ABSTRACT: What are the effects of snow fence variables on wind patterns, and geometry and volume of snow collected in drifts? This question arose from a need to capture winter’s blowing snow to improve water supply during a drought and to protect critical areas from blowing snow.

Last year, during the first phase of this project, various powders were tested to find which would closely replicate snow in a small scale drifting model. It was concluded that Cascade Dish Detergent was the best for modeling wind blown snow. In this year’s continuation, Cascade powder was used to further evaluate the relationship of wind blown snow and snow fences.

Literature research and professional interviews provided information about water supply from drifted snow, wind flow, drifting patterns, wind tunnel modeling, and snow fence variables, but did not describe the effects of varying horizontal board thickness on the wind pattern or the resulting drifts. The intent of this project was to evaluate relationships of fence thickness and porosity to wind direction and speed, and drift geometry and volume.

The model testing system included six scaled model snow fences of varying thicknesses and porosities, a wind tunnel, and apparatus for wind direction and wind speed. Each fence was tested three ways: wind direction, wind speed, and drift geometry. Graphs for each fence were developed to show wind direction and speed, drift profile, and a comparison of wind speed to drift profile. Also, graphs were developed to compare total drift volumes and locations of drift apex for all fences.

Three of the four hypotheses were supported. As fence porosity decreased and board thickness increased, pattern of wind direction changed, wind speed decreased, and the drift apex occurred further upwind. The volume hypothesis for thickness was supported because increased thickness resulted in increased drift volume. However, the volume hypothesis for porosity was denied, because increased fence porosity resulted in increased drift volume.

Based on these results, snow fences can now be designed for specific intents. Other variables that could be tested next include those of terrain, buildings, and wind intensities. The most valuable extension is application of these fence model results to establish full-size fences to collect the snow in desired locations; this will collect more volume of winter wind blown snow to improve water supply in a drought period and keep critical areas free of drifting snow. This project proves potential to “Get the Drift!” into more helpful locations.

Keywords: snow fences, snow control, blowing snow, snowdrifts, snow fence models

1. INTRODUCTION

What are the effects of snow fence variables on the geometry and volume of snow collected in drifts? This question arose from a need to use snow fences to capture winter’s blowing snow in specific locations, rather than allowing it to be lost through sublimation or to accumulate in problematic areas.

Much of the Western United States region is experiencing drought conditions (Figure 1). Residents are seeking ways to increase water availability. Snow blown into a dense snowdrift due to a snow fence melts more slowly than loose snow, providing more water storage, rather than allowing this potential water supply to blow downwind and sublimate. Even during the drought, the snow that does fall can be blown into problematic accumulations. Critical areas to keep free of blowing snow include roadways, driveways, and livestock shelters. Understanding effects of fence variables allows people to protect their property by planned drift placements (Figure 2).
In 2002, during the first phase of this project, various powders were tested to find which would closely replicate snow in a small scale drifting model. It was concluded that Cascade Dishwasher Detergent was the best for modeling wind blown snow. In this continuation, the Cascade powder was used to further evaluate the relationship of wind blown snow and snow fences.

Wind engineering research is extensive, including both field studies and tunnel simulations. Topics are varied, including snow control, buildings, trees, pedestrian comfort, and development of solutions to local problems. Robert Jairell (2002, personal communication) provided instruction about wind flow patterns, drifting patterns, and suggestions for fence variables and procedures. Tabler’s (1994) extensive research on wind and the snowdrifts created by the Wyoming Board Snow Fence provided the data for reference to make sure the control fence was correctly replicating wind patterns, wind speeds, and full-size drift characteristics. Tabler (1994) and his associates have completed extensive work on fence variables, including height, porosity and arrangement. But, the research did not address the barrier’s third dimension, the thickness of the horizontal boards.

The intent of this project was to investigate the barrier’s third dimension, as well as porosity, and their effects on wind direction and speed, and drift geometry and volume.

The question was addressed with 4 hypotheses:
H1: If a decrease in fence porosity changes the pattern of wind direction and decreases the wind speed, then the deepest part of the collected drift will occur further upwind.
H2: If an increase in horizontal board thickness changes the pattern of wind direction and decreases the wind speed, then the deepest part of the collected drift will occur further upwind.
H3: If an increase in fence porosity changes the pattern of wind direction and increases the wind speed, then the total volume of the collected drift will decrease.
H4: If an increase in horizontal board thickness changes the pattern of wind direction and decreases the wind speed, then the total volume of the collected drift will increase.

2. METHODS

2.1 Preparation for Experiments

1) Build 30:1 scaled-down model of 2.1 m Wyoming Design Board Snow Fence as control, with porosity of 50% and horizontal board thickness of 2 boards (Figure 3).

Figure 3. Control Fence 50% Porosity, 2 Boards Thick

2) Build set of model fences, scaled equally to the control, with following variations: a. 0% Porosity, 2 horizontal boards thick (Figure 4); b. 75% Porosity of 75%, 2 horizontal boards thick (Figure 4); c. 50% Porosity, 4 horizontal boards thick; d. 50% Porosity, 6 horizontal boards thick; e. 50% Porosity, 8 horizontal boards thick (Figure 4).

Figure 4. Fence variations, 0% porosity, 75% porosity, and 8 boards thick

3) Build wind tunnel, 325 cm long, 32 cm wide, 45 cm deep, with open top, (Figure 5) powered by 17 amp, 2 speed blower. 4) Build blower support stand, to stabilize blower hose center 3.75 cm above tunnel floor, at center of fences’ height (Figure 5). Build feather support stick, 25 cm long; attach feather with 5 cm thread, 3.75 cm from bottom (Figure 5). Build wind gauge support stand, to stabilize center of sensor propeller 3.75 cm above tunnel floor, at center of fence’s height and perpendicular to wind flow (Figure 5).

Figure 5. Wind tunnel, blower stand, feather support, and wind gauge

2.2 Wind Direction Experiment

1) Secure control fence model on tunnel floor, 270 cm from entry end, and perpendicular to wind flow.
2) Secure blower with opening 50 cm upwind from fence, so wind is blowing directly down center of tunnel, using both blower fans. 3) Using feather system, observe wind direction every cm along centerline, from 40 cm upwind to 150 cm downwind; record findings on wind speed graphs, using symbols (Figure 6).

Flowing Straight Downwind
Oscillating Narrowly Downwind
Oscillating Narrowly Upwind
Oscillating Widely Downwind
Switching between Down & Upwind
Upward Flow
Split Flow, Switching Left & Right
Turbulent Flow

Figure 6. Symbols to represent various wind patterns

2.3 Wind Speed Experiment

1) Secure control fence model on tunnel floor, 270 cm from entry end, and perpendicular to the wind flow. 2) Secure blower with opening 185 cm upwind from fence, so wind is blowing directly down the center of the tunnel, using the faster single fan. 3) Using the wind gauge in kph (kilometers per hour), measure wind speed every cm along centerline, from 40 cm upwind to 150 cm downwind. (Figure 5)

2.4 Drift Geometry (Depth Profile and Volume) Experiment

1) Secure control fence model on tunnel floor, 270 cm from entry end, and perpendicular to wind flow. 2) Secure blower with opening 185 cm upwind from fence, so wind is blowing directly down center of tunnel, using the faster single fan. 3) Place entry sieve 135 cm upwind of fence, 45 cm above floor. 4) Pour 2 measured scoops of Cascade powder, approximately 6.2 kg each, through sieve, steadily over 12-15 minutes, tapping sieve to evenly distribute powder into wind stream. 5) Measure drift’s depth in cm, at every cm along drift at fence’s center, to get longitudinal profile of drift, from 40 cm upwind to 150 cm downwind (Figure 7).

6) Calculate drift volume: Find volume of each centimeter slice of drift, by multiplying length along drift (1 cm), times width of drift (fence) (14 cm), times height of drift. Add all slices’ volumes together to get total volume for the drifts produced by that fence.

3. DISCUSSION OF RESULTS

3.1 Summary of Results

Three of the four hypotheses were supported, because as fence porosity decreased and horizontal board thickness increased, pattern of wind direction changed, wind speed decreased, and the deepest part of the collected drift occurred further upwind. Also as horizontal board thickness increased, drift volume increased. However, the hypothesis for increasing fence porosity decreasing drift volume was denied.

3.2 Results of Wind Direction Experiment

The Control, 50% Porosity, 2 Board Thick Fence, caused the wind to oscillate widely side to side from -10 to -4 cm upwind, then to be turbulent from -4 to -2, then to flow straight forward under the fence from -2 to 3 downwind, then to oscillate narrowly side to side from 3 to 25 cm, then to oscillate widely from 25 to 39 cm, then to oscillate narrowly for the remainder of the distance to 150 cm (Figure 8).
Figure 8. Wind Direction and Speed for Control Fence, 50%, 2 Boards Thick Fence

The 0% Porosity, 2 Board Thick Fence, caused the wind to oscillate widely side to side from -12 to -5 cm upwind, then to split left and right from -5 cm to -3 cm, then to continue split left and right in an upward flow from -2 to 3 cm downwind, then to flow backwards from 3 to 25 cm, then to switch between forward and backward from 25 to 40 cm, then to oscillate widely from 40 to 59 cm, then to oscillate narrowly for the remainder of the distance to 150 cm (Figure 9).

Figure 9. Wind Direction and Speed for 0%, 2 Boards Thick Fence

The 75% Porosity, 2 Board Thick Fence, allowed the wind to continue to oscillate narrowly to oscillate narrowly throughout the entire -40 to 150 cm (Figure 10).

Figure 10. Wind Direction and Speed for 75%, 2 Boards Thick Fence

The 50% Porosity, 4 Board Thick Fence, caused the wind to split left and right from -10 to -6 cm upwind, then to be turbulent from -6 to -3 cm, then to flow straight forward under the fence from -3 to 3 cm downwind, then to oscillate narrowly side to side from 3 to 20 cm, then to oscillate widely from 20 to 40 cm, then to oscillate narrowly for the remainder of the distance to 150 cm (Figure 11).

Figure 11. Wind Direction and Speed for 50%, 4 Boards Thick Fence

The 50% Porosity, 6 Board Thick Fence, caused the wind to split left and right from -9 to -5 cm upwind, then to be turbulent from -5 to -2 cm, then to flow straight forward under the fence from -2 to 3 cm downwind, then to oscillate narrowly side to side from 3 to 13 cm, then to oscillate widely from 13 to 39 cm, then to oscillate narrowly for the remainder of the distance to 150 cm (Figure 12).
Wind Speed Profile - 50% Porosity, 6 Boards Thick

0 2 4 6 8 10 12 14 16 18 20 22
-40 -30 -20 -10 -0.5 8 18 28 38 48 58 68 78 88 98 108 118 128 138 148
Distance from Fence (cm)
Speed of Wind (kph)

Trial 1  Trial 2  Control

Figure 12. Wind Direction and Speed for 50%, 6 Boards Thick Fence

The 50 Porosity, 8 Board Thick Fence, caused the wind to oscillate widely from -11 to -7 cm upwind, then to be turbulent from -7 to -2 cm, then to flow straight forward under the fence from -2 to 1 cm downwind, then to oscillate widely from 1 to 14 cm, then oscillate narrowly from 14 to 28 cm, then to oscillate widely from 28 to 40 cm, then to be turbulent from 41 to 43 cm, then to oscillate narrowly for the remainder of the distance to 15.5 cm (Figure 13).

Wind Speed Profile - 50% Porosity, 8 Boards Thick

0 2 4 6 8 10 12 14 16 18 20 22
-40 -30 -20 -10 -0.5 8 18 28 38 48 58 68 78 88 98 108 118 128 138 148
Distance from Fence (cm)
Speed of Wind (kph)

Trial 1  Trial 2  Control

Figure 13. Wind Direction and Speed for 50%, 8 Boards Thick Fence

The differences in wind pattern and direction are a result of the resistance of the fences to allowing wind to pass through them. The increased resistance slows the wind and causes more to be backed up into turbulent or back and forth flow patterns. Some of the wind flows left, right, or up to go around or over the fence. The area at about -10 cm upwind was a common distance for change in wind pattern, specifically wider oscillations, back and forth, and turbulence, as the wind got backed up at the fence. The few centimeters just upwind and downwind of the fences consistently showed straightforward flow, as the wind was compressed and speeded up between the horizontal boards. The area at about 10 - 25 cm downwind was a common distance for changing oscillations, as the wind that had gone over and around came back in to join the flow going slower downwind, and cause some turbulence. Finally, usually near 40 cm, the pattern had returned to narrow oscillations, as the flow joined back together into straighter laminar flow.

3.3 Results of Wind Speed Experiment

In this experiment, the wind entered the test area at -40 cm upwind of the fence, at approximately 18 kph, and by -15 cm had slowed to about 16 kph, for every fence. The effects of the fences on the wind speeds occurred inside of the -15 cm upwind location.

The Control, 50% Porosity, 2 Board Thick Fence caused the wind speed to gradually decrease to 12 kph between -15 and 0 cm. The speed stayed the same through the fence until 2 cm downwind. Then the speed rapidly decreased to 8.5 kph between 2 and 12 cm, and then increased gradually to about 10 kph between 12 and 39 cm. Then the speed stayed nearly the same during the remainder of the distance out to 150 cm, gradually decreasing to 9 kph (Figure 8).

The 0% Porosity, 2 Board Thick Fence caused the wind speed to very rapidly decrease to 7.5 kph between -15 and 0 cm. The speed was even slower on the downwind side, starting at 2.5 kph at 0.5 cm, and gradually increasing to 4.5, then decreasing back down to 1.8 near 25 cm downwind. Then the speed rapidly increased back to about 8.5 kph between 25 and 40 cm, and gradually increased to 9 to 10 kph by 60 cm. Then the speed stayed nearly the same during the remainder of the distance out to 150 cm, gradually decreasing to 9 kph (Figure 9).

The 75% Porosity, 2 Board Thick Fence caused the wind speed to very rapidly decrease to 7.5 kph between -15 and 0 cm. The speed was even slower on the downwind side, starting at 2.5 kph at 0.5 cm, and gradually increasing to 4.5, then decreasing back down to 1.8 near 25 cm downwind. Then the speed rapidly increased back to about 8.5 kph between 25 and 40 cm, and gradually increased to 9 to 10 kph by 60 cm. Then the speed stayed nearly the same during the remainder of the distance out to 150 cm, gradually decreasing to 9 kph (Figure 10).

The 50% Porosity, 4 Board Thick Fence had a nearly identical wind speed profile to that of the Control, 50% Porosity, 2 Board Thick Fence. The 4-Thick Fence dropped slightly further in speed to
7.8 between 2 and 12 cm, then increased gradually to about 9.5 kph between 12 and 39 cm. Then the speed stayed nearly the same during the remainder of the distance out to 150 cm, gradually decreasing to 8 kph (Figure 11).

The 50% Porosity, 6 Board Thick Fence also had a nearly identical wind speed profile to that of the Control and the 4-Thick Fence. The 6-Thick Fence did not drop further in speed, but stayed near 8 kph for longer, between 8 and 50 cm, then increasing to nearly 10 kph between 50 and 58 cm. Then the speed stayed nearly the same during the remainder of the distance out to 150 cm, gradually decreasing to 9 kph (Figure 12).

The 50% Porosity, 8 Board Thick Fence followed the same pattern, but retained the acceleration through the fence for a greater distance from the fence, from -2 through 4 cm downwind. The speed rapidly decreased to 7.5 kph between 4 and 15 cm, and then increased gradually to 10 kph between 15 and 85 cm. Then, the speed stayed nearly the same during the remainder of the distance out to 150 cm, gradually decreasing to 9 kph (Figure 13).

As in the differences in wind flow patterns, the differences in speed are also a result of the resistance of the fences to allowing wind to pass through them, and the speed changes match closely to the locations of the pattern changes. The increased resistance slows the wind and causes more to be backed up into slower flows. But, some of the wind flows faster left, right, or up to go around or over the fence. The area at about -10 cm upwind was a common distance for sudden speed decrease as the wind met the resistance and backed up air. The few centimeters just upwind and downwind of the fences consistently showed faster flows as the wind was compressed through the boards. The area from about 3 cm downwind to 10 cm consistently had another sudden speed decrease, resulting from the drag of passing over the fence, and also as the air passing through the barrier spread back out and slowed. Then, gradual increases occurred from 10 to about 40 cm, as the flow was being joined from above and the sides, by returning faster flow. Typically, from 40 on out to 150 cm, most of the speeds had returned to about 8-10 kph, as the flow joined back together into more even laminar flow.

### 3.4 Results of Drift Geometry Experiment

The Control, 50% Porosity, 2 Board Thick Fence resulted in the traditional drift produced by the Wyoming Design Board Snow Fence, after which it was modeled. The Control Fence resulted in a lens shaped downwind drift, with a partially steep front and a gradually tapering tail, with the drift apex at 6 cm downwind, depth of 3.45 cm, and tapering down to .2 cm at 132 cm. The small upwind drift began at -5 cm, with the apex at -2, depth of 1.5 cm (Figures 14 and 15). Total volume collected by this fence was 2,305.8 cubic cm (Figures 16).
The 0% Porosity, 2 Board Thick Fence resulted in a drift very different than the Control. The small downwind drift began more shallowly at the fence, with the apex further away at 37 cm, shallower depth of 1.1 cm, tapering down to .2 at a closer 78 cm. The large upwind drift began much further out at -15 cm, with the closer apex right at the fence at -0.5, much deeper depth 7.5 cm, as deep as the fence (Figures 17 and 15). Total volume collected by this fence was 1,797.9 cubic cm, much less than the Control, despite the large upwind drift (Figure 16).

The 75% Porosity, 2 Board Thick Fence resulted in a downwind drift similar to the Control, but located further downwind, and without as evident of a lens shape. The drift apex was at 34 cm downwind, shallower depth of 2.1 cm, and tapering down to .2 cm at similar 134 cm, and there was no upwind drift (Figures 18 and 15). The total volume was 2,324.0 cubic cm, more than the control, due to the 1-2 cm depth being maintained over a longer distance (Figure 16).

The 50% Porosity, 4 Board Thick Fence resulted in another drift similar in shape to the Control, but located further upwind and with increased volume. The downwind drift apex was closer at 0.5 cm, with a similar depth of 3.3 cm, and tapering down to .2 cm still closer at 122 cm. The small upwind drift began further out at -12 cm, with the apex at -0.5, depth of 3.3 cm (Figures 20 and 15). Total volume was 2,598.4, larger than the control, due to a larger upwind drift (Figure 16).

The 50% Porosity, 6 Board Thick Fence resulted in another drift similar in shape to the Control, but located slightly further upwind. The downwind drift had a partially steep front, and gradually tapering tail. The downwind drift apex was the same at 6 cm, but a shallower depth of 2.6 cm, and tapering down to .2 cm closer at 130 cm. The small upwind drift began at -6 cm, with the apex at -0.5 cm, depth of 1.5 cm (Figures 19 and 15). Total volume was 2,302.3 cubic cm, similar to the control (Figure 16).

The 50% Porosity, 8 Board Thick Fence resulted in another drift similar in shape, but located even...
further upwind and with even higher volume. The downwind drift apex was right at the fence at 0.5 cm, depth of 4.2 cm, maintaining at least a 1.5 depth out to 78 cm, and then and tapering down to 0.2 cm closer at 102 cm. The substantial upwind drift began even further out at -17 cm, with the apex further upwind at -1 cm, deeper depth of 4.9 cm (Figures 21 and 15). Total volume was 2702.0, largest of all the fences (Figure 16).

The pattern of drift depositing followed the wind pattern and speeds closely for the 2 Board Thick fences; where the wind pattern changed and speed was the lowest, the drift depth was the highest (Figures 14, 17, and 18). This did not happen as closely in the fences of increasing board thickness; the drift depth increased where the wind began to show turbulence and slow down, making the apex deeper and further upwind (Figures 19, 21, and 22). The drag of the particles over the thicker barriers may have slowed the wind more than shown in measurements with wind alone, and may have resulted in the drift deposits upwind of the slower “wind-alone” areas.

### 3.5 Discussion of Hypotheses

Hypothesis 1 was supported. As porosity of snow fences decreased from 75% to 50% to 0%, the area affected by wind lengthened both up and downwind, from no affect, -10 to 40, and -12 to 60, respectively. The occurrences of turbulence, back and forth, and upward flows also increased. The wind speed decreased from lows of 10 kph, to 8.5 kph, to 2 kph. These changes to the wind, by decreasing porosity, affected drift deposition, resulting in the deepest part of the drifts occurring further upwind. The 75% fence produced a drift apex at 33 cm downwind, the 50% fence at 7 cm downwind, and the 0% fence at -0.5 cm upwind. This occurred because decreased porosity creates less open space, which interfered with the smooth flow and speed of the wind, and allowed fewer particles to be carried far through the openings.

Hypothesis 2 was supported. As the thickness (the third dimension) of the horizontal boards increased from 2 boards to 4 to 6 to 8, the area affected by wind lengthened slightly both up and downwind, from -10 to 40, -10 to 41, -10 to 41, and -12 to 43, respectively. The occurrences of turbulence, back and forth, and upward flows stayed similar as thickness increased from 2 to 4 to 6, but 8 had more turbulence and widely oscillating flows upwind and downwind of the fence. The wind speed accelerated more as it passed through the 6 and 8 thick fences, and maintained the speed for a longer distance downwind of the fence. But, the wind speed eventually decreased more with thicker fences with lows of 8.5 kph, to 7.8 kph, to 7.8, to 7.5. Even these slight changes to the wind, by increasing thickness, affected drift deposition, resulting in the deepest part of the drifts occurring further upwind. The 2-thick fence produced a drift apex at 7 cm downwind, the 4-thick at 6 cm downwind, the 6-thick at 1 cm downwind, and the 8-thick at -0.5 cm upwind. This occurred because even though the increased thickness at first caused wind acceleration through the boards, that acceleration was not maintained far beyond the fence. The thickness also resulted in more drag on the particles, which interfered with the smooth flow and speed of the wind, and allowed fewer particles to be carried far through the openings.

Hypothesis 3 was denied. As explained above in Hypothesis 1, the increase in porosity did change the pattern of wind direction and increase wind speed. But, increase in porosity did not decrease the total volume of the collected drifts. The 0% fence produced a total drift volume of 1,797.9 cubic cm, the 50% fence produced 2,305.8 cubic cm, and the 75% fence produced 2,324.0 cubic cm. The hypothesis was based on the idea that higher porosity would allow the wind to maintain its speed and straight flow, thereby carrying particles beyond the drift collection. The lowest porosity fence did not collect much volume because the wind split and accelerated around the fence, carrying much of the powder away to the outside of the fence. The 75% fence, the highest porosity, collected more than expected, possibly because a 25% change wasn’t enough open area to maintain wind speed to carry particles beyond collection.

Hypothesis 4 was supported. As explained above in Hypothesis 2, the increase in horizontal board thickness did change the pattern of wind
direction and decrease overall wind speed. Increase in thickness did increase total volume of the collected drifts. The 2-thick fence and 4-thick fences produced similar total drift volumes of 2,305.8 and 2,302.2, respectively; the increase showed as the 6-thick fence produced 2,598.4 cubic cm, and the 8-thick fence produced 2,702.0 cubic cm. This pattern occurred because the wind differences were only slight between 2-thick and 4-thick, so the drift volumes were similar. The increased thickness resulted in a higher drag on the particles trying to pass over the thicker fence panel, so they were deposited and contributed to the higher drift volume.

4. CONCLUSION

The intent of this project, to address the barrier’s third dimension, as well as porosity, and their effects on wind direction and speed, and drift geometry and volume, was fulfilled with applicable results.

Three of the four hypotheses were supported. As fence porosity decreased and board thickness increased, pattern of wind direction changed, wind speed decreased, and the drift apex occurred further upwind. The volume hypothesis for thickness was supported because increased thickness resulted in increased drift volume. However, the volume hypothesis for porosity was denied, because increased fence porosity resulted in increased drift volume.

Based on these results, snow fences now can be designed for specific intents. Other variables that could be tested next include those of terrain, buildings, and wind intensities. The most valuable extension is application of these fence model results to establish full-size fences to collect the snow in desired locations; this will collect more volume of winter wind blown snow to improve water supply in a drought period and keep critical areas free of drifting snow. This project proves potential to “Get the Drift!” into more helpful locations.

5. APPLICATIONS, IMPROVEMENTS, AND EXTENSIONS

The applications of this modeling project focus on increasing water availability and protecting critical areas from drifting snow. Specific suggestions for application of the results include:

1. Water supply spread over a large field could be increased by using a 75% Porosity, 2 Board Thick fence placed along the upwind edge of the field (increasing fence porosity increases the length of the drift, decreases the depth, and moves the apex further downwind) (Figure 22).

![Figure 22. 75% Porosity Fence results in longer, shallower drifts](image)

2. Water supply concentrated into a small area, such a small reservoir or gully, could be increased by using a 50% Porosity, 8 Board Thick fence placed directly on the upwind edge of the area. For further concentration, add a 0% Porosity, 2 Board Thick fence placed directly on the downwind edge of the area (increasing board thickness decreases the length of the drift, increases depth, and moves the apex further upwind, and 0% porosity decreases length of the drift, increases depth on the upwind side of the fence, and moves the apex to the upwind side of the fence) (Figure 23).

![Figure 23. 8 Board Thick Fence combined with 0% Porosity Fence results in short, deep drifts](image)

Results were affected by the following factors, which could be improved:

1. Turbulence in Tunnel – the Wind Direction Experiment revealed more turbulence than anticipated throughout the tunnel, beyond the influence of the snow fence. The tunnel could be improved by widening enough to allow for straighter flow.

2. Drifting Time – the substances were drifted for about 12 minutes and achieved mid-stage drifts. Jairell and Tabler’s (2000) outdoor models were drifted for 2 hours to achieve an equilibrium drift. Equilibrium drifts in models would show more of the actual end result rather than a trend toward the end result.

Extensions to the modeling experiments should next include terrain variables and changing wind intensities. Also, including model buildings and livestock areas should investigate fence placement, setbacks, and angles to the wind. The most needed extension would be to apply the results from the model to set up real size fences to
enhance water supply and to keep critical areas clean of snow.

Continued study and use of snow fences will “Get the Drift!” exactly where it is needed for the most benefit from winter wind and snow.

6. ACKNOWLEDGEMENTS

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Second, I’d like to thank my Dad, who helped me build the fences and clean up the garage.

7. REFERENCES


