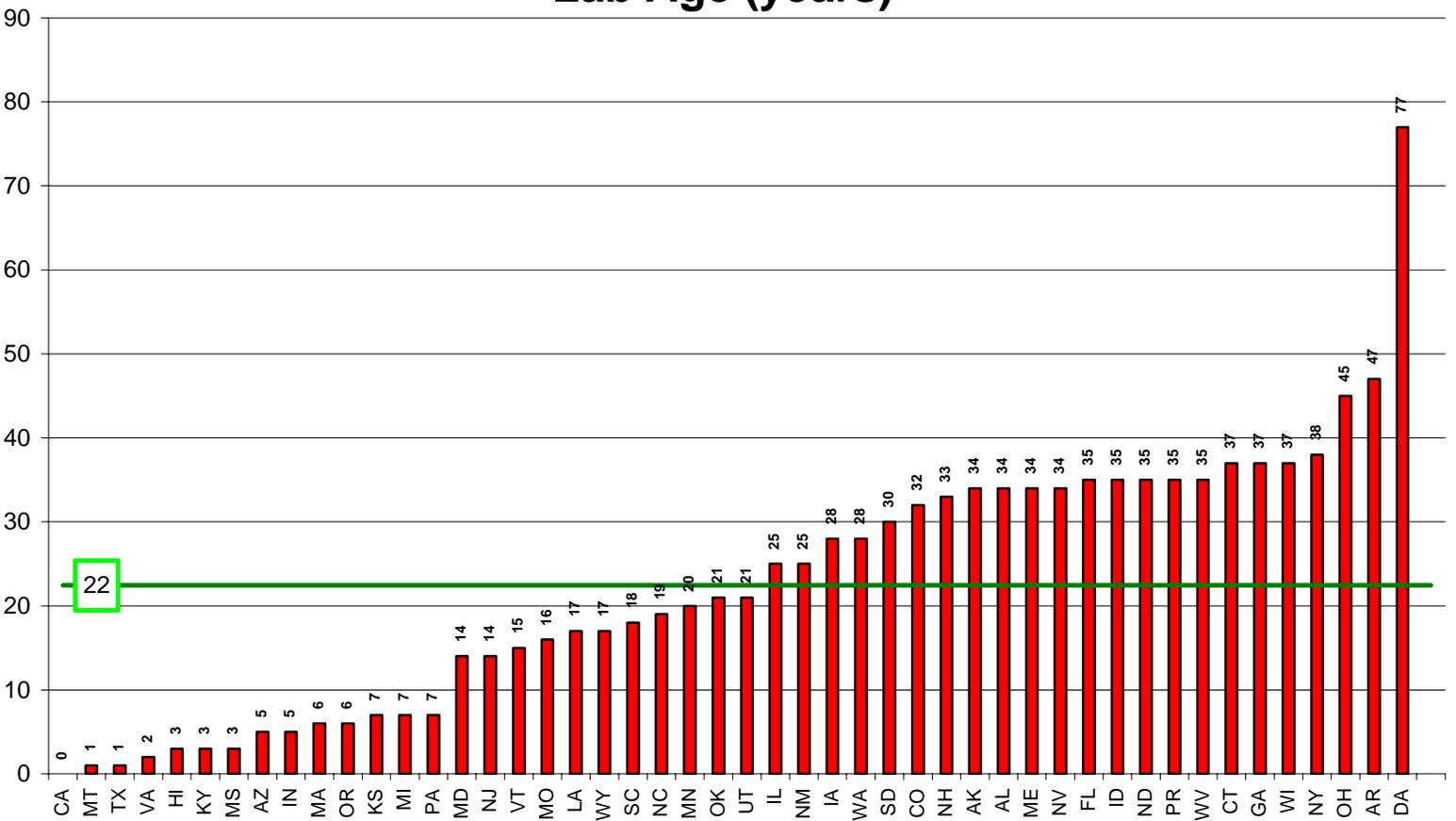
Lab	Year	Square Feet Added	% of Lab Renovated
CA	2004	914	100 %
CO	1998	0	10 %
IL	Many		
MT	2004	2000	50 %
NV	1998	0	20 %
NH	2000	0	50 %
NM	2003	0	100 %
NY	2004	470	18 %
ND	1996	0	70 %
OH	2000	775	36 %
OR	2003		25 %
VA	2003	10,856	100 %
WV	1998 & 2002	0	25 %

IA will be occupying a new laboratory facility during summer and fall 2005.

Lab Size (square feet)



Lab Age (years)



Laboratory Elevations

This question was new for the 2005 survey. Each laboratory was asked to report their laboratory elevation in feet above sea level. This information is useful since all mass measurements must take into consideration the influence of air buoyancy and elevation is one of the key components that will influence the air density in the laboratory. Mass measurements at higher elevations have an increased need for accurate air buoyancy corrections, especially when comparing mass standards that have different densities.

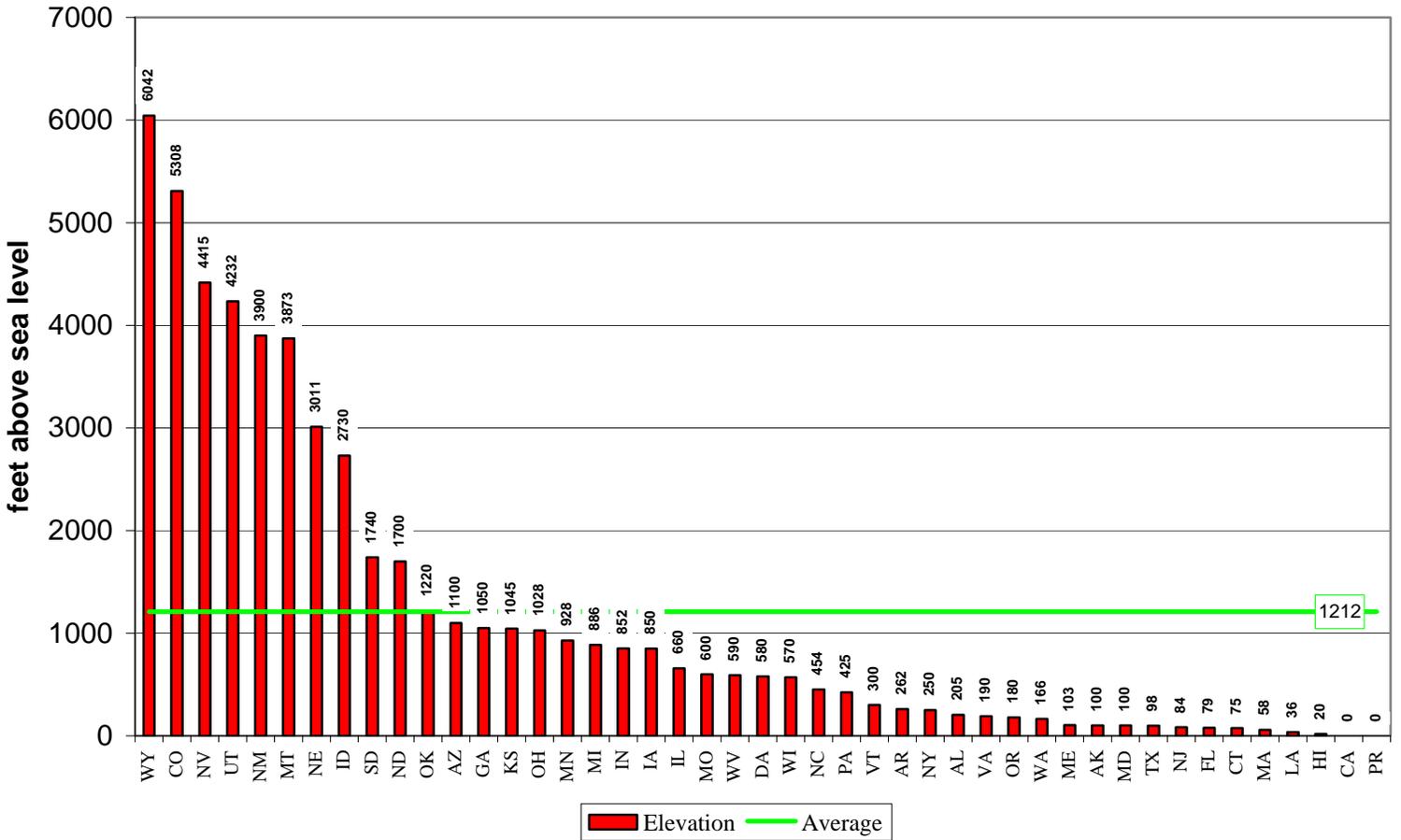
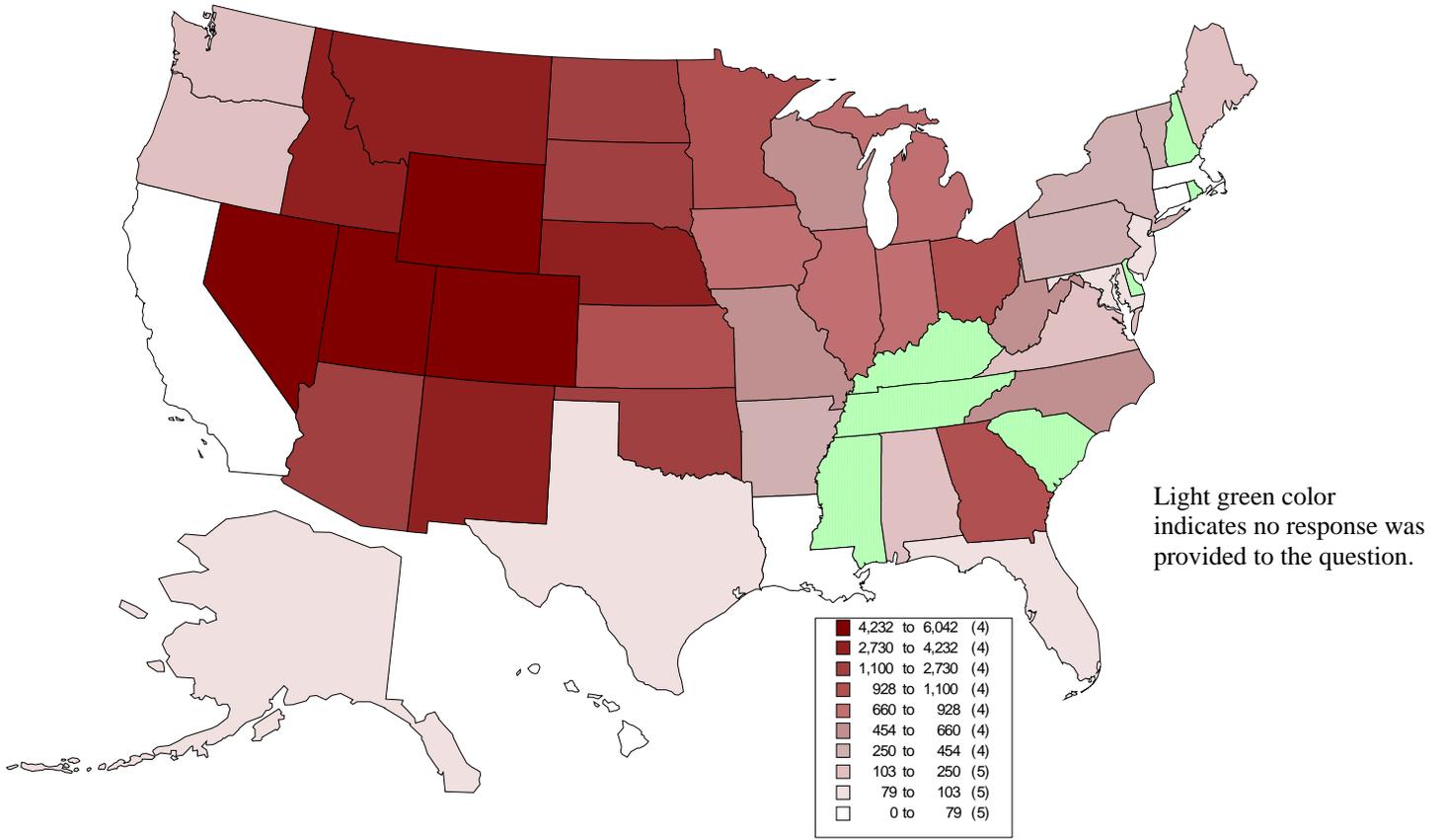
Description

The graphs on the following page provide information on laboratory elevation. The map graph gives a geographical view of laboratory elevation. Darker shading indicates higher elevations. The bar graph at the bottom of the page shows the same elevations in the order of highest elevation to lowest elevation.

Notes and Comments

The mean elevation for the 47 reporting laboratories is 1,212 feet above sea level.

Laboratory Elevation (feet above sea level)



Metrology Experience

Description

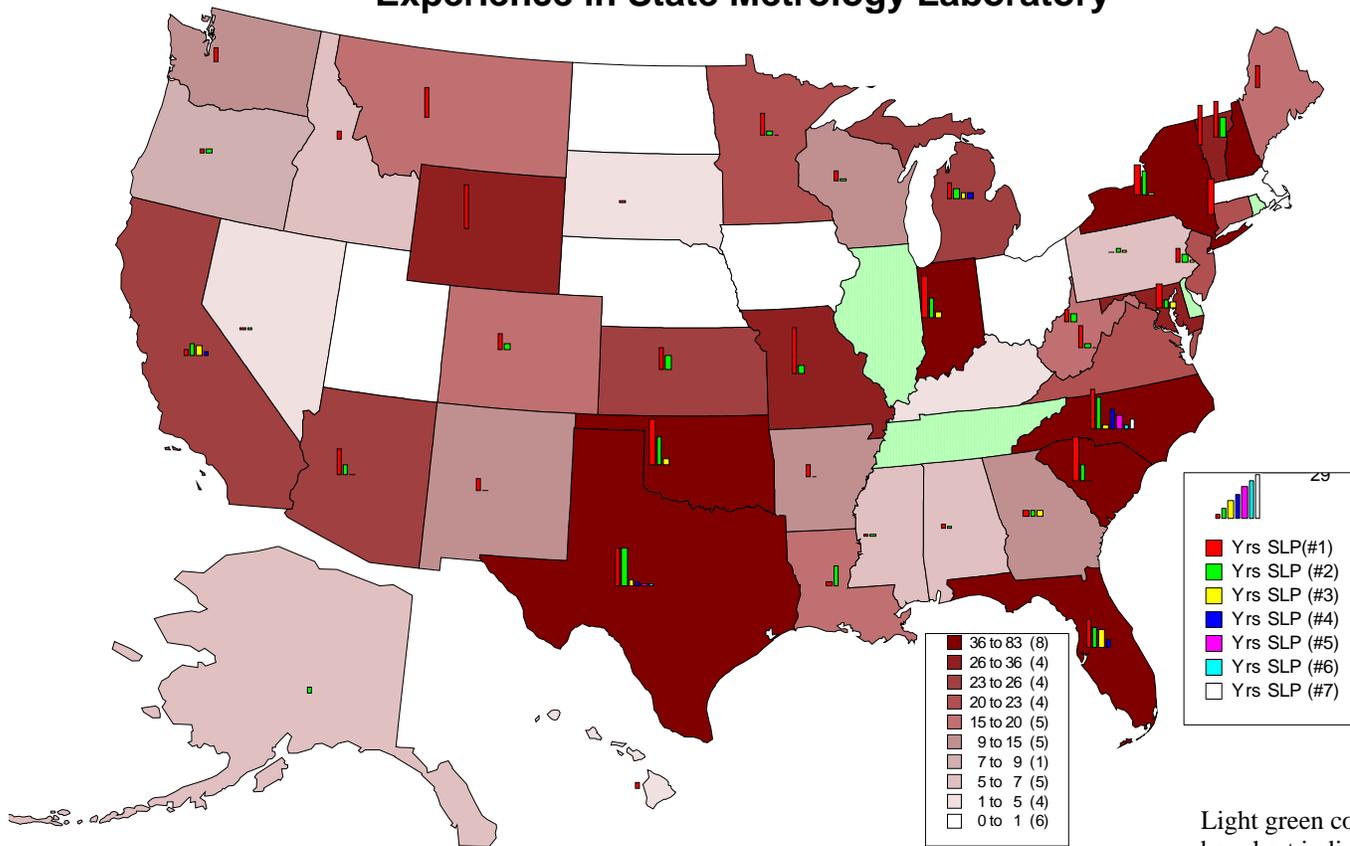
Experience in State Metrology Laboratory Program

The top graph on the next page represents the years of metrology experience gained in a state metrology laboratory. The shading of the state is based on the sum of state metrology lab experience for all metrologists that perform measurements for that lab. The bar graph in each state represents the breakdown for each individual metrologist in that state.

Total Metrology Experience:

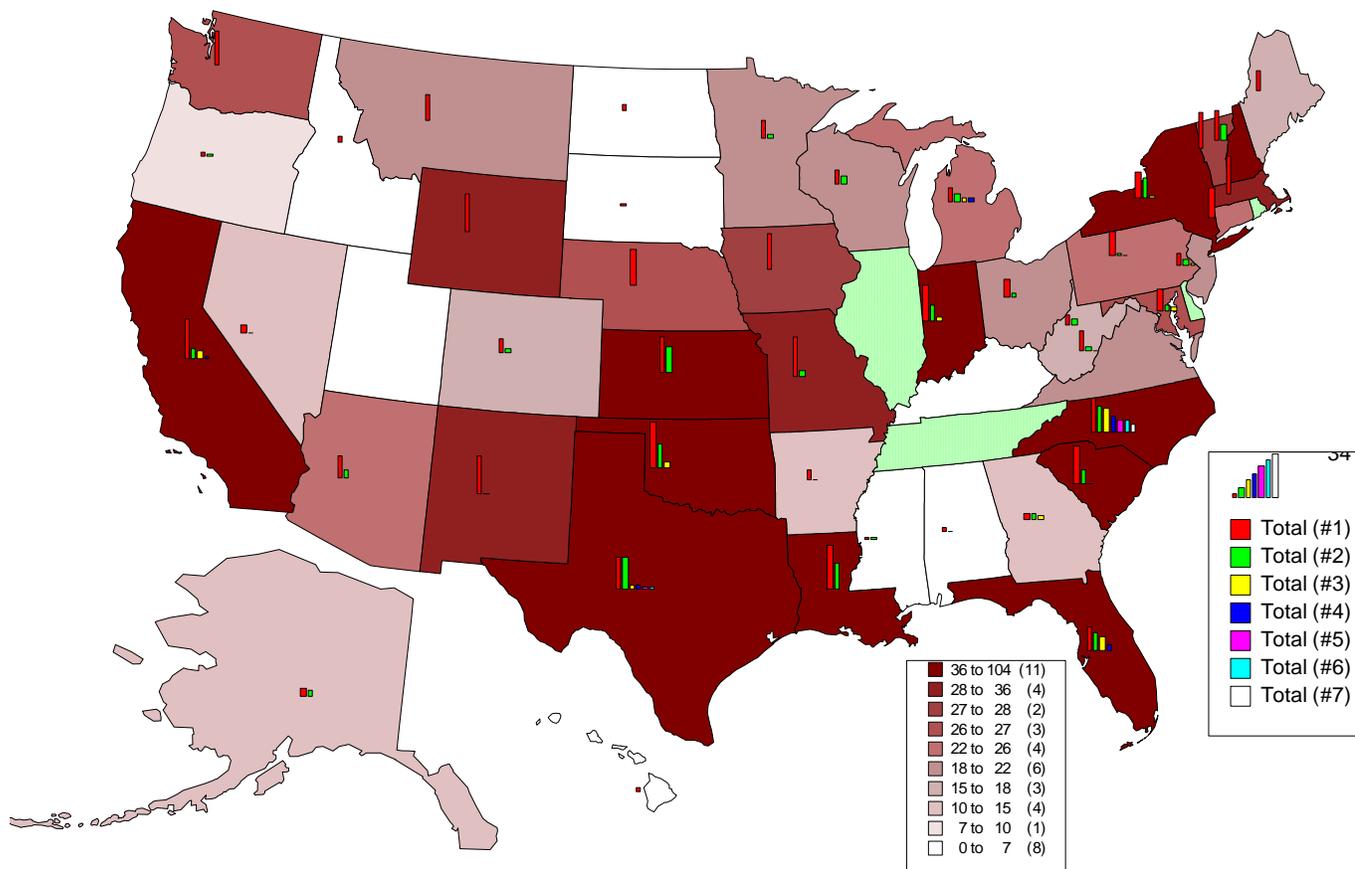
The bottom graph on the next page represents the total metrology experience gained in any metrology laboratory. The shading of the state is based on the sum of all metrology experience for that lab. The bar graph in each state represents the breakdown for each individual metrologist in that state.

Experience in State Metrology Laboratory



Light green color and no bar chart indicate no response was provided to the question.

Total Technical Experience



Metrology Experience (By Individual)

Description

Total Metrology Experience:

The bar graph on the next page represents the total metrology experience by individual metrologist. The graph is a stacked bar, the blue portion represents “other metrology experience” and the red portion represents “state laboratory program experience”.

Comparison of the 2005, 2003, and 2001 Surveys

	Number of Metrologists	Average SLP Experience	Average Other Experience	Average Total Experience
2001	111	8.7	2.4	11.0
2003	113	9.1	2.1	11.2
2005	111	8.1	2.6	10.8

Comments:

Of the 47 responding laboratories:

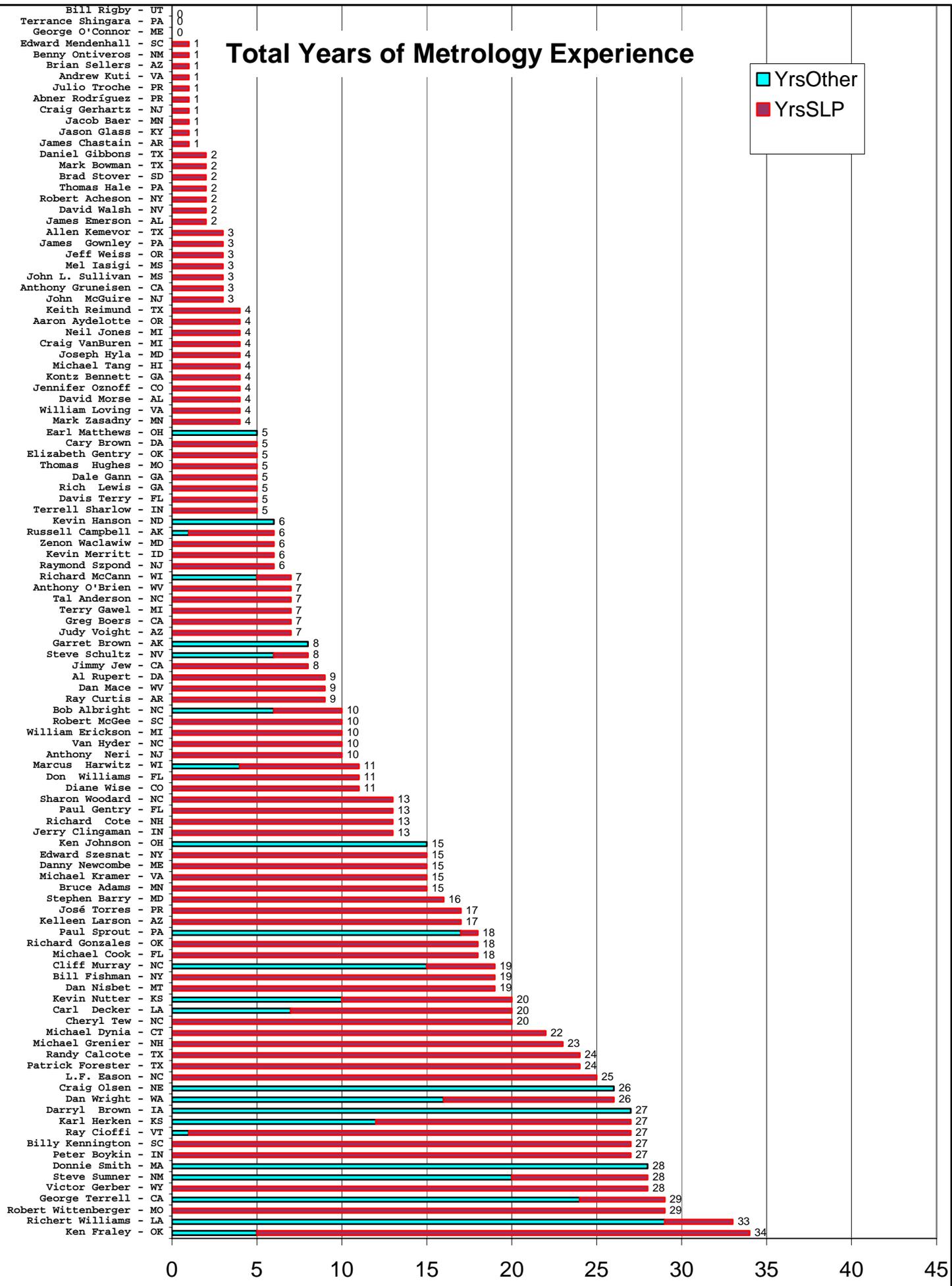
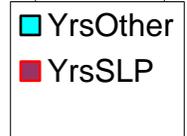
111 individual metrologists

Average SLP experience – 8.1 years

Average Other experience – 2.6 years

Average Total experience – 10.8 years

Total Years of Metrology Experience



**NIST/WMD
Certificates of Traceability
(as of June 2005)**

Description

The top map graph on the following page represents the status of each state.

Comments:

Waiting on Additional Information:

Louisiana
Montana
Nebraska
North Dakota

Not Recognized:

Arkansas
Delaware
Iowa
Kentucky
Puerto Rico
Rhode Island
Tennessee
Texas
U.S. Virgin Islands
Utah
Washington D.C.
Wyoming

**NVLAP
Accreditation Status
(as of June 2005)**

Description

The bottom map graph on the following page represents the NVLAP accreditation status of each state. Six additional laboratories have received their NVLAP accreditation since the last survey.

Comments:

16 laboratories are currently accredited by NVLAP.

Arizona, Florida, Indiana, Maine, Maryland, Michigan, Minnesota, New Hampshire, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Virginia, and Washington.

There are no applications pending.

Fees

Description

This information would be valuable for those labs that are attempting to implement fees for the first time and also to those labs that may be in the process of amending their fees. The next seven pages contain eight graphs. In the past surveys the fee schedule or hourly rate that each lab provided was used to calculate the fees for certain routine work. However a problem arises when using hourly rates. The time it takes to calibrate a particular artifact will vary from state to state depending on weight handling equipment, balances, experience and number of employees. Another factor is that while one state may track the total time it takes to log in, unpack, test, re-pack, and log out an item, another state may only track the actual time required to complete the test. This year, in an attempt to gain more accurate information, we asked each lab to quote the typical fee that they would charge for the various routine calibrations.

Mass Echelon I - Class 0 Precision Weight Kit

Description

The top graph represents the fees charged for calibrating a Class 0 precision weight kit containing 21 individual weights from 100 gram down to 1 milligram using Mass Echelon I procedures. There were 15 laboratories that quoted fees and the average fee charged was \$617.87. This is the first survey that has requested information on fees for Mass Echelon I calibrations.

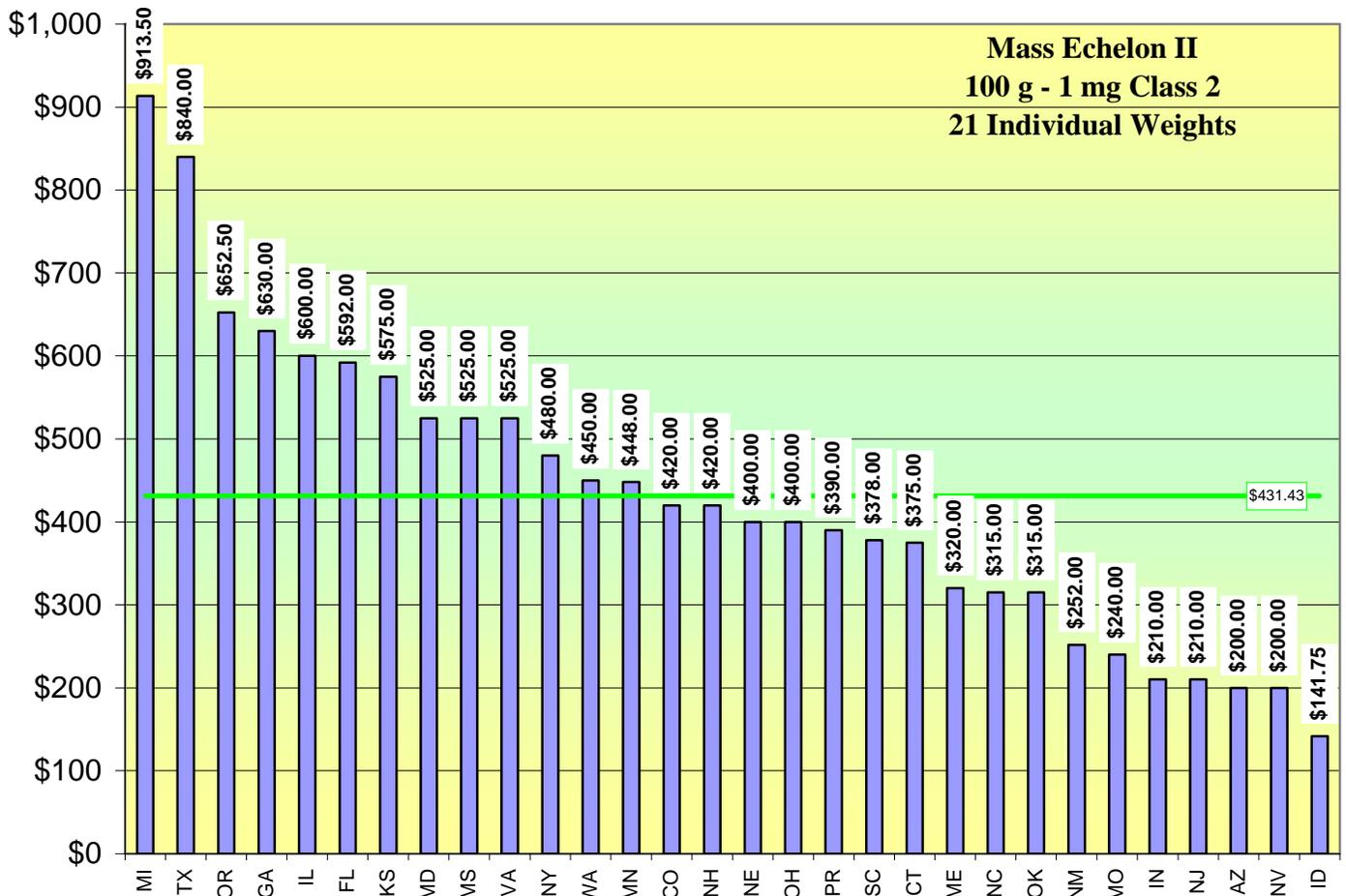
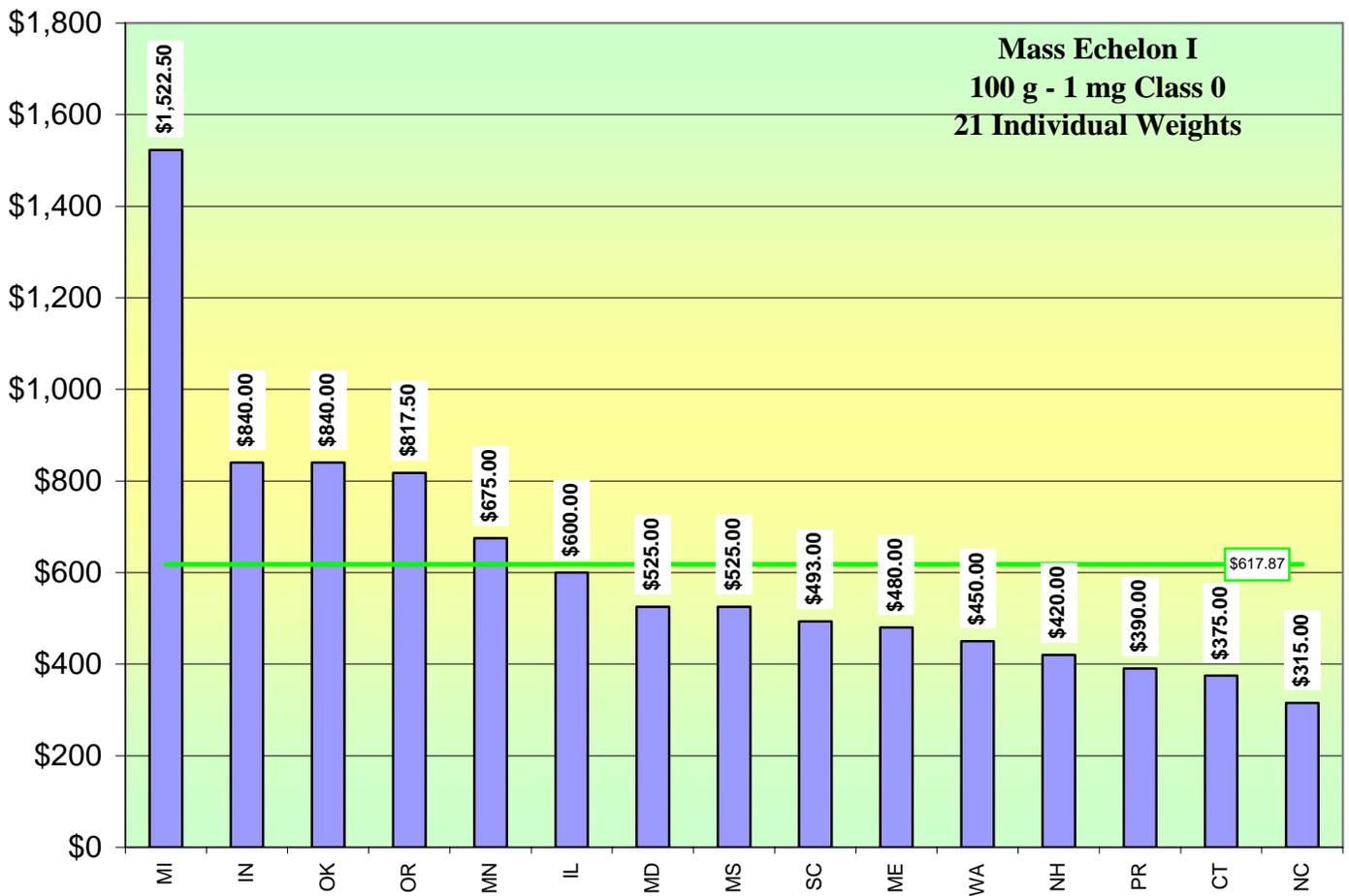
Mass Echelon II - Class 2 Precision Weight Kit

Description

The bottom graph represents the fees charged for calibrating a Class 2 precision weight kit that contains 21 individual weights from 100 gram down to 1 milligram using Mass Echelon II procedures. There were 30 laboratories that quoted fees and the average fee charged was \$431.43.

Comparison of the 2005, 2003, and 2001 Surveys

	# of Labs	Average Fee	% Change
2001	33	\$334.00	--
2003	39	\$414.32	+ 24 %
2005	30	\$431.43	+ 4 %



**Mass Echelon III - Class F Weight Kit
{31 lb kit} 22 Individual Weights**

Description

The top graph represents the fees charged for calibrating a Class F weight kit that contains 22 individual weights using Mass Echelon III procedures. There were 38 laboratories that quoted fees and the average fee charged was \$121.13.

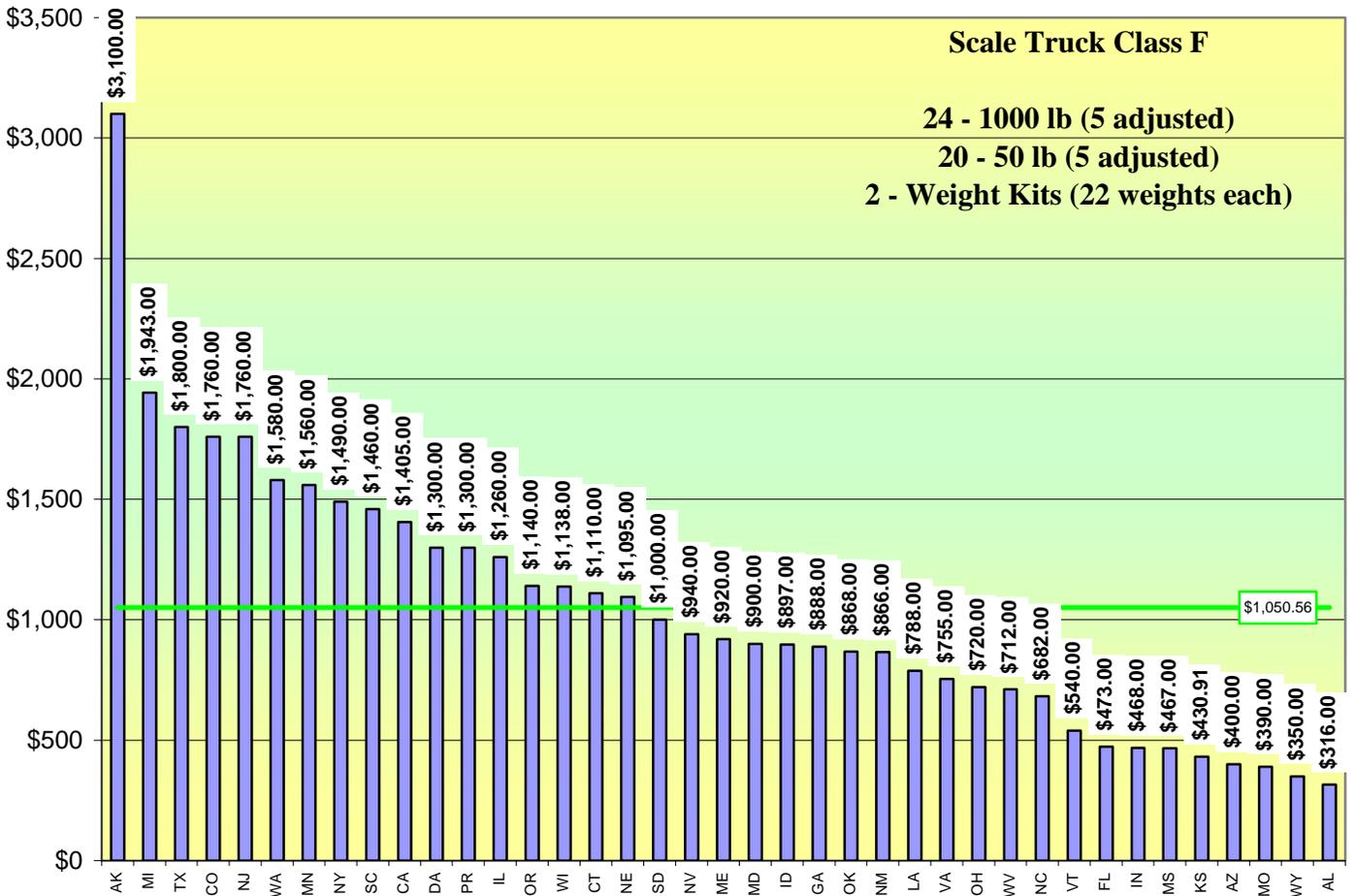
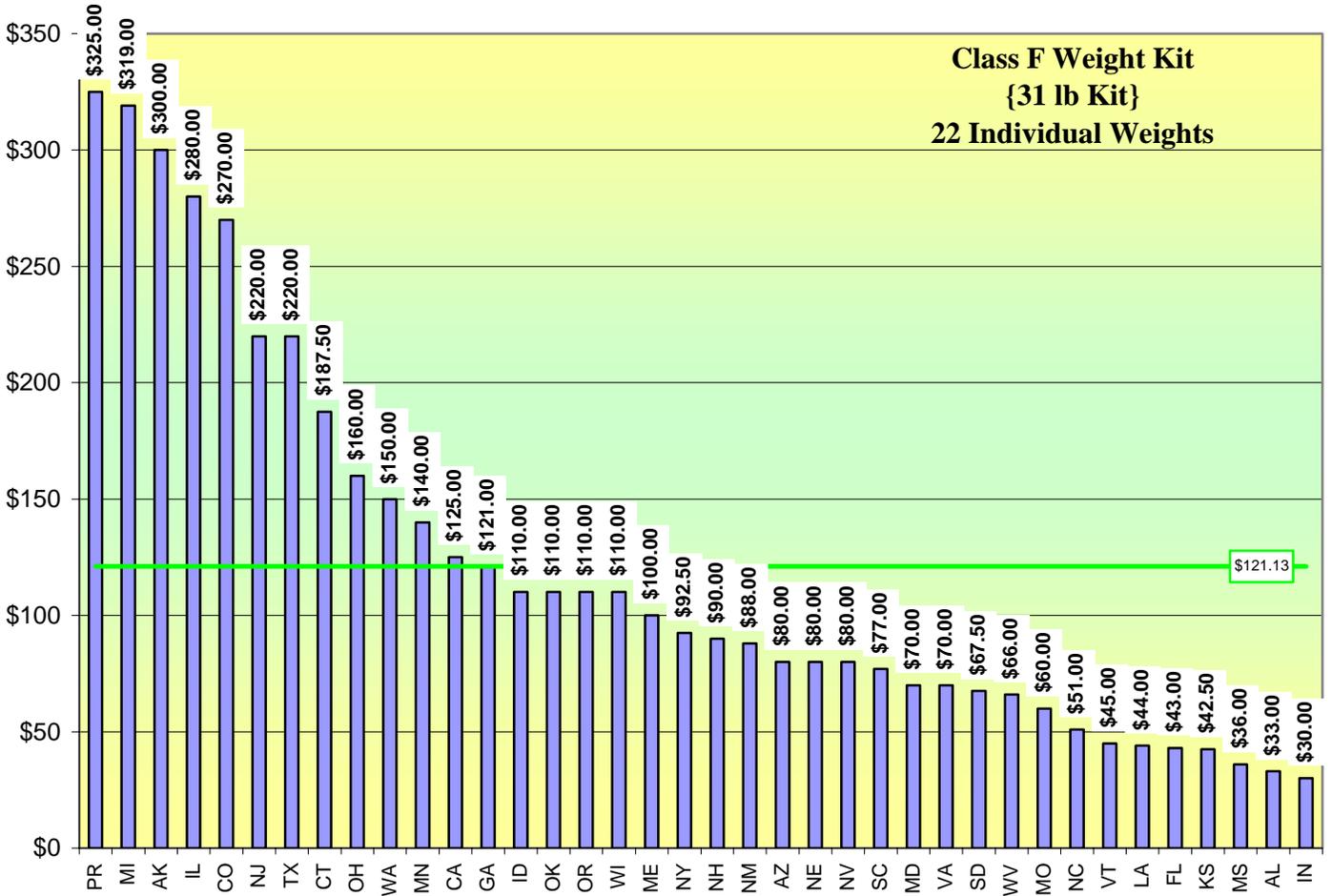
Comparison of the 2005, 2003, and 2001 Surveys

	# of Labs	Average Fee	% Change
2001	36	\$77.00	--
2003	41	\$94.99	+ 23 %
2005	38	\$121.13	+ 28 %

**Mass Echelon III - Class F Typical Scale Truck
24 – 1000 lb (5 adjusted)
20 – 50 lb (5 adjusted)
2 – 31 lb Weight Kits (22 weights each)**

Description

The bottom graph represents the fees charged for calibrating a typical scale truck using Mass Echelon III procedures. There were 39 laboratories that quoted fees and the average fee charged was \$1,050.56. These fees cannot be compared to previous survey results.



Mass Echelon III - 5000 lb Weight Cart

Description

The top graph represents the fees charged for calibrating a 5000 lb weight cart using Mass Echelon III procedures. There were 28 laboratories that quoted fees and the average fee charged was \$163.27. These fees cannot be compared to previous survey results.

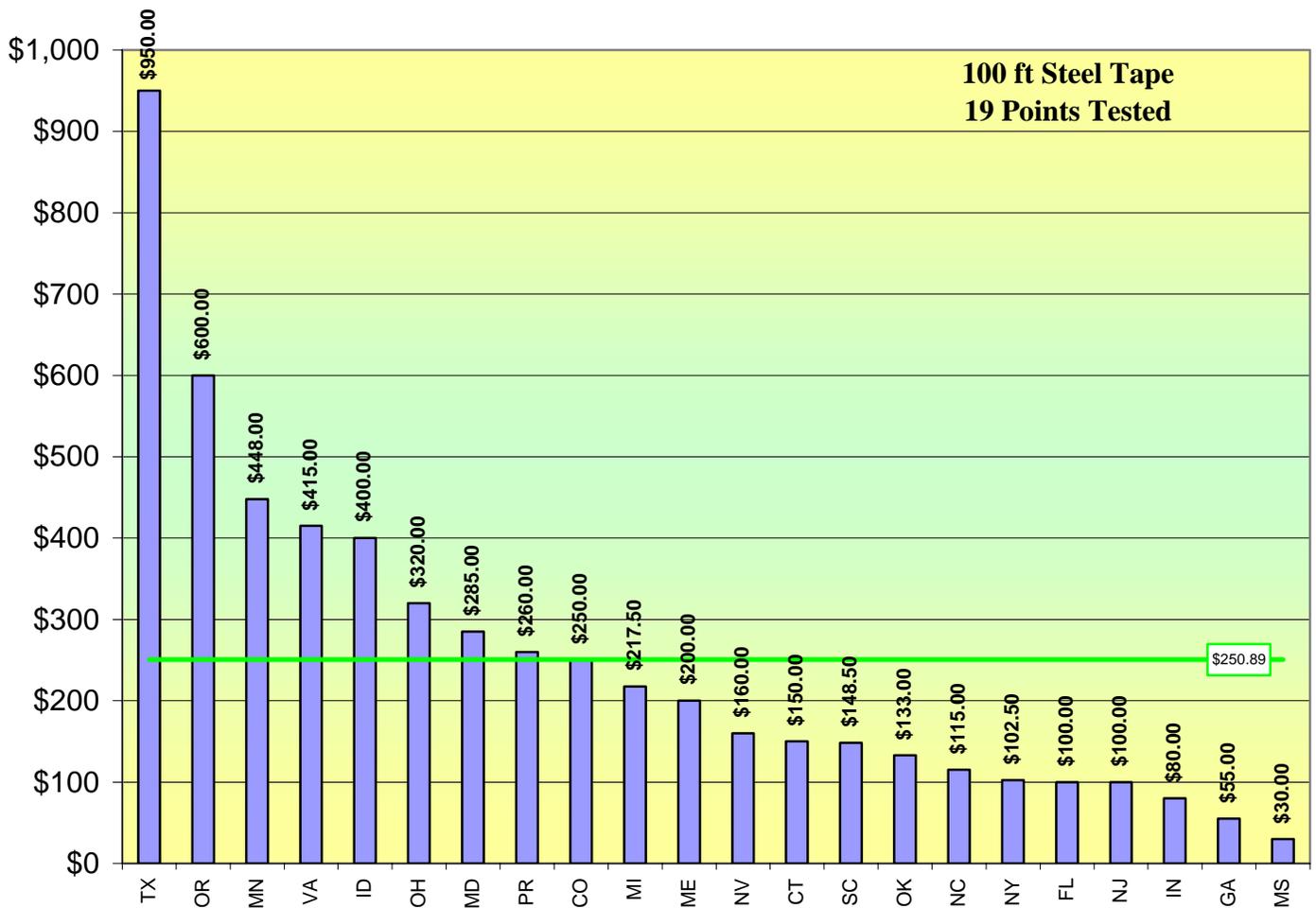
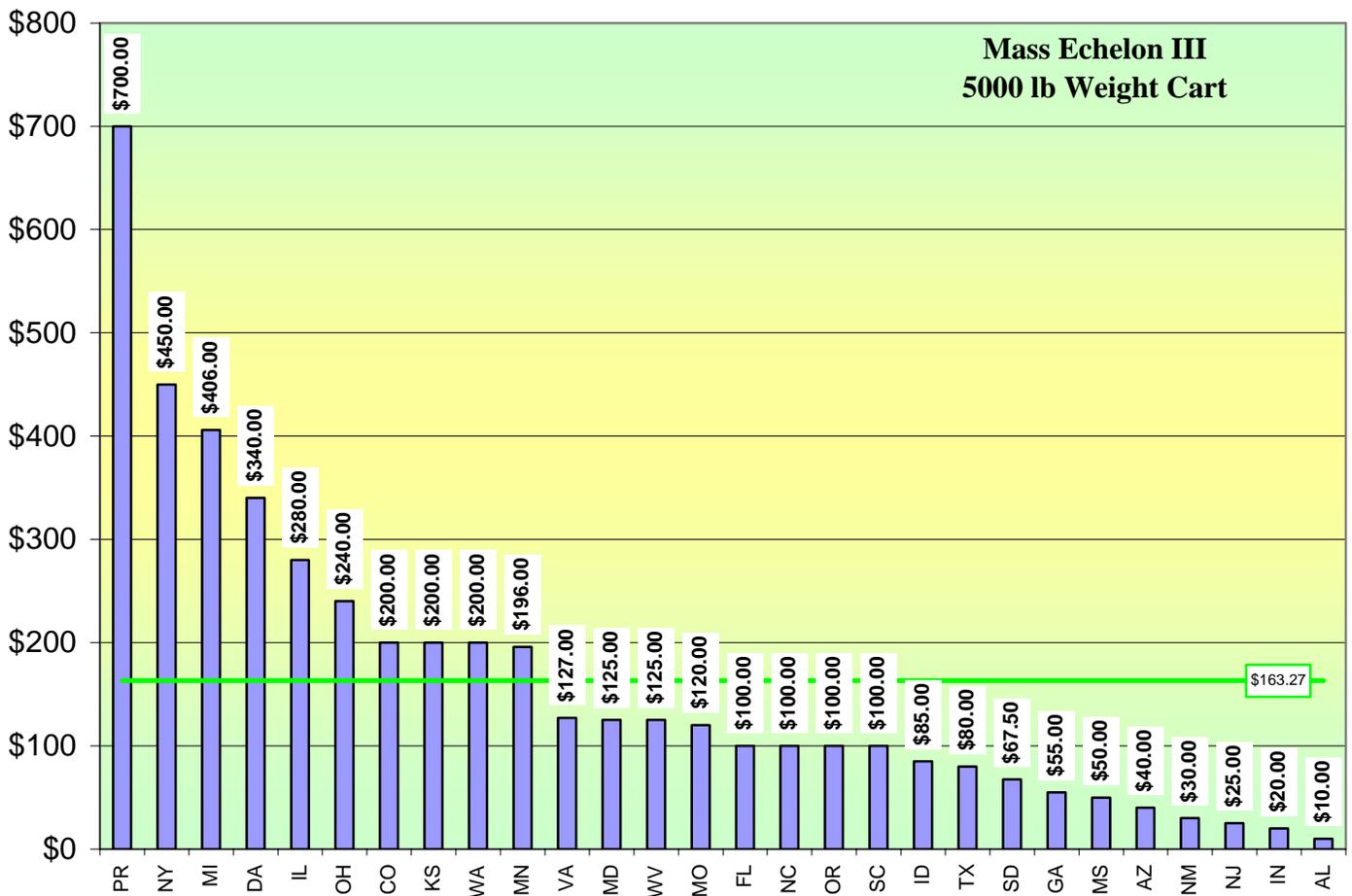
100 foot Tape 19 Points Tested

Description

The bottom graph represents the fees charged for a 100 foot steel tape that contained 19 points to be calibrated. There were 22 laboratories that quoted fees and the average fee charged was \$250.89.

Comparison of the 2005, 2003, and 2001 Surveys

	# of Labs	Average Fee	% Change
2001	33	\$133.00	--
2003	36	\$173.07	+ 30 %
2005	22	\$250.89	+ 45 %



5 Gallon Test Measure

Description

The top graph represents the fees charged for calibrating a 5 gallon test measure. There were 39 laboratories that quoted fees and the average fee charged was \$42.06.

Comparison of the 2005, 2003, and 2001 Surveys

	# of Labs	Average Fee	% Change
2001	35	\$35.00	--
2003	41	\$41.46	+ 18 %
2005	39	\$42.06	+ 1 %

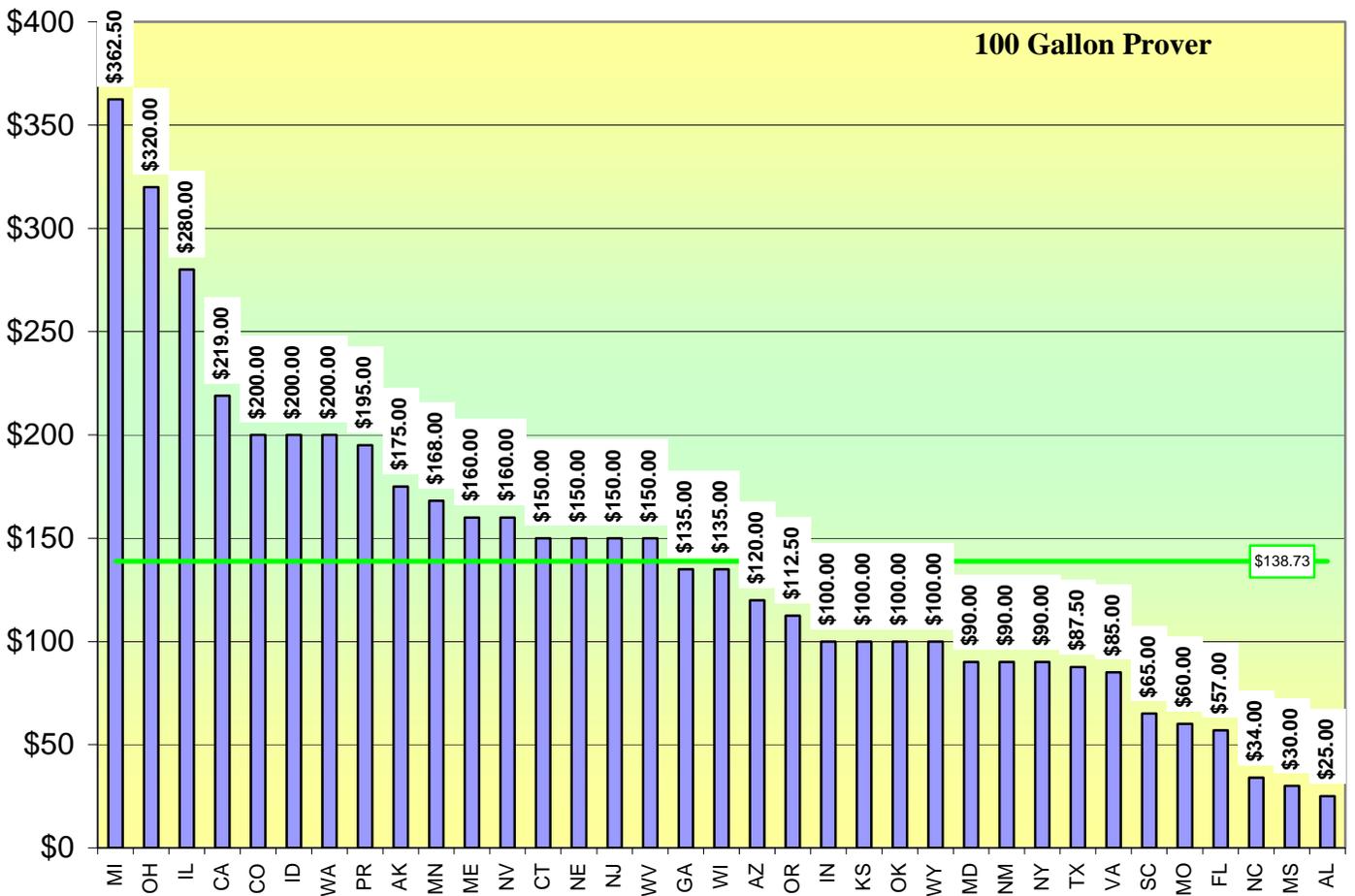
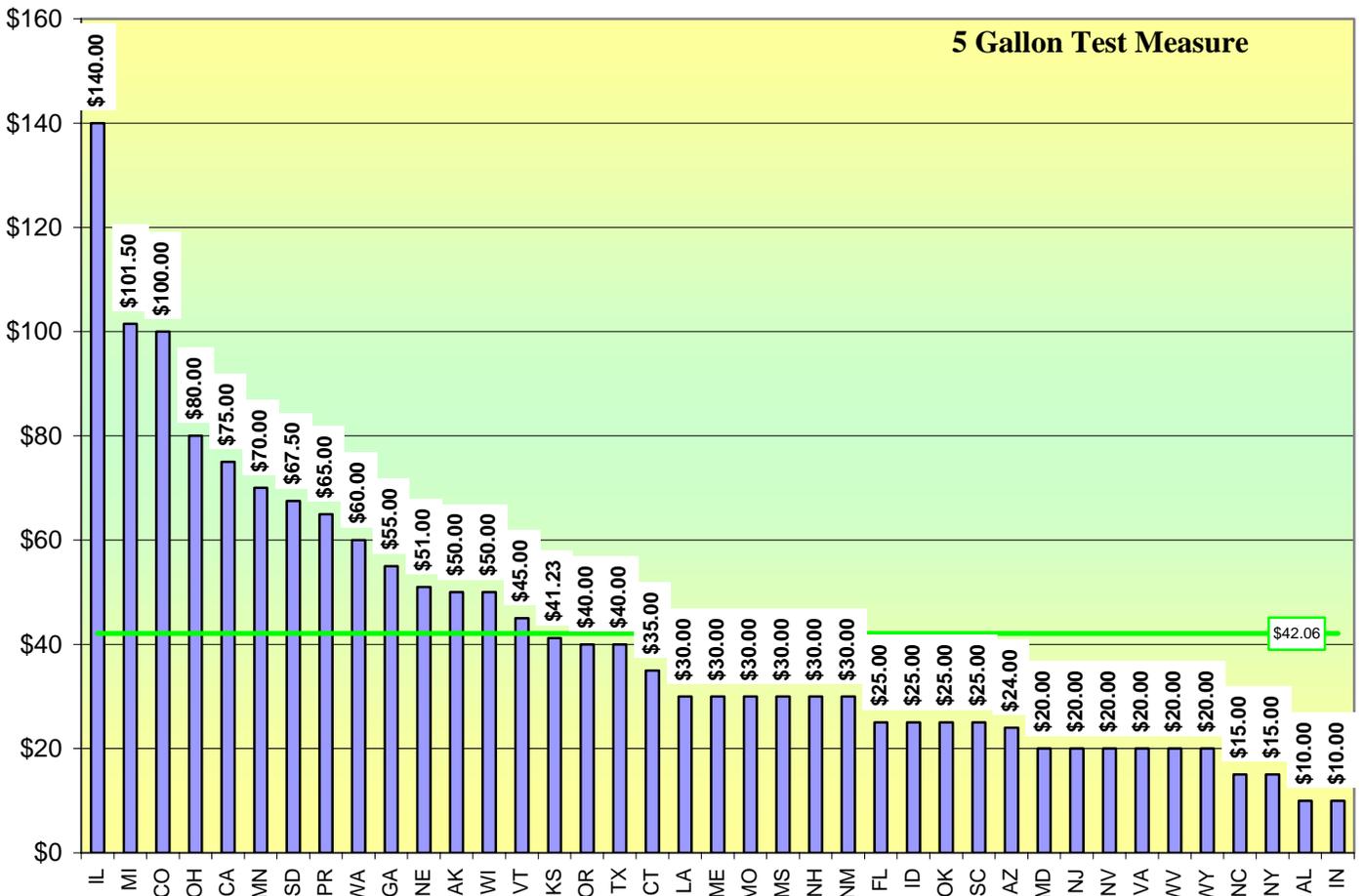
100 Gallon Prover

Description

The bottom graph represents the fees charged for calibrating a 100 gallon prover. There were 35 laboratories that quoted fees and the average fee charged was \$138.73.

Comparison of the 2005, 2003, and 2001 Surveys

	# of Labs	Average Fee	% Change
2001	35	\$108.00	--
2003	40	\$125.19	+ 16 %
2005	35	\$138.73	+ 11 %



Metrology Positions - Salary Ranges

Description

Listed in the table below are the position titles for each position that performs metrology functions.

Lab ID	Position Title	Minimum	Maximum	Mid Point
AK	State Metrologist II	\$3,806.00	\$5,420.00	\$4,613.00
AK	State Metrologist I	\$3,304.00	\$4,742.00	\$4,023.00
AL	Graduate Engineer	\$2,885.00	\$5,080.00	\$3,982.50
AL	Consumer W&M Protection Specialist	\$1,993.00	\$3,337.00	\$2,665.00
AR	Metrologist IV	\$3,894.00	\$3,894.00	\$3,894.00
AR	Metrologist III	\$2,924.00	\$3,409.00	\$3,166.50
AR	Metrologist II	\$2,456.00	\$2,690.00	\$2,573.00
AR	Metrologist I	\$2,033.00	\$2,245.00	\$2,139.00
AZ	Admin. Services Officer II	\$2,962.00	\$5,074.00	\$4,018.00
AZ	Metrology Tech.	\$1,044.00	\$3,815.00	\$2,429.50
CA	Principal State Metrologist	\$5,899.00	\$6,504.00	\$6,201.50
CA	Measurement Standards Specialist III	\$3,837.00	\$4,663.00	\$4,250.00
CA	Measurement Standards Specialist II	\$3,192.00	\$3,834.00	\$3,513.00
CA	Measurement Standards Specialist I	\$2,790.00	\$3,341.00	\$3,065.50
CO	Engineering/Physical Science Technician III	\$3,501.00	\$5,356.00	\$4,428.50
CO	Engineering/Physical Science Technician II	\$3,176.00	\$4,858.00	\$4,017.00
CO	Engineering/Physical Science Technician I	\$2,959.00	\$4,528.00	\$3,743.50
CT	Consumer Protection Metrologist	\$3,675.00	\$5,210.00	\$4,442.50
FL	Senior Metrologist	\$2,763.00	\$4,617.00	\$3,690.00
FL	Metrologist	\$2,350.00	\$3,717.00	\$3,033.50
GA	State Metrologist	\$2,686.00	\$4,568.00	\$3,627.00
GA	Metrologist I	\$1,667.00	\$2,835.00	\$2,251.00
HI	State Metrologist 4	\$3,691.00	\$5,254.00	\$4,472.50
HI	State Metrologist 3	\$3,278.00	\$4,670.00	\$3,974.00
HI	State Metrologist 2	\$3,030.00	\$4,318.00	\$3,674.00
HI	State Metrologist 1	\$2,804.00	\$3,991.00	\$3,397.50
IA	State Metrologist (05104)	\$3,418.13	\$5,071.73	\$4,244.93
ID	Program Manager / Metrologist	\$3,458.00	\$5,725.00	\$4,591.50
IL	State Metrologist	\$ -	\$ -	\$ -
IL	Metrologist Associate	\$ -	\$ -	\$ -
KS	State Metrologist	\$2,552.00	\$3,344.00	\$2,948.00
KS	Ag Inspector II	\$2,318.00	\$3,028.00	\$2,673.00
KY	Program Coordinator	\$2,246.00	\$2,246.00	\$2,246.00
KY	Inspector II	\$1,856.00	\$1,856.00	\$1,856.00
LA	Assistant Division Director	\$4,032.00	\$7,266.00	\$5,649.00
LA	Laboratory Metrologist	\$2,687.00	\$4,524.00	\$3,605.50
MA	Compliance officer II	\$2,739.00	\$3,957.00	\$3,348.00
MD	Laboratory Program Manager	\$2,788.00	\$4,287.00	\$3,537.50
MD	Metrologist II gr. 13	\$2,618.00	\$4,018.00	\$3,318.00
MD	Metrologist I gr. 12	\$2,458.00	\$3,767.00	\$3,112.50
MD	Metrologist Trainee gr. 9	\$2,039.00	\$3,107.00	\$2,573.00
ME	Metrologist	\$2,622.00	\$3,593.00	\$3,107.50
ME	Metrologist Assistant	\$2,310.00	\$3,123.00	\$2,716.50
MI	Metrologist Manager 14	\$3,926.00	\$5,389.00	\$4,657.50
MI	Metrology Specialist 13	\$3,669.00	\$4,992.00	\$4,330.50
MI	Metrologist 12	\$3,368.00	\$4,566.00	\$3,967.00
MI	Metrologist P11	\$3,160.00	\$4,200.00	\$3,680.00

MN	State Program Administrator Principal	\$3,478.00	\$5,128.00	\$4,303.00
MN	State Program Administrator (Vacant)	\$2,537.00	\$3,724.00	\$3,130.50
MN	Student Intern	\$2,016.00	\$2,520.00	\$2,268.00
MO	Metrologist I	\$3,190.00	\$4,755.00	\$3,972.50
MO	Metrology Specialist I	\$2,374.00	\$3,463.00	\$2,918.50
MS	Director V	\$2,449.00	\$4,285.00	\$3,367.00
MS	State Metrologist	\$1,775.00	\$3,106.00	\$2,440.50
MS	State Asst. Metrologist	\$1,604.00	\$2,807.00	\$2,205.50
MT	Metrologist	\$2,200.00	\$3,000.00	\$2,600.00
NC	Standards Laboratory Manager	\$2,754.00	\$4,536.00	\$3,645.00
NC	QA Manager (Metrologist II) / Grain Moisture Supervisor	\$2,332.00	\$3,792.00	\$3,062.00
NC	Metrologist I	\$2,148.00	\$3,464.00	\$2,806.00
ND	State Metrologist/Assistant Director	\$3,000.00	\$3,200.00	\$3,100.00
NE	Metrologist	\$2,785.00	\$4,033.00	\$3,409.00
NH	Weights and Measures Supervisor IV	\$2,898.00	\$3,946.00	\$3,422.00
NH	Program Specialist I	\$2,440.00	\$3,307.00	\$2,873.50
NH	Weights and Measures Metrologist	\$2,154.00	\$2,886.00	\$2,520.00
NJ	Supervisor of Metrology	\$5,175.00	\$7,247.00	\$6,211.00
NJ	Inspector I	\$4,695.00	\$6,574.00	\$5,634.50
NJ	Inspector II	\$4,056.00	\$5,679.00	\$4,867.50
NJ	Inspector III	\$3,503.00	\$4,906.00	\$4,204.50
NM	Specialist III	\$2,894.00	\$4,341.00	\$3,617.50
NM	Specialist I	\$2,238.00	\$3,357.00	\$2,797.50
NV	Weights and Measures Inspector IV	\$3,523.00	\$5,011.00	\$4,267.00
NV	Metrologist	\$3,233.00	\$4,586.00	\$3,909.50
NY	Metrologist	\$3,585.00	\$4,462.00	\$4,023.50
NY	Specialist II	\$3,206.00	\$4,061.00	\$3,633.50
NY	Specialist I	\$2,707.00	\$3,450.00	\$3,078.50
OH	Weights & Measures Technologist	\$2,560.00	\$3,328.00	\$2,944.00
OK	Metrologist III	\$2,702.00	\$4,504.00	\$3,603.00
OK	Metrologist II	\$2,213.00	\$3,689.00	\$2,951.00
OK	Metrologist I	\$1,842.00	\$3,070.00	\$2,456.00
OR	Metrologist	\$3,060.00	\$4,265.00	\$3,662.50
PA	Procurement Quality Supervisor	\$3,552.00	\$5,397.00	\$4,474.50
PA	Metrologist	\$3,113.00	\$4,730.00	\$3,921.50
SC	Program Coordinator II	\$2,755.00	\$5,097.00	\$3,926.00
SC	Lab Technician I	\$2,264.00	\$4,189.00	\$3,226.50
SC	Program Coordinator I	\$2,264.00	\$4,189.00	\$3,226.50
SD	State Inspector	\$1,984.00	\$2,976.00	\$2,480.00
TX	Coordinator for Metrology/Chief Metrologist III	\$3,518.00	\$4,680.00	\$4,099.00
TX	Metrologist II	\$2,589.00	\$3,309.00	\$2,949.00
TX	Lead Metrologist I	\$2,436.00	\$3,111.00	\$2,773.50
TX	Metrologist I	\$1,921.00	\$2,436.00	\$2,178.50
USDA	Industrial Specialist GS-12	\$6,431.00	\$7,031.00	\$6,731.00
USDA	Industrial Specialist GS-11	\$4,512.00	\$5,866.00	\$5,189.00
UT	State Metrologist	\$3,166.00	\$5,023.00	\$4,094.50
VA	Lab and Research Manager	\$3,064.00	\$6,288.00	\$4,676.00
VA	Lab and Research Specialist II	\$2,345.00	\$4,813.00	\$3,579.00
VT	Weights and Measures Specialist	\$3,240.00	\$4,923.00	\$4,081.50
WA	State Metrologist	\$2,615.00	\$3,337.00	\$2,976.00
WI	State Metrologist	\$3,093.00	\$4,640.00	\$3,866.50
WV	Metrologist	\$2,020.00	\$3,475.00	\$2,747.50

WV	Labor Inspector II / Assigned to Laboratory	\$1,539.00	\$2,695.00	\$2,117.00
WY	Consumer Protection Supervisor/W&M Program Coordinator	\$ -	\$ -	\$ -

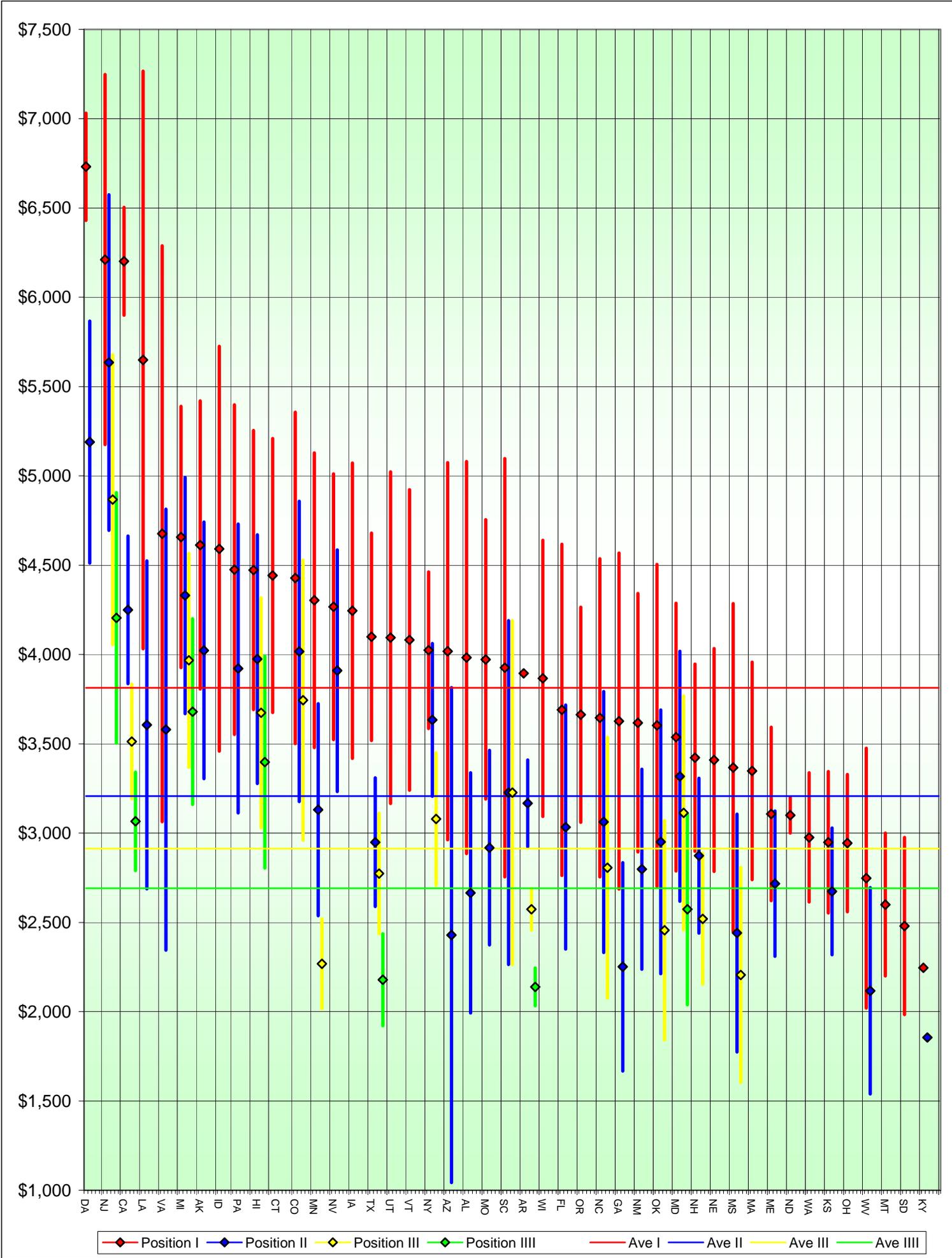
Metrology Positions

Salary Graph

The chart on the following page shows salary information for up to four metrology positions in each reporting laboratory. Each position performing metrology functions is shown with the associated salary pay band. They are presented in descending order from “laboratory management positions” (red) to “metrology technician positions or entry-level positions” (green) for each state.

From the different titles listed, it is evident that the range of responsibilities varies from lab to lab between positions of the same color. The red bar is probably the most comparable position since it is the highest paid position in each lab. Therefore, the order of labs is arranged from highest to lowest by the salary midpoint of this position in each lab. An assumption is made that the position with the highest salary range has the highest level of responsibility in the lab. Yet, even here, in one lab the highest paid position may manage the laboratory with program, facility, budget, and supervisory responsibilities while in another lab, this position may not have program management or supervisory responsibilities. One person may manage a laboratory with a staff of metrologists, a secretary, and maintenance worker while another may work in a one-person lab with shared field inspection responsibilities. Comparisons between the lower positions are even more problematic. Depending on the number of positions in a laboratory, the second position may have quality management responsibilities in one lab, but be a technician, inspector or even a trainee in another laboratory. Of course, even titles can be deceptive. Metrology positions are unique and often do not fit cleanly into government position classifications. Thus, a technician or inspector classification in one laboratory may have the same level of responsibility as a metrologist or manager in another.

In future surveys, we would like to try to get a better idea of salary ranges based on the level of responsibility. For example, the red bar may be reserved for metrologists with program management (including budget, facility, and supervisory) responsibilities. The blue level may be reserved for quality management positions. The yellow level could represent the metrologists in the labs who turn out the majority of the work, but who do not have management and supervisory responsibilities. And the green level could indicate a technician or trainee who works under more direct supervision. These are just some thoughts on how we might be able to improve the data and make it more useful. We would appreciate your ideas.



Laboratory Customers

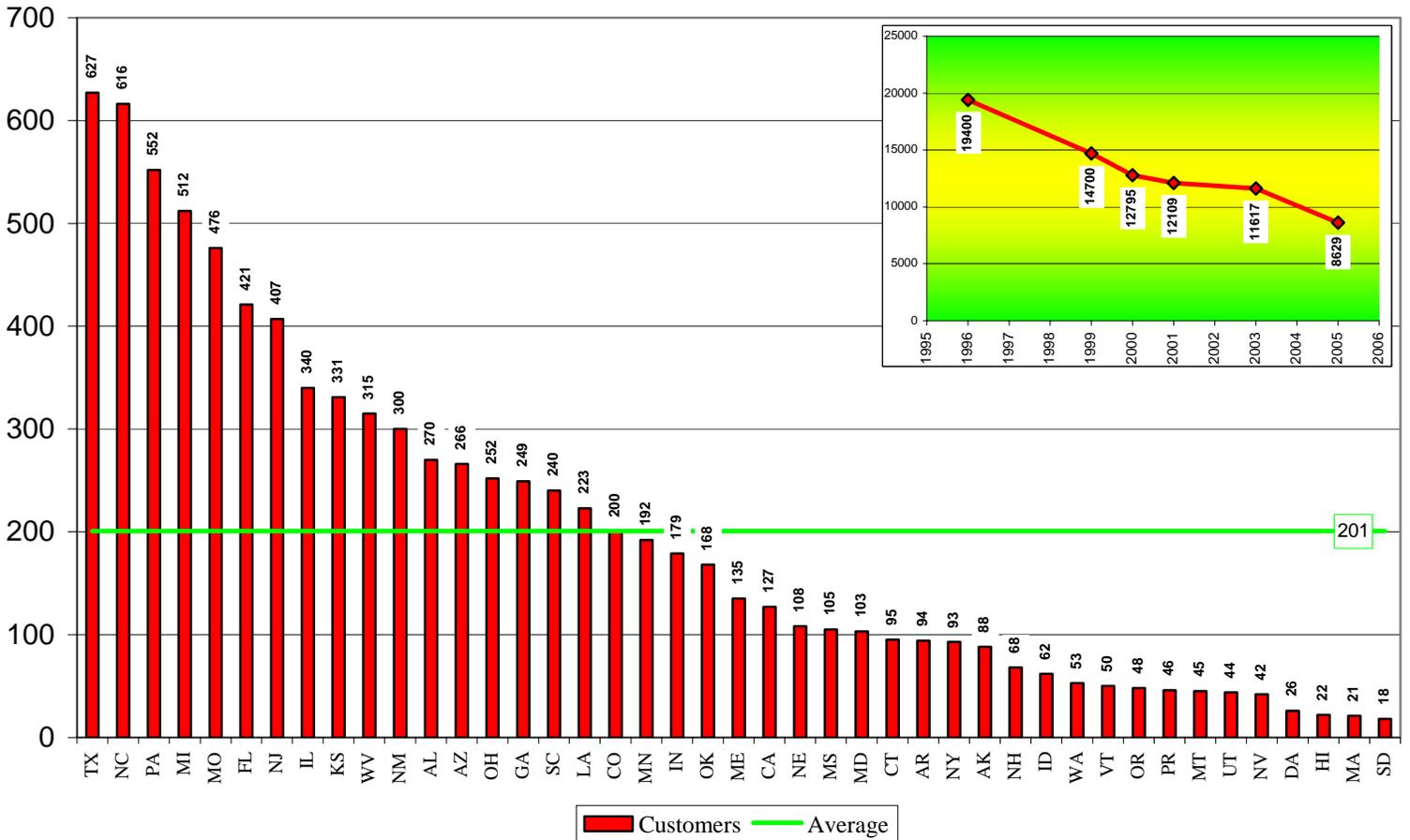
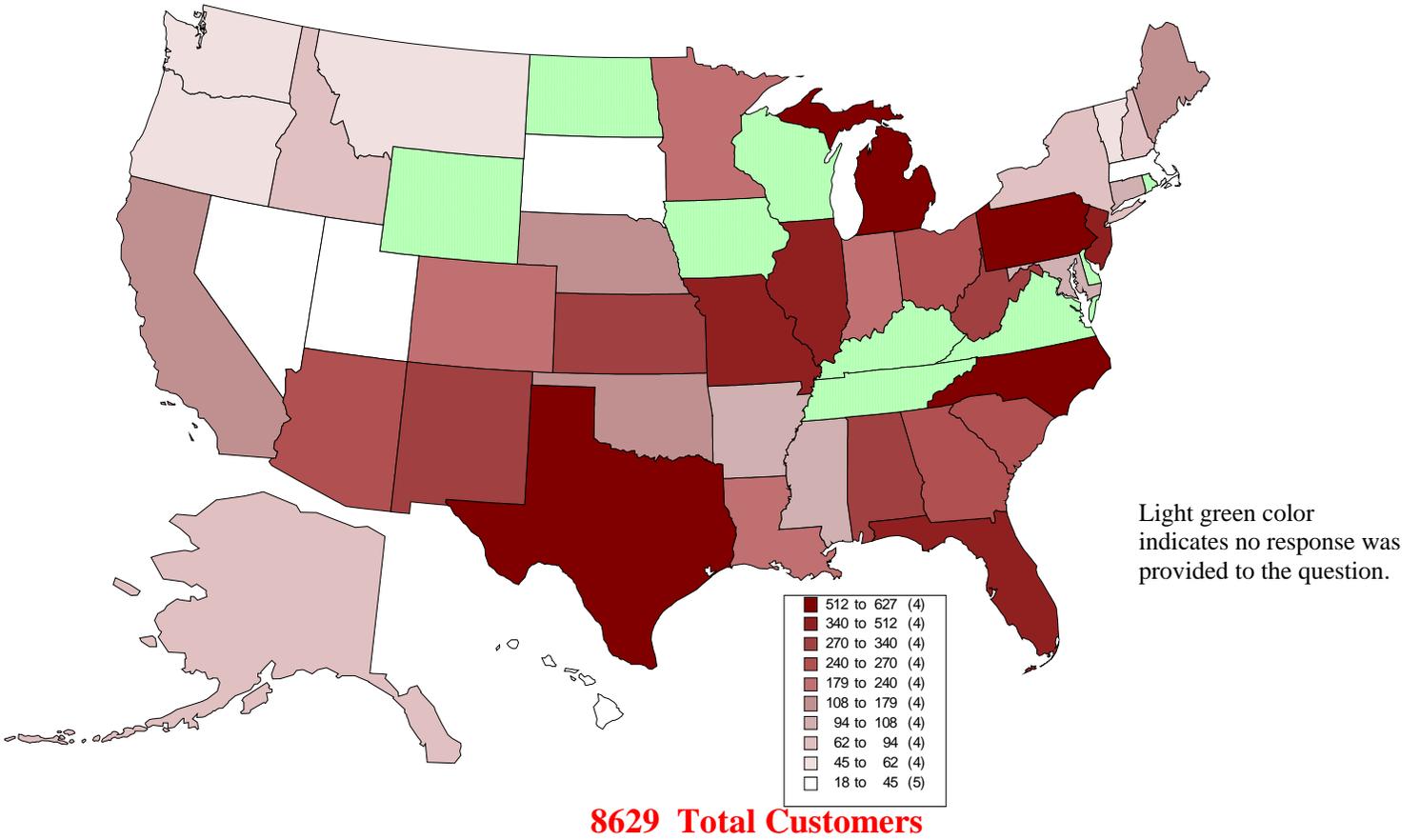
Description

The graphs on the following page represent the total number of laboratory customers served by the 47 reporting laboratories. The map graph gives a geographical distribution of these customers. Darker shading indicates more customers. The bar graph at the bottom of the page shows the same breakdown along with the total number of customers served by each laboratory. There is also a smaller line graph indicating the totals from the 1996, 1999, 2000, 2001, 2003, and 2005 surveys.

Findings

Of the 47 reporting laboratories, 43 labs served a total of 8,629 customers.

Lab Customers



INSTRUCTIONS

Workload Survey 2004 State Metrology Laboratories

We are using the same basic format as the last survey and we plan on using the same format for future surveys. If future surveys require major changes in format, we will provide enough advanced notice to allow for proper data collection for the reporting period.

DUE by April 1, 2005

Instructions

General Laboratory Information Section:

Lab Elevation (NEW)

This is the elevation above sea level of your lab in feet.

Lab Renovation (NEW)

This section was added since many laboratories have had significant renovations since they were built. In many cases, the renovations have significantly improved the laboratory's environment and capabilities.

Staff information:

'Experience' is asking for the number of years of experience in an SLP laboratory and the total number of years of experience in metrology.

Example: Worked 5 years in an Air Force PMEL laboratory and worked 14 years at a state metrology laboratory.

SLP Lab experience = 14 years

Total Metrology experience = 19 years

Job Titles/Salary Ranges (make sure they are monthly salaries):

NOTE: We do not want names or current salaries; we only want the position title and the salary range (this information is usually public record for state government).

Example: Metrologist I	\$1,800.00 - \$2,400.00
Metrologist II	\$2,000.00 - \$2,800.00
Metrologist III	\$2,600.00 - \$3,200.00

Workload Section:

Each category is also broken down into the following customers: Lab, W&M Program and External Customers.

Lab – Those standards calibrated for use by the metrology laboratory, including working standards, surveillance calibrations on primary standards, etc.

W&M Program – Those standards calibrated for weights and measures regulatory agencies.

External Customers – All other standards calibrated by the laboratory for industry.

The survey covers the workload of your lab for a twelve-month period, preferably Jan 1, 2004 through Dec 31, 2004. If the reporting period covers a different period make sure it is noted in the survey.

In general, the survey is asking for the number of individual devices calibrated by the metrology laboratory. Use the following examples as guidelines for reporting numbers for this survey.

Example: A “31 pound weight kit” is not counted as one device; make sure each weight in the kit is counted.

Example: A 100 foot tape is counted as one device; do not count each point tested.

Example: If three double substitutions are used to calibrate a single standard it is counted as one device; do not count it as three devices.

Example: A 100g standard calibrated using a 3-1 weighing design is counted as one device; do not count the check standard. (Same with advanced weighing designs using the mass code; do not count the check standards as they are used solely for defining the measurement process.)

Mass Echelon I – The number of precision mass standards that were calibrated using the Mass Code for data reduction, regardless of accuracy class.

Mass Echelon II – The number of precision mass standards that were calibrated not using the mass code.

Mass Echelon III – Do not count weight carts in this category; weight carts have their own category.

Lottery Balls – This section is new and was added due to the increasing number of labs that were reporting these tests under the ‘other’ category.

Other Calibrations – We would also like to know of any other work that is done by your metrology laboratory which was not covered in this survey. Therefore, there are several “blank categories” at the end of the survey for any calibrations or tests that do not fall into any of the prescribed categories. Please provide enough detail about these additional tests for it to be clear what is being done.

Laboratory Customers: The number of customers served by your lab during the 1-year reporting period. Count different locations of the same parent company as separate customers. If there are separate divisions within the same parent company, count each as a separate customer.

Laboratory Fees - At the end of the survey there is a section for calibration fees. This section is new and was added to more accurately report the typical cost of calibrations at the various state labs. If a fee schedule is used please attach a copy.

At the end of the on-line survey is an option to upload a file. This option was provided so that you can include a copy of your fee schedule if you would like. Uploading the file is not required.

2004 State Laboratory Program Survey

DUE by April 1, 2005

General Laboratory Information

Laboratory: _____	Name: _____
Mail Address: _____	Phone: _____
City, State, Zip: _____	Fax: _____
Age of Lab: _____ Years	Web Site _____
Approx. Sq. Ft.: _____ Sq ft	Address: _____
Lab Elevation: _____ Feet above sea level	
Has lab been renovated? YES <input type="checkbox"/> NO <input type="checkbox"/>	
If so, what year: _____	
How many sq ft were added? _____	
Approximately _____% of lab was renovated	

Please list all personnel which perform metrology measurements or functions in the laboratory

Name	e-mail	Full Time or Part Time	#Yrs Experience	
			SLP Lab	Total

List all Job Titles which could be utilized to perform metrology measurements or functions

Job Title	Minimum Monthly Salary	Maximum Monthly Salary

NOTE: The following information should be based on a 12 month period, preferably Jan 1, 2004 through Dec 31, 2004 or the most recent fiscal year. Reported data should not be estimates. If unable to quote actual data, please attach your comments to the end of this survey.

Actual Period of Time Covered: From _____ To _____

Mass Echelon I

Number of mass standards calibrated using Advanced Weighing Designs and Mass Code Data Reduction. Regardless of Class.	Lab	
	W&M Program	
	External Customers	
	Total	

Mass Echelon II

Number of mass standards. ASTM Class 1, 2, 3 OIML Class E2, F1	Lab	
	W&M Program	
	External Customers	
	Total	

Mass Echelon III

Number of mass standards (except weight carts).
ASTM Class 4, 5, 6, 7
OIML Class F2, M1, M2, M3
 NIST Class F

Lab
 W&M Program
 External Customers
 Total

Weight Carts

Number of weight carts calibrated.

Lab
 W&M Program
 External Customers
 Total

Volume - Glassware

Number of individual pieces of volumetric glassware calibrated.

Lab
 W&M Program
 External Customers
 Total

Volume - Small Metal Standards

Number of metal volumetric standards (20 liter / 5 gallon and smaller).

Lab
 W&M Program
 External Customers
 Total

Volume - Large Metal Standards

Number of metal volumetric standards (larger than 20 liter / 5 gallon).

Lab
 W&M Program
 External Customers
 Total

Length - Tapes

Number of individual tapes (metal, fiberglass, woven fiberglass, cloth, etc.).

Lab
 W&M Program
 External Customers
 Total

Length - Rigid Rules

Number of rigid rules calibrated.

Lab
 W&M Program
 External Customers
 Total

Thermometry

Number of thermometers tested (mechanical, liquid-in-glass, thermocouples, thermistors, PRTs, SPRTs).

Lab
 W&M Program
 External Customers
 Total

Frequency

Number of frequency standards tested (includes tuning forks).

Lab
 W&M Program
 External Customers
 Total

Timing Devices

Number of timing devices tested (stopwatches).

Lab
 W&M Program
 External Customers
 Total

Wheel Load Weighers

Number of wheel load weighers tested :	Lab	
	W&M Program	
	External Customers	
	Total	

Lottery Balls

Number of lottery balls tested : Characteristic Tested: <input type="checkbox"/> Mass <input type="checkbox"/> Diameter <input type="checkbox"/> Other Describe Other _____	Lab	
	W&M Program	
	External Customers	
	Total	

(A) Other Types of Measurements not covered in this survey

Describe type of measurement:	Lab	
	W&M Program	
	External Customers	
	Total	

(B) Other Types of Measurements not covered in this survey

Describe type of measurement:	Lab	
	W&M Program	
	External Customers	
	Total	

(C) Other Types of Measurements not covered in this survey

Describe type of measurement:	Lab	
	W&M Program	
	External Customers	
	Total	

Number of Laboratory Customers served during the reporting period

Count different locations of the same parent company as separate customers. If there are separate divisions within the same parent company, count each as a separate customer.

Laboratory Customers _____

Laboratory Fees

Does your laboratory charge fees for external customers? YES NO

Do you have a minimum fee? \$

In this section please estimate the typical fees charged for each of the described examples.

[Mass Echelon I] ASTM Class 0 Precision mass set 100 g to 1 mg (21 weights) \$

[Mass Echelon II] ASTM Class 2 Precision mass set 100 g to 1 mg (21 weights) \$

One – 31 lb Class F weight set (22 weights) \$

5,000 lb weight cart \$

Scale test truck:

24-1000 lb weights (5 adjusted)

20 - 50 lb weights (5 adjusted)

2 -31 lb weight sets (22 weights each) \$

One - 5 gallon test measure: \$

One – 100 gallon prover: \$

One- 100 foot tape with 19 points tested: \$

