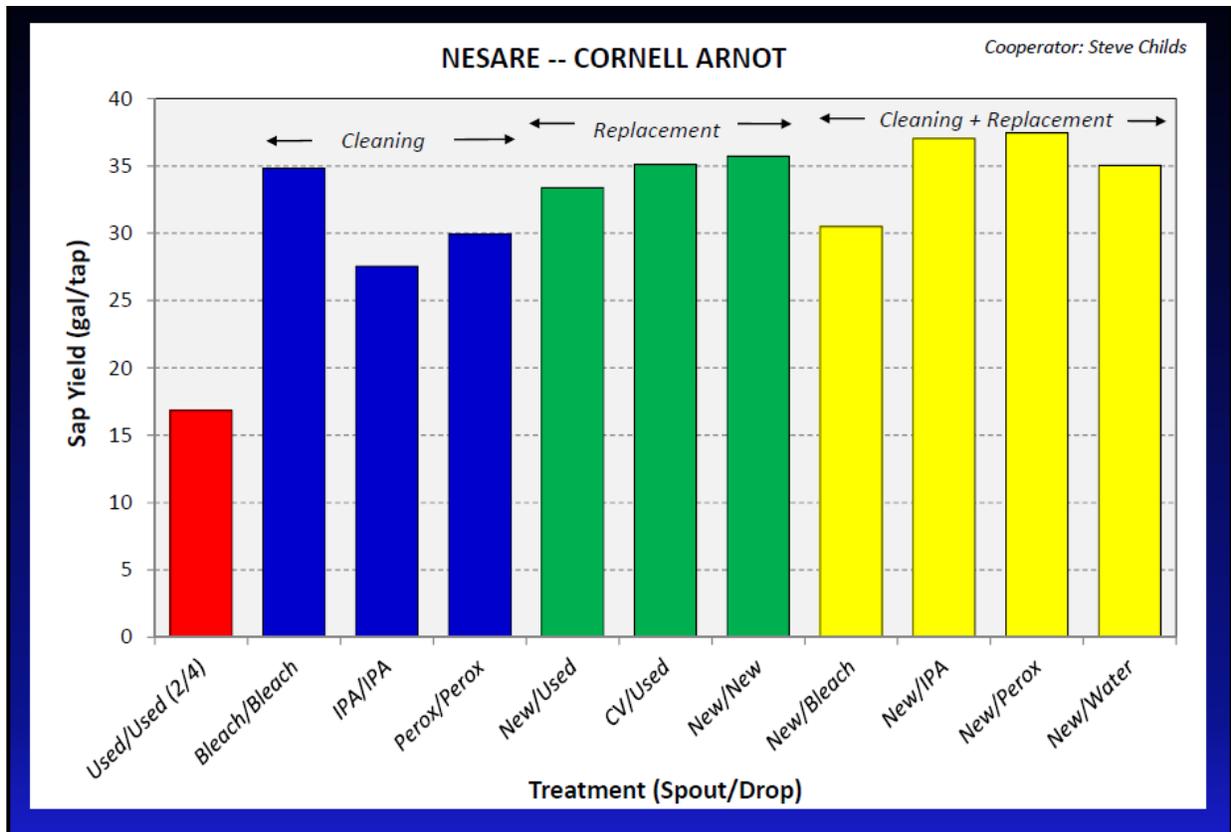


2014 -15 Maple Tubing Research by Stephen Childs, NYS Maple Specialist

In 2014 and 2015 the focus of the tubing and taphole sanitation research changed dramatically. Tests conducted in 2013 showed that if the spout and drop line were adequately sanitized sap yield comparable to a new spout and drop could be obtained. With the assistance of a grant from the Northeast Sustainable Agriculture Research and Extension program of the USDA and in cooperation with the Proctor Maple Research Center in Vermont, a variety of spout and drop cleaning and replacement options were tested to determine the extent of sap yield changes. All of these tests were conducted at the Cornell Arnot Research Forest. All treatments had four replications, each replication with 4 taps on a lateral line. The 2014 season was slow starting with just a few flows in March and the season lasting well into April. The vacuum level was consistently between 21" and 22" Hg. Treatments are listed in the chart below:

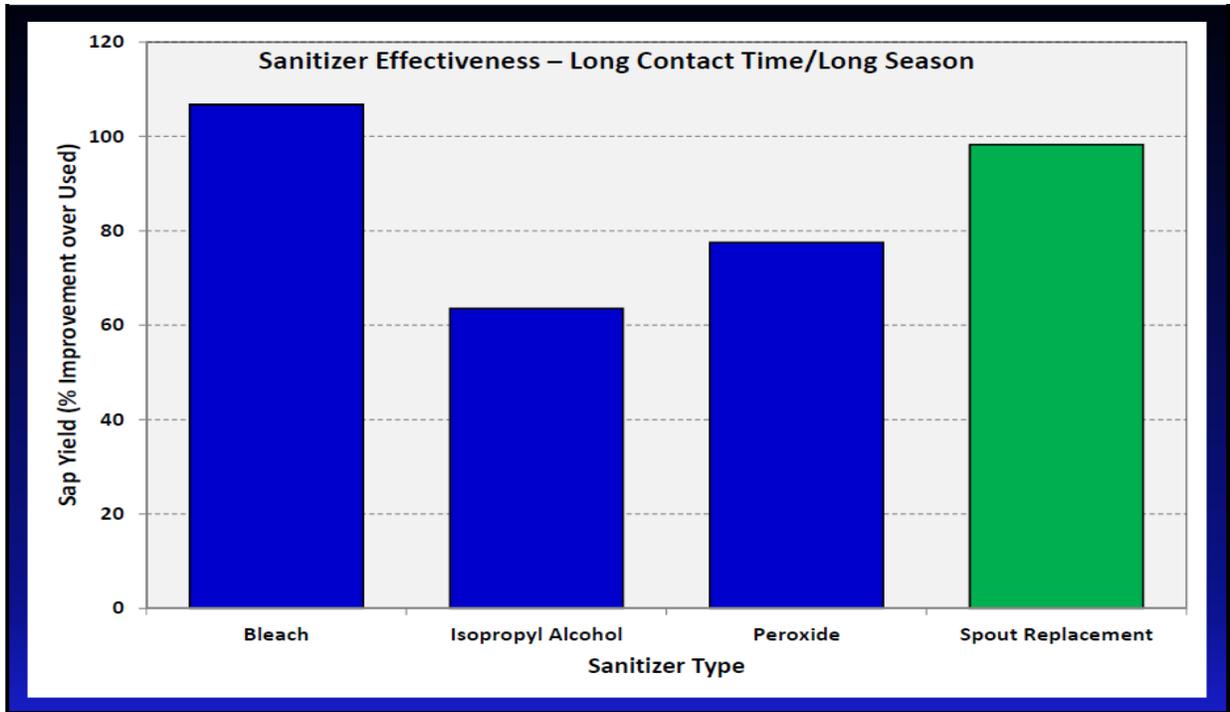
Trt	Drop	Spout	
1	<i>New Drop</i>	<i>New Spout</i>	Control+
2 ←	Used <u>Not</u> Cleaned	Used <u>Not</u> Cleaned	Control-
3	Used <u>Not</u> Cleaned	<i>New Spout</i>	
4	Used <u>Not</u> Cleaned	<i>New CV2</i>	
5 ←	Used Cleaned with Bleach Ca(ClO ₂)	Used Cleaned with Bleach	
6 ←	Used Cleaned with Isopropyl Alcohol	Used Cleaned with Isopropyl Alcohol	
7 ←	Used Cleaned with Premium Peroxide	Used Cleaned with Peroxide	
8	Used Cleaned with Bleach	<i>New Spout</i>	
9	Used Cleaned with Isopropyl Alcohol	<i>New Spout</i>	
10	Used Cleaned with Peroxide	<i>New Spout</i>	
11	Used Cleaned with Water	<i>New Spout</i>	

In every case where a sanitizer such as bleach, peroxide or isopropyl alcohol were used the treated spout and drop were brought from the sugarbush where they had been in prior use and sanitized with at least 30 minutes of contact time in the sanitizer. Following sanitizer treatment they were rinsed, dried, and reinstalled in the tubing system. All the drops in these tests were in the sugarbush for their 4th season and spouts for their 2nd season. All treatments were made in February and installed by the middle of February. Sap yields are reported in the following graph prepared by Dr. Tim Perkins at Proctor:

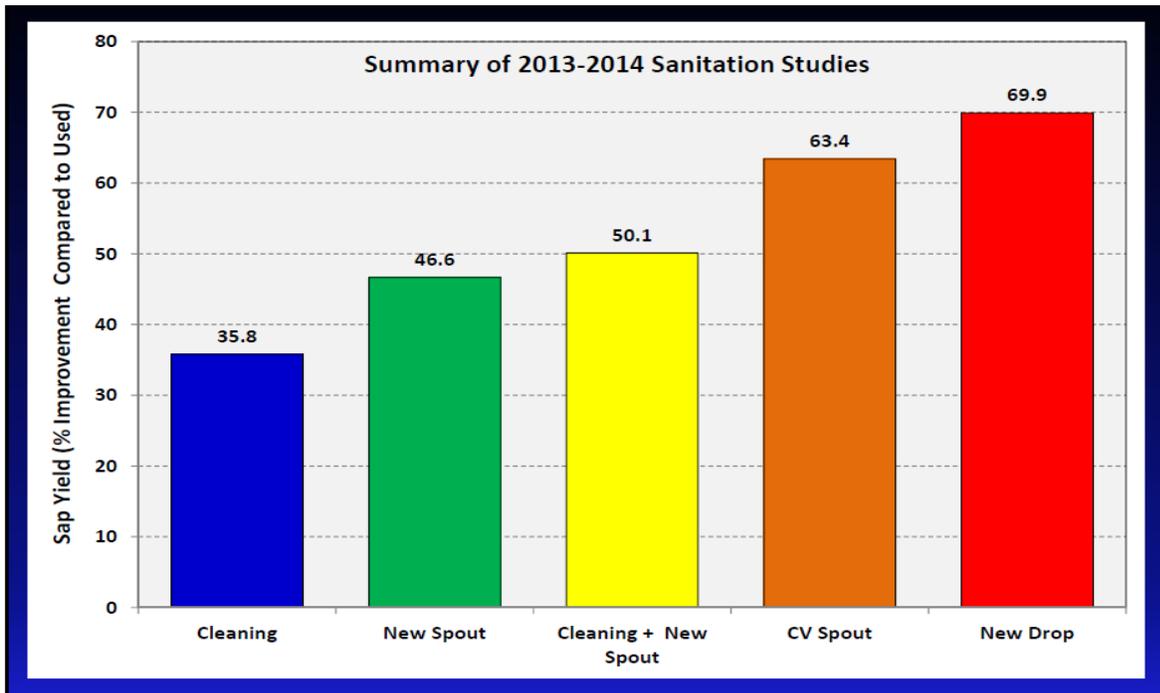


The used spout and drop with no cleaning treatment yielded an average of about 17 gallons of sap per tap. All other treatments show production between 27 and 37 gallons of sap per tap, yields were increased between 59% and 118% depending on the sanitizer used and the spout or drop replaced. The new clear check valve on a used drop line also showed results nearly equal to the new spout and drop. The new spout and drop yielded 106% more or an increase of 18 gallons of sap per tap more than the old spout and drop. Providing proper contact time with the sanitizer clearly provides significant yield improvement similar to replacement of the spout and drop. It is important to point out that Isopropyl alcohol is not approved for cleaning plastic tubing in New York as it is in Canada and is included only to see the Canadian claims of its superiority are true under New York conditions. Most cleaning and sanitation systems maple producers currently use in New York do not provide the necessary contact time with the sanitizer to obtain these kinds of sap yield improvement.

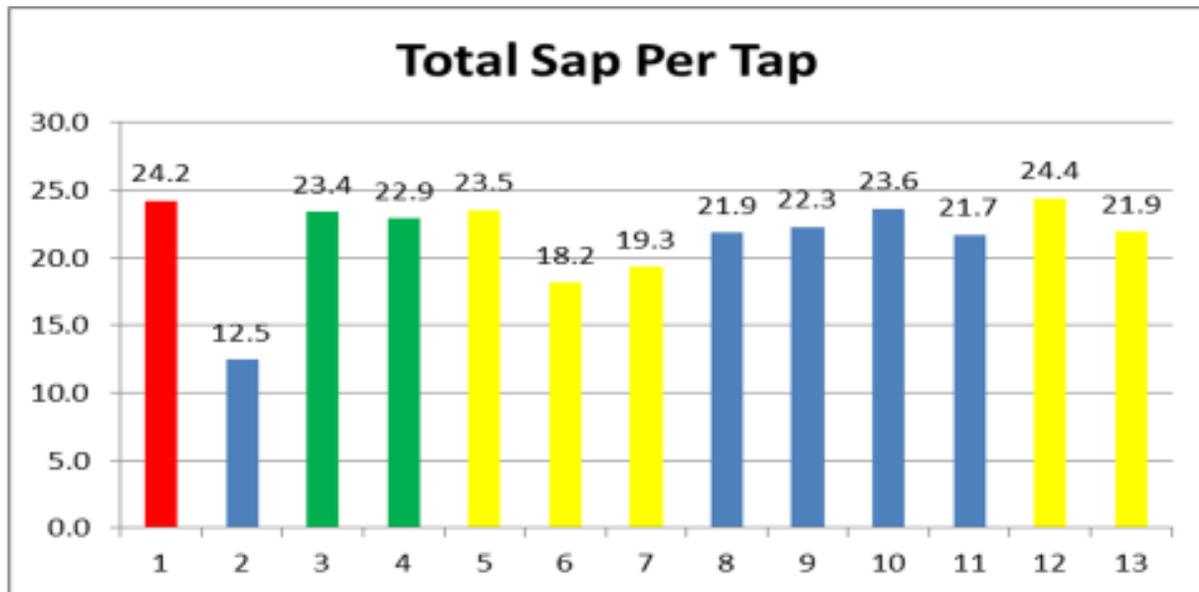
The following chart shows the relative effectiveness of the various sanitizers used in this study. It appears that bleach and spout replacement with a new spout provided the best results while isopropyl alcohol provided the least.



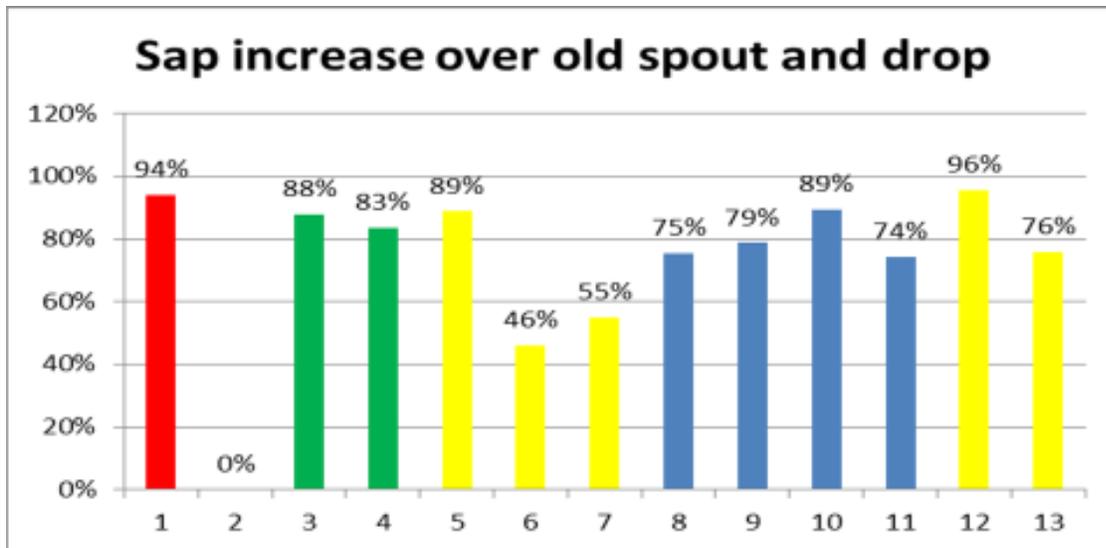
The next chart compares results from all tests conducted at Cornell and Proctor in the 2013 and 2014 maple seasons. The summary shows the relative value of the different styles of treatment with new spout and drop performing the best, followed by check valves followed by new spouts placed on sanitized drops then new spouts and last sanitizing both spout and drop. In the Proctor tests drops and spouts were treated using techniques common in the industry which provide only very short sanitizer contact time.



The 2015 season was very similar to the 2014 season where the season started late in March and much of the syrup made in April. The primary change made in 2015 compared to 2014 was that most of the treatments, 1-11 were conducted in the sugarbush in mid-September to see if working in the woods without the issues of snow and demands of taping time would still be effective. In the case of the sanitizers, drop lines were filled with sanitizer and capped so that they would have sufficient contact time then drained at tapping time in mid-February. Treatments with bleach(12) and peroxide(13) were also conducted at tapping time by removing them from the sugarbush and providing at least 30 minutes of contact time with the sanitizer solution followed by a rinse and dried. These treatments were then returned to the sugarbush at tapping time in mid-February and installed. Results were very similar to those in 2014 with the new spout and drop out performing the old spout (3rd season in use) and old drop (5th season in use) by 94% yielding 11.7 more gallons of sap per tap. Treatments ranged from yield increases of 46% to a high of 96%. Treating in the fall performed only slightly less than the treatments at tapping time. Sanitizing with proper contact time again proves to be very effective to producing excellent sap yield. To make removing the spout and drop convenient quick connects were added just above the drop line T as is pictured below.



- | | |
|--------------------------|------------------------------|
| 1. New spout/new drop | 7. Peroxide/Peroxide Fall |
| 2. Old spout/old drop | 8. New/Bleach Fall |
| 3. New spout/old drop | 9. New/Iso Fall |
| 4. New ck spout/old drop | 10. New/Peroxide Fall |
| 5. Bleach/Bleach -Fall | 11. New/Water wash |
| 6. Iso/Iso Fall | 12. Bleach/Bleach Spring |
| | 13. Peroxide/Peroxide Spring |



- | | |
|--------------------------|------------------------------|
| 1. New spout/new drop | 7. Peroxide/Peroxide Fall |
| 2. Old spout/old drop | 8. New/Bleach Fall |
| 3. New spout/old drop | 9. New/Iso Fall |
| 4. New ck spout/old drop | 10. New/Peroxide Fall |
| 5. Bleach/Bleach -Fall | 11. New/Water wash |
| 6. Iso/Iso Fall | 12. Bleach/Bleach Spring |
| | 13. Peroxide/Peroxide Spring |



In 2014 trials were also run to follow up testing of silver spouts started in 2013 and 2010. In 2013 new silver spouts on old drops on gravity were compared with old spouts and drop showing a 129% increase.

At the end of the season when these were pulled from the tap holes they were simply hung on the drop line T and the lines vacuumed dry, no other cleaning was provided. Then in 2014 they were removed from the T holder and placed in the new tap hole. This second season silver spout test showed they yielded 82% better than the old spout and drop. In the second 2014 silver spout trial, on vacuum, silver spouts were first used in 2010 as well as each year since so that this year was 5th season of use without any other washing or sanitizing other than vacuuming the lines dry after each season. The silver spout on an old drop still out performed the old spout and drop by 21%.



Silver spouts – production history

Gravity

- **2013 – Arnot 129% increase**
- **2014 – Arnot 82% increase 2nd season**

Vacuum

- **2010 – Arnot 67% increase over old s&d.**
- **2011 – Arnot 72 % increase over old s&d 2nd season**
- **2012 – Arnot 13 % inc. 3rd**
- **2013 – Arnot 36% inc. 4th**
- **2014 – Arnot 21% inc. 5th**