

AN INVESTIGATION INTO THE REPORTED SURGE OF SERIOUS BEAR INCIDENTS IN NEW JERSEY FROM 2007 TO 2009

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## DRAFT

### SYNOPSIS

Commissioner Bob Martin, in his approval of the New Jersey Fish and Game Council's 2010 Comprehensive Black Bear Management Policy, said, "Growth [in the black bear population] coincides with an increase in serious bear incidents supporting the need for population control [i.e., a hunt] . . ." This statement is the crux of the issue. The Department of Environmental Protection's Division of Fish and Wildlife (F&W) and the New Jersey Fish and Game Council (Council) have led many to believe that there has been an increase in the number of serious bear incidents per year. But is this true? Has there been an increase in serious bear incidents per year?

A change in the number of serious bear incidents (Category I and II complaints) per year can only be determined by comparing the data from the collection and interpretation of bear incidents over at least several years, under the same conditions each year. In the current case the conditions were *not* the same. They varied markedly in the number of

- sources used for collecting and interpreting the data
- inclusion of duplicate records
- miscategorizations of type
- inclusion of faxed police department (PD) reports

When adjustments were made by the author to correct these errors, linear regression analyses of the resulting data demonstrated that from 1999 to 2009 *there was actually a statistically significant decrease in complaints, not an increase.*

## INTRODUCTION

The New Jersey Fish and Game Council issued “Comprehensive Black Bear (*Ursus americanus*) Management Policy” in 2005, 2007 and 2010. These documents define the New Jersey Fish and Game Council’s policies and recommendations regarding the continued management of resident black bears in New Jersey. A primary objective of the Council policy is reportedly to use bear management approaches that will reduce human conflicts/complaints regarding black bears. The primary approaches being considered to meet this objective are (a) a hunt and (b) a non-lethal approach (educating the public about bears’ propensity to eat garbage, bear-proofing garbage containers, enforcing ordinances regarding garbage, etc.).

In 2005 the author wrote a report specifically on this subject, “Correlation of reduction in nuisance black bear complaints with implementation of (a) a hunt vs. (b) a non-violent program”<sup>2</sup>. Data from three national parks, three local communities, five states (including New Jersey) and one Canadian province were studied to determine the effects of these two approaches on the reduction of human complaints/conflicts. The results demonstrate that at every site in which the hunting approach was evaluated no effect in reducing the complaints was observed while at every site in which the non-lethal program was evaluated, the non-lethal approach was demonstrated to be markedly effective in reducing complaints.

In 2009 a Rutgers University study<sup>6</sup> was reported on the effect of bear-resistant garbage cans in West Milford, NJ. The results demonstrated that in seven out of seven parameters evaluated, the treatment group (group with bear-resistant garbage cans) had directionally fewer bear interactions than the control group (group without bear-resistant garbage cans), demonstrating the efficacy of garbage control. Combined with the author’s above cited national study<sup>2</sup> data from thirteen sites demonstrated the hunting approach showed no effect in reducing the human complaints/conflicts, while the non-lethal approach was markedly effective in reducing human complaints/conflicts. In absolutely no case that the author evaluated was there even a hint that hunting reduced complaints, or that the non-violent approach did not reduce complaints.

The New Jersey data<sup>2</sup>, however, are unusual (see figure 5 of this report). From 1995 until 1999, while there was no non-lethal program in place, complaints increased. In 1999 the non-lethal program (garbage control, bear education and aversive conditioning) was enhanced and the upward trend in complaints reversed. The data from 1999 to 2007 showed a continuing statistically significant (greater than 99% confidence level) decreasing trend in complaints. This is consistent with the data from the thirteen sites reported above. However, in 2008 and 2009 there was a sharp discontinuity. The complaints surged from 900 in 2007 to 1869 in 2008, more than double. Saying this another way, the data for thirteen years (1995 to 2007) are consistent with the thirteen above sites, but the data from the last two years are way out of line.

With knowledge of this surge, Commissioner Bob Martin, in his approval of the New Jersey Fish and Game Council’s 2010 Comprehensive Black Bear Management Policy, which includes a 2010 hunt, said, “Growth [in the black bear population] coincides with an increase in serious bear incidents supporting the need for population control [i.e., a hunt] . . .” This statement is the crux of the issue. F&W and the Council have led many of the public and in the state government to believe that there has been a surge in the number of serious bear incidents in 2008 and 2009. But is this true? Has there been a surge in serious bear incidents in 2008 and 2009?



## PROCEDURES AND METHODOLOGY

### YEARS CHOSEN FOR THE ANALYSIS

Complaint records were obtained for 2007 and 2009. 2007 was chosen because it was the last year of decreasing trend in complaints (900 Category I and II complaints). Either 2008 or 2009 could have been chosen, representing the years of the reported surge in complaints (1869 and 1803 complaints, respectively), but 2009 was chosen to bring the analysis to the present. Time and financial resources made analysis of other years prohibitive. All of the data from 2007 and 2009 were entered onto a spreadsheet. Every parameter on the spreadsheet was analyzed to try to get an understanding of the differences between 2007 and 2009.

### TWO CATEGORIES OF PD COMPLAINT RECORDS

The PD complaint records are divided into two types. One is the *bulk* PD complaint reports, referred to as “Police Reports” depicted in the line graph of Figure 2 in the Council’s report.<sup>1</sup> The other is the police department complaint reports which were individually faxed to F&W, categorized and numbered by F&W, and subsequently became part of the F&W complaint records. It is these individually faxed PD complaint records that are discussed in this report (referred to as “faxed PD records”), not the bulk PD complaint reports.

### CATEGORY OF BEARS CHOSEN FOR THE ANALYSIS

Category I, II and III bears are defined in the Council report as follows<sup>(1)</sup>. Category I black bears are those bears exhibiting behavior that is an immediate threat to human safety or that causes agricultural damage to farmland as defined pursuant to the Farmland Assessment Act (N.J.S.A. 54:4-23.1 et seq.) or significant damage ( $\geq$ \$ 500) to property. Category II black bears are nuisance bears that are not a threat to life or property. Category III bears are bears that are exhibiting normal behavior and are not creating a threat to the safety of the public nor are a nuisance. The Council report focuses only on Category I and II bears, the bears that reportedly cause serious incidents. Therefore, this report also will focus only on Category I and II bears, and ignore all data on Category III bears. Although Category I and II bear interactions with humans have been referred to as “serious bear incidents”, this report will refer to these interactions simply as “complaints”.

## RESULTS AND DISCUSSION

Figure 1: This line graph shows that the complaints increased from 1995 to 1999 when there was little to no implementation of a non-lethal program to manage the black bears, such as garbage control, bear education and aversive conditioning. When the non-lethal program was enhanced in 1999, the number of complaints per year was reversed, showing a downward trend.

Figure 2: In 2001, F&W began to collect police reports.

Figure 3: F&W then combined the F&W complaints with the PD complaints resulting in the appearance that the complaints were surging in 2003. This was reported to the public, and was probably instrumental in the decision to have a 2003 bear hunt. This method of handling data, i.e., adding two independent sets of data, one covering only a portion of the time period that the other one covers, is scientifically and statistically unacceptable (meta analysis). Saying this another way, one cannot change the experimental conditions in the middle of an experiment and expect to get meaningful results. One must compare apples with apples. In this case there were F&W complaints (apples) from 1995 to 2003, but a combination of F&W and PD complaints (oranges) from 2001 to 2003. When only the F&W data were compared (apples only), linear regression analysis from 1999 to 2003 demonstrated a downward trend in the number of complaints through 2003, not an upward surge, as the “Total Complaints” line would suggest. The blue line between 1999 and 2001 deserves mention. It is depicted as part of the “Total Complaints” line, but it isn’t the *total* of anything. It is misleading, providing false emphasis to the reported surge in the Total Complaints line.

Figure 4: The trend in decreasing F&W bear complaints continues from 1999 to 2007. The downward trend of the line is statistically significant at the 99% confidence level.

Figure 5: In 2008 F&W reported a strong discontinuity in complaints which continued into 2009. The number of complaints reportedly spiked, more than doubling, from 900 to 1869. This is an alarming rise. Statistics is used to determine probabilities. What is the probability that these 2008 and 2009 data points belong to the data set from 1999 to 2007? A statistical outlier is one which is two standard deviations (SDs) from the mean.<sup>(5)</sup> Individually tested, the 2008 data point is 11.8 SDs from the mean, while the 2009 data point is 12.1 SDs from the mean. These two points are not just outliers; they are *extreme* outliers. These points are not credible. They appear to be errors. It would be reasonable to discard these two points. However, rather than discarding them, the author chose to initiate an investigation to determine if there is any possible rationalization for keeping these two points as part of the data set. F&W suggested that the surge was due to an increase in bear population. Can the surge in the data be explained by a surge in the bear population?

Figure 6: The black bear population from 1992 to 2009 was taken from the 2010 Council’s report.<sup>(1)</sup> The “R<sup>2</sup>” value is 0.9046, a value that demonstrates that the data points are close to the linear regression line. It is clear that there was no surge in black bear population. Hence, the justification of the outliers being due to [a surge in] the black bear population is invalid.

Table 1: Another possible explanation for the surge would be a scarcity of the bears’ natural food supply (often referred to as “mast”) in the forests of New Jersey. An extensive literature search on this subject proved to be unsuccessful in finding relevant data. However, the Council report<sup>(1)</sup> made finding the data unnecessary. F&W said, “[Only] small year-to-year fluctuations [in bear-human interactions] may be

attributed to . . . natural food scarcity, such as mast failures.” Hence, even if there were a scarcity in natural food supply in 2008 and 2009, this variation in food supply would not have resulted in a surge in complaints.<sup>1</sup>

Figure 7: Another possible explanation for the surge was an error or errors in data collection or interpretation. All complaint records (approximately 4700) from 2007 and 2009 were obtained and all parameters entered onto an Excel spreadsheet. Analysis revealed that in 2007 the source of the vast majority (1257) of the complaint records was from F&W. However, in 2009, the major source of the complaint records was from the Department of Environmental Protection Communication Center (CC) (1016 from F&W and 2249 from CC). Another way of saying this is that F&W used one government agency to collect and interpret data in 2007, but two government agencies to collect and interpret data in 2009. As in 2003, changing the experiment in the middle is scientifically unacceptable. That is, one cannot compare F&W data (apples) from 1995 to 2007, to a combination of F&W and CC data (oranges) in 2008 and 2009. This is scientifically unacceptable. Consequently, the results of 2008 and 2009 appear to be invalid.

Table II: This table compares F&W with CC in the treatment of identical complaints. Each pair of complaints was from the same complainant on the same day, and with the same reference number; i.e., each pair represents a single complaint being evaluated by the two agencies. The results suggest that CC is weaker in providing the seriousness of the complaints than F&W, and correspondingly, that the procedures of collecting and interpreting data were not standardized. In meta-analysis rules, in those rare cases where sets of data from two different groups *may* be added, the procedures of data collection and interpretation have to be standardized. Hence, due to the lack of standardization alone (again, apples vs. oranges), the 2009 data are not acceptable.

Figure 8: Due to the apparent lack of standardization (see table II), a review of significant miscategorization of type was undertaken. An example of miscategorization would be a non-aggressive bear walking in the woods (or the back yard), and being designated Category II instead of Category III. The figure 8 bar graph demonstrates that this is true, with 80 miscategorizations by F&W (not including faxed PD complaint reports), vs. 688 by the CC, in the same year. This is another error apparently resulting from the participation of the CC in collecting and interpreting the data.

Figure 9: During the analysis it was noticed that there was a large number of faxed PD complaint records. There shouldn't have been *any* PD complaint records mixed in with the F&W records. Having PD records mixed in with the F&W records amounts to duplication of counting the police records, since they are already accounted for in the F&W graph<sup>(1)</sup>. Four police departments faxed records to F&W in 2007, while 21 police departments faxed records in 2009. So from 1999 to 2007, virtually all of the complaint records were from F&W, but in 2009 the complaint records were from F&W, the CC and the PD. Using more than one source for the collection and interpretation of data appears to be a similar pattern to 2003.

Figure 10: Corresponding to the approximately five-fold increase in PDs faxing complaint records in 2009 as compared to 2007 is the approximately five-fold increase in the number of PD faxed complaints in 2009 (671 complaints) as compared to 2007 (130 complaints).

Figure 11: Another difference between 2007 and 2009 is the number of duplicate complaint reports. There were 303 duplicate complaint reports in 2009 compared to only 10 in 2007. This is a 3000% increase in duplicate complaints.

Figure 12: As stated above, there were miscategorizations of type. Since the majority of miscategorizations was in the CC reporting, and the CC reporting was exclusively in 2009, it is not surprising that there would be many more complaint report miscategorizations in 2009 (950 miscategorizations) as compared to 2007 (231 miscategorizations).

Figure 13: As discussed above, there were major errors in the state's report regarding the number of serious bear incidents in 2007 as compared to 2009. The main problem was the collection of bear complaint data from three different sources (F&W, CC and PD) in 2009, as compared to virtually a single source (F&W) in 2007. In addition, large differences were found in complaint record duplication, miscategorization of type, and the number of faxed police department records. An effort was made to "repair" F&W's analysis by removing all duplications, miscategorizations and police department records from the 2007 and 2009 complaint records. This resulted in the trend of serious bear incidents *decreasing* from 1999 to 2009 (significant at the 96% confidence level). It should be pointed out that significance at the 95% confidence level is the requirement for most scientific studies. Significance at the 90% confidence level is often the requirement for biological studies, due to inherent lack of reproducibility of biological data.

Figure 14: Rather than making multiple corrections to repair the data, as in Figure 13, one might simply delete all of the Communication Center records from the 2009 analysis. The results continue to demonstrate a statistically significant decrease in bear-human interaction, from 1999 to 2009 (significant at the 99.8% confidence level)

Figure 15: . Yet another approach to evaluating the data is to simply acknowledge that the experimental procedure was flawed between 2007 and 2008, so only the data up to 2007 should be considered. Here, too, the results demonstrate a statistically significant decrease in bear-human interactions (significant at the 99% confidence level).

FIG. 1 - F&W COMPLAINT REPORTS IN NEW JERSEY 1995 – 2003<sup>(7)</sup>

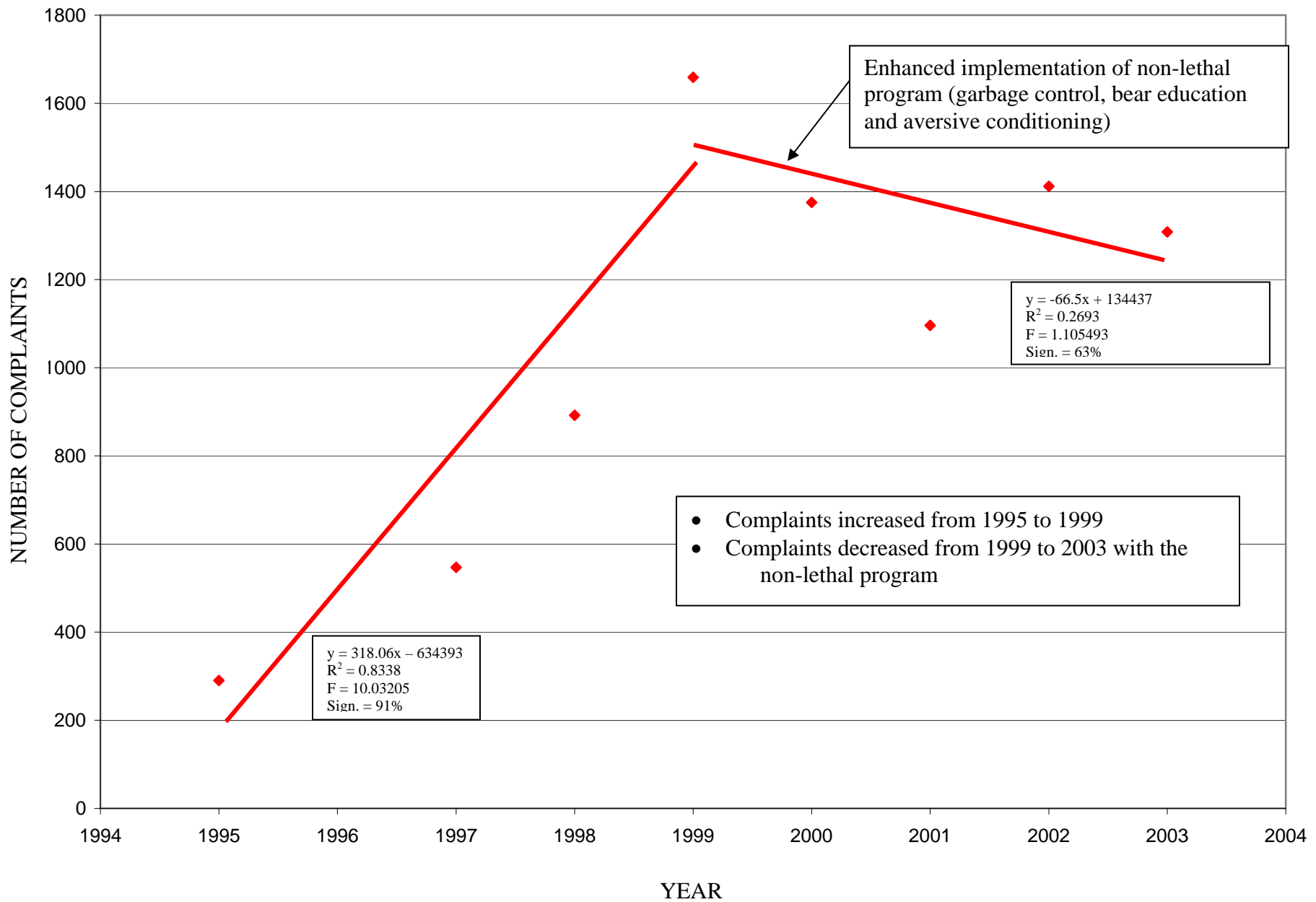


FIG. 2 - F&W COMPLAINT REPORTS IN NEW JERSEY 1995 – 2003  
+ POLICE RECORDS

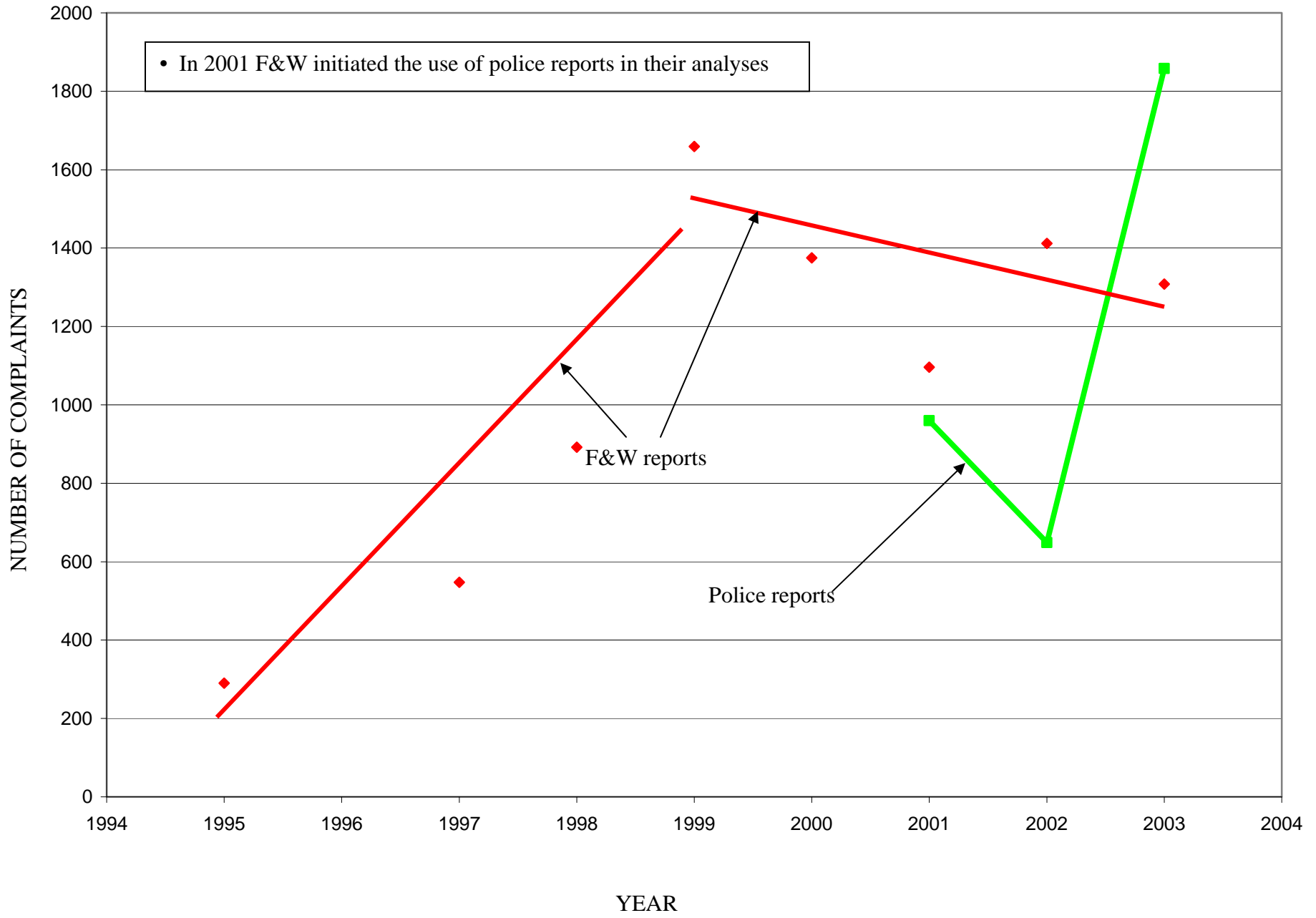


FIG. 3 - F&W COMPLAINT REPORTS IN NEW JERSEY 1995 – 2003

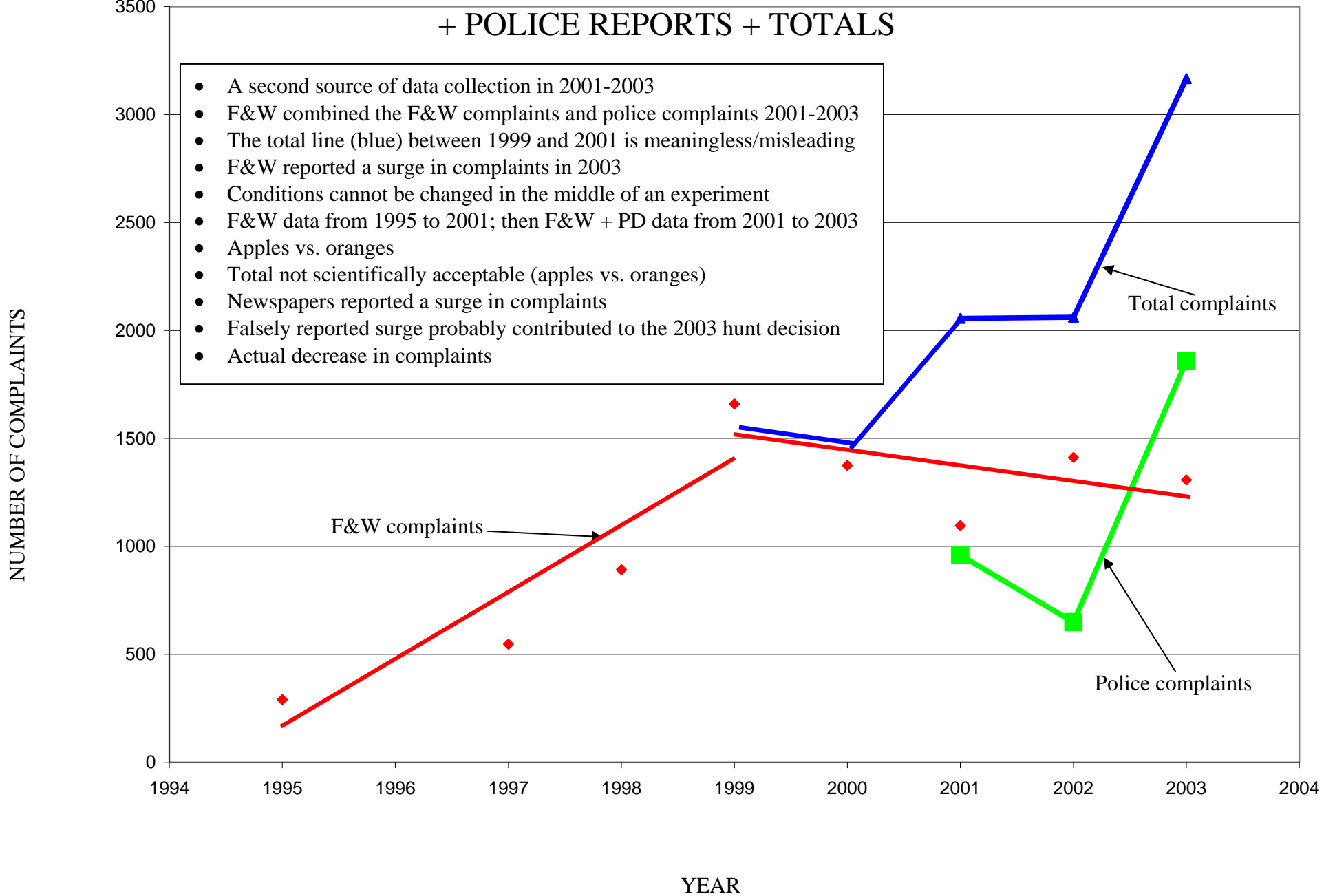


FIG. 4 - F&W COMPLAINT REPORTS IN NEW JERSEY 1995 – 2007

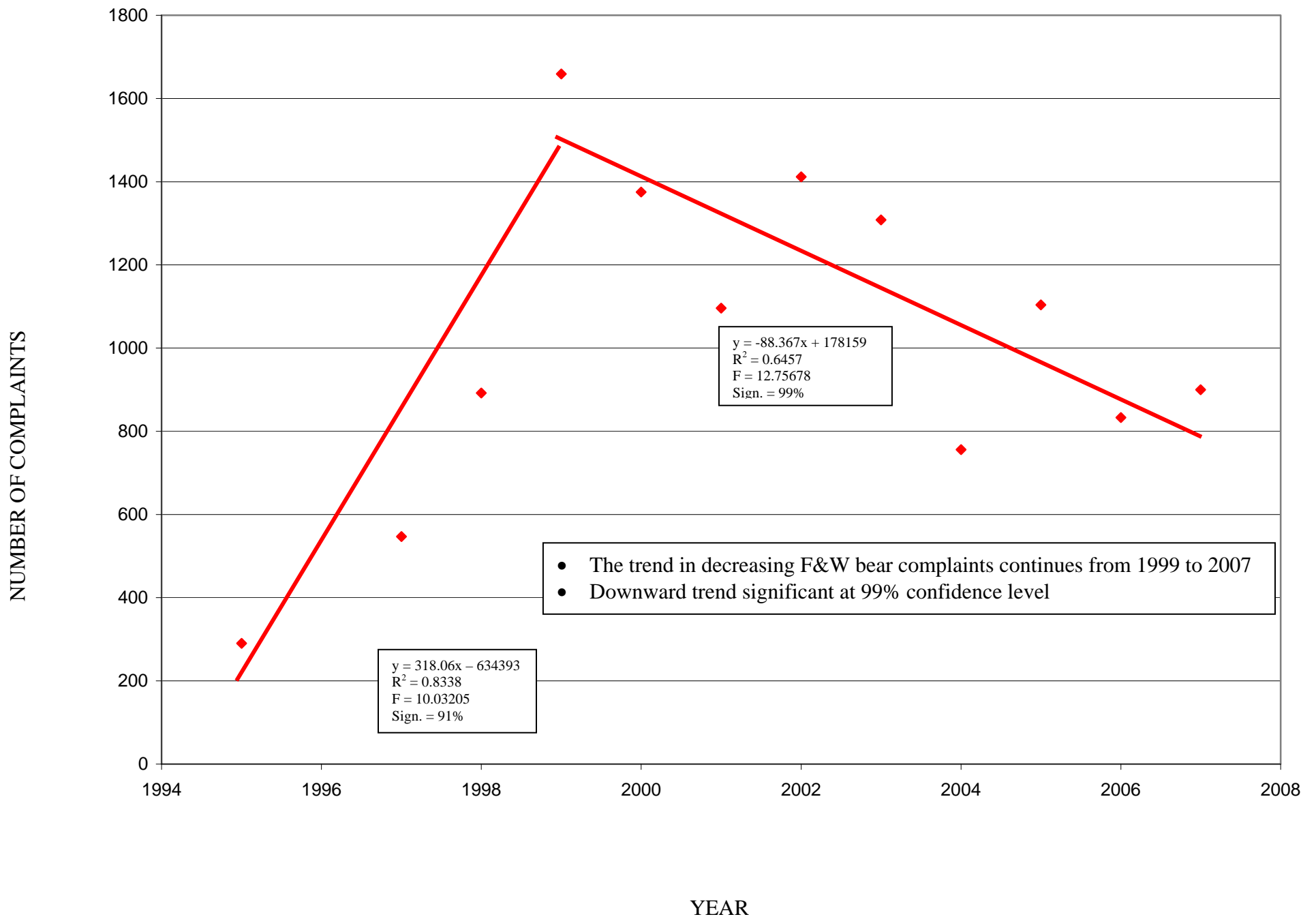
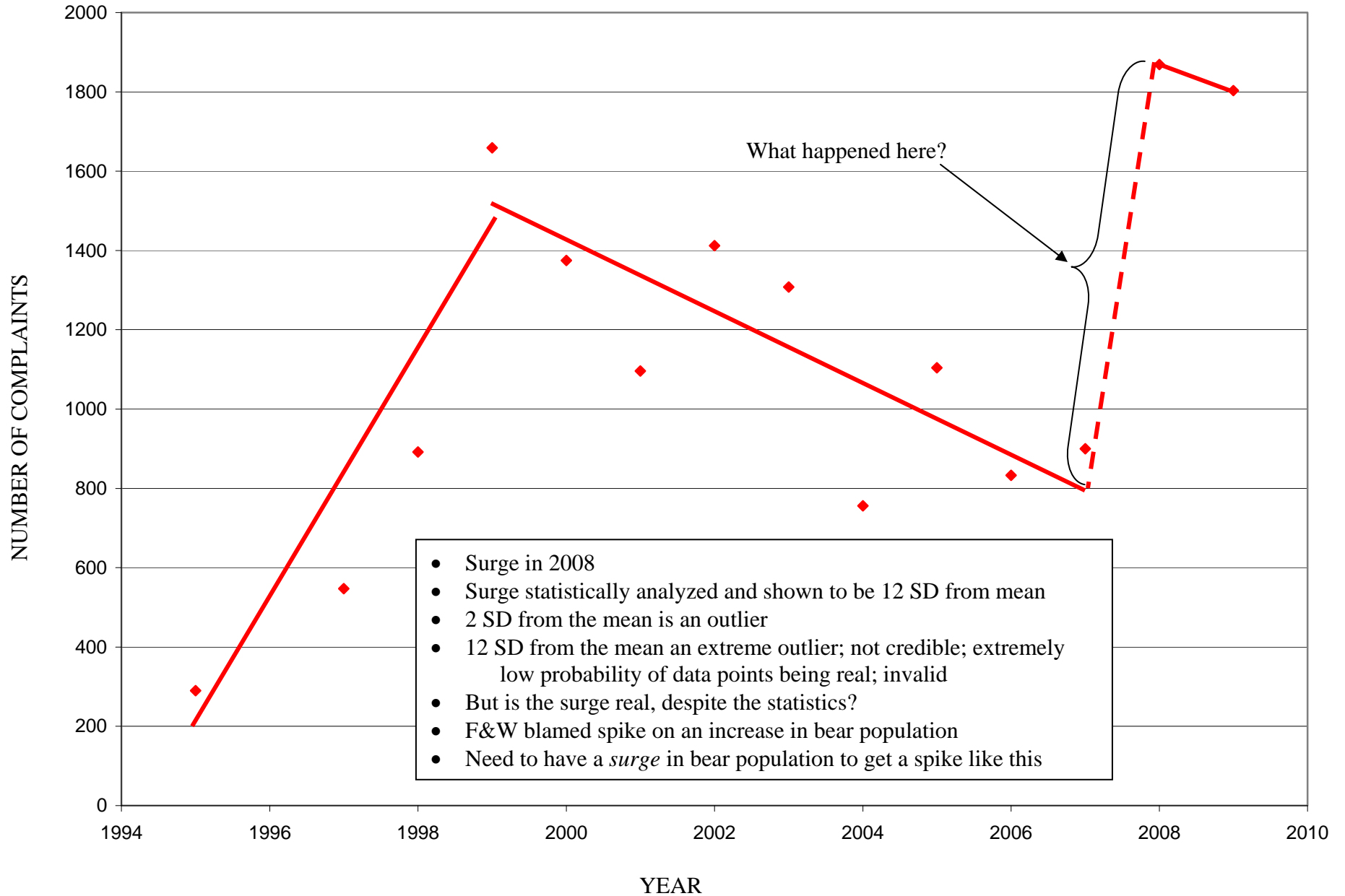


FIG 5 - F&W BEAR COMPLAINT REPORTS IN NEW JERSEY 1995 - 2009



**FIGURE 6**

**Black Bear Population Estimates in Northern New Jersey<sup>1</sup>**

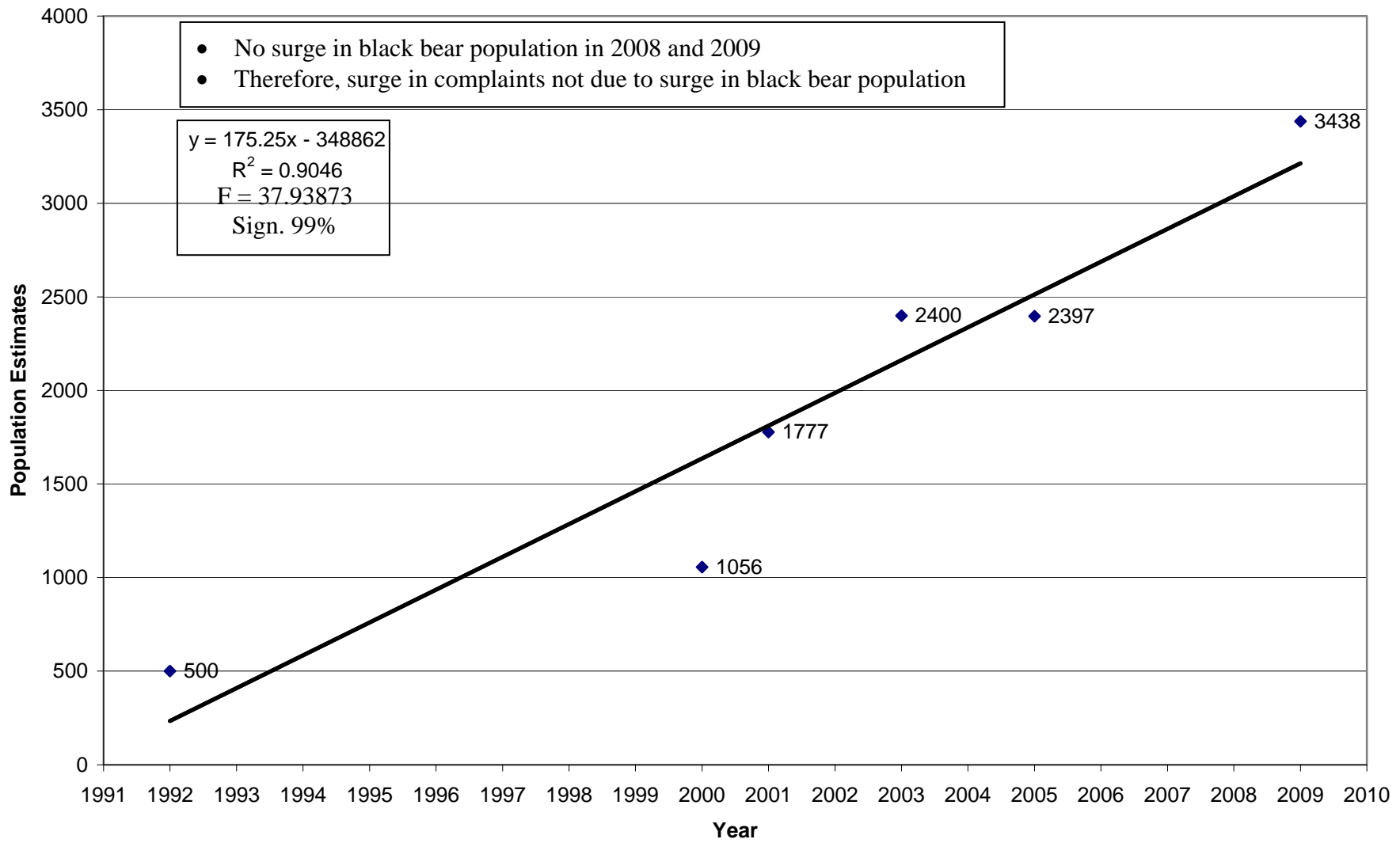


TABLE I  
Literature Search for Mast/Natural Food Supply Scarcity  
in New Jersey in 2008 and 2009

Search strategy:

((“black bear\*”) OR (“Ursus Americanus”)) AND (mast OR “natural food”)

Searched data bases:

Thousands of articles on black bears (*Ursus Americanus*) including their natural food supplies.

- o Biosis Previews
- o CAB Abstracts
- o Academic Search Premier
- o Environmental Sciences and Pollution Management

Coverage: 2007 to present

Extensive databases

No reports on any study on mast/natural food supply in the forests of New Jersey.

However, not important:

“[Only] small year-to-year fluctuations [in bear-human interactions] may be attributed to . . . natural food scarcity, such as mast failures”.<sup>1</sup>

- |  |
|--|
| <ul style="list-style-type: none"><li>• Possible decrease in natural food supply investigated as cause of reported surge.</li><li>• Literature search inconclusive.</li><li>• But F&amp;W said . “[Only] small year-to-year fluctuations [in bear-human interactions] may be attributed to . . . natural food scarcity”.</li><li>• Hence, natural food scarcity ruled out as source of surge</li></ul> |
|--|

FIG. 7  
2007 VS. 2009 NON-PD SOURCES OF COMPLAINT RECORDS

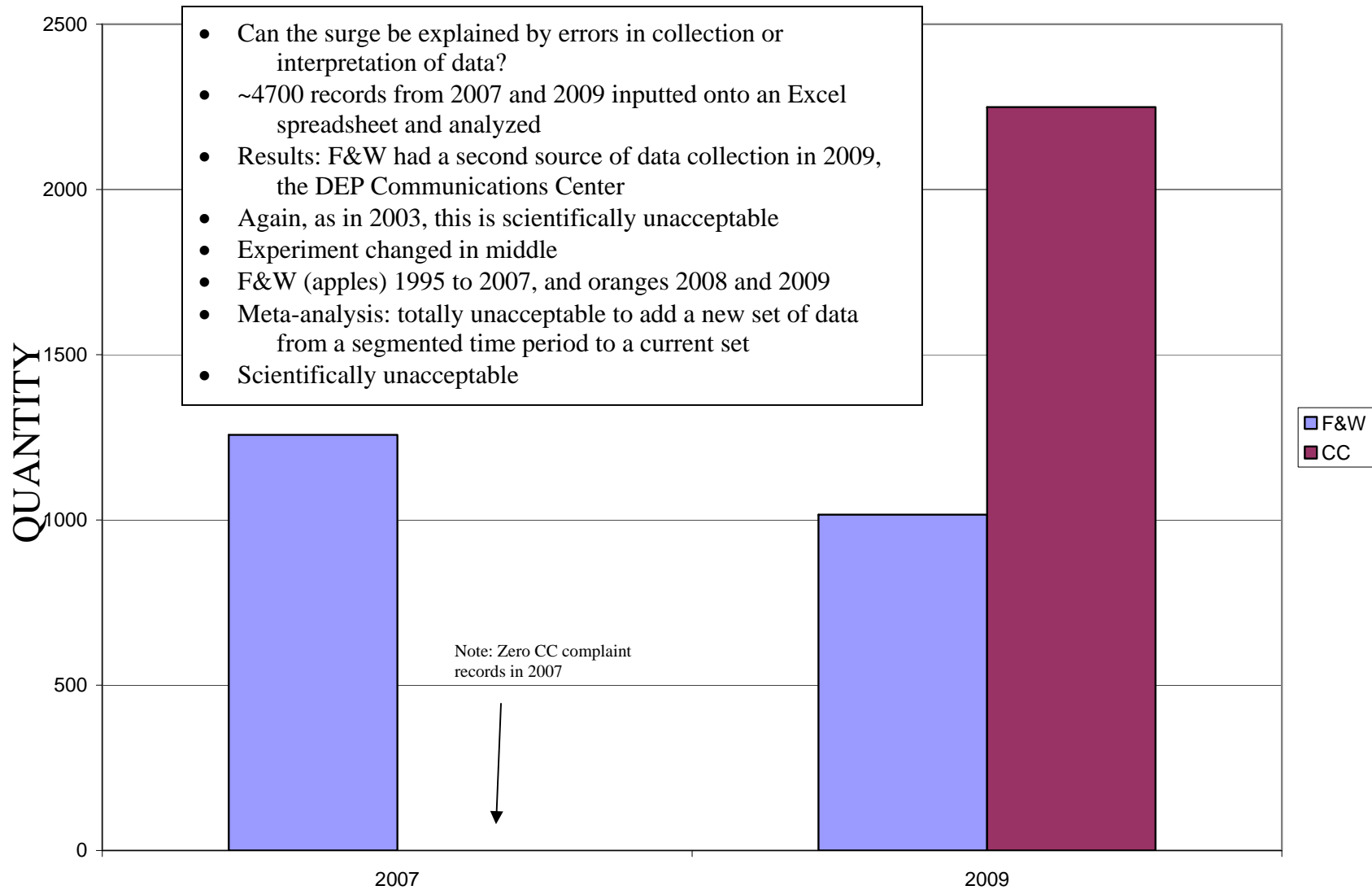


TABLE II

EXAMPLES OF F&W AND CC NOT HAVING THE SAME STANDARDS

Note: Each pair of complaints was from the same complainant on the same day, and with the same reference number; i.e., each pair represents a single complaint being evaluated by the two agencies.

09-04-29-0808-02      CC: "Nuisance black bear spread trash in yard."  
09-04-29-0808-02      F&W: "Left garage door open – bear went in for garbage"  
Weak report by CC  
Same incident, but CC report equivalent to Category II (garbage), whereas F&W report equivalent to Category I (home entry).

09-05-22-0902-38      CC: "Bears are roaming throughout the neighborhood."  
09-05-22-0902-38      F&W: "On back porch - not screened in. Paw prints on house."  
Weak report by CC  
Same incident, but CC report equivalent to Category III (sighting), whereas F&W report equivalent to Category I (attempted home entry)

09-05-11-1148-28      CC: "3 bears had been in area"  
09-05-11-1148-28      F&W: "Bear destroyed shed. Garbage was stored inside."  
Weak report by CC  
Same incident, but CC report equivalent to Category III (sighting), whereas F&W report equivalent to Category I (property damage plus)

- Comparison made between CC and F&W handling of the same complaints
- Data interpretation weaker from CC than from F&W
- Data interpretation not standardized
- Meta-analysis rules: In those rare occasions that data sets may be added, the data collection and interpretation must be standardized

FIGURE 8

COMPLAINT REPORT MISCATEGORIZATIONS IN 2009

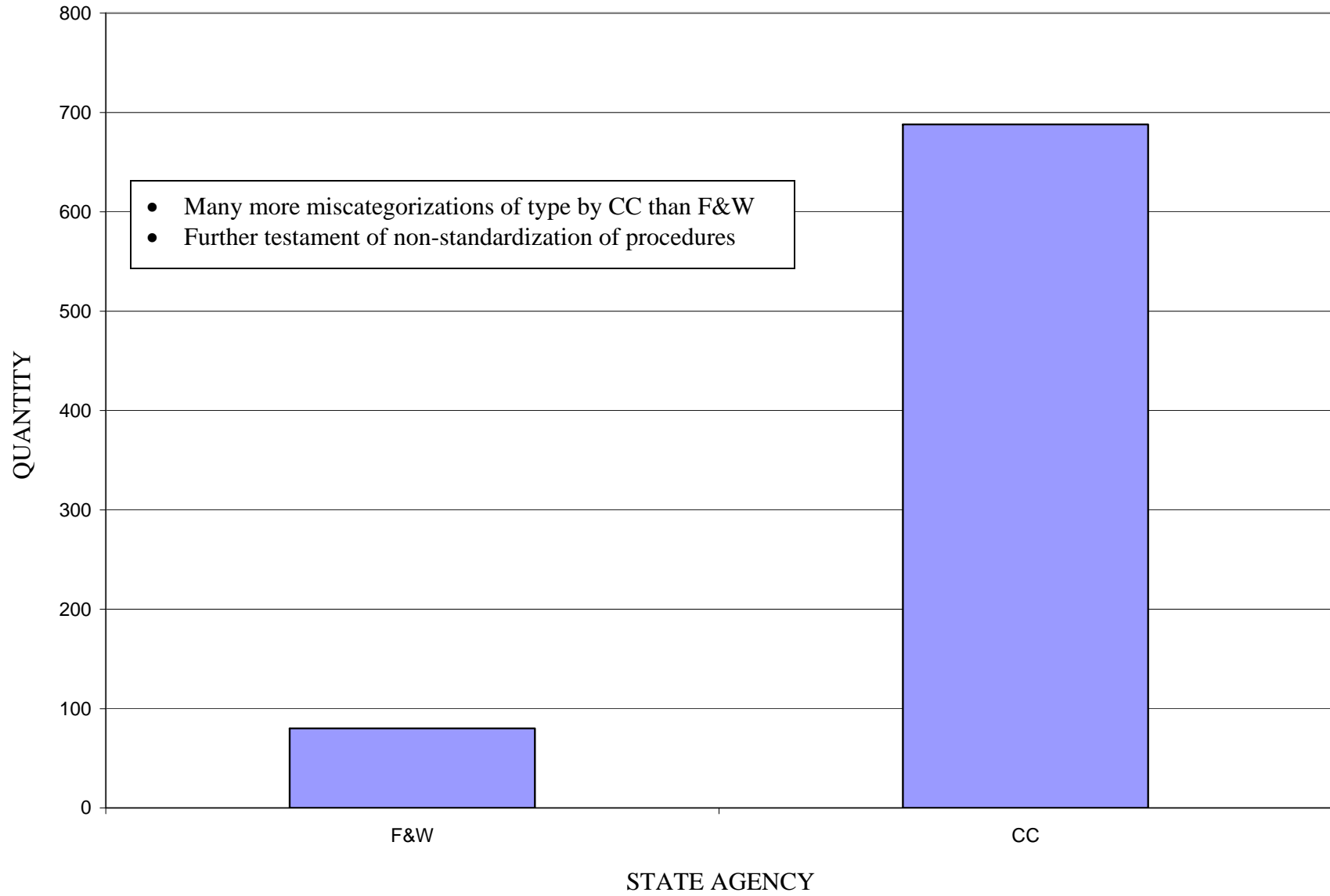


FIGURE 9  
NUMBER OF POLICE DEPARTMENTS FAXING COMPLAINT RECORDS

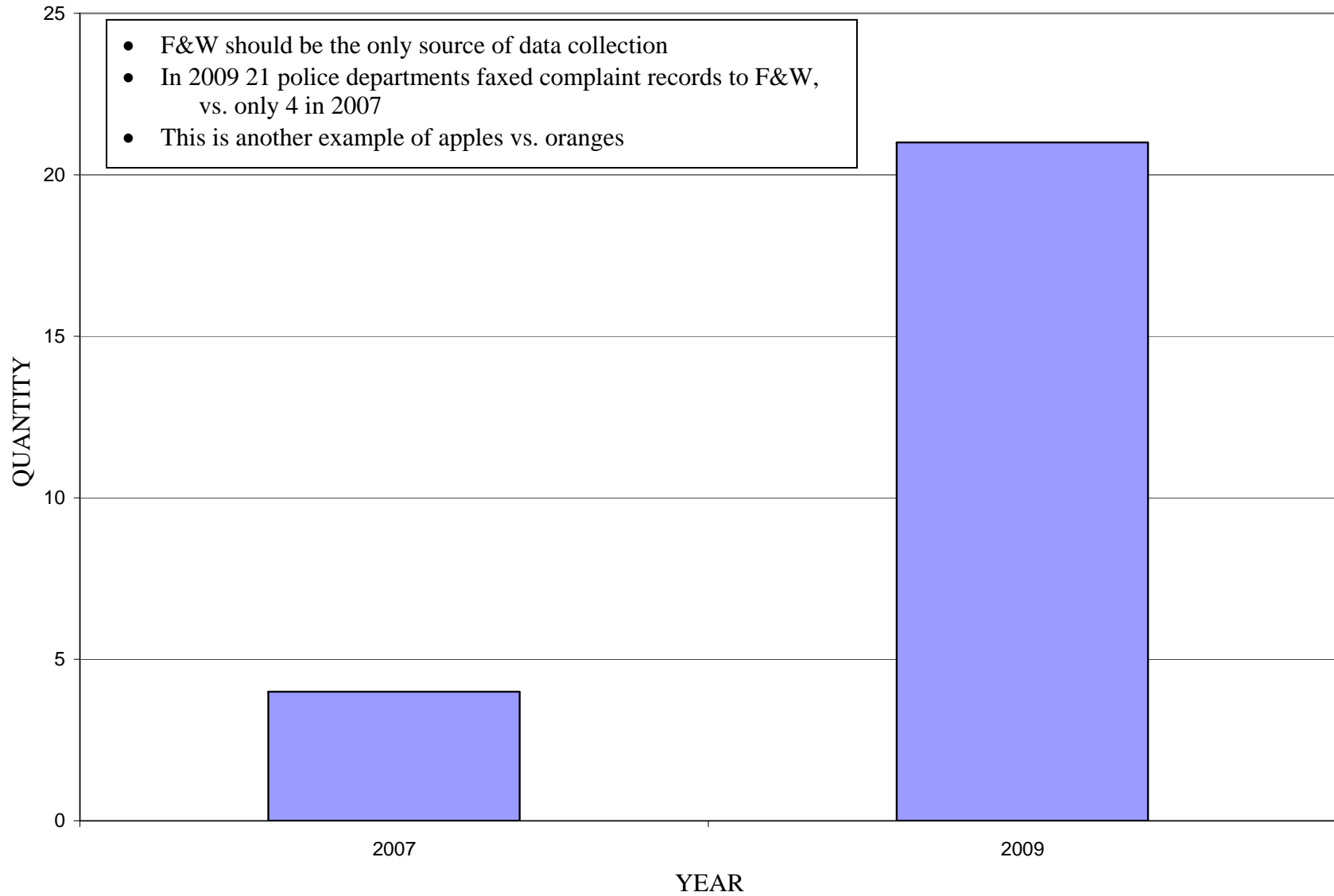


FIGURE 10  
POLICE DEPARTMENT COMPLAINT RECORDS

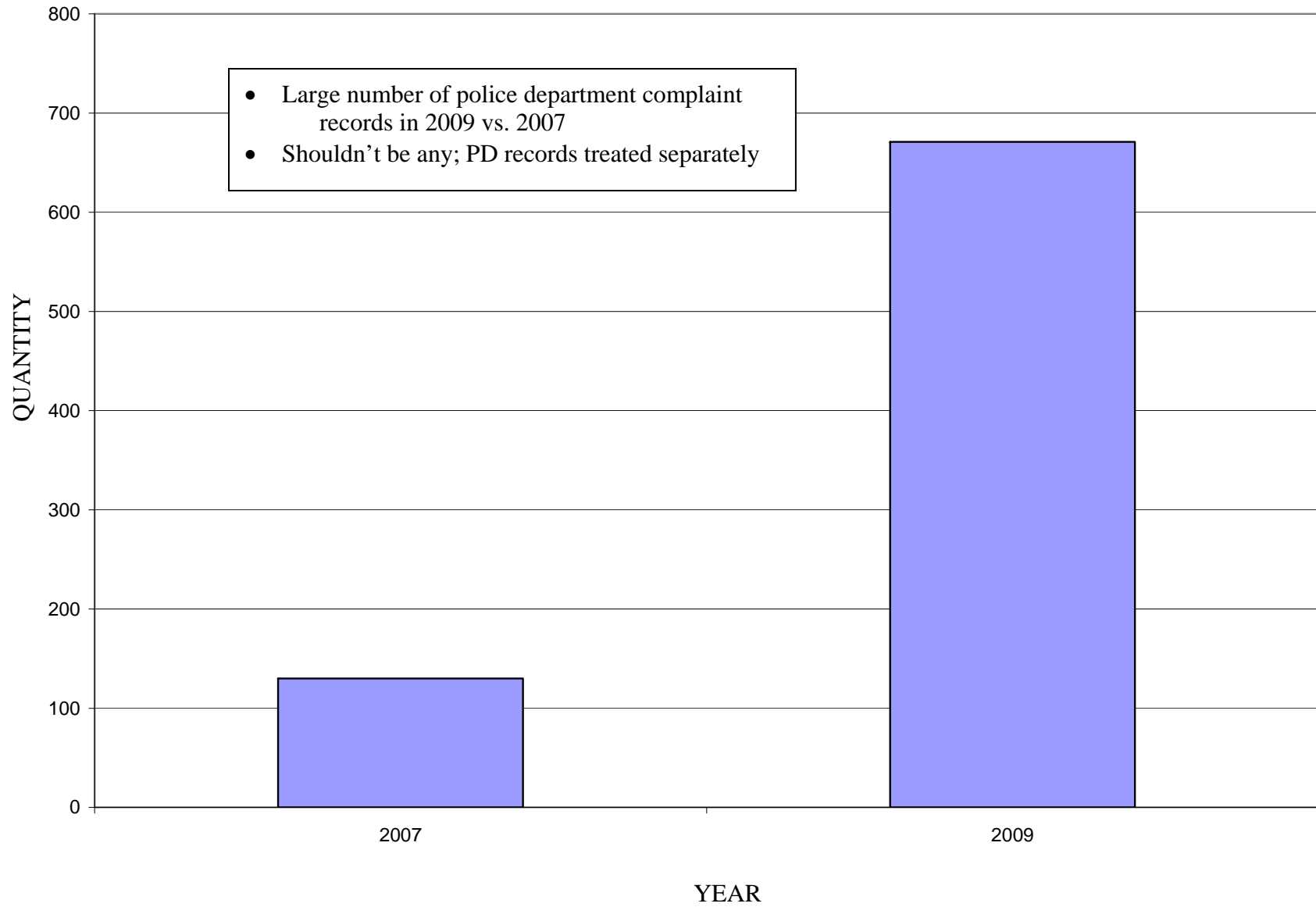


FIGURE 11  
COMPLAINT REPORT DUPLICATES

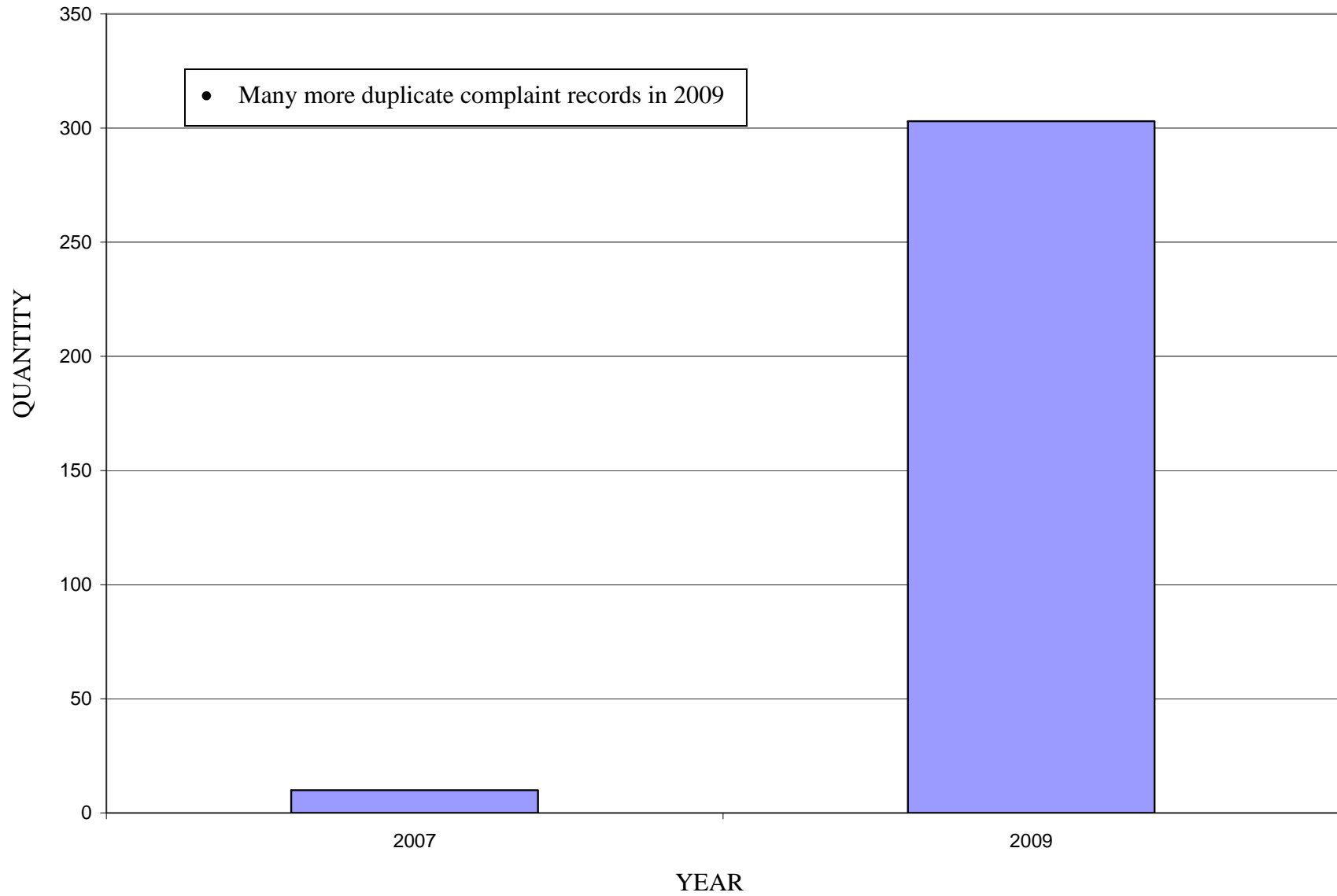


FIGURE 12  
COMPLAINT REPORT MISCATEGORIZATIONS

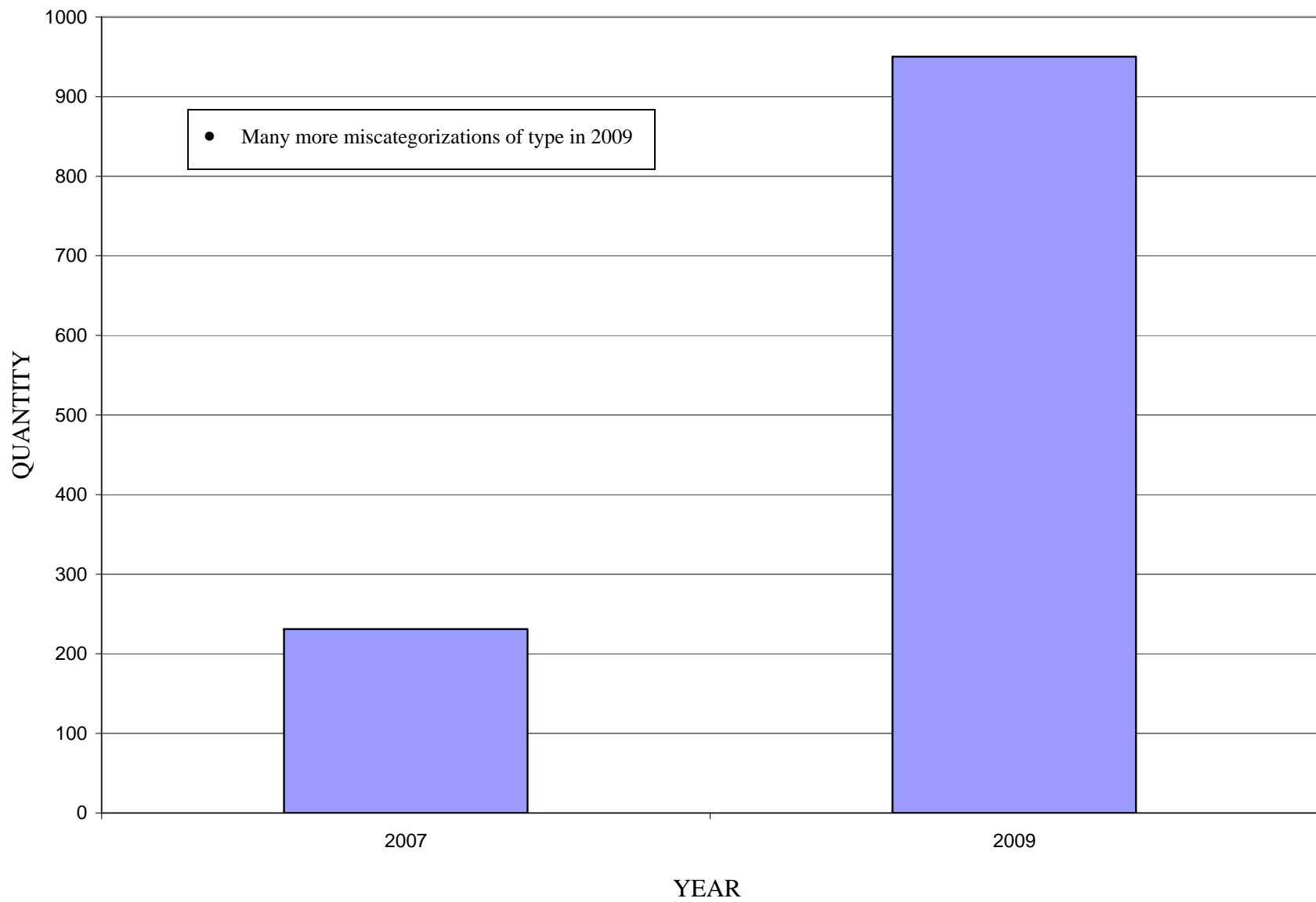
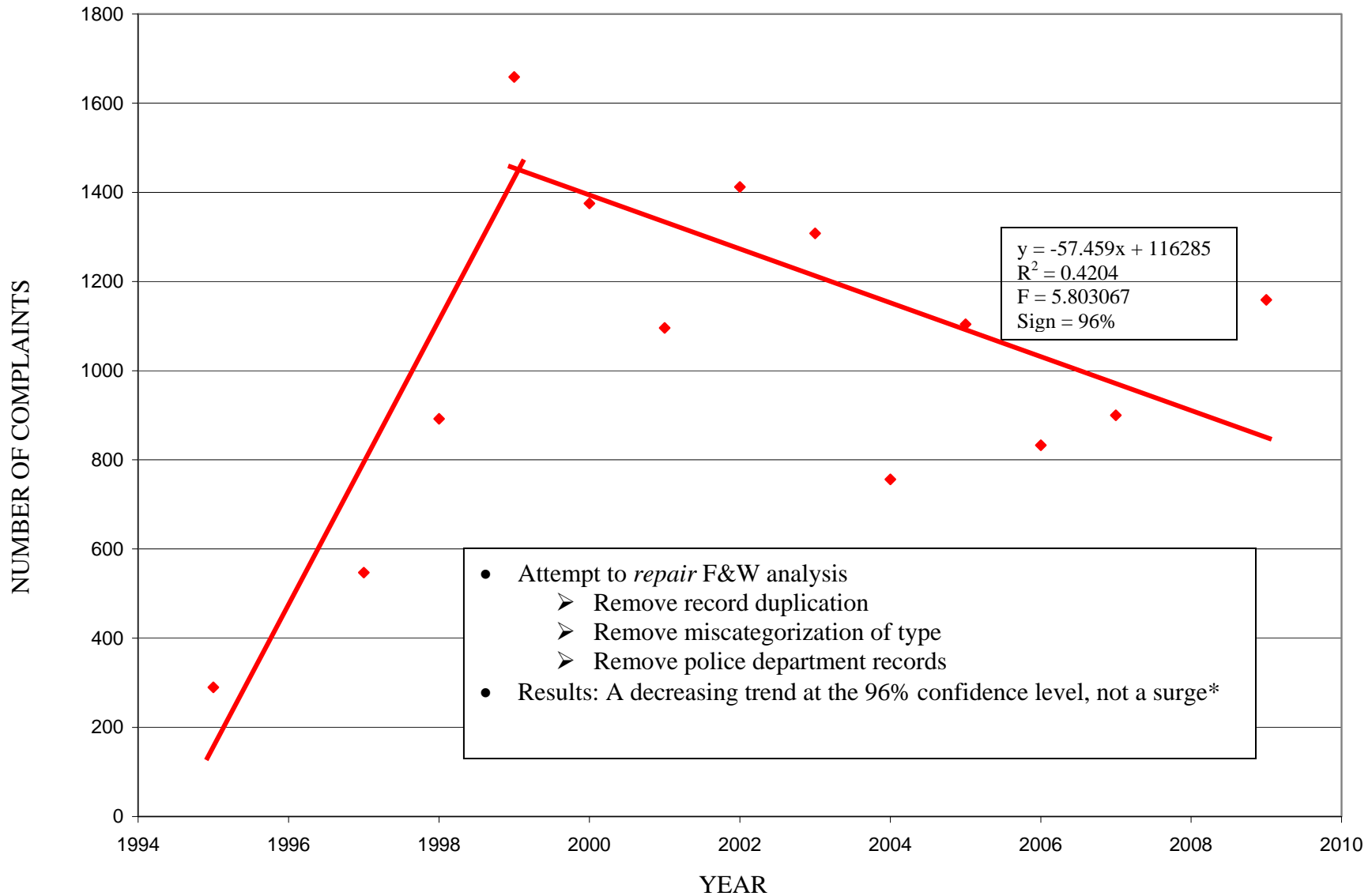


FIG. 13 – F&W COMPLAINT REPORTS IN NEW JERSEY 1995 – 2009  
 AFTER DUPLICATION, MISCATEGORIZATION AND POLICE  
 DEPARTMENT RECORDS WERE REMOVED



\* The analysis was on 2007 and 2009 data. It was decided to leave the 2008 data point out of this graph until such time as it, too, would have undergone thorough analysis.

FIG. 14 – F&W BEAR COMPLAINT REPORTS IN NEW JERSEY 1995 – 2009 AFTER REMOVAL OF ALL COMMUNICATION CENTER RECORDS

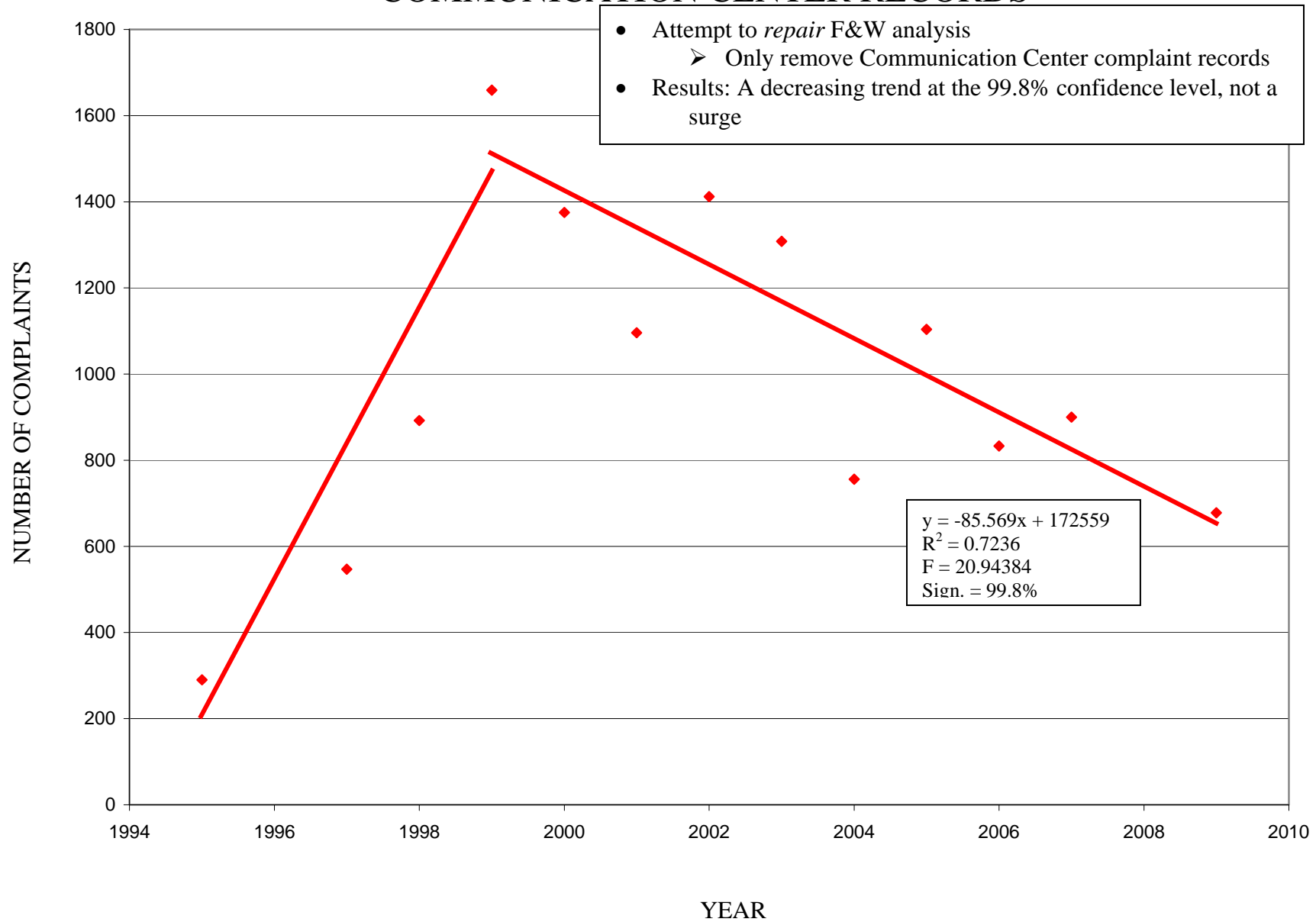
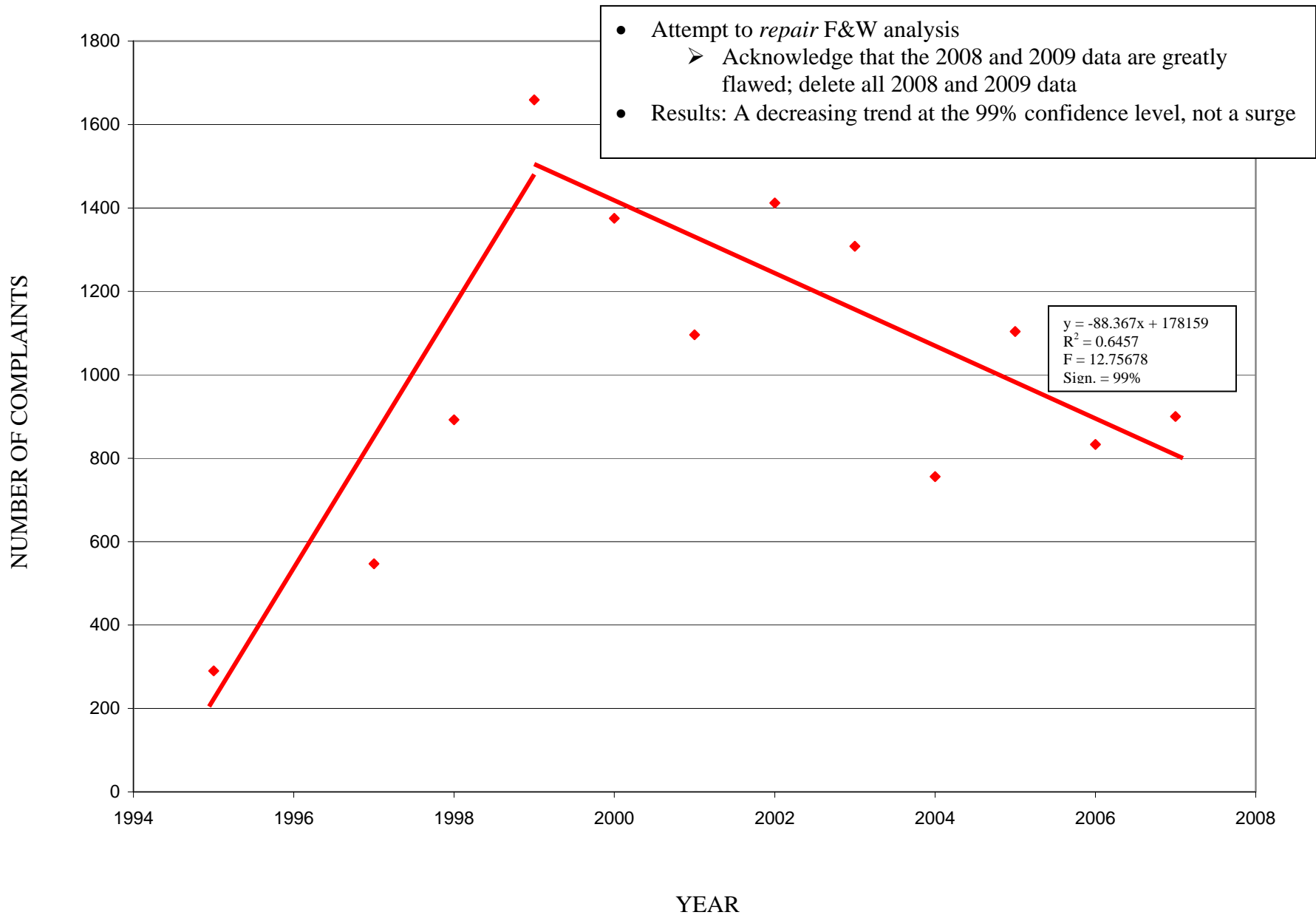


FIGURE 15  
F&W COMPLAINT REPORTS IN NEW JERSEY 1995 – 2007  
(ALL 2008 & 2009 DATA IGNORED)



## CONCLUSION

- There was a reported surge in bear incidents in 2008 and 2009.
- The cause of the reported surge in 2009 was investigated.
- It was not caused by a surge in bear population.
- It was not caused by a decrease in bears' natural food supply.
- It was caused by a combination of scientifically unacceptable practices:
  - multiple sources for collecting and interpreting the data in 2009 (as compared to 2007)
  - many duplicate records in 2009 (as compared to 2007)
  - frequent miscategorizations of type in 2009 (as compared to 2007)
  - many faxed police department reports in 2009 (as compared to 2007)
- The collection and interpretation of data in 2009 were scientifically flawed.
- When adjustments were made to correct these errors, linear regression analyses of the resulting data demonstrated that from 1999 to 2009 *there was actually a statistically significant decrease in complaints, not an increase.*
- The data in this report are consistent with the data from other reports, including studies nationwide, demonstrating that the implementation of non-lethal means, such as garbage control, bear education, and aversive conditioning is effective in reducing serious bear incidents.
- The finding that complaints decrease while the bear population increases
  - demonstrates that there is no relationship between the number of bear-related complaints and the bear population. (The relationship is between the amount of available human-based food and the bear population.)
  - is consistent with previously shown data that bear hunts (i.e., decreasing the bear population) have no effect on the number of complaints.
  - is contrary to the hypothesis that the bear population needs to be culled in order to decrease complaints.
  - demonstrates that in New Jersey people are learning how to co-exist with black bears.

## NEXT STEPS AND RECOMMENDATIONS

- o It is a poor idea having more than one government agency collecting and interpreting the data, unless their Code of Practices has been standardized. Directives to PDs and the CC must be reviewed and shown to be consistent with F&W standards.
- o Based on the author's data, there is no justification for implementation of a bear hunt as called for in the current Black Bear Management Policy. The number of complaints is decreasing, not increasing. If an increase in complaints is the justification of a proposed bear hunt in 2010, then the proposal for a hunt should be rejected.
- o The current downward trend of complaints can continue without great effort; most of the complaints are related to human activity that should be easily corrected:
  - appropriate garbage/trash handling (e.g., *doctoring* the garbage or using bear-resistant containers).
  - protecting livestock – chickens, rabbits, etc. (e.g., installing an electric fence around the livestock).
  - removing bird feeders, other food stuffs and any other attractants (e.g., tree-dropped fruit, uncleaned grill) from the back yard
  - not actively feeding and baiting bears
  - leaving garbage or food-related items in closed garages or sheds, and keeping kitchen doors closed during peak bear activity
  - teaching people how to easily get bears out of their back yards, e.g., air horns, pepper spray (research on tazers, remote control miniature vehicles, bear-bangers)
  - educating the public that bears are virtually harmless; in the approx. 4700 records this author analyzed, there was no confirmation that any human suffered as much as a scratch from black bears, despite numerous tales of extreme perceived threat.
  - enforcing the law; if citizens in bear country knew that they would receive a fine if they violated any part of the law regarding voluntarily or involuntarily feeding bears, there would likely be rapid compliance, and a corresponding rapid decrease in the number of complaints per year.
- o The government should consider the author's national research, the current research used in this report, and Rutgers' West Milford study. All three studies demonstrate that garbage control and bear education will reduce the number of complaints.
- o The government should consider the author's national research in making a decision regarding a hunt. This research clearly demonstrates that bear hunts are ineffective in reducing complaints.
- o The government should continue collecting data that will add to the national study demonstrating that human/black bear interaction can be effectively minimized by garbage control and other non-lethal methods.

## ACKNOWLEDGMENTS

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