The Effects of Ice Mitigation Strategies on Livestock Waterers

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Abstract

The purpose of this project was to determine how ice mitigation strategies affect the ice formation in livestock waterers. How do ice mitigation strategies affect the amount of ice formation in a livestock waterer? As the mean and methods of insulation changes, the ice thickness either increases or decreases. The more insulation that is provided for the water buckets, the more difficult it will be for ice to form and keep the water accessible for a longer period of time. Various ice mitigation strategies were used on livestock waterers to test how they impacted the amount of ice that formed in the water, which was measured through the ice's thickness in centimeters. The more insulation that was provided, the less ice formed in the bucket and the thinner the ice block was. Prior to experimentation, it was hypothesized that as the amount of insulation increased, the amount of ice in the waterers would decrease. Overall, the experimentation proves that with the decreasing trend.

Introduction

This experiment was designed to test the effects of different ice mitigation strategies on livestock waterers and see which method is most effective. The research question is "How do ice mitigation strategies affect the amount of ice formation in a livestock waterer?" As the mean and methods of insulation changes, the ice thickness either increases or decreases. The more insulation that is provided for the water buckets, the more difficult it will be for ice to form and keep the water accessible for a longer period of time.

All livestock owners around the globe deal with water buckets and troughs freezing during cold weather. Because the water needs to be able to be consumed by animals, many typical ice mitigation strategies do not work. This leaves livestock owners faced with the problem of how to provide their animals with safe water during the winter when it is prone to freezing. In addition, they are also faced with the issue of finding a method that does not require electricity. Not all farms have a way to get electricity out to the pastures, and even if they do the power could go out. There are many methods out there, both natural and artificial, so finding the best ice mitigation method for livestock waterers is important.

Frozen water buckets are a problem that almost every livestock owner goes through in the cold weather and it is difficult to find a method that is reasonable and actually works. There are many ways that livestock owners keep their animal's waters thawed. Science is used during these methods because you are finding a way to prevent ice from being formed.

There are many different ways that ice formation is prevented in livestock waterers. Some of them include either insulating them with silver insulation or hay, putting a heater in the water (which not everybody has access to), or digging underground to create an either naturally insulated water system or to create running water that will take longer to freeze. The hypothesis for this project is the more insulation the bucket has, the more effective the ice mitigation will be. This is because there is less chance for the water to freeze because it is more protected.

Methods

- Trial 1: Silver Insulation
- Trial 2: Double layered (two bucket)
- Trial 3: Hay Insulation
- Trial 4: Excessive sun exposure

The dependent variable will be measured in ice thickness (centimeters). The control group will be the bucket with no insulation. The controlled variables will be:

- Location of buckets
- Amount of water in each bucket
- Starting temperature of the water
- Type of bucket
- Amount of insulation/mitigation technique

The materials used in this experiment will be:

- 6 5 gallon buckets
- Hay
- Silver Insulation
- Laundry basket
- Warm water
- Duct tape
- Measuring tape

The procedure will go as follows:

1. Fill a 5 gallon bucket mostly full with warm water.
2. Set it in a paddock with not much sun exposure (this will serve as the control group)
3. Repeat step 1 four more times to create your different independent variables
4. Trial 1-place the trough in a paddock with not much sun exposure, then fully wrap in silver insulation and secure with duct tape.
5. Trial 2-place the trough in a paddock with not much sun exposure, then put it inside another bucket.
6. Trial 3-place the trough in a paddock with not much sun exposure, then surround it with hay as insulation in the laundry basket.
7. Trial 4-place the trough in a paddock with excessive sun exposure and no natural shade
8. Wait 24 hours from set up on all trials
9. Measure the amount of ice in centimeters with a measuring tape in all the buckets.
10. Compare and record results.

Results

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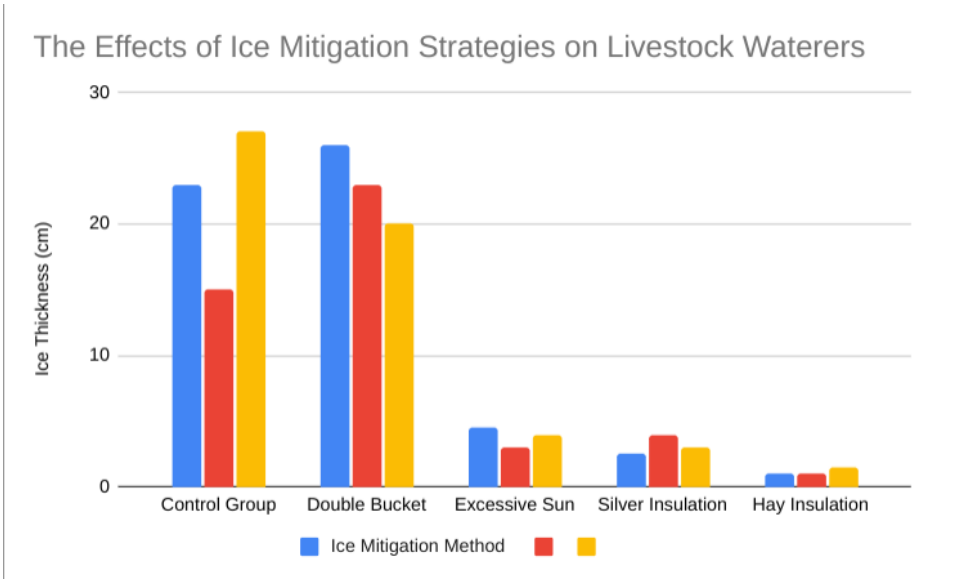
Ice Mitigation Method	Ice Thickness (centimeters)			Average
Control group	23	15	27	21.67
Silver Insulation (Trial 1)	2.5	3	4	3.167
Double Bucket (Trial 2)	26	23	20	23
Excessive Sun Exposure (Trial 3)	4.5	3	4	3.83
Hay Insulation (Trial 4)	1	1.5	1	1.67



As the amount of insulation increases, the ice's thickness decreases. This means that a livestock waterer with more insulation provided (natural or artificial) will take longer to freeze and be accessible to the animals for a longer period of time. For example, the bucket with the hay insulation was packed with about 3 inches of hay around the perimeter, while the bucket with the silver insulation only had about a half an inch. Overall, this means that the hay-insulated bucket will stay thawed for longer.

Discussion

The more insulation provided for the waterer, the less ice formed. This did support my hypothesis, because I hypothesized that as the means and methods changed, the amount of ice in the bucket would either increase or decrease. It was thought that with more insulation, there would be less ice in the bucket.

The results turned out this way because as the amount of insulation increased, there was more material to keep the water warm and the heat stayed trapped in. In my research, I found that for the water's temperature to stay high enough to stay thawed, the heat in the water needed to be trapped in. The hay insulation in the experiment did the best with this.

This project relates to real world situations because freezing livestock waterers is a real problem experienced by the agricultural community. During the winter, if a trough or bucket is not insulated properly, it can freeze rather quickly, especially if the barn doesn't have access to electricity (which is a common problem). Finding ways to keep the water thawed and accessible for long periods of time is a real struggle in the agricultural world and many people look for the best ways to solve that problem.

If I were to do this project again, I would first do more research on ice formation and other ice mitigation methods. This would further my knowledge on the problem and give me more to work with as I go into experimentation. One specific mistake I made was not giving myself enough time to do the testing and then record my results. I would budget more time for this so the project overall could be done to the best of its ability.