Information published by the American Council of Snowmobile Associations is Unreliable

Review by Jeff Erdoes, July, 2015 Photographs by author

The American Council of Snowmobile Associations (ACSA), with support from the International Snowmobile Manufacturers Association (ISMA), publishes a 40-page color booklet titled *Facts and Myths about Snowmobiling and Winter Trails*. (ACSA 2014)
http://snowmobilers.org/docs/ACSA_Facts_and_Myths_book.pdf

ACSA's booklet is distributed freely to the public and to public land managers; its title suggests a purpose to 'set the record straight' about snowmobile recreation on public lands. Yet few of the skiers, snowshoers, snowmobilers and other snow-season users who encounter impacts of unbound snowmobile activity across the wide-open national forests of California and Nevada will acknowledge the 'facts' which ACSA holds forth.

For instance, ACSA posits that forests are better off with snowmobiles instead of bipedal visitors because (as we're told on page 10) "snowmobiles exert dramatically less pressure on the earth's surface than other recreational activities." Furthermore, says ACSA, "wildlife species are disturbed more by cross-country skiers and people on foot than by snowmobiles," (page 18), and "skiers may do more damage to the snowpack than snowmobiles," (page 24).

ACSA portrays (page 13) that all new snowmobiles make less pollution than older models.

ACSA holds forth (page 14) that "scientific monitoring has proven that snowmobiles do not emit gasoline and other contaminants directly into the snowpack or have a negative effect on water quality."

ACSA even informs us (page 16): it's a *myth* that "snowmobiles are noisy and pollute natural soundscapes." ~ ~ ~ ~

Familiar ethics of *Leave No Trace* and *Tread Lightly!* empower citizens to recognize, restrain and even avoid most of the impacts which can arise from avid recreation on public commons. The fulfillment of these ethics occurs when willing citizens are well informed.

Conversely, when forest visitors misapprehend or fail to recognize the potential impacts of their activity on the forest, they lose the ability to avoid or control their impacts. Certainly, reliable education is essential to achieve sustainable practices of sporting recreation.

Clearly, in representations of snowmobile use and impacts, ACSA has a duty to be honest. Yet, a closer look reveals that ACSA misrepresents scientific findings and selectively ignores - and even omits - critical facts. In other words, information offered by ACSA concerning snowmobile recreation is often incorrect and is unacceptable as public education.

Following are a few examples of truncated, contradictory and erroneous information concerning snowmobile activity[1] presented in ACSA's *Facts and Myths* publication about such important concerns as snowmobile pollution of ambient air and remote snow and waters, and snowmobile impacts upon ordinary pedestrian visitors across the public snow scape.

Snowmobile pollution of ambient air:

On page 12, ACSA recognizes the complaint that "snowmobile emissions cause air pollution and harm the environment," but ACSA calls it a *myth*. Yet, in citing a 2006 VOC study (on page 14) in which researchers Arnold and Koel *affirm* that snowmobiles exhaust volatile and noxious compounds such as benzene, ethers, xylene and toluene, ACSA inexplicably bites its own tale.

Besides VOC (volatile organic carbon), snowmobile exhaust products also include particulate matter (PM), complex hydrocarbon (polycyclic aromatic hydrocarbon, aka PAH), carbon monoxide (CO) and other noxious substances (e.g. nitrogen oxides). Exposure to these air toxics presents serious health concerns, including the potential for acute effects.[2] ACSA also contradicts the warnings of Dr. Fussell, co-founder of the 'clean snowmobile challenge'.[3]

Pure air is a extremely valuable resource. ACSA's denials notwithstanding, 'environmental harm' certainly includes contamination of ambient air in and around venues popular for winter recreation. By insisting (on page 26) that "user conflicts" are really just "social conflicts" based on "intolerance,"ACSA completely ignores the physical effects at altitude of poisonous exhaust upon humans. With unabashed duplicity ACSA prods land managers to focus on "requiring all user groups to 'play together in the sandbox.'" That's some smoke for ACSA to blow considering that *power users of wheeled OHVs* are banned from snow-bound trails and areas because snowmobilers really don't like to 'play together' in their wheel ruts.
100 hp snowmobilers would much rather 'share' with 0.3 hp pedestrians.

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[1] For precision, I define snowmobile recreation as a subset of snowmobile activity. *Snowmobile recreation* is the practice of many people who enjoy themselves according to the principles of Tread Lightly! whereas *snowmobile activity* captures the entire spectrum of snowmobile operation, including undesirable events of inexpert, inconsiderate and unlawful driving. Again, for precision, I refer to this undesirable subset of snowmobile activity as *snowmobile misuse*.

[2] At altitude, even brief carbon monoxide (CO) exposure vitiates aerobic pursuits. Oxygen uptake and respiratory gas exchange in many animals including human beings is impaired by (odorless and colorless) CO which, as carboxyhemoglobin (COHb), can take hours to purge from the bloodstream, impairing endurance. Outdoor exposure to carbon monoxide degrades recreation quality and opportunity well before it produces unconsciousness, and the Centers for Disease Control and Prevention affirm that "elevated %COHb levels can occur among persons in open, outdoor settings."

[3] Dr. Lori Fussell, co-founder of the 'Clean Snowmobile Challenge,' states in the National Park Service journal *Park Science*, Volume 17, 1 (July, 1997):
"...snowmobile tourists should be warned of the potential exposure to pollution and taught to recognize early signs of excessive exposure. They can decrease their own exposure by traveling in small groups, touring on windy days, turning off the engines of stationary snowmobiles, avoiding popular destinations during peak season, driving far behind other snowmobiles, and by driving off-centerline whenever safe and legal." http://www.aqd.nps.gov/parksci/vol 17(1)/07

Snowmobile pollution of remote snow and waters:

ACSA claims, on page 14, that "scientific monitoring has proven that snowmobiles do not emit gasoline and other contaminants directly into the snowpack or have a negative effect on water quality." Biting its own tale again, ACSA cites the 2006 VOC study by Arnold and Koel!

Even though VOC can vaporize (escape) from snow-bound deposits into surrounding air, the researchers *still* measured persistent snowmobile exhaust remainders in snowmelt including benzene, ethylbenzene, xylene, and toluene; they identified five of the nine target compounds which were screened! The researchers did not attempt to measure the hundreds of other hydrocarbons spread via snowmobile exhausts, and *they expressly indicate the need to investigate snowmobile pollutants such as polycyclic aromatic hydrocarbon (PAH).*[4] ACSA's mischaracterizations and disregard of research findings work against education.

I have sampled snow from a fresh snowfall which had been promptly overrun and contaminated by a single snowmobile operating unlawfully on protected forest, (through the designated pedestrian area of Tahoe Meadows, Nevada, on the Humboldt-Toiyabe National Forest). The uppermost inches of fresh snow at the sample site were visibly discolored and smelled of gasoline and scorched oil. The snow sample contained measurable quantities of at least 76 varieties of PAH, a considerable fraction being naphthalene ('moth balls' insecticide). These snowmobile exhaust fractions were measured by means of gas chromatography-mass spectrometry. I append those measurements at the conclusion of this review. Measurements which ACSA calls a *myth*.

Many of the various PAH detected in OSV-contaminated snow are listed by the US EPA as known or suspected carcinogens. Some, such as benzo-a-pyrene, are not volatile (boiling point ~ 590° F) but persist in the environment (can accumulate over years) and are toxic to animal life in minute concentrations.

ACSA's denials notwithstanding, there is ample basis for concern about increasing snowmobile pollution of remote waters and its cumulative and long-term effects upon aquatic systems in the Sierra Nevada.

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[4] In 2006 the Yellowstone National Park Center for Resources published the investigations of J. Arnold and T. Koel titled *Effects of Snowmobile Emissions on the Chemistry of Snowmelt Runoff in Yellowstone National Park*, YCR-2006-1. The two-season study targeted a subset of snowmobile emissions known as Volatile Organic Carbon (VOC), five types of which were detected in snowmobile-contaminated snow. ACSA incorrectly characterizes this study as "long term" and "extensive," and summarily ignores the conclusion of its authors, Arnold and Koel, who warn:
"Although VOCs did not appear to be in high enough concentration to negatively impact aquatic systems, a concern arose during the study regarding the large amounts of petroleum based products that originated from snowmelt water observed at the Old Faithful site. These products could contain a different group of hydrocarbons, known as polycyclic aromatic hydrocarbons (PAH), which are much more persistent in the environment than VOCs. The PAHs do not easily dissolve in water and readily settle on the bottom of lakes and streams adhering to sediment particles (ATSDR 1995). In addition, PAHs can also accumulate in plant and animal tissues. Further studies are needed to identify concentrations of PAHs in effluent draining the Old Faithful area to determine possible affects on the aquatic environment there." http://www.nps.gov/yell/parkmgmt/upload/snwmbil_snwmlt_rpt.pdf

US EPA final (2012) exhaust emission standards for snowmobile manufacture:

ACSA argues on page 12 that "snowmobile engines are dramatically cleaner than portrayed." Yet on page 13, ACSA incompletely reports EPA corporate 'fleet average' emissions allowances for 2012 and later-made snowmobiles. ACSA's booklet displays the table below (at left) to summarize US EPA's limits on HC and CO exhaust from new- and future-made snowmobiles.

ACSA 2014:

EPA Snowmobile Emission Standards

Model Year	Emission Standards HC g/kW-hr	CO g/kW-hr	% of Fleet Phase-In
2002 baseline 2-stroke snowmobile	150	400	NA
2006	100	275	50%
2007 – 2009	100	275	100%
2010	75	275	
2012	75	200	

The real table (EPA 2008):

Table 1 of § 1051.103.—Exhaust Emission Standards for Snowmobiles (g/kW-hr) Back to Top

Phase	Model year	Phase-in (percent)	Emission standards		Maximum allowable family emission limits	
			HC	CO	HC	CO
Phase 1	2006	50	100	275		
Phase 1	2007-2009	100	100	275		
Phase 2	2010 and 2011	100	75	275		
Phase 3	2012 and later	100	[1]	[1]	150	400

[1] See § 1051.103(a)(2).

By rejiggering columns and lopping off notes, ACSA has concealed significant details. For instance, ACSA portrays that the final (2012 and later) allowance for emission of carbon monoxide (CO) from a new-made snowmobile is 200 grams per kilowatt-hour, and ACSA's portrayal further suggests that 100% of a manufacturer's snowmobile 'fleet' must meet that standard. Neither of those representations are correct.

Expressed loopholes make EPA's snowmobile exhaust standard non-rigid: into the future, EPA allows a snowmobile manufacturer's 'family average' limit for CO to reach 275 g/kW-hr and, further, allows high-output specialty snowmobiles to exhaust nearly double the 'family average' for CO and hydrocarbon (HC). Columns at the right side of the *right* table set *Maximum allowable family emission limits*: 150 g/kW-hr of HC and 400 g/kW-hr of CO. By concealing the true size of snowmobile exhaust allowances, ACSA works against public education.

Here's the link to the US EPA standard published in the Federal Register. The genuine summary table (copied above at right) appears on the last page of the entry:

https://www.federalregister.gov/articles/2008/06/25/E8-14411/exhaust-emission-standards-for-2012-and-later-model-year-snowmobiles

Of course, ISMA knows and exploits the real allowances. Interviewed in *ArcticInsider* magazine about Arctic Cat's corporate compliance with EPA rules, AC's emissions manager affirms:

"*If a person looks at it straightforward the difference is that maximum carbon monoxide (CO) emissions drop from 275 grams (per kilo Watt-hour) to 200 grams. [But] there is a nice calculation [provided in the EPA rule] that allows the CO to increase to a maximum of 275 as the HC decreases from 75.*"

http://www.arcticinsider.com/Article/QA-with-Glen-Martin-Emissions-Manager-at-Arctic-Cat

ACSA's booklet also fails to mention that EPA rules apply to snowmobile manufacturers, not to individuals who purchase and use snowmobiles. ACSA fails to disclose that final EPA 2012 standards limit the corporate average (HC and CO) emissions of new-made snowmobiles to specified amounts per horsepower, not per mile. US EPA standards do not limit the maximum available horsepower in future snowmobiles: EPA allows *any* snowmobile to burn more fuel (and release more total exhaust waste) per hour making 50 horsepower than it does making, say, 34 horsepower.

As a result, when throttled aggressively, a new-made EPA-compliant snowmobile can release MORE total pollution than would a pre-regulation snowmobile operated modestly for the same amount of time.[5] This demonstrates that power-intensive trends in snowmobile recreation can overwhelm EPA-induced emission improvements, allowing snowmobile exhaust emissions to become more problematic across the Sierra into the future rather than diminish.

While progress has been made in reducing pollution from some snowmobiles, conventional two-stroke models still predominate in California,[6] and likewise off-trail in the Sierra's slope-rich environment. Without any state or regional snowmobile exhaust management to tier from EPA's rock-bottom standard for manufacturers, visitors in national forests of the Sierra Nevada should expect to encounter continued if not increasing OSV exhaust into the future.

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[5] Published emissions factors allow everyone to compare, for example, carbon monoxide (CO) emissions from a new-made 'family average' snowmobile vs a pre-regulation snowmobile (per the 2002 'baseline' factors displayed in ACSA's table). The comparison reveals that the extra horsepower available in a future-made snowmobile enables it to produce, in aggressive applications, more CO per hour than a pre-regulation snowmobile operated modestly, at lower throttle:

Since there are 750 watts per horsepower, and 1000 watts per kilowatt, the term .75 kW/hp serves below to convert kilowatts into horsepower, leaving the remainder in grams of CO emitted per hour (g/hr). The remainder is then converted to pounds of CO emitted per hour (lb/hr):

CO emissions per hour at **50 horsepower** at EPA 2012 snowmobile corporate 'family average' allowance:

(275 g/kW-hr) x (.75 kW/hp) x 50 hp = 10,312 g/hr

(10,312 g/hr) x (1 lb / 453 g) = 22.8 lb/hr

That is 22.8 pounds of CO per hour allowed for a brand new 'family average' snowmobile at **50 hp**

CO emissions per hour at **34 horsepower** from a pre-regulation (2002 baseline) snowmobile:

(400 g/kW-hr) x (.75 kW/hp) x 34 hp = 10,200 g/hr

(10,200 g/hr) x (1 lb / 453 g) = 22.5 lb/hr

That is 22.5 pounds of CO per hour from a 2002 'baseline' snowmobile at **34 hp**

[6] The multi-area survey of recreational snowmobilers published by California's Department of Parks and Recreation Off-Highway Motor Vehicle Recreation Division (October, 2010) indicates that as recently as 2009, more than 95% of all privately-owned snowmobiles used in California were two-stroke models. Even though the initial EPA rules (effective in 2006) were supposed to boost sales of less-polluting four-stroke models, the changeover has in fact been negligible. Survey data can be found on page 17 of the pdf, (page A-23 of Appendix A).

Expanding affects on wildlife and wild habitat:

Most people understand that some snowmobile exhausts enter waters and that some, including noise, become airborne - and that any OSV, when operated off trail, routinely crosscuts *ten times* more snow per hour than any pedestrian shoer or skier might be so bold as to ponder. Ignoring these facts, ACSA stridently insists that "wildlife species are disturbed more by cross-country skiers and people on foot than by snowmobiles."

The implication of ACSA's dismissiveness is that wildlife - from frogs and fishes to foxes and Fishers - would benefit once every person who now walks or skis on snowy wild land switched to snowmobile recreation instead. Even if that would be good for wildlife (it wouldn't), one wonders how recreational snow motorists would warm to the challenge of sharing fresh snow when ten times more snowmobiles suddenly show up to ply hill and dale in every direction (to help wildlife).

On-site visitors see, hear and smell reality:

ACSA insists that snowmobiles are unfairly maligned by *myths*... but the genuine impacts of scarcely-managed snowmobile activity are matters of fact to private land owners and to visitors on national forests and other public commons.

< March 4, 2012

Six years *after* US EPA exhaust emission standards for snowmobile manufacture kicked in, I recorded this site of exceptionally concentrated (idiopathic) snowmobile exhaust waste discharge pendant above headwaters of Forestdale Creek, on Mokelumne Wilderness, California.

Yet, ACSA reminds us:
"scientific monitoring has proven that snowmobiles do not emit gasoline and other contaminants directly into the snowpack or have a negative effect on water quality."

The pair of photographs below show a single location on two different days. I recorded the first photo on Wednesday, April 2, 2014. It shows the site on Mokelumne Wilderness (not far from the foregoing March 4, 2012 photograph) where a one-man Skidoo snowmobile plowed into a void in the snowpack, became stuck, and was finally extracted by the labor of two young men shifting and packing snow over the space of somewhat more than one hour.

Confined in the crater as the snowmobile was finally throttled out, enough exhaust was trapped by the underlying snow to embed the brownish (odorous hydrocarbon-soot) stain in the middle of the crater. I recorded the companion photograph (on the right) five days later (on April 7, 2014), following an intervening snowfall. Notably, the fresh layer of snow has concealed the contaminated floor of the OSV crater.

< Now that the OSV exhaust is encased in the snowpack, this snowmobile impact will surely 'melt away'

... by translocating into a wilderness creek valued by anglers and other multiple use stakeholders who may not even recreate during snow season.

Land pressures from recreation:

One possible measure of 'recreation land pressure' is the timing and intensity of anthropogenic sound. Another type of land pressure is snowmobile traffic congestion. Sadly now, even 'oil pressure' is a metric of vehicular recreation on remote wild lands. Disingenuously, the *only* measure of 'land pressure' offered by ACSA is pounds per square inch upon soil.

Extravagantly, with this single metric, ACSA proclaims: "given responsible use, snowmobiling has less impact than other forms of recreation," adding that skiers with narrow skis "may do more damage to the snowpack than snowmobilers..."

On smooth fresh snow, when an ascending snowmobile overpasses my ski up-track, the vehicle typically penetrates several inches deeper (but sometimes MUCH deeper) than my up-track. Why the difference? Because ACSA's table of static pressures (page 10) flagrantly ignores the dynamics of motion: the greater forward thrust (acceleration) of the snowmobile, the affects of its flailing tread, and the shifting weight distribution of its operator.

< December 15, 2013:
A trace of narrow skis negotiates the troughs of turbocharged plow-lines.

With mendacious duplicity, ACSA warns us:

"Skiers may do more damage to the snowpack than snowmobilers because narrow skis cut deeper into the snow pack and have a heavier foot load."

< December 20, 2013 I recorded this photograph of my inbound ski track side-stepping up fresh snow along the Pacific Crest National Scenic Trail route on Mokelumne Wilderness, approaching Forestdale Divide.

The set trail lasted less than an hour before a snowmobile motorist dogged it all the way onto the designated Wilderness - apparently with intent deliberately to ruin the new-set pedestrian access and render surrounding slopes unsuitable for down-skiing. As can be seen in the vehicle's wake, the OSV cut twice as deep into the snowpack as did my skis.

< January 4, 2006:
(100 hp + speed) vs (0.3 hp + inertia)
The cross-country up-track which I etched this morning with my narrow skis was overrun one hour later by a off-road specialty 'over snow' vehicle. The vehicular impact of belt-driven forward thrust is a fact, not a myth.

ACSA could have offered genuine information about the potential for unbound snowmobiling to impact public resources and forest visitors. ACSA could have empowered specialty motorists with knowledge to reduce or even avoid most OSV impacts. ACSA could have promoted self-restraint for enthusiasts who come to ply public commons with 100 horsepower.

Instead, ACSA indicts all sportsmen for problems which are spread by ill-informed motorists. "User conflicts," says ACSA, are really just "social conflicts" based on "intolerance."

Polycyclic Aromatic Hydrocarbon (PAH) detected in snow contaminated with snowmobile exhaust. Snow sample obtained from Tahoe Meadows (south of NV SR 431), high Ophir Creek drainage near summit 8943. Approximate site coordinates: 39° 18.353' N, 119° 53.997' W

ACSA informs us that these measurements are a *myth*:

Sample ID: Erdoes
Analysis Date: 04/12/2001 1:02
Calculation Date: 04/18/2001 17:12
Injection Sample Notes: 10x dilution of whole extract

Target Compounds

Compound Name	Amount (ug/sample)	Compound Name	Amount (ug/sample)
Naphthalene	54.25	2-methylnaphthalene	24.592
1-methylnaphthalene	23.109	Biphenyl	0.966
1+2ethylnaphthalene	3.293	"2,6+2,7-dimethylnaphthalene"	6.317
"1,3+1,6+1,7dimethylnaphth"	13.549	"1,4+1,5+2,3-dimethylnaphth"	3.743
"1,2-dimethylnaphthalene"	2.523	2-Methylbiphenyl	0.257
3-Methylbiphenyl	1.498	4-Methylbiphenyl	0.63
Bibenzyl	79.942	A-trimethylnaphthalene	1.731
1-ethyl-2-methylnaphthalene	0.585	B-trimethylnaphthalene	2.675
C-trimethylnaphthalene	2.008	2-ethyl-1-methylnaphthalene	0.05
E-trimethylnaphthalene	1.574	F-trimethylnaphthalene	1.566
"2,3,5+I-trimethylnaphthalene"	3.294	"2,4,5-trimethylnaphthalene"	0.563
J-trimethylnaphthalene	0.739	"1,4,5-trimethylnaphthalene"	0.556
"1,2,8-trimethylnaphthalene"	0.038	Acenaphthylene	18.094
Acenaphthene	0.256	Fluorene	3.586
Phenanthrene	10.28	Anthracene	1.732
A-methylfluorene	0.854	1-methylfluorene	0.74
B-methylfluorene	0.193	9-fluorenone	0.58
Xanthone	0.186	Acenaphthenequinone	0.627
Perinaphthenone	0.262	A-methylphenanthrene	1.771
2-methylphenanthrene	2.115	B-methylphenanthrene	0.588
1-methylphenanthrene	0.045	Anthraquinone	0.278
"2,3-Benzofluorene"	0.626	"3,6-dimethylphenanthrene"	0.885
A-dimethylphenanthrene	0.945	B-dimethylphenanthrene	0.489
C-dimethylphenanthrene	1.731	"1,7-dimethylphenanthrene"	1.184
D-dimethylphenanthrene	0.55	E-dimethylphenanthrene	0.99
9-methylanthracene	0.109	Fluoranthene	9.956
Pyrene	8.924	9-Anthraaldehyde	0.916
Retene	0.11	Benzonaphthothiophene	0.065
1-MeFl+C-MeFl/Py	0.291	B-MePy/MeFl	0.536
C-MePy/MeFl	0.475	D-MePy/MeFl	0.23
4-methylpyrene	0.312	1-methylpyrene	0.144
Benzo(c)phenanthrene	0.352	Benz(a)anthracene	0.556
Chrysene	0.883	"Benz(a)anthracene-7,12-dione"	0.098
5+6-methylchrysene	0.12	Benzo(b+j+k)fluoranthene	2.6
BeP	0.819	Benzo(a)pyrene (BaP)	0.188
Perylene	0.046	7-methylbenzo(a)pyrene	0.023
Indeno[123-cd]pyrene	1.345	Dibenzo(ah+ac)anthracene	0.041
Benzo(ghi)perylene	2.401	Coronene	2.266

Polycyclic Aromatic Hydrocarbons

* " " # of isomers of given compound implies that # of different isomers of that compound will have unique data, although the precise structure of that isomer is not known.

** nomenclature which shows # + # or letter implies that those two isomers detected at the same time data presented are the sum of both or either compound.