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Snowmobile Impact on the Natural Environment

Emissions

Recreational two-stroke vehicles including snowmobiles, all terrain vehicles (ATV's), mini-bikes, and other specialty vehicles, are significantly more polluting than four stroke engines due to their poor combustion. The typical snowmobile produces significantly more Carbon monoxide (CO) and unburned hydrocarbons (UHC) than a modern automobile (National Park Service).

Figures submitted to the California Air Resources Board by the snow machine industry show that one snowmobile emits the same volume of hydrocarbons and nitrous oxides as 1,000 cars, and as much carbon monoxide as 250 to 500 automobiles (Bama 1995). Levels of carbon monoxide (CO) and particulate matter (PM) are a primary concern. CO is noxious to humans and PM is a recently confirmed human carcinogen by the Environmental Protection Agency. In February 1999 the EPA announced plans to write emission standards for two-stroke non-road vehicles. The announcement is based on a 1999 EPA document which lists the emissions of non-road spark ignition engines either rated above 19 kilowatts or found in land-based recreational vehicles. The cause for concern stems from a 1991 EPA report entitled "Non-road Engine and Vehicle Emissions Study," which estimates that in the year 2000 recreational vehicles with 2 stroke engines will contribute 15% of all mobile source hydrocarbon emissions and 9% of all mobile source carbon monoxide emissions. These emission estimates do factor in population growth and the effects of regulatory control programs. The effectiveness of all control programs is offset by the anticipated growth in engine production (U.S. EPA 1999).

The EPA determined that emissions of NO_x, HC, and CO from nonroad engines and equipment contribute significantly to Ozone and CO concentration in more than one nonattainment area. The EPA states that air pollution may reasonably be anticipated to endanger public health or welfare. The smoke emissions can be inhaled into the lower lung cavity, posing potential health threat. The EPA also noted that the smoke affects visibility and soiling of urban buildings and other properties (U.S EPA 1999).

In 2002 the U.S. Environmental Protection Agency (EPA) adopted new emission standards for unregulated nonroad engines and vehicles. These standards only apply to newly produced engines that have been made in the U.S. or have been imported after these standards have been

issued. New standards have been adopted for emissions of oxides of nitrogen (NO_x), hydrocarbons (HC), and carbon monoxide (CO) and apply to nonroad engines that previously have never been regulated. These engines include large industrial spark-ignition engines, recreational vehicles, and diesel marine engines.

The significant source of air pollution from these engines is the reason for establishing new emission standards required by Congress under the Clean Air Act. If the emissions from these engines are left uncontrolled, by 2020 these oxides will pose a major threat to the health and safety of the atmosphere (U.S. EPA 2002).

Noise

Snowmobile noise is known to have a negative aesthetic effect on winter walkers, Nordic skiers, and people seeking quietness and solitude. Noise levels are described in decibels (dBA), which express the relative intensity or loudness of noise. The most commonly used weighting scale for noise levels is the typical A-weighted scale or dBA. According to a 1988 report submitted by the International Snowmobile Industry Association, snowmobiles produced since 1975 and certified by the Snowmobile Safety and Certification Committee's independent testing company emit up to 78 dBA from a distance of 50 feet while traveling at full throttle (US Dept. of Interior 1991). For point of reference, the sound level of snowmobiles (78 dBA) falls between the sound level of a diesel truck at 50 feet (80 dBA) and passenger car, 65 mph at 50 feet (75 dBH).

Some states have snowmobile noise *laws*, that is, the maximum legal decibel (dBA) level at 50 feet. They are as following:

- Indiana: muffler required
- Maine: 78 dBA
- Michigan: 78 dBA
- Minnesota: 78 dBA
- Nebraska: muffler required
- New Hampshire 96 dBA
- Utah: noise control device required
- Vermont: 73 dBA
- Wisconsin: 78 dBA

(for sources see: www.uvm.edu/~vlrs/doc/snowmobile_safety)

Wildlife

Dorance *et al.* (1973), Moen (1978), Hudson (1973), Harlow *et al.* (1987) all found that energy use by animals is of crucial importance during the winter. As winter progresses, many animals experience a negative energy balance, with more energy being used to survive than is being consumed in the form of forage. Natural (i.e., predators, snow) or, artificial (i.e., snowmobiles, hunting) perturbations to an animal's environment or behavior which affect, either negatively or positively, an animal's energy balance or stress level can have a substantial effect on survival and

productivity, and can impair immune function. Furthermore, Dorance *et al.*, (1973), Moen (1976) have suggested that additional human caused stress on wildlife in the winter is undesirable since it may increase energy use and stress resulting in increased mortality, decreased productivity, and changes to behavioral adaptations.

Alternatives

Snowmobiles could be altered by switching to a small four-stroke engine with conventional pollution control equipment, running a two-stroke engine slightly lean with catalytic after-treatment, or using two stroke engines with fuel injection would also aid the environment. A study prepared for the National Park Service and the Montana Department of Environmental Quality by Lela and White (2002) concluded

- Commercially-available 4-stroke snowmobiles are significantly cleaner than 2-stroke sleds. Compared to previously tested 2-strokes, these 4-stroke sleds emit 98-95 percent less HC, 85 percent less CO, and 90-96 percent less PM.
- Four-stroke snowmobile NO_x, however, is considerably higher than from a 2-stroke, being increased by a factor of seven to twelve.
- The commercially-available 4-stroke snowmobiles emit roughly 90 percent less toxic hydrocarbons, such as 1,3-butadiene, benzene, formaldehyde, and acetaldehyde, than 2-stroke sleds.
- Four-stroke snowmobiles achieve approximately 40 percent better fuel economy than 2-stroke sleds.
- Use of a catalyst can further reduce snowmobile emissions. The University of Idaho CSC 2002 sled, that incorporates a 4-stroke, closed-loop controlled engine with catalyst, generated the lowest emissions of all sleds tested. Compared to the 4-stroke Arctic Cat sled, the Idaho sled emitted 64 percent less HC, 29 percent less CO, 99 percent less NO_x, and 36 percent less PM (Lela and White 2002).

A proposed way to eliminate environmental and wildlife effects from snowmobiles is President Clinton's ban on snowmobiles in Yellowstone and Grand Teton National Parks that was suppose to take full effect in 2003-2004. The Bush Administration has issued alternatives to the Clinton proposal, which could also apply to other parks and wildlife areas around the country as other options to control the volume of snowmobile activity and limit their negative effects. These alternatives include applying new emissions and noise-reducing technology on all snowmobiles, limiting their access to only major snow roads instead of all of them, and reduce the number of snowmobiles at popular entrances to parks while increasing the number at others; making it easier to regulate the population flow in particular areas (Seelye 2002).

Federal action concerning snowmobiles since 2002

Yellowstone National Park has been at the center of snowmobile controversies since the 1990's when President Clinton and the National Park service declared and outright ban on snowmobile use. This ban has been the center of numerous lawsuits by interest groups and attempts to reverse the total ban has gone through several different court decisions.

Since 2004 there has been a temporary solution adopted that might become new law on snowmobile use in the park. The park has been allowing 720 snowmobiles in the park per day and groups that have ten or more snowmobiles must be accompanied by a guide. The guide is trained to protect snowmobilers from interfering with animals and minimizing the traces snowmobiles leave behind (Brady 2007).

References

- Bama, Lynne. 1995. "Yellowstone Snowmobile Crowd May Hit Limit," *High Country News* (Vol. 27, No.4)
- Brady, Jeff. 2007. "Snowmobiles Likely to Keep Access to Yellowstone." *NPR Morning Edition*, January 15th, 2007.
- Dorance , M.J., P.J. Savage, and D.E. Huff. "Effects of Snowmobiles on White-tailed Deer." *Journal of Wildlife Management*. 39(3):563-569. 1973.
- Fussell, Lori Marie Snook. 1999. " Carbon monoxide Exposure by Snowmobile: Emissions Pose Potential Risk" *NPS Park Science*.
[http://www.aqd.nps.gov/parksci/vol17\(1\)/07carbon.htm](http://www.aqd.nps.gov/parksci/vol17(1)/07carbon.htm)
- Harlow, H.J., E.T. Thorne, E.S. Williams, E.L. Belden, W.A. Gern. "Adrenal Responsiveness in Domestic Sheep (*Ovis ovis*) to Acute and Chronic Stressors as Predicted by Remote monitoring of Cardiac Frequency." *Canadian Journal of Zoology*. 65:2021-2027. 1987.
- Haste, Ron. 1999. California Air Resources Board, Mobile Source Control Division. EM:
rhaste@arb.ca.gov
- Lela, Chad C. and Jeff J. White. 2002. "Laboratory Testing of Snowmobile Emissions." Report prepared for Yellowstone National Park, National Park Service and Howard Haines, Montana Department of Environmental Quality.
[http://www.deq.state.mt.us/CleanSnowmobile/publications/Reports/Lab_Testing_of_Snowmobile_Emissions-\(July%202002\).pdf](http://www.deq.state.mt.us/CleanSnowmobile/publications/Reports/Lab_Testing_of_Snowmobile_Emissions-(July%202002).pdf), accessed May 20, 2008.
- Hudson, R.J. "Stress and In Vitro Lymphocyte Stimulation by Phytohemagglutinin in Rocky Mountain Bighorn Sheep." *Canadian Journal of Zoology*. 51:479-482. 1973.
- Moen, A.N. "Seasonal Changes in Heart Rates, Activity, Metabolism, and Forage Intake of White-tailed Deer." *Journal of Wildlife Management*. 42(4):715-738. 1978.
- Scranton, Eric. 1999. Telephone interview. Department of Environmental Conservation, Office of Mobile Sources
- Seelye, Katharine Q. 2002. "Snowmobilers Gain against Plan for Park Ban." *New York Times*

February 20th, 2002.

United States Department of the Interior National Park Service. 1991. "Revised Draft Environmental Impact Statement for a Wilderness Recommendation." Voyageurs National Park, Minnesota.

United States Environmental Protection Agency. 1999. Office of Mobile Sources L&E:1,3-butadiene (part c). "Control of Emissions from New Nonroad Spark-Ignition Engines Rated above 19 Kilowatts and New Land-Based Recreational Spark-Ignition Engines." <http://www.epa.gov/ttnchie1/efdocs/butadn/c.pdf>

United States Environmental Protection Agency. 2002. Office of Transportation and Air Quality EPA420-F-02-037: 1-5. "Regulatory Announcement: Emissions Standards for New Nonroad Engines." <http://www.epa.gov/OMS/regs/nonroad/2002/f02037.pdf>

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Disclaimer: This report has been compiled by undergraduate students at the University of Vermont under the supervision of Professor Anthony Gierzynski. The material contained in the report does not reflect the official policy of the University of Vermont.