



Davenport Living Snow Fence Demonstration in Washington State

Wednesday, 2:00PM - 4:00PM

Andrew B. Perleberg
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Pacific Northwest Agroforestry Workshop & Field Tour
September 17-19, 2019. Spokane, WA



National
Agroforestry
Center



Oregon State University
College of Forestry



Forestry

WASHINGTON STATE UNIVERSITY
EXTENSION



LIVING SNOW FENCE PROJECT

Landowner

BILL AND KATHY REINBOLD

Sponsors

WASHINGTON STATE DEPARTMENT OF FISH & WILDLIFE

USDA NATURAL RESOURCES CONSERVATION SERVICE

LINCOLN COUNTY CONSERVATION DISTRICT

USDA NATIONAL AGROFORESTRY CENTER

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

WASHINGTON STATE UNIVERSITY EXTENSION

INLAND POWER AND LIGHT COMPANY

Problem

- Abundant snowfall drifts along roadways:
 - impacting farm operation
 - creating hazardous conditions for wintertime highway travel
 - requiring additional snowplow clearing maintenance
- Broad belief that *trees will not grow here*

Rationale for Demonstration Experiment

- Snow fences are common in areas subject to significant snowfall, such as the Great Plains and upper Midwest
- Successful demonstrations in southeastern Idaho and small-scale dry land test plantings of junipers near Ritzville, Wash., suggested that living snow fences could be useful for reducing snow drift on roadways in eastern Washington.

A demonstration was needed to help landowners and the affected public, in particular motorists, visualize their utility for lessening snow drift on roads in this region of Washington.

Purpose

- The primary purpose of this planting was to **demonstrate implementation and survival.**
- A secondary purpose was to **observe tree growth and row variability.**



**Demonstration was not intended to measure snow-catching effectiveness*

Learn more: Gary Kuhn, Donald P. Hanley, and Kevin R. Gehrlinger

"Davenport Living Snowfence Demonstration: Five-Year Update," Northwest Science 83(2), 163-168, (1 April 2009).

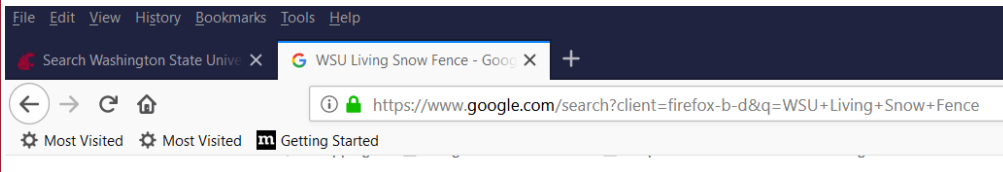
**We are trying to
demonstrate a no- or low-maintenance living snow fence**

**Because
snow drifts dangerously over highways and driveways**

**So
there are opportunities to incorporate agroforestry
technologies into dryland farm and ranch management
adjacent to roadways.**

**If we do this, we will
provide safe travel for people
and
reduce roadway snow clearing maintenance
and
demonstrate a feasible, functional live fence system.**

Literature and Photos Available Online



About 188,000 results (0.42 seconds)

Living snow fence thrives, surprises - WSU Cahnrs

<https://cahnrs.wsu.edu> › [blog](#) › 2015/12 › [living-snow-fence-thrives-surpri...](#)

Dec 21, 2015 - For the past decade, **WSU's Living Snow Fence** has survived and thrived near Davenport. The fence was planted in 2003 to show that Great ...

'Living snow fence' shows promise for E. Washington ...

<https://www.capitalpress.com> › [ag_sectors](#) › [research](#) › [living-snow-fence-sh...](#)

Jan 25, 2016 - of Gary Kuhn Washington State University Extension forester emeritus Donald Hanley inspects the living snow fence planted 10 years ago ...

Images for WSU Living Snow Fence



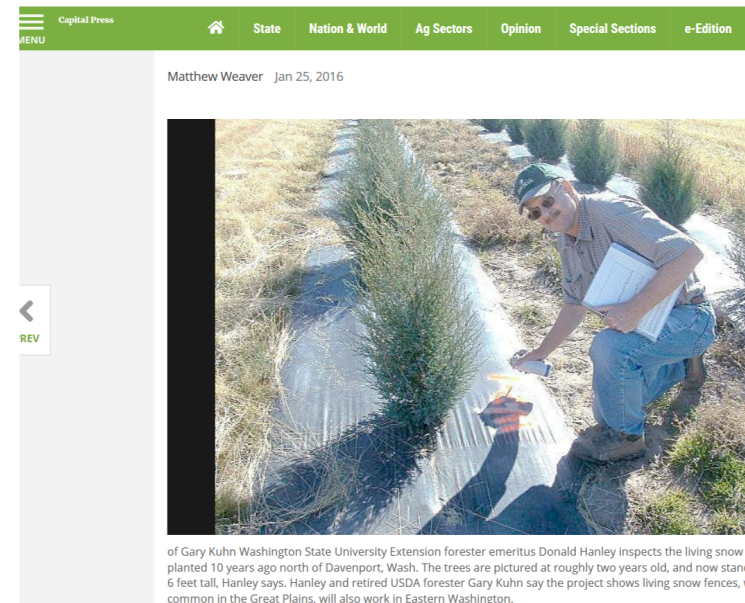
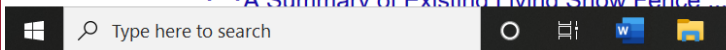
→ [More images for WSU Living Snow Fence](#)

Davenport Living Snowfence Demonstration

<https://www.aftaweb.org> › 104-2008-vol-16 › [september-no-4](#)

Apr 1, 2014 - Davenport Living Snowfence Capturing Snow in January
WSU Extension and Mark Stannard, USDA-NRCS Measure ...

[PDF] A Summary of Existing Living Snow Fence

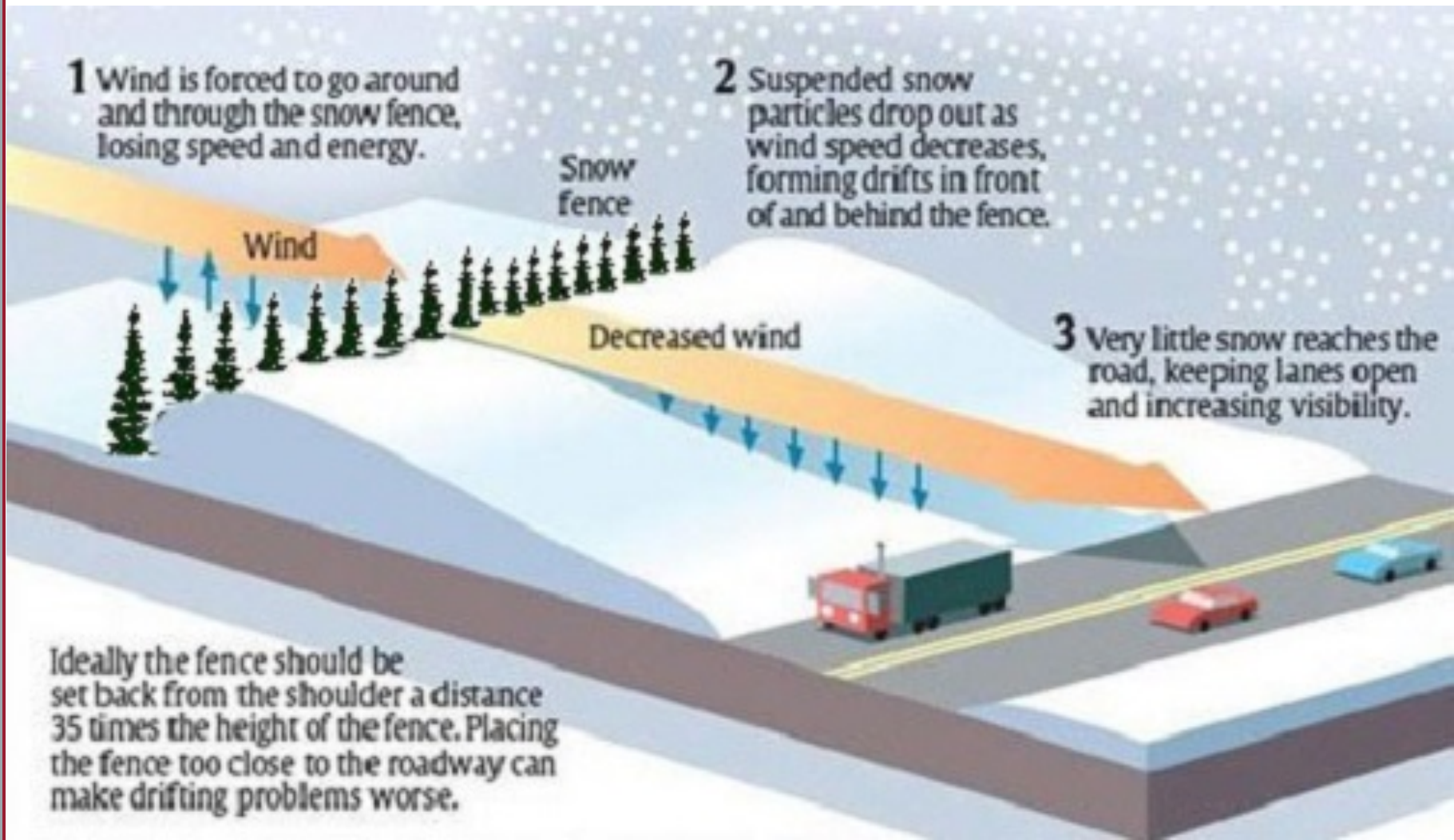


DAVENPORT LIVING SNOW FENCE DEMONSTRATION: TEN-YEAR SURVIVAL AND GROWTH UPDATE

By
Donald Hanley, PhD, Extension Forester Emeritus, School of the Environment, WSU, **Gary Kuhn**, State Forester, (retired), USDA Natural Resources Conservation Service, Spokane, **Dennis J. Robinson**, State Forester, (retired), USDA Natural Resources Conservation Service, Spokane, **Andrew B. Perleberg**, Extension Forester, WSU, Wenatchee, **Brenda Hanley**, PhD student, Bioinformatics and Computational Biology Program, University of Idaho, Moscow

Conceptualization

Evergreen trees and shrubs make excellent snow fences to reduce wind and trap snow along road sides and other areas where drifting snow may pose problems for drivers (Brandle and Nickerson 1996)



Study Area

Route 25 north of Davenport, Washington



© Nations Online Project

Rocky Mountain Juniper (*Juniperus scopulorum*)

- To 35ft in height
- to 7,500 elev
- Winter hardy
- Wide range of soil and moisture
- Long-lived; slow-growing



Range of Rocky Mountain Juniper (*Juniperus scopulorum*)



*Map by Elbert L. Little, Jr., of the U.S. Department of Agriculture,
Forest Service*



Butte, MT

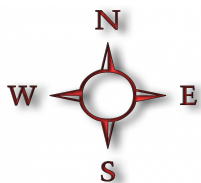
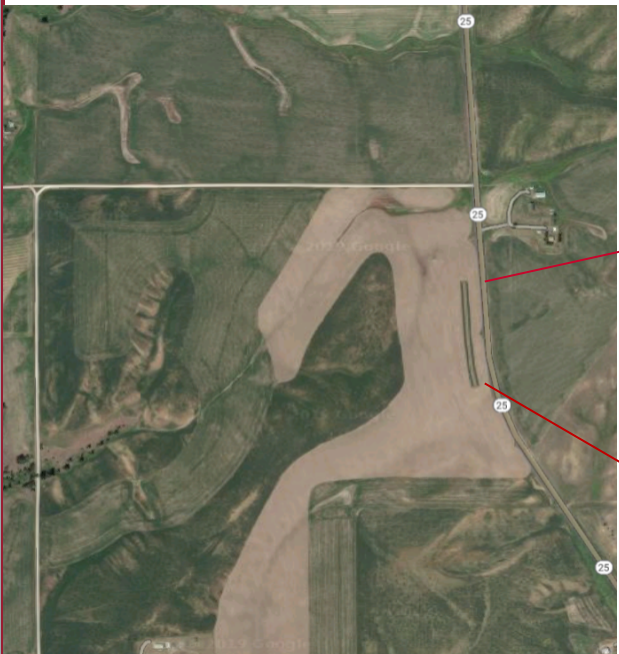


Photo by GoogleEarth





Wildlife – Food and Shelterbelt

- Twigs and leaves consumed by mule deer and white-tailed deer
- “Berries” (fruit + seeds) for birds like cedar waxwings and small mammals
- Cover for nesting, hiding
- Shelter from weather

Cultural uses of the Rocky Mountain Juniper

- Incense in purification and ritual, tea for aches and pains, anesthetic (Kindscher 1992)
- Bows, arrow shafts, furniture
- Beautification
- Erosion Control
- Windbreaks
- Snow Fences



The Day No Cows Would Die



Montana Lost 37,000 Cattle To Brutal Winter

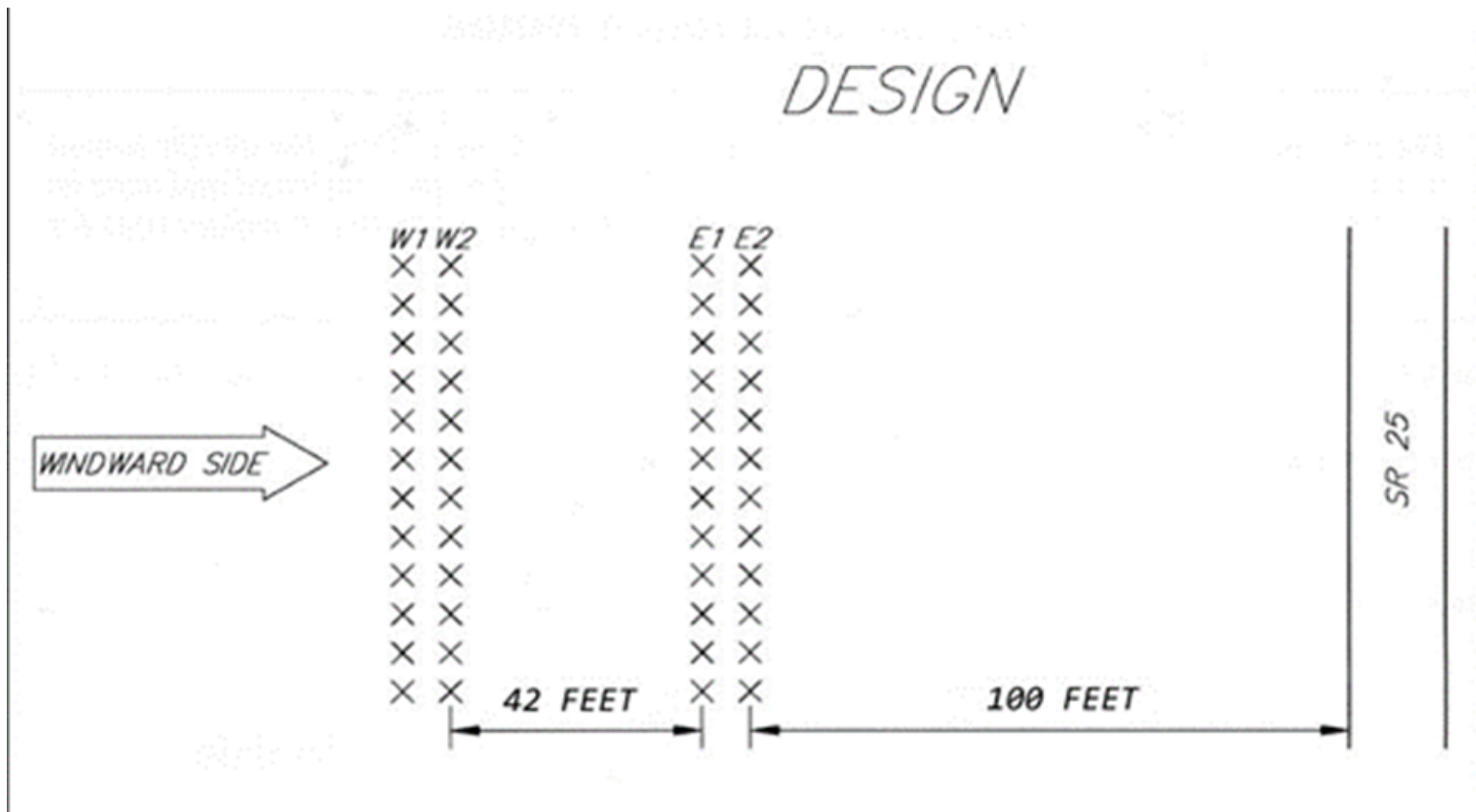
Photo: <https://www.bovinevetonline.com/>

Livestock Indemnity Program (LIP) paid out \$11.1 million for the loss of 37,352 cattle in Montana in 2018. – USDA

South Dakota – 70,000 in 3-day October event

Washington Feb. 9, 2019 1,850 cows died from blizzard; \$3.7 million

Container-grown Rocky Mountain juniper seedlings of the Bridger Select province (USDA-NRCS Plant Materials Center, Bridger, MT) were grown at the **University of Idaho** greenhouse for one year. In 2003, **532 seedlings** were **planted in four 880-foot-long rows** using a **double, twin-row, high density design**.



- Dry cropland soil consisting of a deep silt loam (USDA-NRCS 1981).
- About 13.8 inches of total precipitation (30 inches of snow) annually with very little precipitation from July through September (U.S. Census Data 2015)



Spring 2003



Fall 2003



Fall 2004



Fall 2009



Fall 2010



Fall 2013



Fall 2018

Development of the snow fence over time

**** these trees were grown with Lumite ground covering and were never irrigated**



Seedling should be placed in a hole or furrow large enough to contain the entire root system without bending.

Management

Weeds and other competing vegetation must be controlled during the first and second years of establishment.



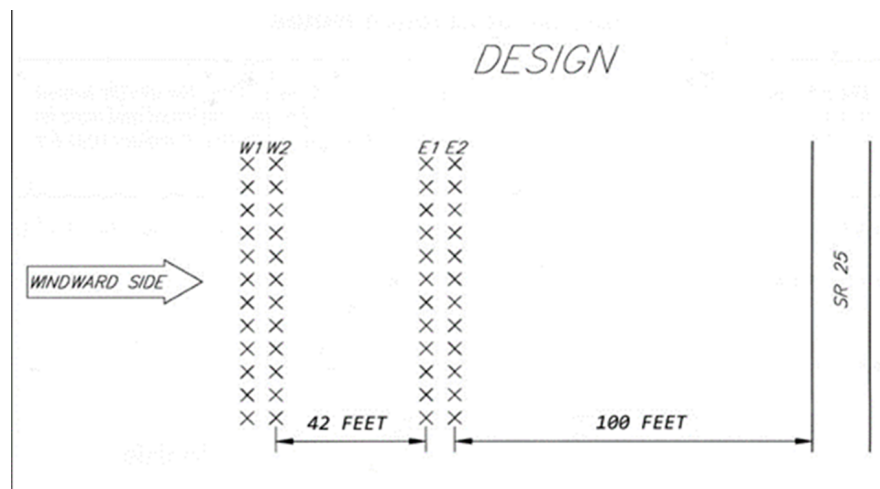
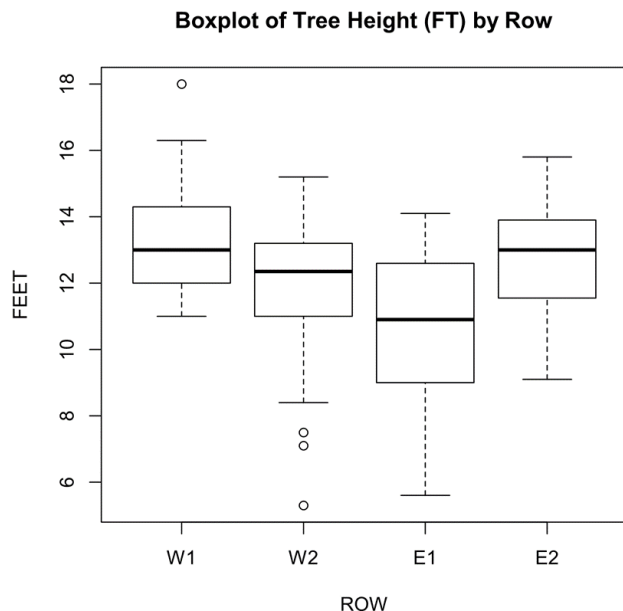
Care should be taken to protect young seedlings from feeding damage by small rodents, rabbits, and deer.

Pests and Potential Problems

Rocky Mountain juniper is relatively free of serious insect and disease problems. It is the alternate host for the cedar-apple rust disease which does very little harm to this species, but causes serious damage to apples and other pome fruits. (*USDA NRCS Plant Materials Program*)

Results

- 99% survival at 15 years
- Grew significantly taller during this period; Ave Ht = 12.1ft., Crown W = 6.8ft.
- Significant difference exists between rows; No significant difference in crown widths.



- “Windy edge” of both clusters makes a difference.
- “Rain Shadow Effect” makes a difference; Windward most row (W1) receives and hold the most snow and moisture, AND not all snow comes from the prevailing wind direction. The two most inward rows (W2 and E1) are in the “rain shadow” and thus grow slower. * supplemental irrigation, if available, is expected to improve these growth results.

More interesting results

- 12 extra trees planted at the north end of the rows, but without Lumite® fabric mulch. Extra trees were half the height and had less than half the crown width as those planted with fabric mulch. In addition, only 60% of them survived 10 years (Kuhn et al. 2009).
- After 15 years, fabric mulch showing signs of deterioration. The crowns are large enough now to completely cover the fabric in most cases. It is not known how long the fabric will last in this area's dry climate. Or if the trees will require its benefits as the roots grow deeper into the soil.

Almost 100% reduction in drifts at LSF Project

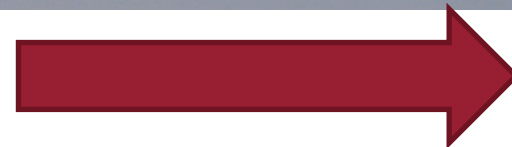


"Don't recall any unplanned maintenance since the fence was planted. Before, it was a daily need during drifting conditions. We had 1-2 dozen incidents a year." WDOT

After 5 years of establishment, functional for trapping snow



Prevailing wind



Conclusion

This 15 year-old Rocky Mountain juniper living snow fence demonstration, on dryland conditions, has shown that **excellent tree height and crown- width growth, coupled with very high survival rates, can be achieved** in eastern Washington.



Conclusion

High survival rate (99%) achieved by:

- excellent site preparation
- high quality nursery stock of a hardy species
- proper planting technique
- high quality Lumite® groundcover



Co-authors

Donald Hanley, PhD, Extension Forester Emeritus, School of the Environment, WSU

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Brenda Hanley, PhD, Postdoctoral Scientist, Department of Population Medicine and Diagnostic Science, Cornell University College of Veterinary Medicine, Ithaca, NY.



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Thank you for your attention!

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