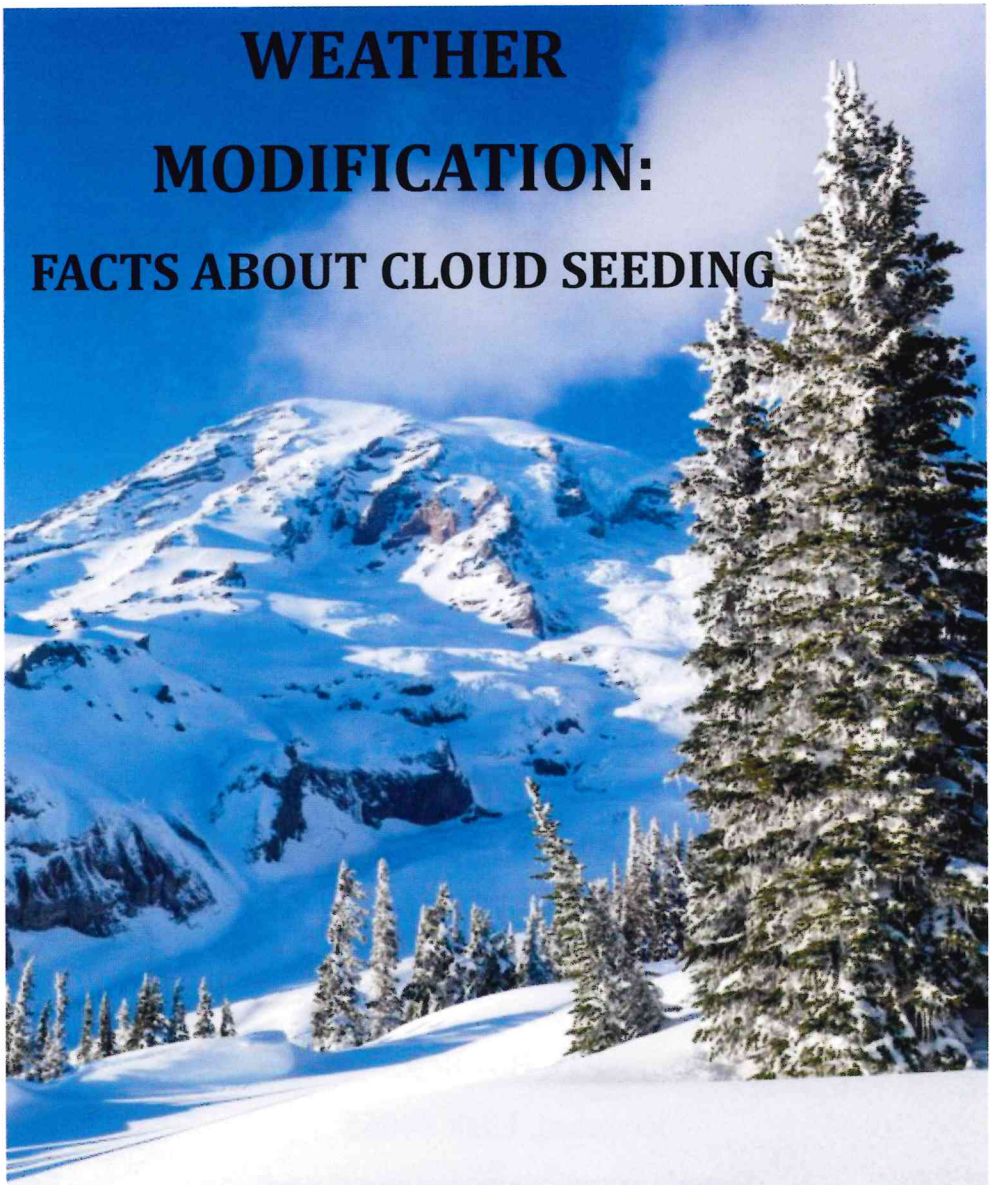
WEATHER MODIFICATION:

FACTS ABOUT CLOUD SEEDING



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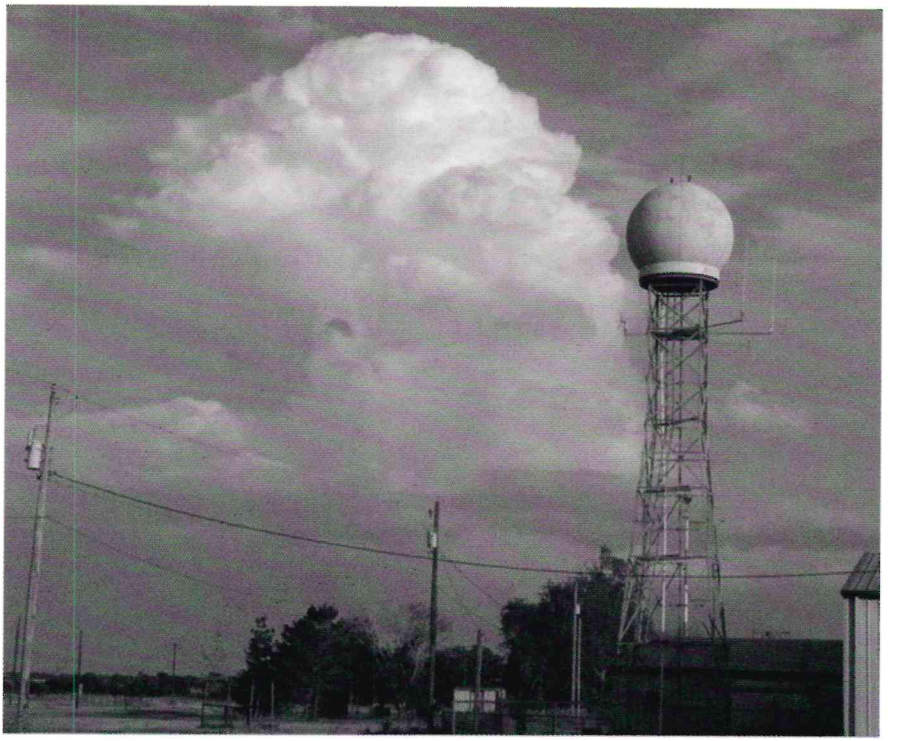
An international organization promoting research, development, and applications of weather modification



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FREQUENTLY ASKED QUESTIONS

When did modern cloud seeding begin?

Modern cloud seeding dates back to the late 1940's, springing from a discovery at the General Electric (GE) labs in Schenectady, New York in 1946. The GE lab discovery led to the realization, through a series of laboratory trials, that flecks of dry ice converted supercooled water droplets (those existing as water at temperatures lower than freezing) to ice crystals . These efforts also demonstrated the ice nucleating properties of various inorganic compounds in certain cold (lower than freezing) cloud conditions. Trials in the atmosphere soon followed, and operational and research cloud seeding projects began in the late 1940's/early 1950's.

In what areas are cloud seeding projects conducted?

There are two major types of project areas; mountainous areas and crop or range lands. Projects in mountainous areas are most commonly conducted to increase winter snowpack, which subsequently increases spring and summer runoff. Other projects are conducted directly over crop or range lands, typically during summertime, to provide more precipitation for agricultural crops or range land vegetation. Projects are conducted in areas which would normally benefit from additional precipitation.

Who typically sponsors cloud seeding projects?

The typical types of sponsors include agricultural organizations, municipalities and hydroelectric utilities. Agricultural organizations desire additional runoff for irrigated agriculture or direct precipitation on crop or range lands during the growing season. Municipalities are interested in enhancing drinking water supplies (via reservoir storage or enhanced streamflow). Hydroelectric utilities can generate additional hydroelectric power from augmented runoff which is either flowing into reservoirs or from enhanced flows in rivers which have hydroelectric generation facilities. Some government entities ranging in size from local governments up to state governments provide cost sharing support to cloud seeding projects.

Is cloud seeding successful?

Yes, it can be very successful. But like any tool it has its limitations, and sometimes cloud seeding can be ineffective. Studies have shown certain clouds or stages of cloud development are susceptible to seeding while others are not. Cloud seeding will not "end" a drought, although it may provide some increases in precipitation even during drought periods.

The seeding agents and methodologies used in present day cloud seeding projects have been developed and refined for over 60 years. There is some consensus that cold cloud seeding technologies can increase area-wide seasonal precipitation by approximately 5-15% when the seeding is effectively applied to suitable clouds.

Various analyses have indicated that the estimated benefit/cost ratios in a number of operational cloud seeding projects have ranged from 5/1 to 15/1 or perhaps even higher in some cases. Other analyses of long-term winter mountainous projects have indicated that additional streamflow from these projects is being produced at a cost of approximately 1 to 10 dollars per acre-foot.

Are there safeguards built into the conduct of cloud seeding projects?

Yes, cloud seeding projects normally have suspension criteria built into the

project designs. Reasons for suspensions may include: 1) excess snow water contents 2) avalanche warnings 3) severe weather warnings and 4) forecasts of extreme rainfall amounts, especially over short time periods. Such suspensions may be temporary or sometimes for the remainder of the scheduled seeding period.

Does cloud seeding have any significant negative environmental impacts?

There is no evidence that suggests cloud seeding creates any significant negative environmental impacts on the environment. Measurements made since the 1950's indicate that the amount of silver iodide deposited in a target area after a long standing cloud seeding project falls several orders of magnitude (multiples of 10) short of the amount known to be toxic to plants, animals, trees, or humans. It is often difficult to detect any silver accumulation above the background amounts naturally present in the environment. Naturally, this kind of investigation continues. See the next FAQ for more information about this topic. Warm cloud seeding is not conducted nearly as frequently as silver iodide cloud seeding, and the effect of warm cloud seeding agents on the environment is not as well known. Warm cloud seeding agents are salts. Preliminary results suggest that because the amounts of seeding agent used are so small, even these warm cloud seeding materials probably do not have any significant impacts.

Is silver iodide harmful to the environment?

As noted in the previous response (with respect to cloud seeding), questions sometimes arise regarding the environmental effects of silver iodide aerosols used in cloud seeding, which include silver iodide aerosol complexes such as silver iodide-silver chloride. Silver iodide is the primary component of silver iodide-based ice-nucleating complexes used in cloud seeding, and all these complexes will be referred to as silver iodide (**AgI**). The published scientific literature clearly shows that *no environmentally harmful effects* arising from cloud seeding with silver iodide aerosols have been observed; nor would they be expected to occur. Based on this work, the WMA finds that silver iodide is environmentally safe as it is currently being dispensed during cloud seeding programs. (See the WMA's 2009 Position Statement on "The Environmental Impact of Using Silver Iodide as a Cloud Seeding Agent" on page 21 of this brochure.

Doesn't cloud seeding rob "Peter" of rainfall to water "Paul"?

It is a common misconception that cloud seeding robs someone of rainfall, or, robs "Peter" to water "Paul". This misconception is often based on the belief that there is limited moisture in the atmosphere. Water vapor is always present in the atmosphere but because it is vapor we do not visually recognize its presence. Calculations indicate that of the amount of water (liquid and vapor) that passes over the Unites States on an annual basis only approximately 10% reaches the ground as precipitation. If cloud seeding results in approximately a 10% increase over some limited geographical area, then only approximately 1% of the water balance is impacted in this limited area. Several studies of the impact of cloud seeding downwind of the intended target areas have indicated that the precipitation is typically increased not decreased, in these downwind areas to distances of approximately 50-100 miles.

Is there any link between cloud seeding and chemtrails?

No. The WMA is unaware of any connection between cloud seeding as is practiced by its members and to what some refer to as "chemtrails" (chemical trails). Atmospheric scientists even dispute the existence of "chemtrails". What some choose to call chemtrails are actually "contrails" (condensed engine exhaust trails), which are well-understood atmospheric phenomena. Contrails are defined as "streaks of condensed water vapor created by an airplane or rocket at high altitudes." These condensation trails are the result of normal emissions of water vapor, carbon dioxide, and some carbon-containing particulates from piston engines and jet engines at high altitudes in which, given the right atmospheric conditions, the water vapor condenses into a visible cloud. Actually, due to the very cold temperatures at high altitudes, the water droplets that initially form this cloud rapidly freeze, forming an ice cloud similar to naturally occurring cirrus clouds. Under certain conditions contrails can merge or contribute to the development of a larger area of cirrus clouds. Contrails are normally observed on otherwise clear days, when cloud seeding would not be conducted. The cloud seeding nuclei from ground or airborne sources do not produce such visible clouds.

This is a sample of the WMA's Frequently Asked Questions. They can be viewed in its entirety at:

http://weathermodification.org/faq.php