

**Testimony**  
**Engrossed House Bill 1166 – Department of Water Resources**  
**Senate Agriculture and Veterans Affairs Committee**  
**Senator Larry Luick, Chair**  
**March 16, 2023**

Chairman Luick, and members of the Senate Agriculture and Veterans Affairs Committee – I am Darin Langerud, Director of the Atmospheric Resource Division of the Department of Water Resources. I am here today to testify in neutral position on Engrossed HB 1166, to provide facts on the scientific benefits of cloud seeding and provide technical expertise on the implications of this bill on weather modification activities within the state.

Engrossed HB 1166 would create and enact a new section under chapter 61-04.1, relating to requirements to cease cloud seeding, amend and reenact several additional sections and subsections of code related to the extension of county weather modification authorities, and prohibit the use of state funding for weather modification operations. These requirements would pose significant impediments to counties choosing to participate in the program by shifting all operating costs to those counties and imposing operational restrictions within the boundaries of the permitted project areas.

Section 1 of HB 1166 would require seeding to cease on a storm exiting the county operations area when the radar reflectivity core of that storm crosses the boundary of a township that borders a township of an adjacent county that does not have an active weather modification program. Longstanding operational guidelines already address the intent of this change, as pilots are instructed to cease seeding storms before they reach the downwind operations boundary. Other variables, such as storm speed, orientation of the radar core, and angular approach to the county boundary are also factors to be considered when making the decision to cease seeding a storm. Employing the township boundary approach in Section 1 would limit operational decision making and seeding effectiveness.

Sections 8 and 9 are related to the State's ability to cost-share with counties participating in the program. The State has long provided cost-share for weather modification operations, with counties paying 66 percent of project costs and the State providing 34 percent. State cost-share for water-related projects is common, and cloud seeding for hail suppression and rain enhancement has been part of that equation for decades. Last year, the State contributed \$250,000 in cost-share toward the project.

Sections 8 and 9 also call into question whether funding for UND student intern pilot training would be allowed. The Atmospheric Resource Board has an MOU with the University of North Dakota for pilot instruction and training, which has placed more than 400 intern pilots on the North Dakota Cloud Modification Project (NDCMP) since 1975. This unique program has launched hundreds of careers in the aviation industry by providing workforce training through classroom instruction and flight experience. Likewise, the Board employs meteorologists and meteorologist interns each summer, with 70 interns trained through the program since 1996. We would support an amendment that would exempt the intern pilots and meteorologists from the state funding ban.

Several independent, scientific evaluations have shown cloud seeding operations in North Dakota increase precipitation in the general range of 5 to 10 percent and reduce crop damage from hail by up to 45 percent. Further, studies show that cloud seeding in upwind operations areas does not reduce downwind precipitation, but enhances it, as seeding effects don't arbitrarily end at county boundaries. This effect is shown to diminish with time and distance downwind.

A recent study by Bangsund and Hodur (2019) at NDSU examined the benefits to the eight most common crops grown in North Dakota. Using long-term estimates of 5-10 percent increases in rainfall and a 45 percent reduction in crop-hail losses, they calculated a direct benefit to agricultural production of \$28.1-\$48.8 million annually.

Estimated state tax revenues gained from the sale of increased crop production ranged from \$576,000 to \$999,000; more than double the amount of state cost-share funds spent on the program. Benefit to cost ratios ranged from 31-53 to 1.

Employing different datasets and methodology, a 2021 study by Michigan State University scientists evaluated the NDCMP and found very similar results. Using 30 (1989-2018) years of insurance data from the USDA Risk Management Agency (RMA) and crop yield data from the National Agricultural Statistics Service (NASS), the study sought to determine if there was any difference in wheat and barley yields and insurance loss ratios for NDCMP counties versus surrounding counties not involved in the program. Their analysis found annual wheat yields in the NDCMP counties were higher by 3.87 bushels per harvested acre, and statistically significant at the 95% confidence level. Moreover, crop insurance loss ratios for wheat were lower for the NDCMP counties. The authors concluded, “Our evaluation indicates that the cloud seeding program had significant positive effects on crop yields and improved loss ratios. The examination offers new evidence about the effectiveness of hail suppression through cloud seeding.” A further analysis of economic benefits yielded a benefit to cost ratio of more than 36 to 1.

According to the World Meteorological Organization, cloud seeding programs are currently operating in more than 50 nations worldwide. Programs are established in ten U.S. western states with new programs or expansions occurring in California, Colorado, Idaho, Nevada, New Mexico, Utah, and Wyoming. Airborne cloud seeding in North Dakota began out of necessity, when farmers in Bowman County couldn't afford the high price of hail insurance due to several years of severe hail losses. In the early 1960s, three entrepreneurs took it upon themselves to equip and fly their own aircraft to protect their crops from hail. Today, the company they established (Weather Modification International, Fargo) is the global leader in the application of cloud seeding technologies, having completed operations and research programs in dozens of countries around the world. North Dakota has been a pioneer in the field,

providing advancements to the science and technology of cloud seeding through its operations, research, and development.

Thank you for the opportunity to testify before you today. I would be happy to address any questions you may have.