

Breathe Better Program Annual Report 2015 – 2016

Summary

The Breathe Better (B²) Program is an anti-idling, clean air campaign directed toward schools. The goal of the program is to protect the health of students, teachers and faculty by reducing vehicle emissions on school campuses across South Carolina. The program is very flexible by nature and can be easily adapted to the needs of any school. B² is a voluntary initiative and there is no cost to participate in the program.

Participating schools are asked to adopt an anti-idling policy and post signage on the school campus to reinforce this policy. Beyond this central condition, schools can participate in a variety of ways.

Table 1 provides a quick snapshot of participation during the 2015-16 school year. Of the 36 participating schools, 80.5% were returning participants and 61% also participated in the Air Quality Flag Program. Twenty-five schools completed a vehicle counting activity to evaluate the effectiveness of their anti-idling policies. This counting activity showed an overall decrease in the number of idling cars (11.2%) and buses (16%).

Table 1. Summary of 2015 – 16 B² Participation

Number of Individuals Reached	47,969
Total Number of Schools	36
Number of Continuing Schools	29
Number of New Schools	7
Counties	10
Platinum Level Participants	20
Gold Level Participants	3
Silver Level Participants	2
Bronze Level Participants	8
Flag Program Only Participants	3
Total # Flag Program Participants	22
Percent Decrease in Idling Cars	11.2 %
Percent Decrease in Idling Buses	16 %

Audience Reached

During the 2015-16 school year, the B² Program reached 35 schools and one Environmental Discovery Center in 10 counties across the state. This roughly equates to:

- 25,481 students and teachers at their schools
- 2,083 parents (assuming one per vehicle counted)
- 155 bus drivers
- And 20,250 visitors to the Environmental Discovery Center at Lynches River Park.

This adds up to a total of 47,969 individuals that were reached by the program.

Schools participated in the B² program in varying ways. Participation levels are outlined in Table 2, along with the number of participants at each level for the 2015-16 school year. Of these schools, 25 reported

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baseline and final vehicle counts (cars and/or buses) to track the effectiveness of their anti-idling campaign and 61% of B² schools also participated in the Air Quality Flag Program.

Table 2. Participation Level Descriptions and Counts for 2015 – 16

Participation Level	Description of Activities		Number of 2015-16 Schools
Platinum	Adopt anti-idling policy, post anti-idling signage, perform vehicle counting activity	and three additional air quality activities	20
Gold	Adopt anti-idling policy, post anti-idling signage, perform vehicle counting activity	and two additional air quality activities	3
Silver	Adopt anti-idling policy, post anti-idling signage, perform vehicle counting activity	and one additional air quality activity	2
Bronze	Adopt anti-idling policy, post anti-idling signage	and one additional air quality activity	8
Flag Program Only	School only participates in the Air Quality Flag Program and does not adopt an anti-idling policy or post signage.		3

Table 3 lists all the participants for the 2015 – 16 school year as well as the number of teachers and enrolled students (or, in the case of the Environmental Discovery Center at Lynches River Park, the number of visitors over the past year).

Table 3. Participating Schools for 2015 – 16

County	School Name	Students Enrolled	Teachers
Anderson	Wren Elementary School	581	32
Charleston	Cape Romain Environmental Education Charter School	136	13
Florence	Environmental Discovery Center at Lynches River Park	20,250	--
Florence	Theodore Lester Elementary School	473	43
Florence	Sneed Middle School	901	53
Florence	Williams Middle School	696	48
Greenville	A.J. Whittenburg Elementary School of Engineering	535	30
Greenville	Camperdown Academy	130	36
Greenville	Christ Church Episcopal School	1132	178
Greenville	Northwest Middle School	800	45
Greenville	Oakview Elementary School	975	55
Greenville	Slater Marietta Elementary School	484	34
Greenville	Taylor's Elementary School	776	44
Horry	Burgess Elementary School	775	43
Horry	Ocean Bay Middle School	1161	69
Horry	Seaside Elementary School	644	42
Lexington	Deerfield Elementary School	470	32
Lexington	Irmo High School	1505	116

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Lexington	Leaphart Elementary School	452	38
Lexington	Meadow Glen Middle School	1058	66
Lexington	River Bluff High School	1769	117
Oconee	Blue Ridge Elementary School	639	57
Oconee	West Oak High School	961	60
Pickens	Central Elementary School	367	28
Pickens	Dacusville Middle School	348	24
Pickens	Holly Springs Elementary Garden Club	215	16
Pickens	Liberty Middle School	500	35
Richland	A.C. Moore Elementary School	419	34
Richland	Conder Elementary School	799	61
Richland	Dutch Fork Academy of Environmental Sciences	543	44
Richland	H.E. Corley Elementary Leadership Magnet School	540	52
Richland	Longleaf Middle School	664	51
York	Doby's Bridge Elementary School	481	37
York	Hunter St Elementary School	431	27
York	Orchard Park Elementary School	785	54
York	Springfield Elementary School	580	42
Totals:		43,975	1,756

Observed Behavior Changes

Twenty-five schools performed baseline and final vehicle counts for personal vehicles/cars and buses – 24 data sets for cars were usable and 21 data sets for buses were usable. At each count, the total number of cars and buses are counted as well as the number of cars and buses that are idling. The total tallies of idling cars and buses from all participating schools are listed in Tables 4 and 5, respectively.

Table 4. Personal Vehicle (Car) Counts

	Initial	Final
Total # of Cars	2083	1909
# of Cars Idling	503	408
% of Cars Idling	24.1%	21.4%
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% Decrease in Idling Cars	11.2%	
# of Cars that Stopped Idling ¹	56.3	

Table 5. Bus Counts

	Initial	Final
Total # of Buses	155	147
# of Buses Idling	59	47
% of Buses Idling	38.1%	32%
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% Decrease in Idling Buses	16%	
# of Buses that Stopped Idling ¹	9.4	

Overall, the percentage of vehicles that were observed to be idling decreased over the course of the school year. At the initial count, 24.1% of car drivers were idling and 38.1% of bus drivers were idling. By the final count, the number of idling cars decreased to 21.4% and the number of idling buses decreased by to 32%. On the whole, idling cars decreased by 11.2% and idling buses decreased by 16%.

¹ This number is calculated using the initial number of idling vehicles and the percent decrease in idling vehicles.

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Of the schools that participated in the vehicle count, only three were new schools and only one new school provided usable data on idling buses. Because the sample size of new schools is so small, many statistics comparing new and continuing schools are not appropriate to discuss. However, it is interesting to note that the percent decrease in idling cars for continuing schools was only 0.86% while the decrease in idling at new schools was 76.6%. Therefore, for the 2015-16 school year, the majority of the decrease in idling vehicles was observed at new B² schools. This suggests that anti-idling behavior was retained at continuing schools and was well received at new schools.

Note: This data is self-reported and may contain inconsistencies, some of which are related to weather. Additionally, the data sets are small. Despite these factors, the overall trend has been towards positive behavioral change.

Estimated Emissions Reductions and Cost Savings

Emissions reductions due to the decrease in idling vehicles were estimated for the following pollutants: carbon dioxide (CO₂), volatile organic compounds (VOCs), carbon monoxide (CO), nitrogen oxides (NO_x), and particulate matter (PM).

These estimations are simplistic in nature and require several assumptions to provide continuity:

1. Each vehicle that “stopped” idling at school did so on all 180 days of the 2015-16 school year. Idling time for each driver was reduced by 15 minutes per day.
 - a. Realistically, each school started participation at different times of the school year and idling times vary.
2. All personal vehicles run on gasoline and all school buses run on diesel.
3. Personal vehicles consume fuel at an average rate of 0.375 gallons/hour while idling² and school buses consume fuel at a rate of 0.5 gallons/hour while idling.
 - a. Realistically, fuel consumption depends on the engine size and type.
4. The following emission rates are assumed for personal vehicles and buses:

Table 6. Emission Rates Assumptions

	Personal Vehicles	Buses
CO ₂ emission ³	19.6 lb/gal	22.4 lb/gal
VOC emission ^{4,5}	3.31 g/hr	4.97 g/hr
NO _x emission	3.77 g/hr	43.51 g/hr
CO emission	71.92 g/hr	25.63 g/hr
PM ₁₀ emission	-- ⁶	1.52 g/hr
PM _{2.5} emission	-- ⁶	1.40 g/hr

² <http://www.fueleconomy.gov/feg/driveHabits.jsp>

³ U.S. Energy Information Administration. <http://www.eia.gov/tools/faqs/faq.cfm?id=307&t=9>

⁴ Emission rates for personal vehicle VOC, NO_x, and CO are calculated as a weighted average of emission rates for idling light-duty gasoline vehicles and light-duty gasoline trucks. Weighted average calculated using 2013 vehicle numbers from: <http://cta.ornl.gov/data/index.shtml>. Emission rates from: <https://www3.epa.gov/otaq/consumer/420f08025.pdf>.

⁵ Values for bus VOC, NO_x, and CO emission rates come from: <https://www3.epa.gov/otaq/consumer/420f08026.pdf>

⁶ PM emissions from gasoline powered personal vehicles are negligible.

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Using the stated assumptions, the following values have been calculated for the number of vehicles that stopped idling during the 2015-16 school year:

Table 7. Emissions, Fuel Waste and Idling Time Avoided

	Single Personal Vehicle	All Personal Vehicles	Single Bus	All Buses	Total
Hours of Idling Avoided	45	2535	45	425	2960
Gallons of Fuel Saved	16.9	951	22.5	212	1163
CO ₂ Emission Avoided (tons)	0.2 tons	9.3 tons	0.25 tons	2.38 tons	11.7 tons
VOC Emission Avoided (lbs)	0.3 lbs	18.9 lbs	0.06 lbs	4.7 lbs	23.6 lbs
NO _x Emission Avoided (lbs)	0.4 lbs	21.2 lbs	0.5 lbs	40.7 lbs	62.0 lbs
CO Emission Avoided (lbs)	7.1 lbs	402 lbs	0.29 lbs	24 lbs	426 lbs
PM ₁₀ Emission Avoided (lbs)	--	--		1.4 lbs	1.4 lbs
PM _{2.5} Emission Avoided (lbs)	--	--		1.3 lbs	1.3 lbs

Assuming an average gas price of \$2.10⁷, the savings in fuel cost from reduced idling throughout the school year would be \$35.49 per passenger vehicle and \$47.25 per school bus. For all vehicles that stopped idling, this equates to a savings of \$2,442.30 over the school year.

⁷ Average 2015 gas price in South Carolina, from AAA Year-End Gas Price Report.

<http://newsroom.aaa.com/2015/12/2015-gas-prices-second-cheapest-in-a-decade-aaa-year-end-gas-price-report/>