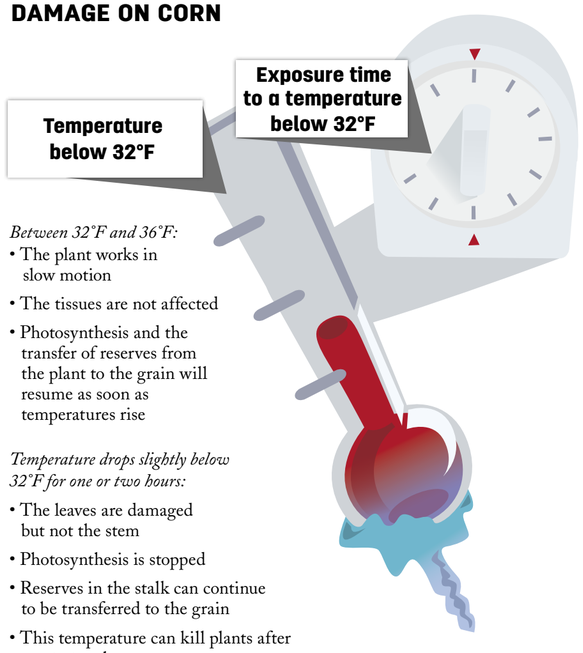
Frost damage on corn 101

Maxime Leduc for *Progressive Forage*

PROGRESSIVE FORAGE
HAY | SILAGE | PASTURE

FACTORS INFLUENCING FROST DAMAGE ON CORN

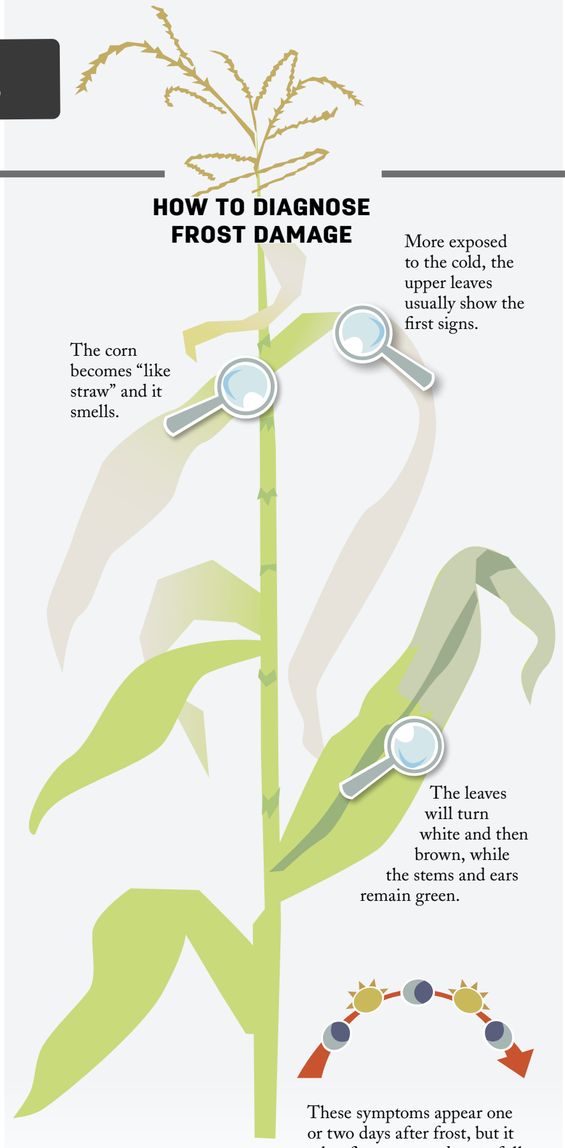


Between 32°F and 36°F:
- The plant works in slow motion
- The tissues are not affected
- Photosynthesis and the transfer of reserves from the plant to the grain will resume as soon as temperatures rise

Temperature drops slightly below 32°F for one or two hours:
- The leaves are damaged but not the stem
- Photosynthesis is stopped
- Reserves in the stalk can continue to be transferred to the grain
- This temperature can kill plants after one to two hours

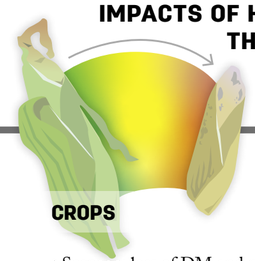
Below 28°F for a few minutes:
- The whole plant dies
- Sugar transfers stop permanently

HOW TO DIAGNOSE FROST DAMAGE

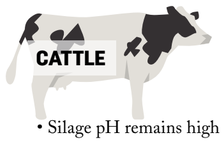


These symptoms appear one or two days after frost, but it takes five to seven days to fully assess the extent of damage to the crop.

IMPACTS OF HARVESTING CORN AT LESS THAN 30% DRY MATTER (DM)



- Seepage: loss of DM and nutrients (soluble sugars, nitrogen)
- Unwanted clostridial fermentation (conversion of carbohydrates and organic acids to butyric acid, CO_2 and NH_3)
- Rancid fishy smell (foul)
- Fungi present everywhere in the environment attack and degrade decaying organic matter (opportunistic fungi, saprophytes)
- The stalk becomes spongy
- Frost causes microcracks on the pericarp of immature corn kernels
- If very high moisture content after frost: *Cladosporium, alternaria, trichoderma*



- Silage pH remains high
- Risk of acetonemia
- Less DM intake
- Little appetite
- Poor nutritional quality
- Loss of productivity

Corn development	Silage moisture	Silage yield	Crude protein	ADF	NDF	IVD	Milk production	
	%	t/ac	%	%	%	%	lbs/t	lbs/ac
Soft dough	76	4.9	10	27	53	77	1,764	8,598
Early dent	73	5.1	10	24	48	79	2,094	10,803
50% milk	**66**	**5.7**	**9**	**23**	**45**	**80**	**2,315**	**13,228**
25% milk	**63**	**5.8**	**9**	**24**	**47**	**80**	**1,000**	**2,205**
Black layer	60	5.7	8	24	47	79	2,139	12,346

KERNEL QUALITY IMPACT ON SILAGE YIELD AND QUALITY

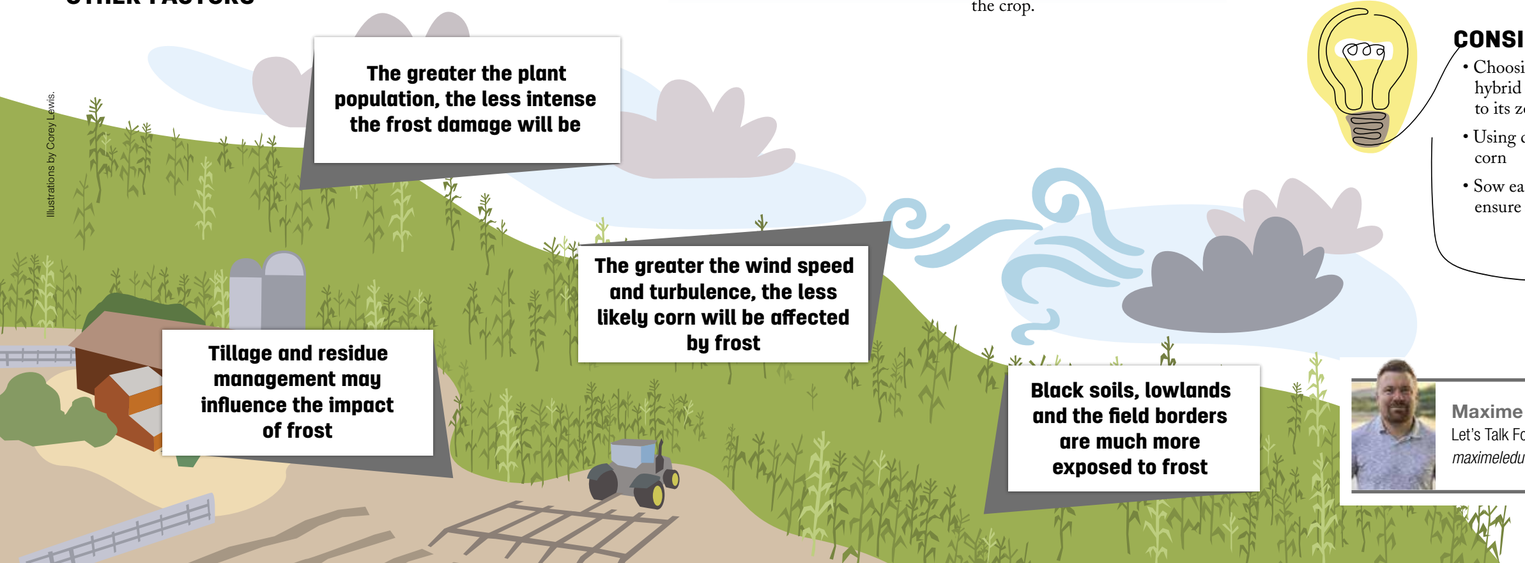
Derived from Wiersma et al. (1993) and Undersander et al. (1993)

Source: Wisconsin Corn Agronomy (2020)

WHAT TO DO IF...

	Less than 30% DM	Less than 25% DM	Less than 20% DM
What's happening?	• Ensile as soon as possible (be careful, however, to the moisture content contained in the stem and in the ear) • Frost will accelerate the drying out of the plant	• The total plant moisture is too high for the corn to be ensiled immediately • Wait until the moisture content of the silage reaches at least 70% • Watch for the appearance of mold on the ears during this waiting period • Risk of never reaching 30% DM • Perform regular moisture content tests with a Koster tester or microwave oven	• The moisture content of the whole plant is unlikely to drop to the desired level (less than 70% to achieve good fermentation of the silage) before it rots in the field
Storage	• Store in a separate silo, horizontally	• Store in a horizontal silo for less runoff (i.e., bunker, silage bag, mole silo)	
Feeding	• Not far from the desired 35% to 38% DM • Normally, going from 30% to 35% DM requires 10 days (0.5% less per day)	• Adding DM is an option • Allow about 0.5% moisture loss per day, like normal corn	• Add DM (crushed dry grain corn, barley or beet pulp) to the silage as an absorbent • For every 30 pounds of DM added per tonne of silage, the moisture content drops by 1% • Serve silage directly to animals with lower nutritional needs (heifers, dry cows) – watch out for nitrates
Risks	• Consequences of freezing will be very limited • Each additional day increases the risk of mold and a reduction in dNDF	• Risk of acidosis from greater solubility of sugars in the rumen: • Observe an adequate intake of fiber in the ration • Coarsely chop the fiber (3/4 to 1 inch)	• The worst stage to suffer a fatal early frost

OTHER FACTORS



Illustrations by Corey Lewis.

CONSIDER
- Choosing a corn hybrid corresponding to its zone (UTM)
- Using dual-purpose corn
- Sow early and ensure sowing

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▶ Watch the full webinar at youtu.be/pUCZjfGcof0

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▶ Complete the quiz here for the chance to win great prizes! Contest closes Oct. 1.