Preserving forage quality from windrow to feedbunk

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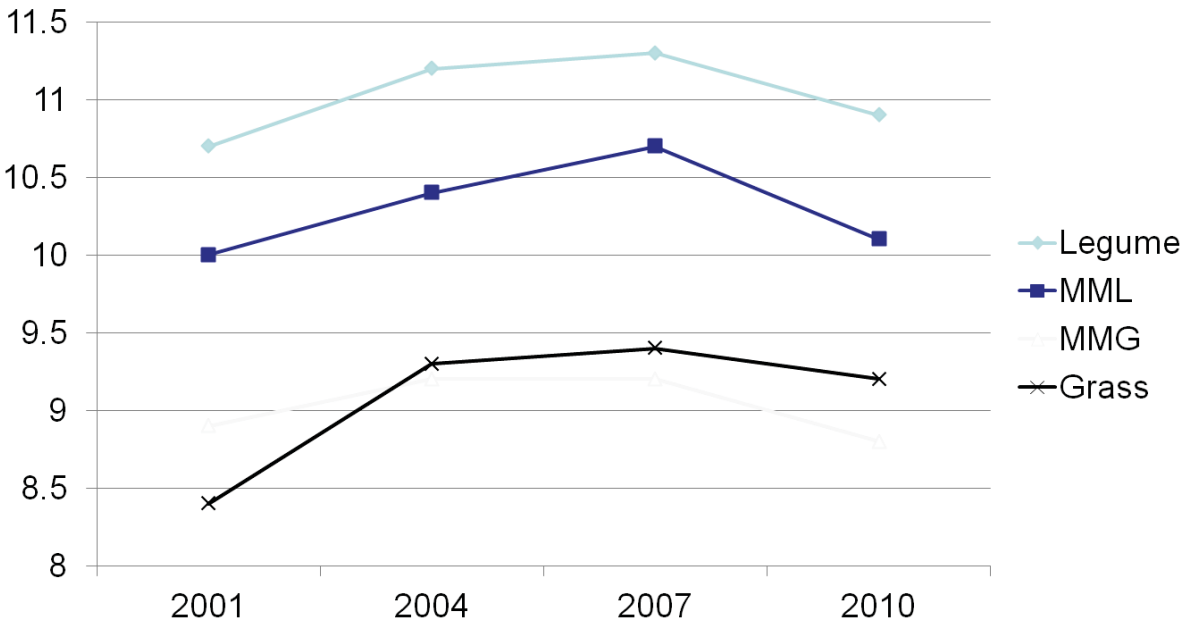
The need for speed

- On most farms disc mowers have completely replaced sicklebar mowers—and for good reason.
- This move has been driven by *the need for speed*, since mowing is often the bottleneck in large dairy operations.
- Sickle bar mowers are slow. Disc mowers are fast.
- A huge difference with high-yielding grasses.
- With new technology, however, comes new problems.

<== Slow

Fast ==>

Speaking of problems: Ash concentration in hay crop silages



DairyOne Forage Lab, 2001-2010

Ash concentration: An increasing problem

- The rapid change from sicklebar mowers to disk mowers has resulted in increased ash concentration in hay crop silages.
- Ash is simply the total mineral content of a forage, both nutritive minerals and contaminants.
- High amounts of ash in hay crop silages used to be a rare problem but is now much more common.
- Check forage analyses for ash concentration.

Ash:
What isn't "internal" minerals is dirt

Average ash content of alfalfa silage	=	11%
Internal mineral content of alfalfa silage	=	6%
"Dirt difference"	=	5%

This means that for every 19 lbs of alfalfa silage dry matter fed, there's one pound of dirt or old manure solids. Dirt has lousy digestibility, while manure solids may contain pathogens.

Ash content: Is there a problem?

If it ain't broke, don't fix it. Don't increase the mowing height of alfalfa unless ash concentrations are higher than normal. If they are high, why?

- Mowing too close to the ground?
- Over-aggressive raking?
- Flat vs. curved disc mower knives. Flat knives are better, less "vacuuming" action.

Hay crop conditioners: Which is best?

← Rubber rolls?

Steel flails? →

Mower conditioners

- Rubber rolls vs. steel flail (AKA impeller or tine) conditioners: Which is best? This depends on the crop grown.
- *Legume and legume-grass*: Rubber rolls are better. Flails rip legume leaves off the plants, lowering yield and quality. *Flails result in 3-4% more alfalfa leaf loss than do rolls.*
- *Grass*: Either is OK, but flails will do a better job.

Conditioners: Ideal vs. reality

- Some farm equipment reps claim that the reason flails increase alfalfa leaf loss is because they're not being operated correctly.
- John Deere : No more than an inch or so of paint should be worn off the ends of JD MoCo flails. New Holland says the same about its Discbine flails.
- Bottom line: Research shows greater alfalfa leaf and quality loss with flail conditioners.

Wide swathing

- Mow in the AM, spread the swath to at least 2/3 of mower width, chop at 35-40% DM in the PM.
- Goal: Stem to silo the same day.
- Wide swathing works with any forage crop…the heavier the yield, the more difference it will make. *Wide swathing is a no-brainer.*

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Yes, they ran over the mowed alfalfa.

Research results: Delaware

- *First cut*: Narrow windrows took almost twice as long to dry down to 45% DM.
- *Second cut*: Narrow windrows took almost twice as long to reach 45% DM.
- *Third cut*: Narrow windrows took four times as long to reach 45% DM.

Research results: N.Y.

- Wide swath (75-85% of cutterbar width) vs. narrow windrows ~3 feet wide.
- First cut alfalfa silage, 48” high: 20% more milk per ton of forage from wide swaths.
- Wide swath alfalfa ready to chop in 7 hours, while narrow windrows took 25 hours.
- Second cut grass: 11% more milk per ton of forage from wide windrows.

When should you mow?
Wide swath used for all treatments

Mowing time	% DM at 3:00 pm	24 hr % IVDM	Sugar % at mowing	RFV
8:00 pm	40.4	81.8	10.0	196
6:00 am	40.8	82.0	7.5	199
9:30 am not conditioned	42.8	83.3	8.1	201
9:30 am conditioned	39.8			

Silage inoculants

Silage inoculant economics

- A survey of inoculant trials including all types of silage found that milk production was increased in half of the trials.
- Where production improved, the average increase was 2 pounds/cow/day. So for all trials, 1 pound.
- 50 lbs silage/cow/day = 40 “cow days” per ton of silage. 40 x 1 lb = *40 pounds more milk per ton of silage*.
- 40 pounds of milk @$20/cwt = $8.00. How much does it cost to inoculate a ton of forage?

Risks and rewards

- Silage inoculants should be considered as part of a dairy’s *risk management* strategy. It’s a form of crop insurance.
- Miner Institute inoculates every ton of ensiled forage, every year, and has been doing so for at least 30 years.
- But there are lots of products out there: Which is best?
- Start with a reputable company, one that backs its performance claims with research data.

The good, the bad and the ugly

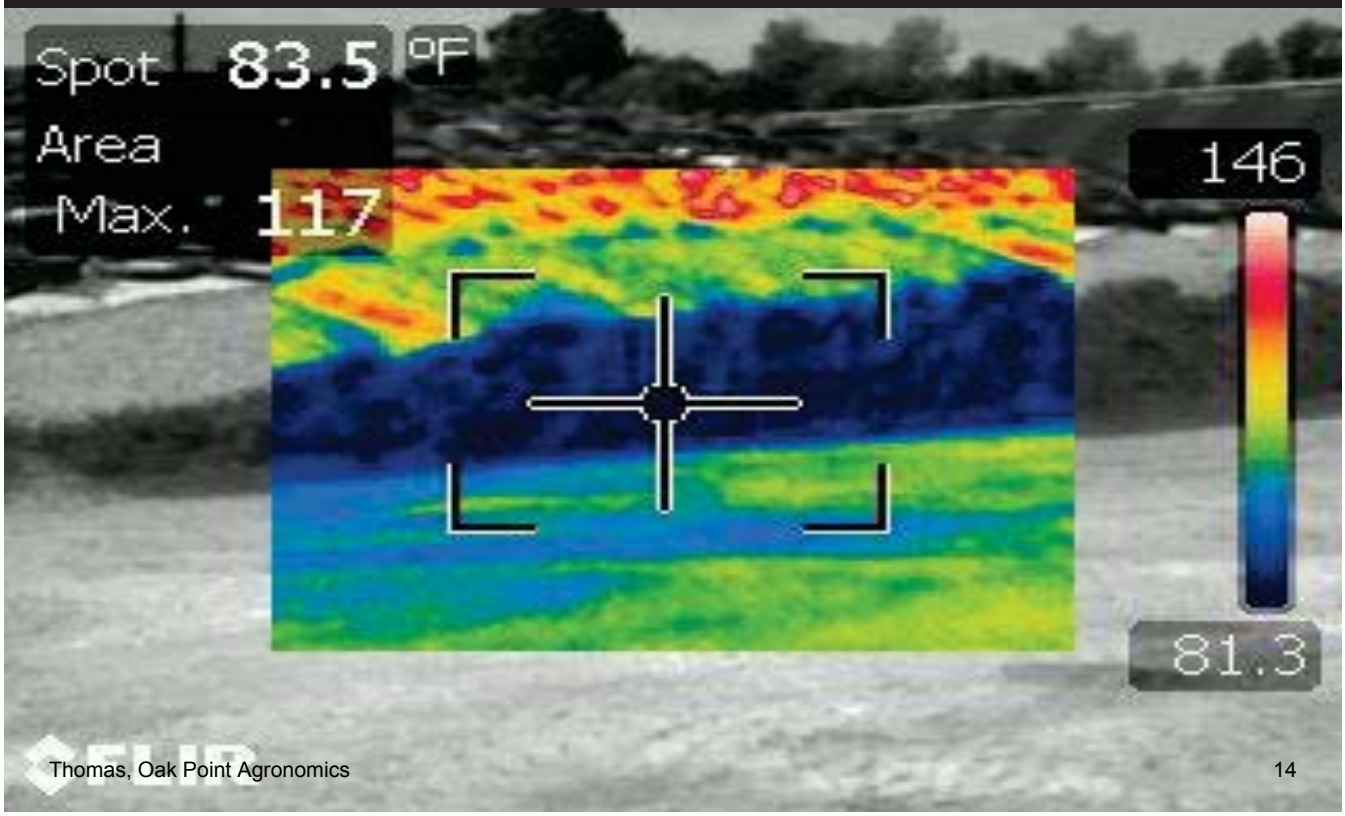
- There are thousands of strains of *Lactobacillus plantarum*, the primary homofermentative bacteria, as well as several other types of fermentation bacteria.
- The various strains and types vary greatly in their effectiveness, including how fast and how far they drop silage pH during fermentation, and impact on face and bunk life.
- The best silage inoculants contain the most effective bacteria. Rely on research data, preferably from independent sources.

Lactobacillus buchneri

- A fermentation bacteria that results in the production of more acetic acid than other silage inoculants. Acetic acid is a preservative (vinegar).
- Greatly increases both face and bunk life. Intended primarily for corn silage, probably also excellent also for sudan-sorghum silage but not a lot of data.
- Especially good where face management is less than ideal. More expensive than most other inoculants, but I'm a believer in *L. buchneri* for corn and perhaps for other high-sugar summer annual crops.

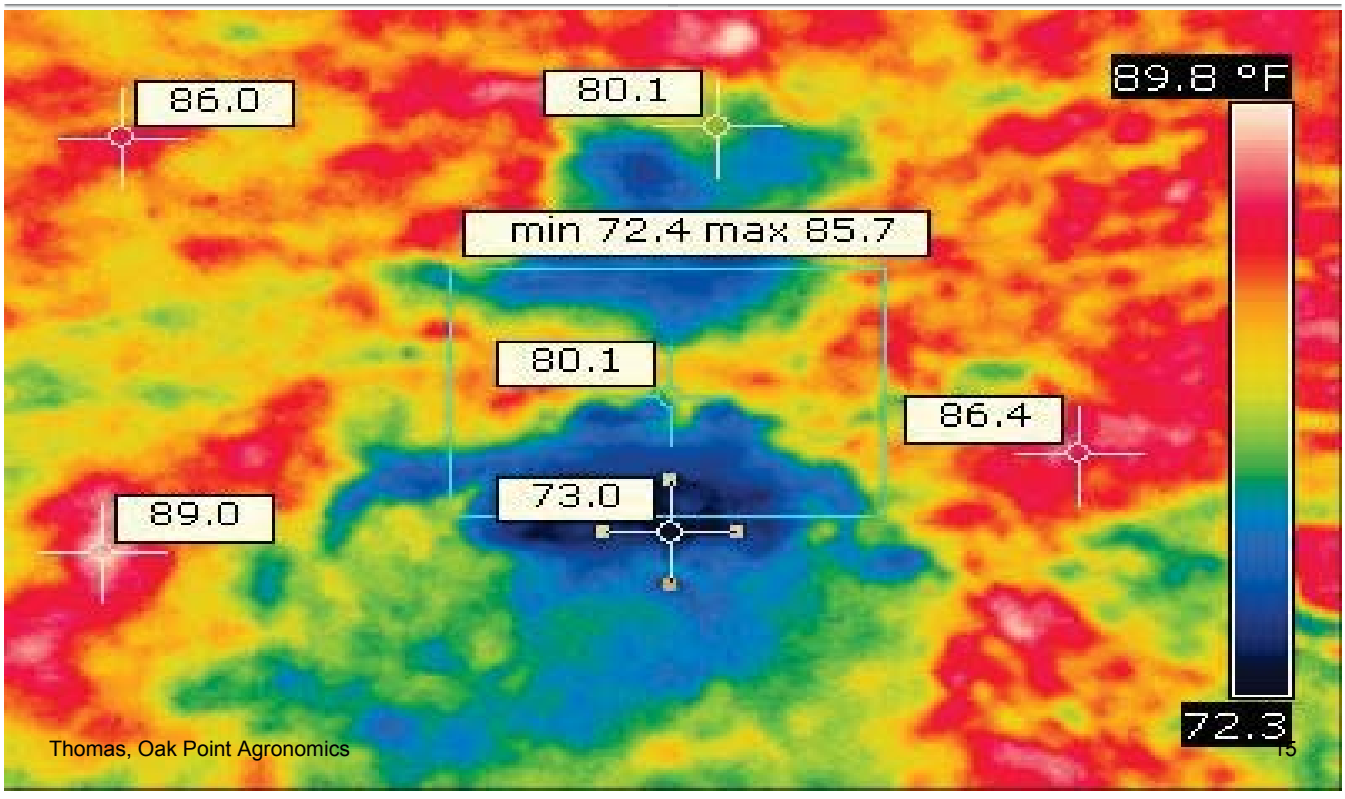
Corn silage drive over pile at Miner Institute, treated with *Buchneri 500*

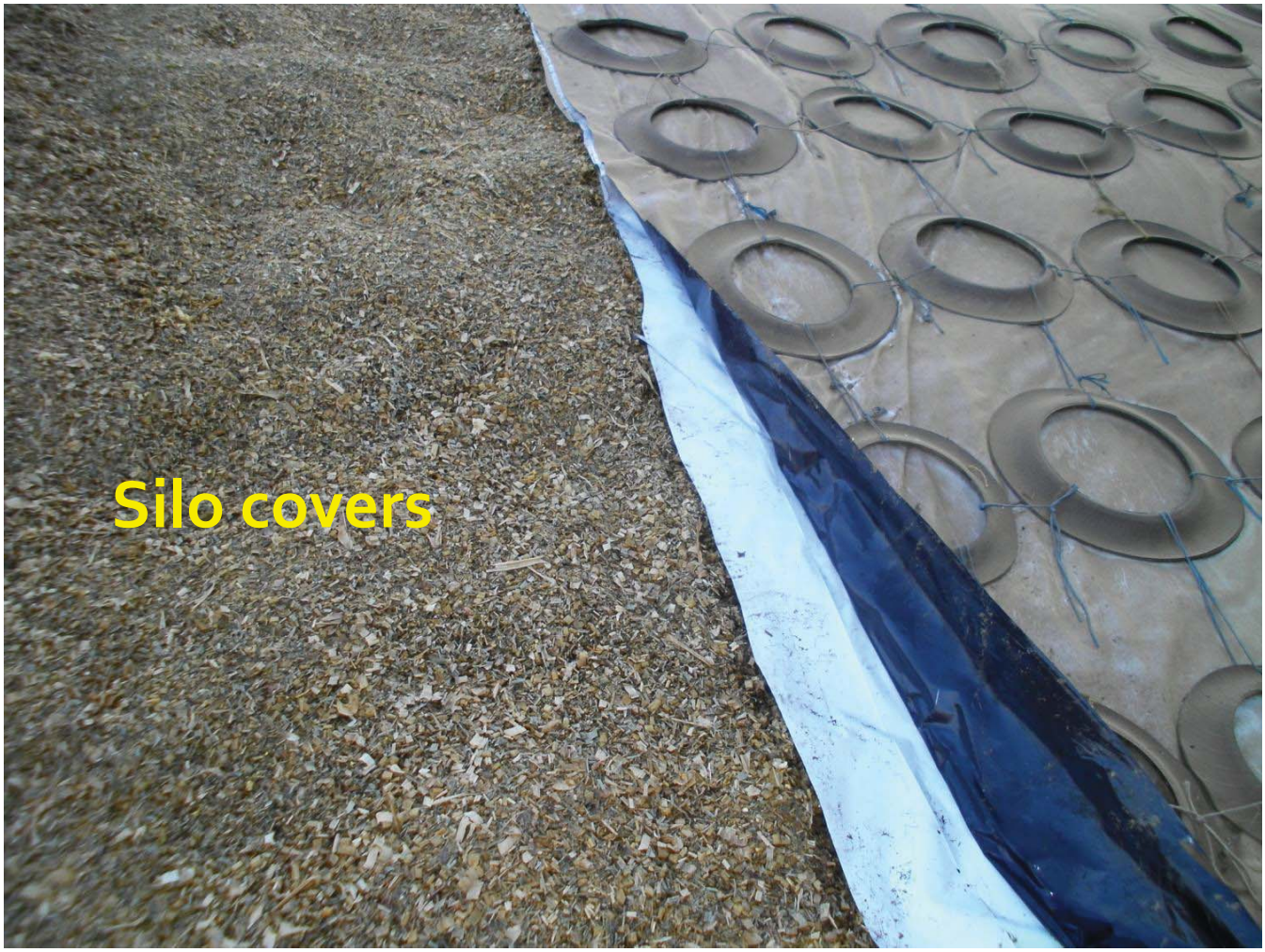
Heating along exposed top of pile



Back into face and into pile on ground

Heating on the face, but cool just inside the face




Silo covers


Double plastic

SAMPLE	THICKNESS	OTR ASTM D3985 CM3/M2/24H 1.00% O_2
Conventional White/Black cover	5 mil	1811
Silostop Clear 2-Step	**1.8 mil**	**30**
Silostop 1-Step White/Black cover	**4.5 mil**	**10**

Source: Michigan State University

However, this only measures the permeability of the plastic, not how it performs “in the real world”!

Silo plastic economics, cost/sq. ft. (2012 California prices)

- Silostop 1.8 mil $0.08 + standard 5 mil $0.04 = $0.12
- Silostop 1-Step 4.8 mil = $0.12
- Average contractor cost to apply 5 mil Silostop 1-step plastic + tires = $0.22 =$0.36 total/sq. ft
- Average contractor cost to apply 5 mil plastic + 1.8 mil Silostop + tires = $0.28 = $0.40 total/sq.ft
- Difference between 5 mil and “the best” = $0.36 vs. $0.40, but reduced spoilage in top 3 feet more than pays for this.

Silage effluent

- Completely preventable.
- Very high BOD: Highly polluting.
- EPA is cracking down on silage effluent.
- High volumes of effluent can ruin silage leachate treatment systems (vegetated filters).

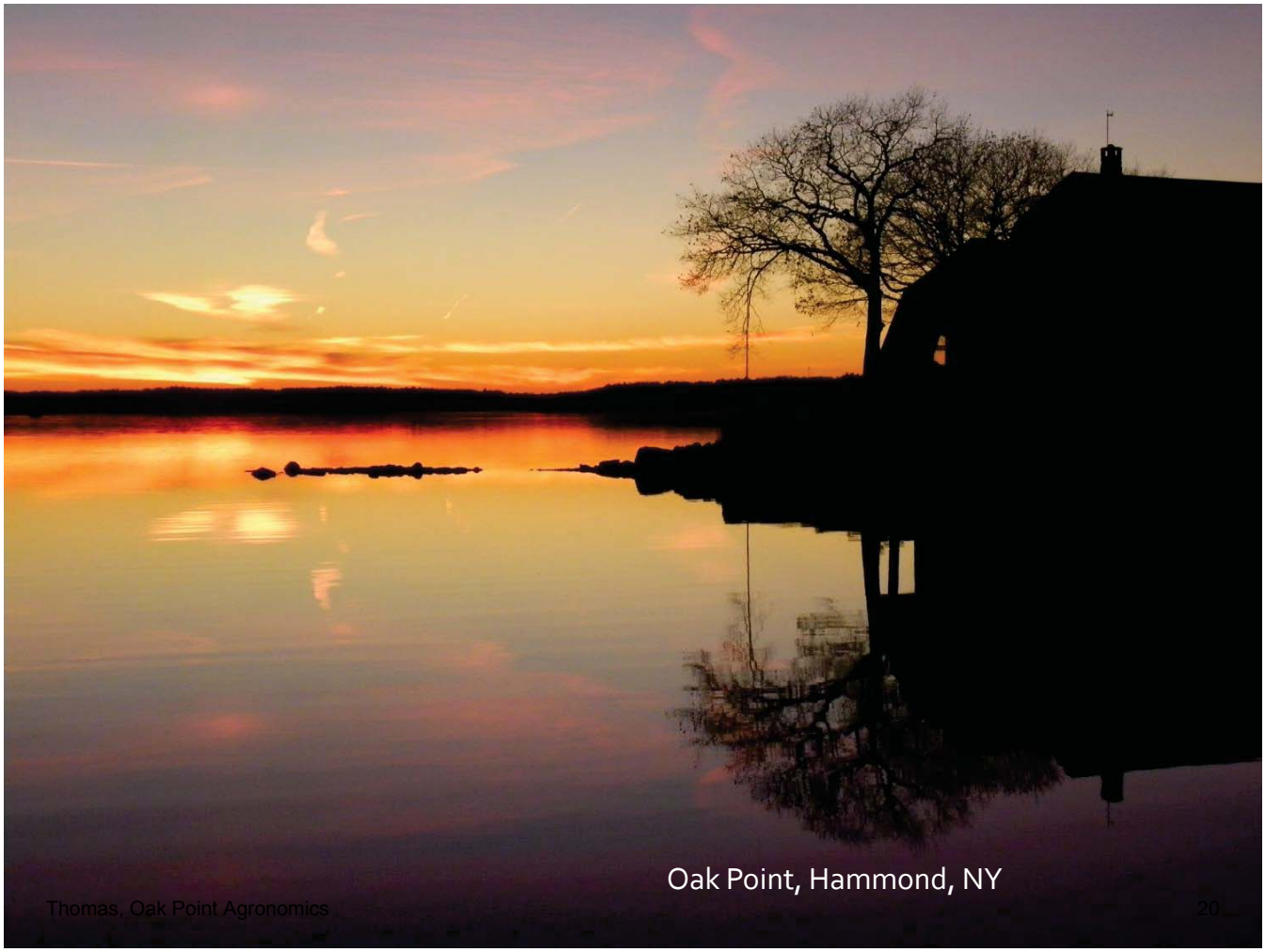
Preventing butyric acid in low DM forage crops

	DM %	Hours after mowing	pH	Butyric acid, %	Ammonia %
Winter rye	26%	0	4.6	0	0.3
Winter rye		12	6.1	0.2	1.0
Alfalfa	<20%	0		0	
Alfalfa		12		2.6	

Windrowed forage will sit in the field 12-16 hours before it produces butyric acid. Mow early, use wide windrows and chop the same day even if it means harvesting at *moderately* under 30% DM. Silage effluent is a consideration.

Managing butyric acid in silages

- Butyric acid is highly volatile; that's why butyric silage stinks. Most of this is from two related compounds: Putrescine and cadaverine.
- Aerating butyric silage can remove about half the butyrate and related volatile compounds. No problem with heating.
- Remove the silage and stir it up with the front end loader or skid steer bucker. Wait a few hours, stir again if practical, wait a few hours and feed.



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