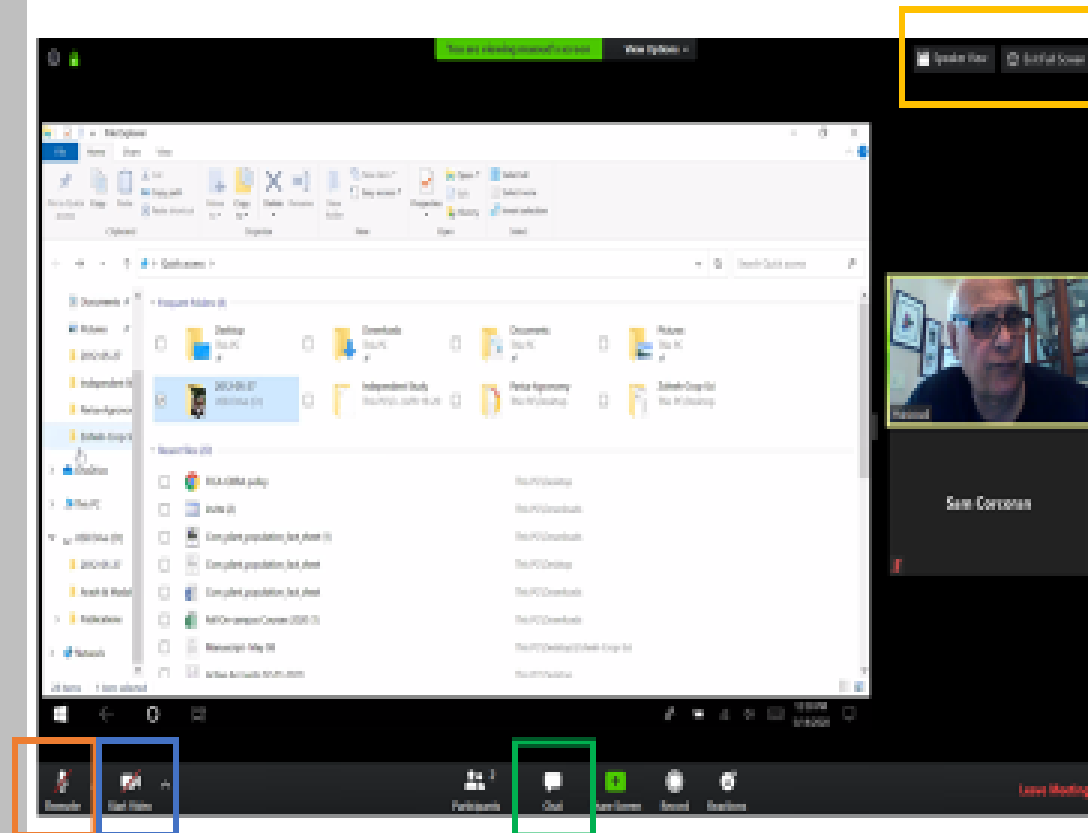


Please familiarize yourself with these housekeeping items

- You are currently muted by the host. Please remain muted until the end of the presentation.
- At the end of the presentation, you can unmute yourself to ask a question or you can submit a question in the chat box (indicated in the green box)
- Click on the microphone (indicated in the orange box) to mute and unmute yourself.
- Click on the video camera (indicated in the blue box) to turn your web cam on and off. If it is on, everyone can see you.
- You can adjust your view and the size of the zoom window using the features indicated in the yellow box.

Welcome to the webinar!



Text or call Sam (Dr. Hashemi's lab manager) at 978-855-3242 if you are experiencing technical difficulties and she will try to assist you.

Getting a Handle of Manure and Mud in Equine Operations



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A photograph of a pond covered in a thick layer of green algae. The background is a dense forest of evergreen trees under a clear blue sky. In the foreground, there are some green plants and a thin vertical pole on the right side.

Today's talk:

What is Non-point Source Pollution?

Manure Management, in Barns and in Pastures

Mud Management

Non-point Source Pollution

- As water moves, it picks up and carries pollutants e.g. nutrients and pathogens
- Sources of non-point pollution are diverse and often difficult to identify



What's got Manure to do with NPS?



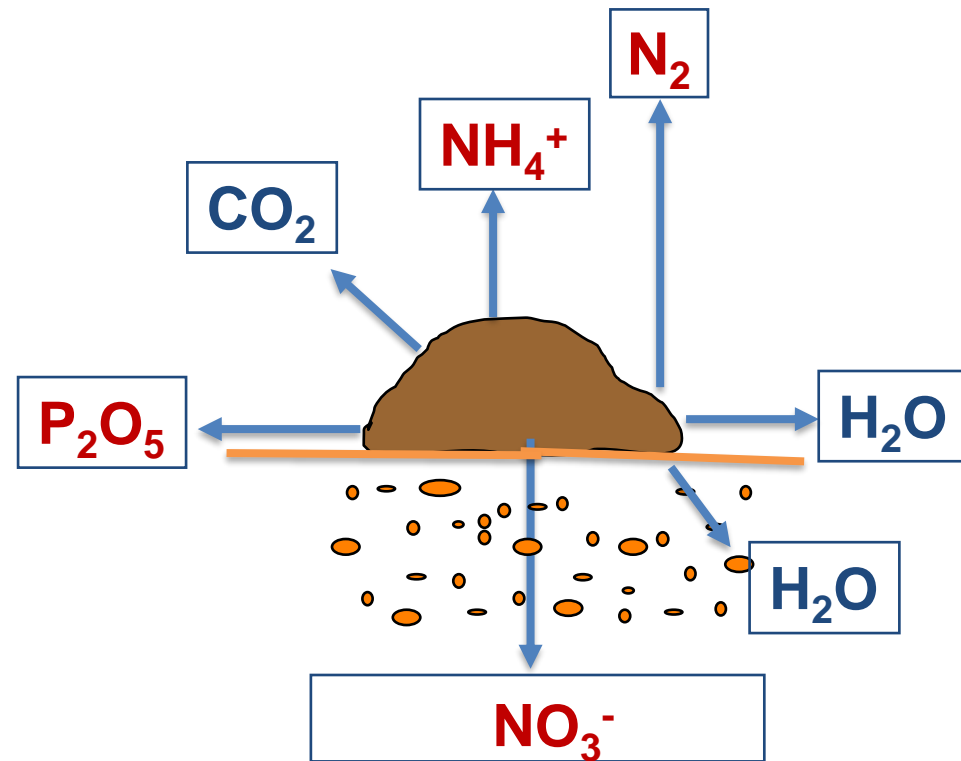
Manure Must be Managed

- Prevent surface and ground water contamination
- Protect animals' health
- Minimize offensive odor
- Preserve nutrients in manure, so it can be used as valuable fertilizer



Nutrient Losses from Manure

- Runoff
- Leaching
- Volatilization
- Denitrification



Environment Risks from Manure

Pollutants in Manure

- 1) Nitrate-N
- 2) Ammonia-N
- 3) Phosphorus, Nitrogen
- 4) Pathogens
- 5) Organic matter

Environmental Risk

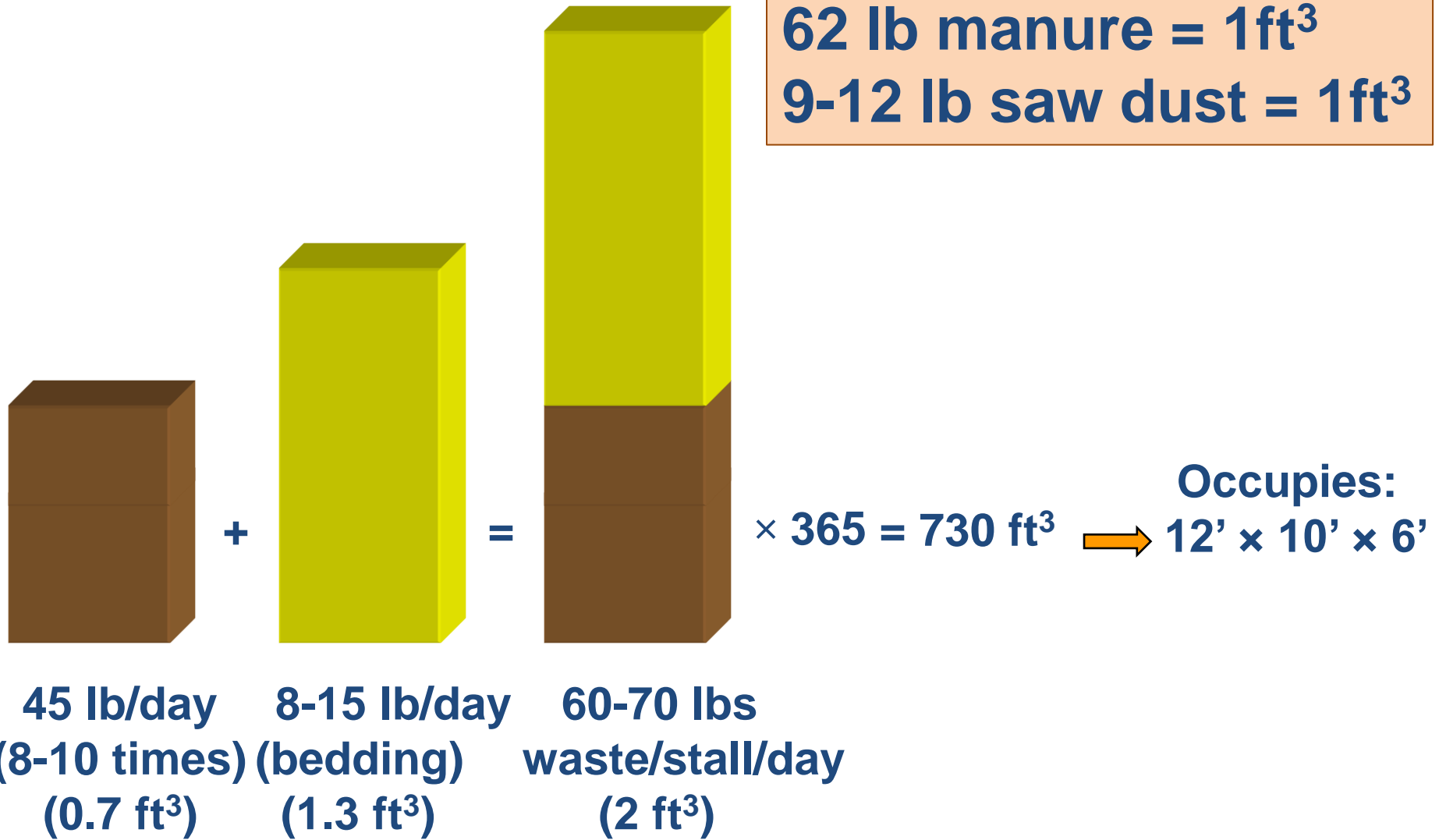
- Blue baby syndrome
- Fish kills
- Algae bloom
- Health issues
- Oxygen depletion

You Got Animals, You Got Manure

- Horses generate relatively large volume of waste (manure + bedding)
- Waste, accumulates in no time



How Much Manure/Waste in Barn?

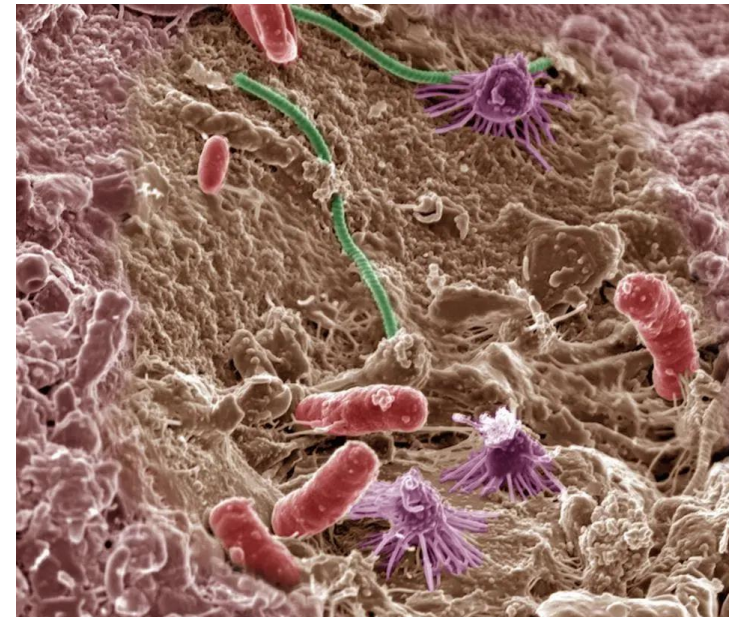


Nutrient Content of Manure

Animal Type	Daily Manure lbs/AU	N -----	P lbs/ton	K ----
Dairy (solid)	82	10	4	8
Poultry	61	30	20	10
Beef cattle	60	11	7	10
Swine	65	14	11	11
Sheep/Goat	40	23	8	20
Horse	45	12	5	9

Why Horse Manure is Unpopular?

- Raw horse manure, or mixed with straw, old hay, are as good as livestock manure
- Woody materials as bedding, makes horse manure bad
- Wood materials have very high Carbon and no Nitrogen
- Soil microbes need C (energy) and N (proteins)
- Ideal C:N ratio is \leq **25:1**



Typical C:N Ratios

<u>Material</u>	<u>C:N ratio</u>
Agricultural soils	8-14:1
Legume hay	15-19:1
Cow manure	18:1
Finished compost	17-20:1
Non-legume hay	24-41:1
Corn stalks	42:1
Rye straw	82:1
Sawdust	500:1

Barn Manure Management

- Collection from stalls
- Storage
- Treatment (composting)
- Land application
- Nuisance



Manure Storage Site

location, location, location!

- On high ground, dry, max 4% slope
- Not in paddocks, pastures, or barn/stables (parasite issues)
- At least 100' from wetlands, wells, drainage way, water body
- Far away from neighbors and property line



Covering Manure Pile



Manure Storage Size

Type of Animals	Storage/animal/6mo (SQ ft)*
Horse & Cattle	72
Sheep & Goat	6
Llamas & Alpacas	12
Pig	12

* based on 5' high manure pile, and average bedding

Manure Storage Flooring

- Storage floor can be slightly sloped to one or both ends
- Options for flooring include:
 - concrete
 - packed gravel
 - compacted earth/stone dust



Composting

- Piling manure for a period of time is not composting!
- Natural breakdown of organic material by microbes
- Requires the right amount of oxygen, moisture, and temperature
- Frequent turning provides enough O²



Aerated Composting







Aerated Composting Trash Bins









Aerated Composting



<https://ag.umass.edu/crops-dairy-livestock-equine>

Managing Manure in Pasture



Remove Manure from Pastures

- If not collected, manure provides the right condition for fly reproduction and environment pollution
- Collect manure every 1-3 days to:
 - prevent fly breeding
 - animals health
 - control mud
 - minimize loss to runoff



Collected Manure from Pastures

Raw manure collected from pastures can be used directly, or added to the compost



Harrowing Pasture

- Harrow pastures to break up manure clumps
- Spread manure on pastures in thin layer



Mud Management



Issues with Mud

Mud is not only an unpleasant view

- Is a serious source of pollution
- Creates unsafe footing
- In drier months, turns into dust
- Increases fly breeding areas



Recipe for Mud

- Overgrazing
- Animals access to wet pastures
- Soil compaction, especially in high traffic areas
- Runoff rainwater from barns and shelter roof
- Presence of high organic matter (manure, hay, etc.) in soil

Case Study



Issue # 1

Issue # 3

Issue # 2

Issue # 4

Overgrazed Pasture = Mud



Same pasture after well managed



Barn Roof Runoff

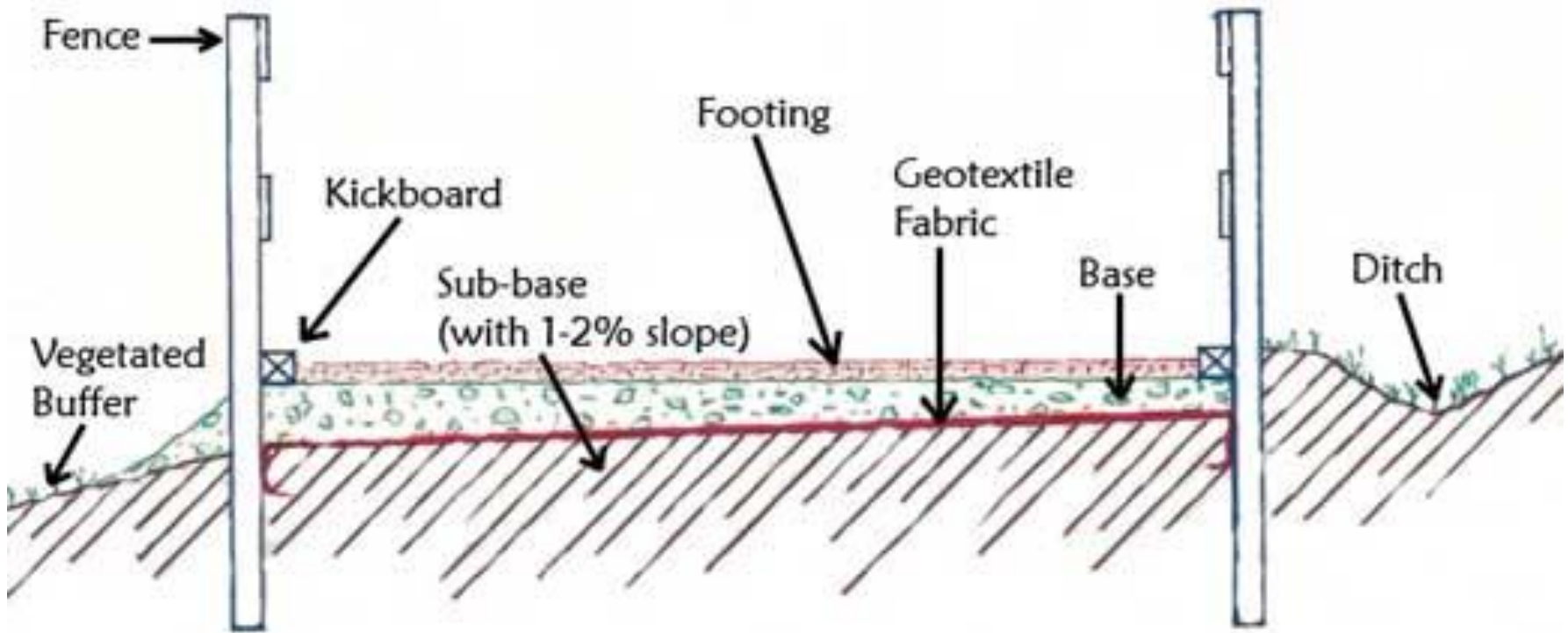
- 1" rain on 30' X 100' roof ~ 2000 gals additional water!
- It usually runs into high traffic areas and eventually runs off into streams
- Rain gutters, French drains, and downspouts can direct rain water away from confinement areas
- Keep clean water (rainfall) clean



Sacrifice Areas

- You sacrifice a small area (200-400 sq ft /horse) to save the rest of your pastures
- Avoid overgrazing (not enough land)
- Control forage consumption (obesity)
- Avoid compaction (pasture/soil) is wet
- Plants are not growing actively (summer slump)
- Application of chemicals (lime)

Diagram of a Sacrifice Area : Longitudinal Section



Depth: twice as you have mud in the winter.
New footing materials may need to be added every 2-3 years.



Wood Chips + Geotextiles

Size of Sacrifice Area: 60' x 40' – 4200 ft²

Materials:

Geotextile Fabric – \$445 for (1) 12.5' x 432' roll-used 1 roll

De-Barked White Pine Paper Grade Wood Chips - \$12-\$15/yd

Spread at a thickness of 12"-used 155 yd³ for 4200 ft²

Cost of Materials = \$2,305

Labor:

~10 Man Hours + Machine (with ¾ yd bucket) @\$75/hr

Cost of Labor = \$750

Total Cost = \$3,055

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Crushed Gravel + Geotextiles

Size of Sacrifice Area: 60' x 40' – 4200 ft²

Materials:

Geotextile Fabric – \$445 for (1) 12.5' x 432' roll. Used 1 roll

¾" Crushed Gravel - \$13/yd Spread at a thickness of 12"

Used 150 yd³ for 4200 ft²

Cost of Materials = \$2,395

Labor:

~15 Man Hours + Machine (with ¾ yd bucket) @\$75/hr

Cost of Labor = \$1,125

Total Cost = \$3,520

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Gravel + StoneDust + Geotextiles

Size of Sacrifice Area: 60' x 40' – 4200 ft²

Materials:

Geotextile Fabric – \$445 for (1) 12.5' x 432' roll-used 1 roll

Bank Run Gravel - \$12/yd-Spread at a thickness of 8"

Used 120 yd³ for 4200 ft²

Stone Dust – \$15/yd- Spread at a thickness of 4"

used 40 yds³ for 4200 ft²

Cost of Materials = \$ 2,485

Labor:

~15 Man Hours + Machine (with ¾ yd bucket) @\$75/hr

Cost of Labor = \$1,125

Total Cost = \$3,610

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Rotating Water and Feed

- Rotate watering and feeding containers frequently to avoid animal traffic
- Collect manure from sacrifice areas and riding arenas every 1-3 days



Vegetated buffer around the paddocks and other confinement areas to catch nutrients carried by runoff is highly recommended. Grasses can be grazed/harvest and shrubs and flowers can be sold.



Pasture Paradise



Pasture Paradise





Thank You