AG Bootcamp

Steve Higgins

Director of Animal and Environmental Compliance

Developing and Implementing KY Ag Water Quality Plans

KY Agriculture Water Quality Act

- 10+ acres in agriculture or forestry must develop a water quality plan
- Plan includes Best Management Practices (BMPs) to protect water quality

What is an Ag Water Quality Plan?

- A list of BMPs implemented on the farm to protect water quality
  - Livestock
  - Crops
  - Pesticides and Fertilizers
  - Farmstead
  - Forestry
  - Streams and Other Waters
- Plans should be up-to-date and reflect current farm activities
- The self-certification is NOT your Ag Water Quality Plan

Agriculture Water Quality Plan Self Certification

I understand my obligations under the Agriculture Water Quality Act to implement the applicable requirements of the statewide water quality plan and I have developed a water quality plan for my individual operation(s) based on its guidance. I am aware of the need to review my plan periodically to record those practices or measures that I have completed and to modify my plan as major changes are made in my operation. If my management practices are questioned by regulatory agencies or through civil actions, these updated records will serve as documentation of my efforts to improve and protect the natural resources. This plan will entitle me to:

- The Corrective Measures Process A process to correct any identified water quality problems that may be the result of activities conducted on my operation.
- Availability of technical assistance through the conservation districts to develop or modify as needed my water quality plan, practices and/or measures or to recommend

This is NOT your Ag Water Quality Plan, this is only the self-certification sheet.

I would like to be kept informed, through the conservation districts mailing list, of new information, as it becomes available regarding: resource needs, water quality, environmental conditions, new or more effective best management practices, new and beneficial technologies, and new or expanded sources of technical and financial assistance, such as cost share or incentive programs.

_____County Conservation District, KY _____
(Farm I.D.#)

_____
(Name, Landowner/Landuser)

_____ _____
(Date) (Address)

Instruction: Please mail or deliver to your local conservation district office (http://www.conservation.ky.gov/condistricts/) or contact them if you need technical assistance or additional information to complete your plan.

Livestock

1) **Do you have livestock?**

Yes_____ No_____

Notes: _____

_____

_____

Choose all practices below that you have implemented on this operation:

- ☐ Livestock BMP #11: Nutrient Management
- ☐ Livestock BMP #15: Dead Animal Disposal

2) **Are there any streams, rivers, wetlands, or other water bodies in, or adjacent to, any of your pastures?**

Yes_____ No_____

Notes: _____

_____

_____

Choose all practices below that you have implemented on this operation:

- ☐ Livestock BMP #1: Planned Grazing System
- ☐ Livestock BMP #2: Proper Grazing Use
- ☐ Livestock BMP #3: Riparian Area Protection
- ☐ Livestock BMP #4: Limiting Access to Streams by Fencing with Alternative Water Systems, Limited Access Points, or Stream Crossings
- ☐ Livestock BMP#18: Stormwater Management

3) **Do you overgraze your pastures?**

Yes_____ No_____

Notes: _____

_____

_____

Choose all practices below that you have implemented on this operation:

- ☐ Livestock BMP #1: Planned Grazing System
- ☐ Livestock BMP #2: Proper Grazing Use
- ☐ Livestock BMP #14: Feeding and Heavy Use Area Management
- ☐ Livestock BMP#18: Stormwater Management

Gulf of Mexico Hypoxic Zone

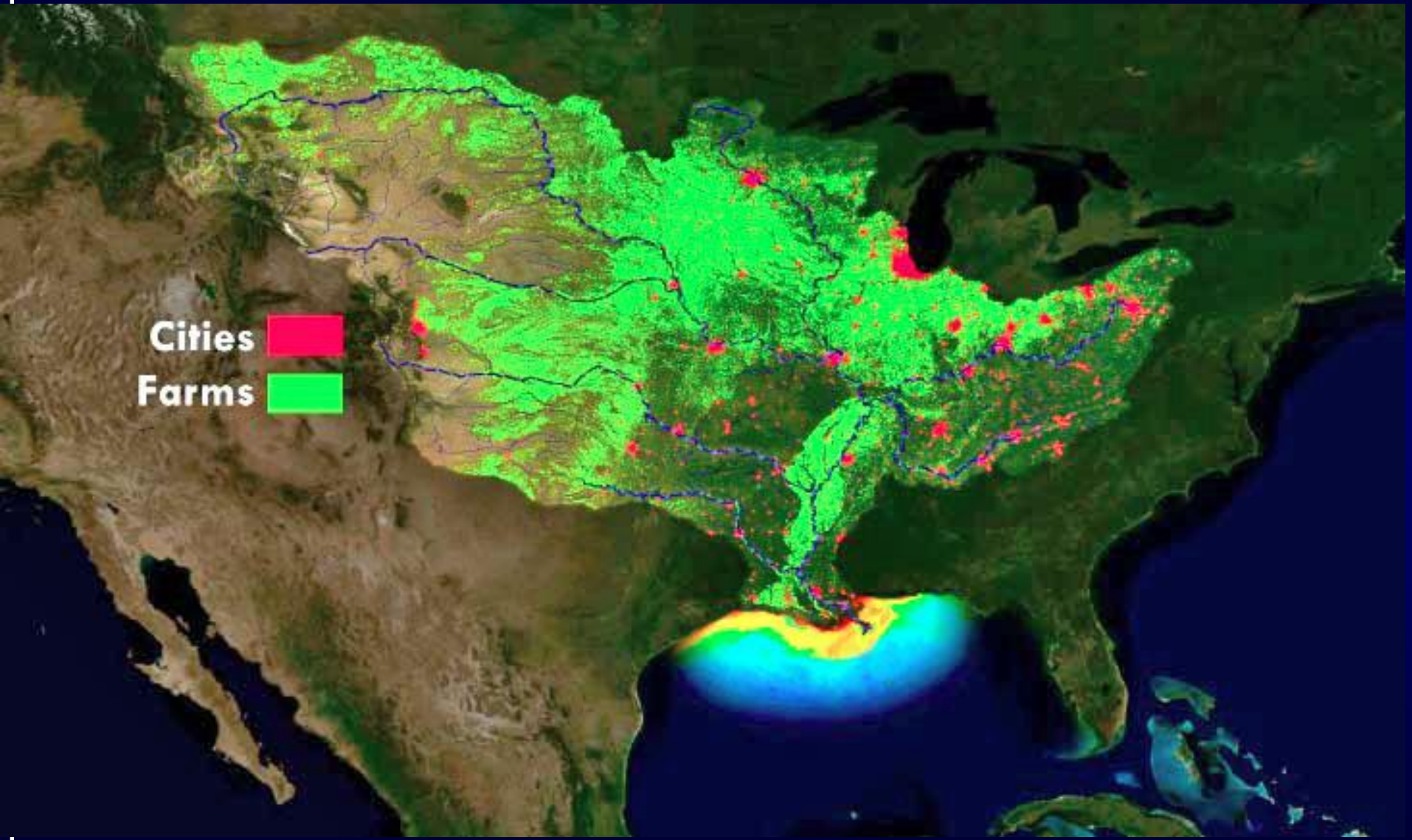
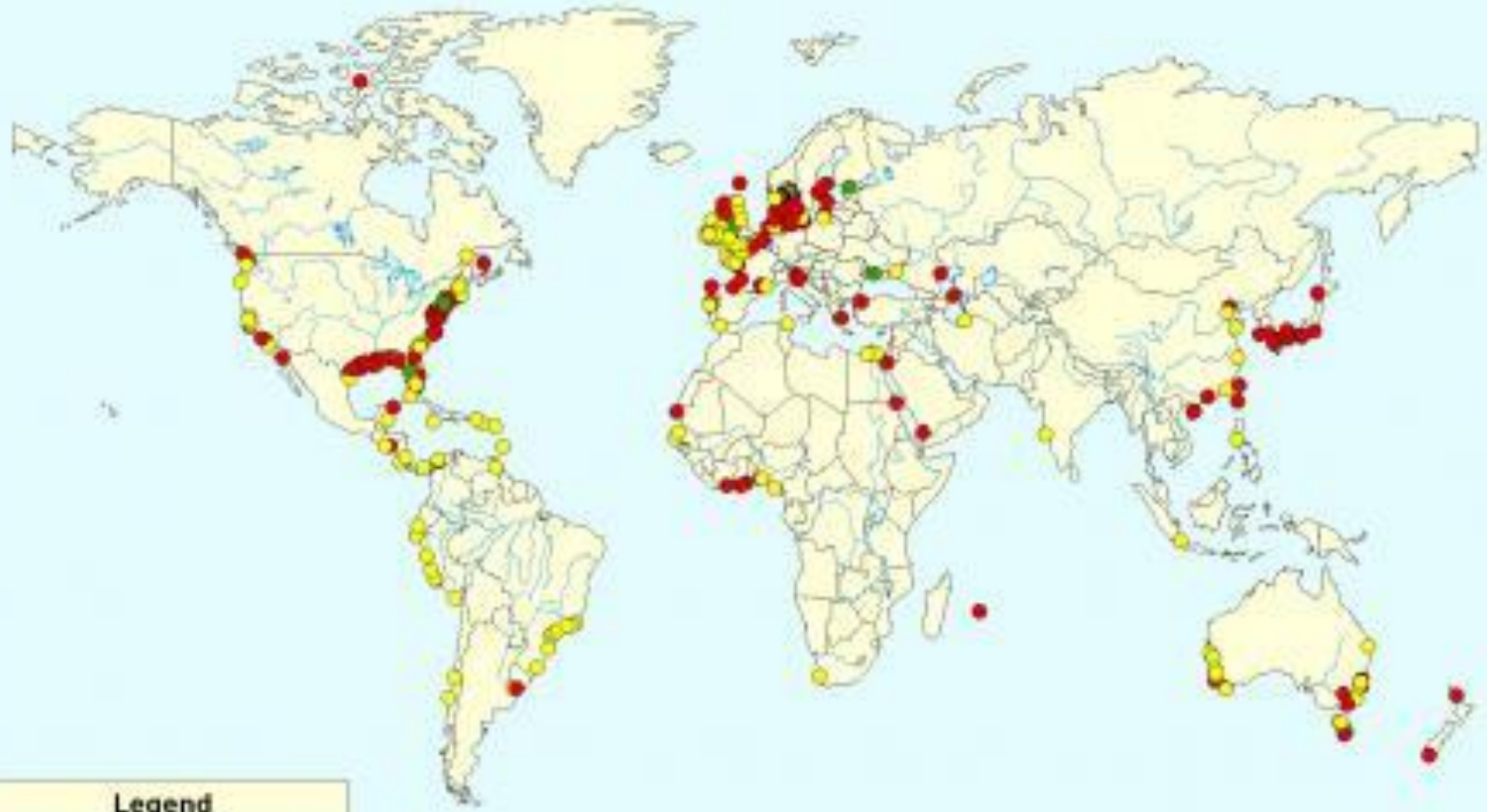


Photo Credit: National Oceanic and Atmospheric Administration (NOAA)

Gulf of Mexico Hypoxic Zone

UK

World Hypoxic and Eutrophic Coastal Areas



Data compiled from various sources by R. Diaz, M. Selman and Z. Sugg.

762

Let's be honest

- We are not enthusiastic about conventional 'Soil and Water Conservation' recommendations.
- Some folks get uneasy about environmental talks.
- In my opinion, there is still too little critical discussion and that we are blinded by years of repetition and "traditional" thinking……"This is the way we have always done it."

What's the cattle market doing?

Why would a producer want to spend money on water quality practices?

What if they could make more money?

What Do Livestock Operations Produce?

Rotational grazing increases livestock performance and is a water quality BMP

Number of Paddocks	Days of Grazing	Grazing Efficiency
1 (or continous grazing)	>14	30
3-6	9	35
3-8	7	40
5-8	4	45
8-24		50
> 24 (or hay)	1	70

Well-selected improvements in management can help producers fulfil their aims, while simultaneously increasing the conservation effectiveness of their farming operation.

Optimum Livestock Performance

Active Management of:

- **Rainwater**
- **Vegetation**
- **Slopes and Soils**

- **Requires cross-disciplinary knowledge.**

Livestock Performance

Active management of:

- **Rainwater**
- **Vegetation**
- **Slopes and Soils**

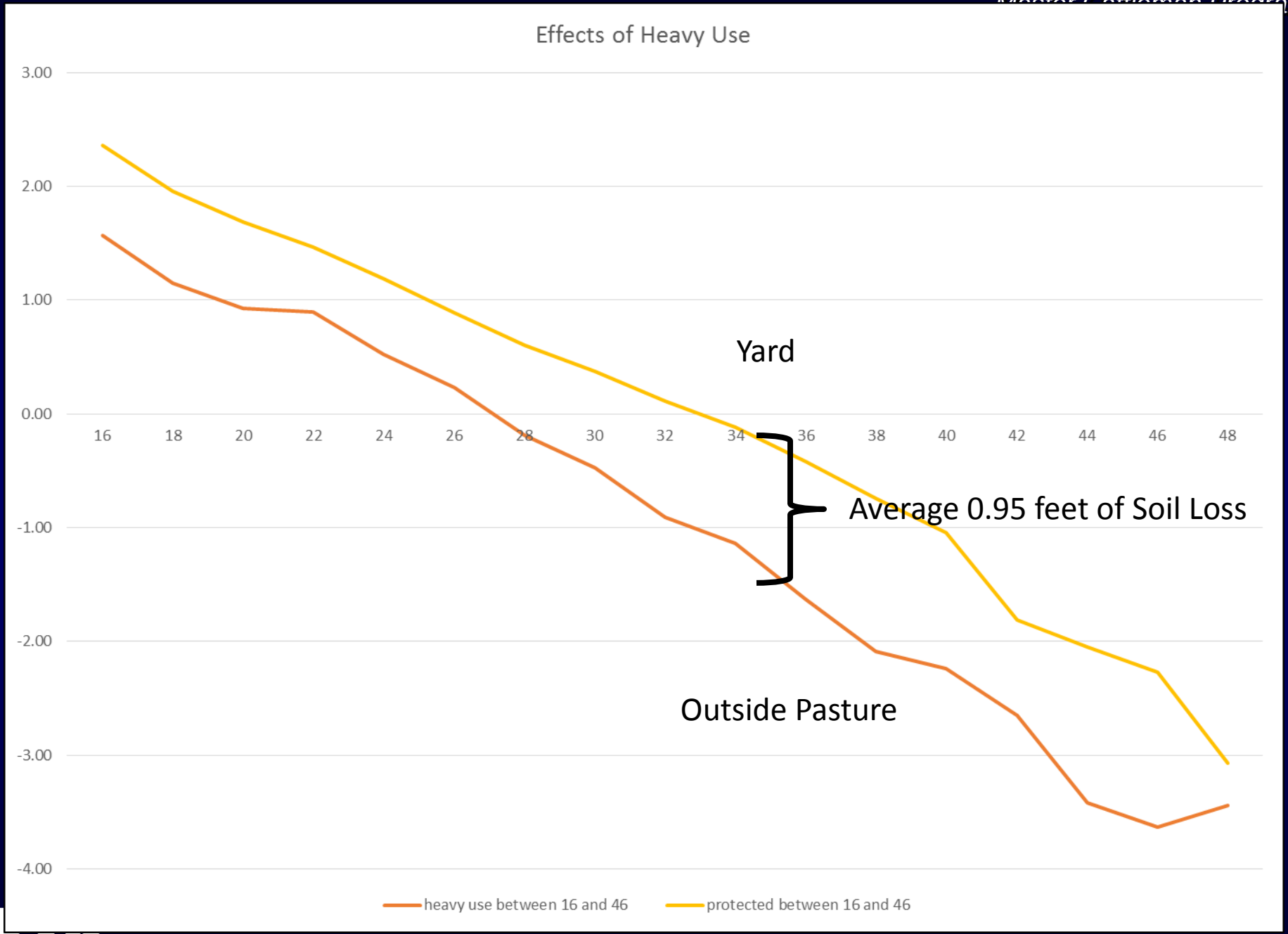
- **Requires cross-disciplinary knowledge.**

Water erodes soil in two ways:

- **Violent splash of falling raindrops**
- **Scouring action of soil laden water**

Raindrops

- 20 mph
- Single raindrop can send soil 2 feet high and 5 feet from the spot.
- One inch rainfall – weighs more than 150 tons/acre
- 2 inches per hour is the equivalent of 250 hp – on an acre.
- Equals a force to lift 7 inches of the topsoil to a height of 3 feet, 86 times during an hour's rain.
- One inch rain may move 150 tons of soil per acre.


Effects of Heavy Use
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
Yard
Average 0.95 feet of Soil Loss
Outside Pasture
heavy use between 16 and 46
protected between 16 and 46

Water Management

- Understand that water is transient
- Increasing Infiltration
- Increasing Organic Matter
- Contour Ripping
- Vegetative Terracing
- Controlling Runoff
- Water Harvesting

Water Conservation is what we need to be doing - We need to improve

- Cover
- Porosity
- Soil Organic Matter

This is what it needs to be about

- **Cover**
  - decrease canopy - decrease production
  - Increase erosion and loss of organic matter
- **Porosity**
  - decrease porosity – decrease infiltration – increase water loss, runoff, and erosion
- **Organic Content**
  - decrease soil organic matter – decrease water holding capacity, decrease yield

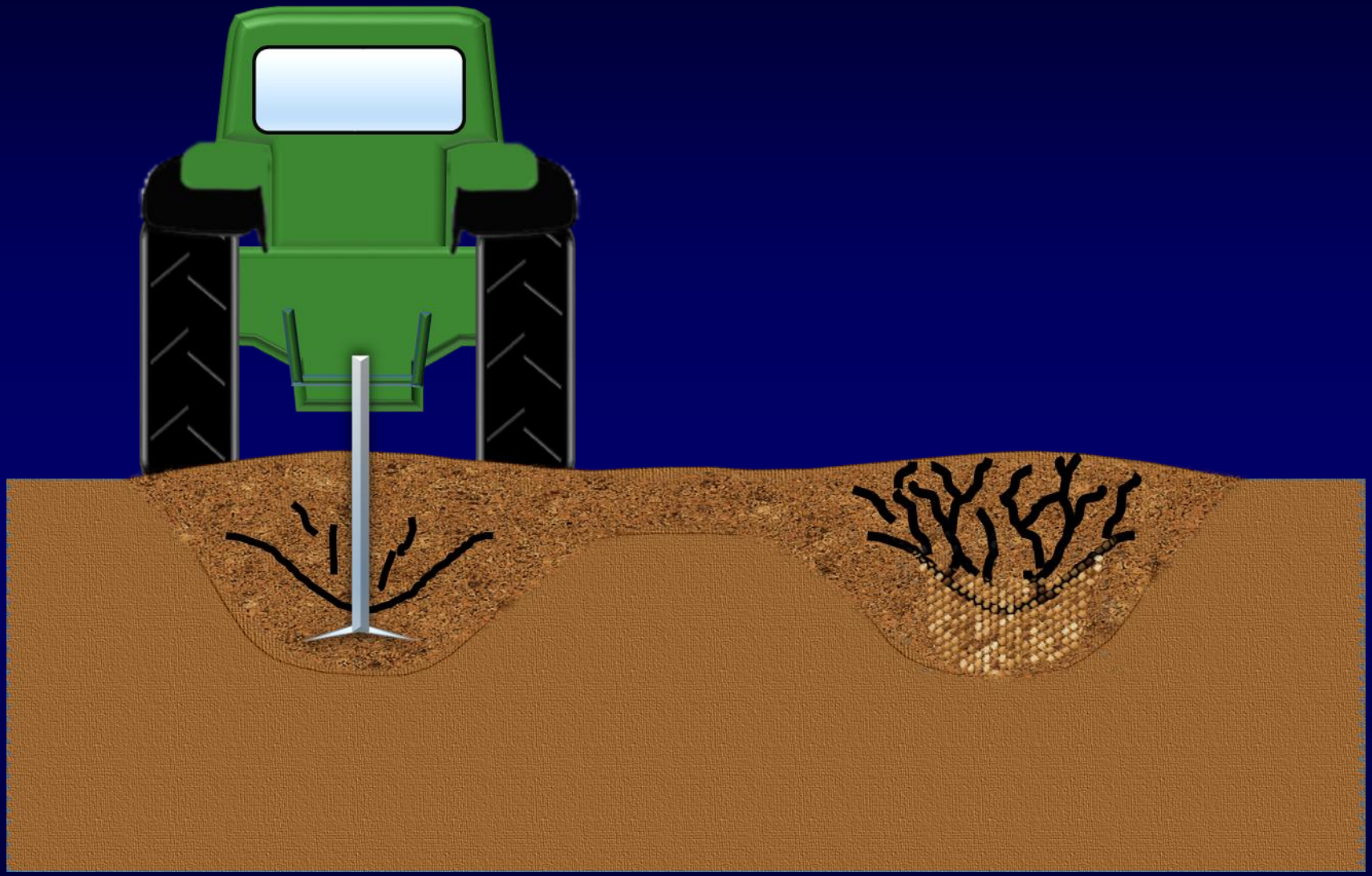
Soil Organic Matter

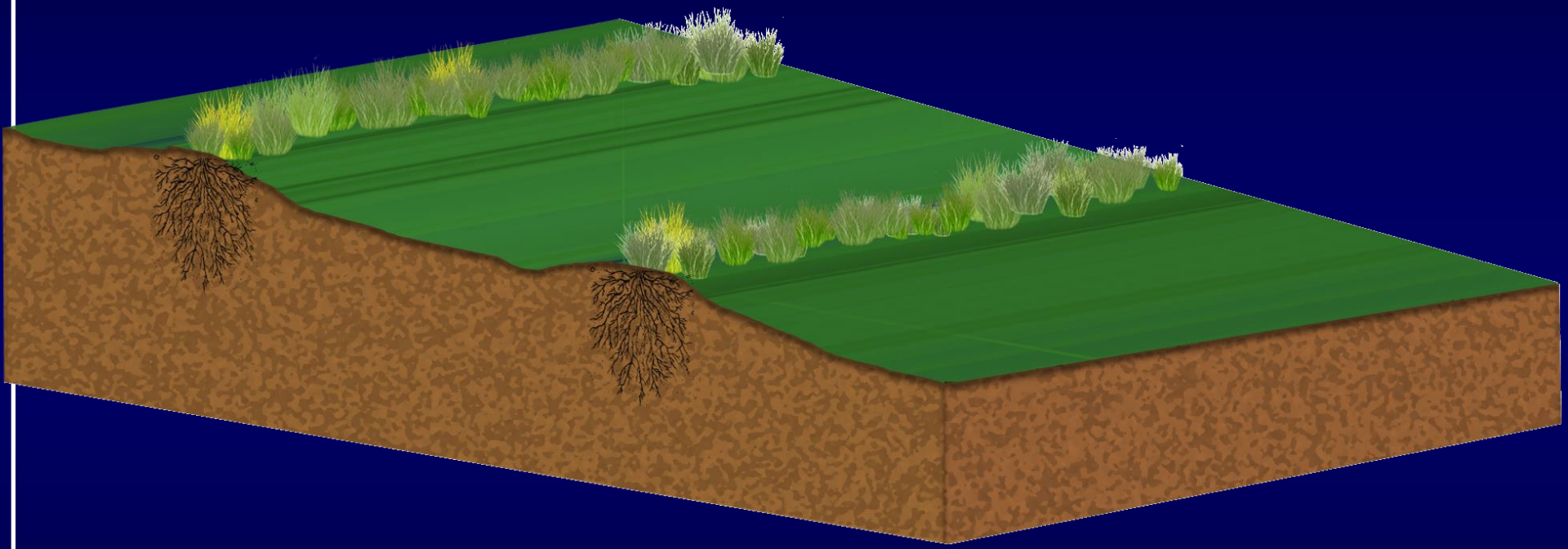
- Increased water holding capacity
- Enhanced water infiltration
- Improved soil structure
- Increased CEC
- Enhanced microorganisms
- pH buffer capacity
- Enhanced chelation
- Enhanced adsorption capacity
- Reduced damage by soil pathogens
- Reduces ability to compact

Water Management

- Understand that water is transient
- Increasing Infiltration
- Increasing Organic Matter
- Contour Ripping
- Vegetative Terracing
- Controlling Runoff
- Water Harvesting


75'
742
498
176
105
75
676
612
271
118
97
749
344
340
341
212
1032
555
307
133
115
348
181
112
96
63






Paved Lot
North

Water Management

- Understand that water is transient
- Increasing Infiltration
- Increasing Organic Matter
- Contour Ripping
- Vegetative Terracing
- Controlling Runoff
- Water Harvesting


845
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Google earth

What we need to do to get conservation on the ground

- Provide short-term benefits –
  - Increase yields or money within the first year
  - Reduce risks
  - Reduce inputs (money, labor, energy, etc.)
- Basically, we need to meet the producer's needs/wishes, otherwise there will be no adoption or maintenance of the practices.

Livestock Performance

Active Management of:

- **Rainwater**
- **Vegetation**
- **Slopes and Soils**

- **Requires cross-disciplinary knowledge.**

1976 Soil Survey

- 4 inches of topsoil
- Organic matter content is low, Droughty, restricted root layer
- Silty clay loam
- Slightly sticky and plastic
- Narrow ridges in hilly areas – some 12 to 20% slopes, most 20 to 30% - severely eroded
- Runoff is rapid, permeability is low

Livestock Performance

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- **Vegetation**
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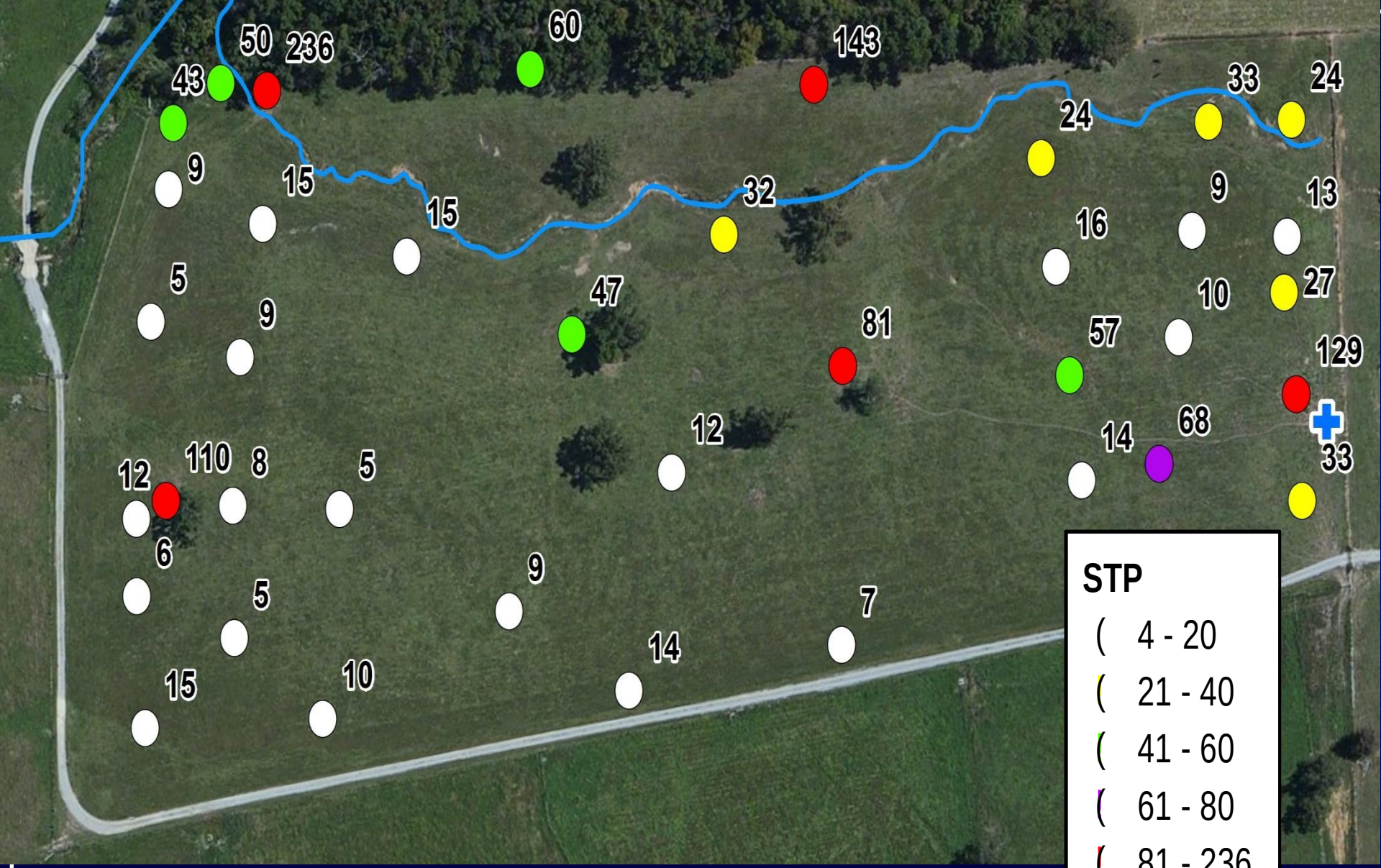
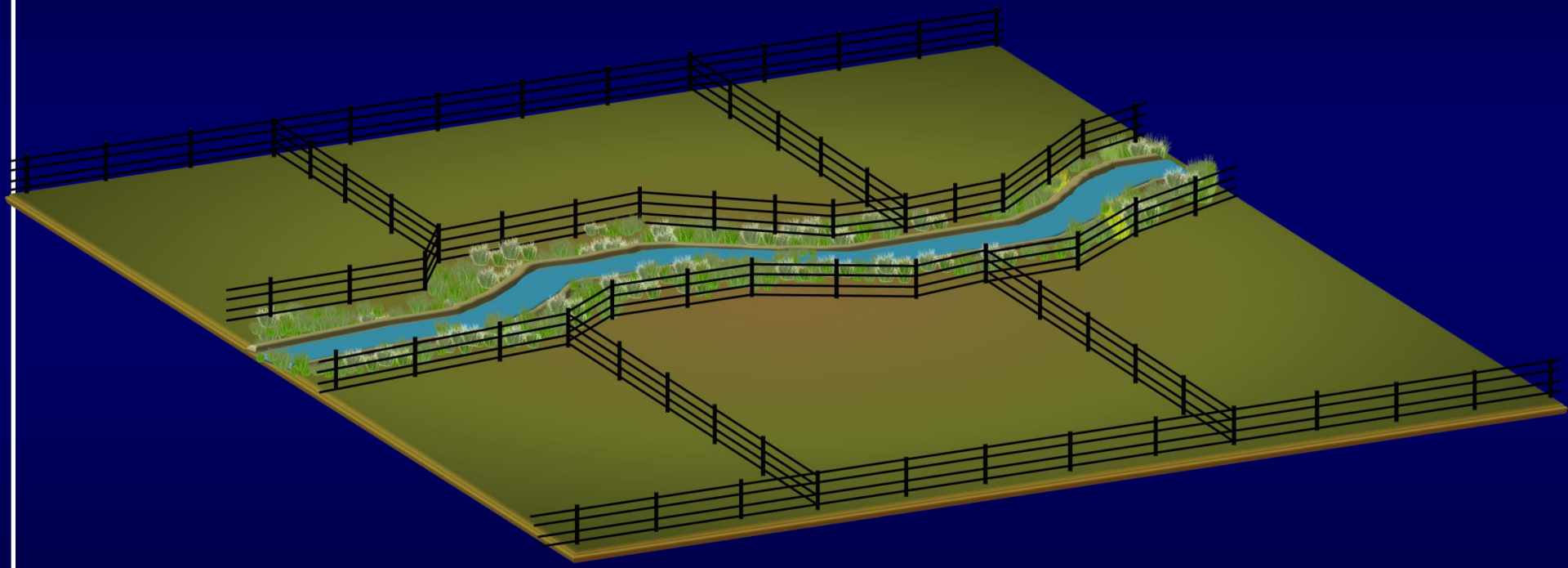


1,600 feet from waterer to road

UK

Environmentally Sound Grazing



Flash Grazing Near Stream

- Treat stream area as a pasture
- High intensity grazing
- 1/2 to 1 day duration
- Dry periods only
- Provide off-stream water source

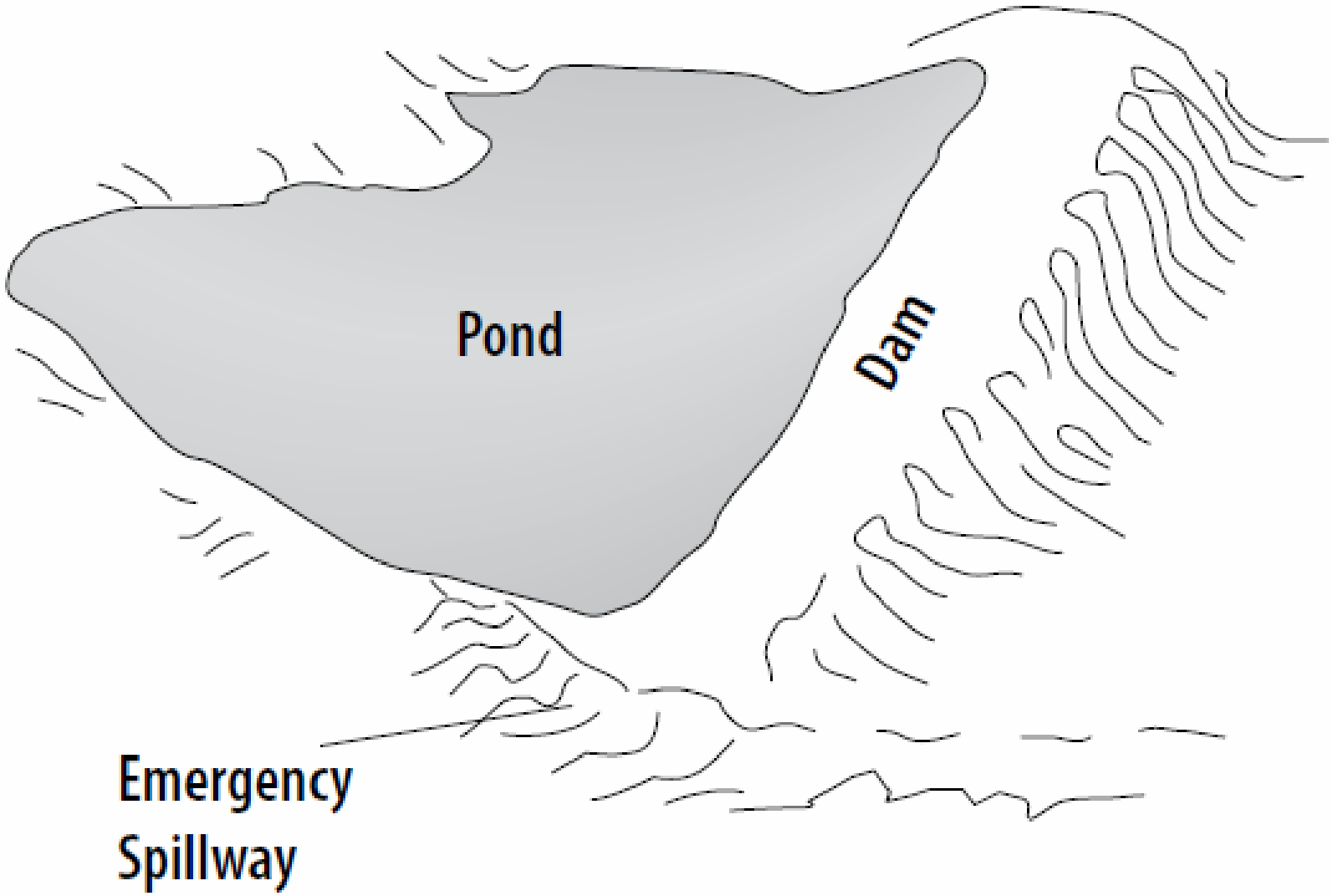
Streams

Advantages

- Naturally occurring, no direct installation cost
- Hardened surfaces can be used to minimize animal damage
- May provide a vehicle crossing point

Limitations

- Water may be poor quality
- Susceptible to bank erosion
- Potential injury to livestock slipping on banks or getting caught in tree roots
- Needs regular repairs to water gaps after floods
- Trees attractant cattle that can cause heavy use of riparian areas and poor grazing patterns
- Flow may be seasonal and stop during dry periods
- Water may become stagnant and be of poor quality in low flows
- Increases levels of fecal coliform and other water borne disease


Pond
Dam
Emergency
Spillway

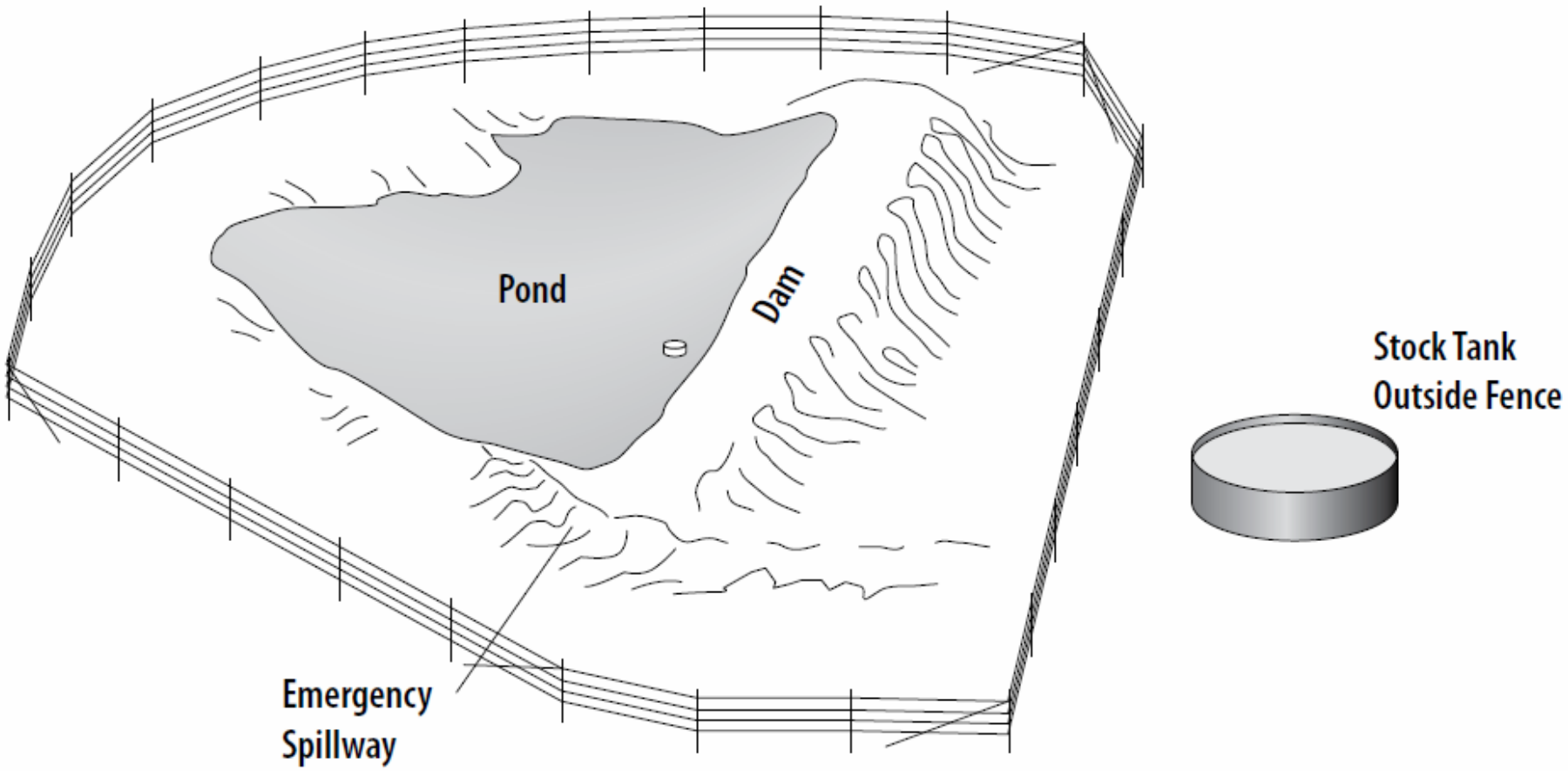
Ponds

Advantages

- Simple and adaptable to many locations
- Will generally store a long-term supply
- Multiple examples and experienced contractors readily available
- Does not involve mechanical or electronic parts that can fail
- Often used for fishing and other recreational activities

Limitations

- Sedimentation and bank erosion limit life of reservoir storage
- Direct livestock access can cause poor water quality
- Initial construction and later restoration costs are high
- Steep banks are hazards to livestock when muddy
- Animals walking on the pond in the winter may fall through the ice
- A hole may need to be chopped in the ice to provide water for livestock
- Erosion in emergency spillways is a common problem
- Runoff needed to refill the reservoir will be limited during low rainfall
- Generally not suitable for sandy or rocky soils
- Ponds that do not hold water are difficult to remedy


Pond
Dam
Emergency
Spillway
Stock Tank
Outside Fence

Pond Exclusion

Advantages

- Minimizes erosion of pond shorelines and dam faces
- Reduces sediment deposition in reservoir
- Extends useful life of the pond
- Improves quality of water for livestock and aquatic life
- Better wildlife habitat along the shoreline
- Prevents cattle from getting on ice and falling into pond
- Eliminates animal trails in the emergency spillway
- Eliminates or minimizes transmission of water borne diseases

Limitations

- Additional cost for fence construction; numerous corners and rough terrain add to the cost

Limited Access

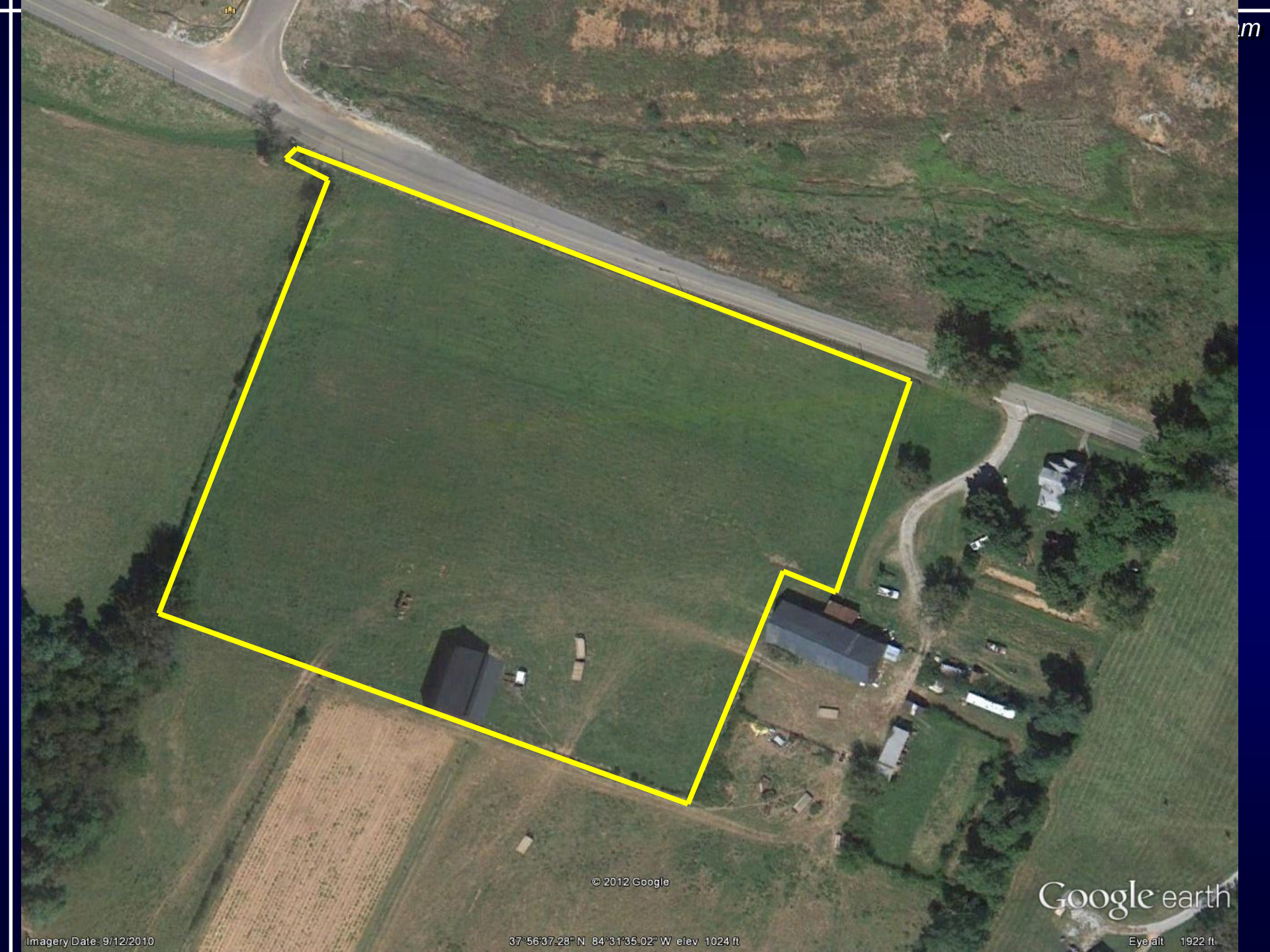
Advantages

- Simple and inexpensive
- Improved livestock safety and health, less foot rot and fewer leg injuries
- Reduced bank erosion
- Less sediment and fewer nutrients entering streams and ponds
- Extended pond life
- Applicable to new and existing ponds
- Increased water intake may mean better livestock gains

Limitations

- Not adapted to large streams
- Fence maintenance required when stream floods
- Few options for location of watering point

Limited Access


© 2012 Google
Google earth
Imagery Date: 9/12/2010
37°56'37.28" N 84°31'35.02" W elev 1024 ft
Eye alt 1922 ft

UK

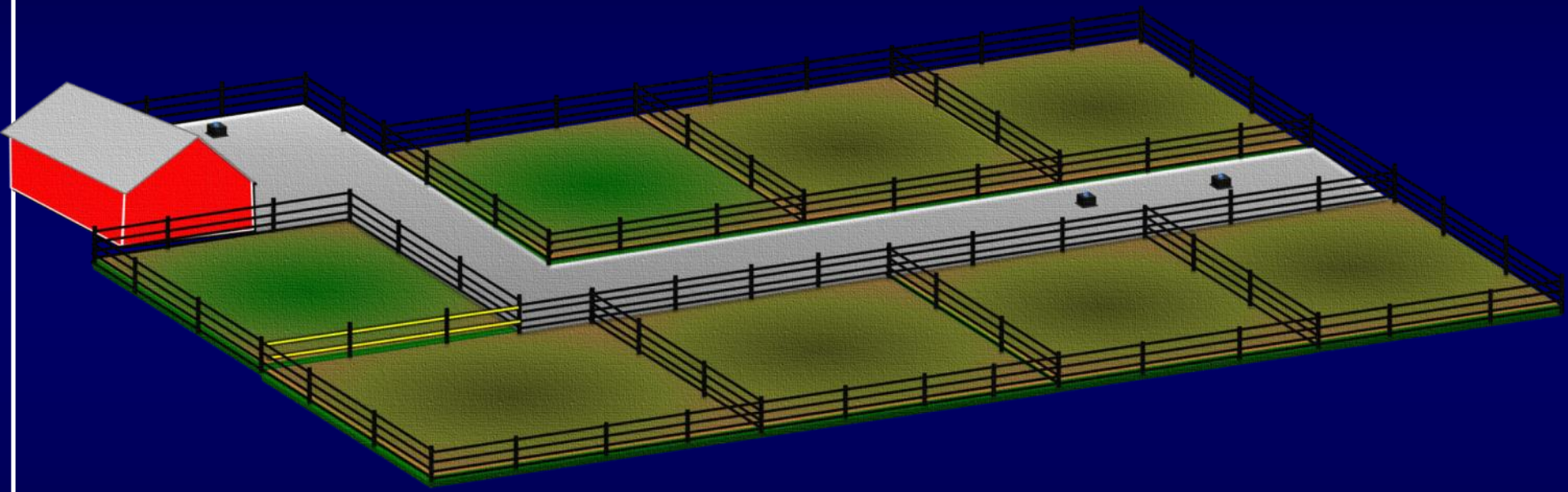
Cyanobacteria

- Cyanobacteria appear as slicks of bright green paint on the water surface.
- Humans - Exposure can lead to gastrointestinal symptoms such as stomach pain, nausea, vomiting and diarrhea. It also can cause skin, eye and throat irritation, in some cases, breathing difficulties.
- Cattle - Can cause death.

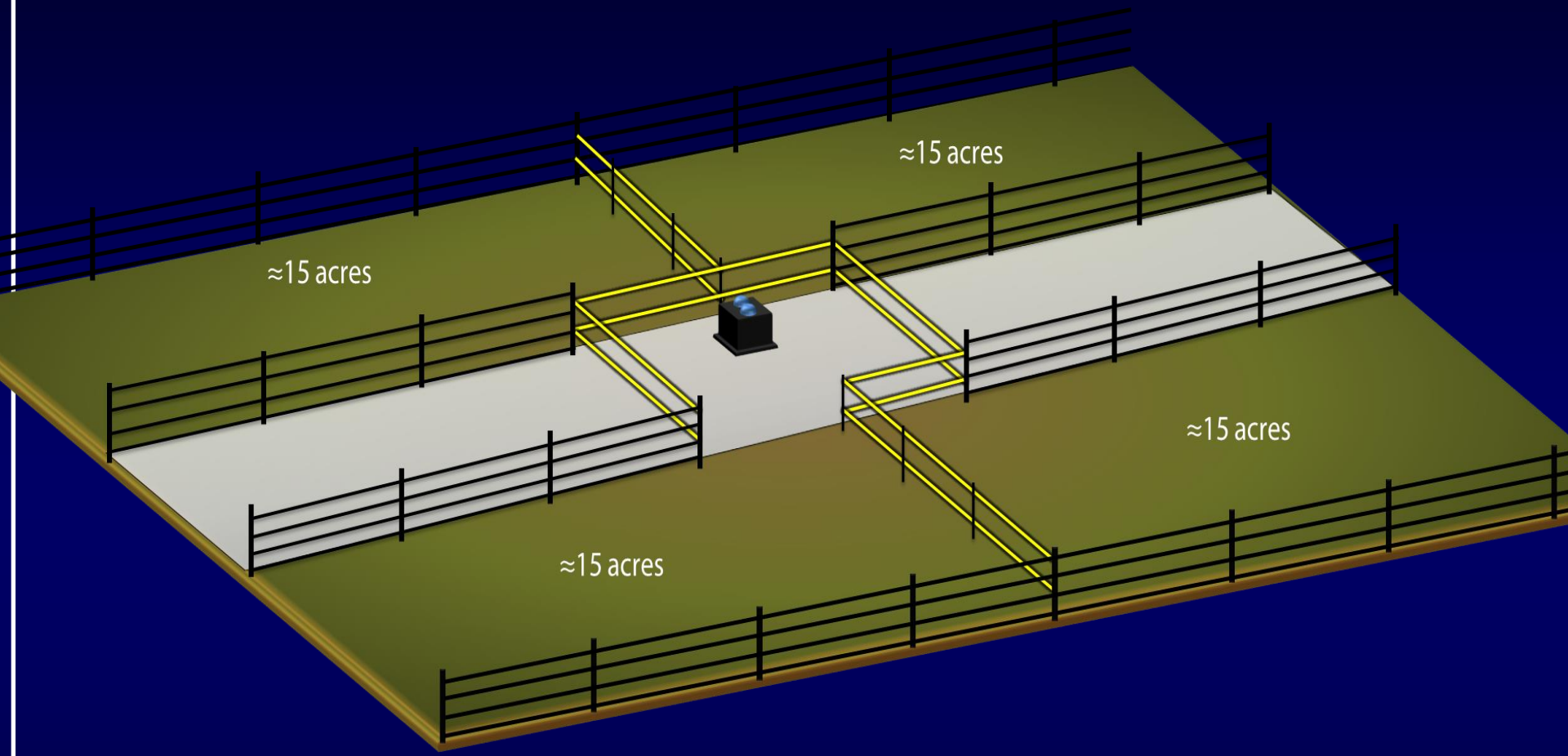
- **The UKVDL has received several cattle with suspected blue-green algae poisoning. The cows were found acutely dead in or near ponds in which the blue-green algae (Aphanizomenon and Microcystis) were identified.**

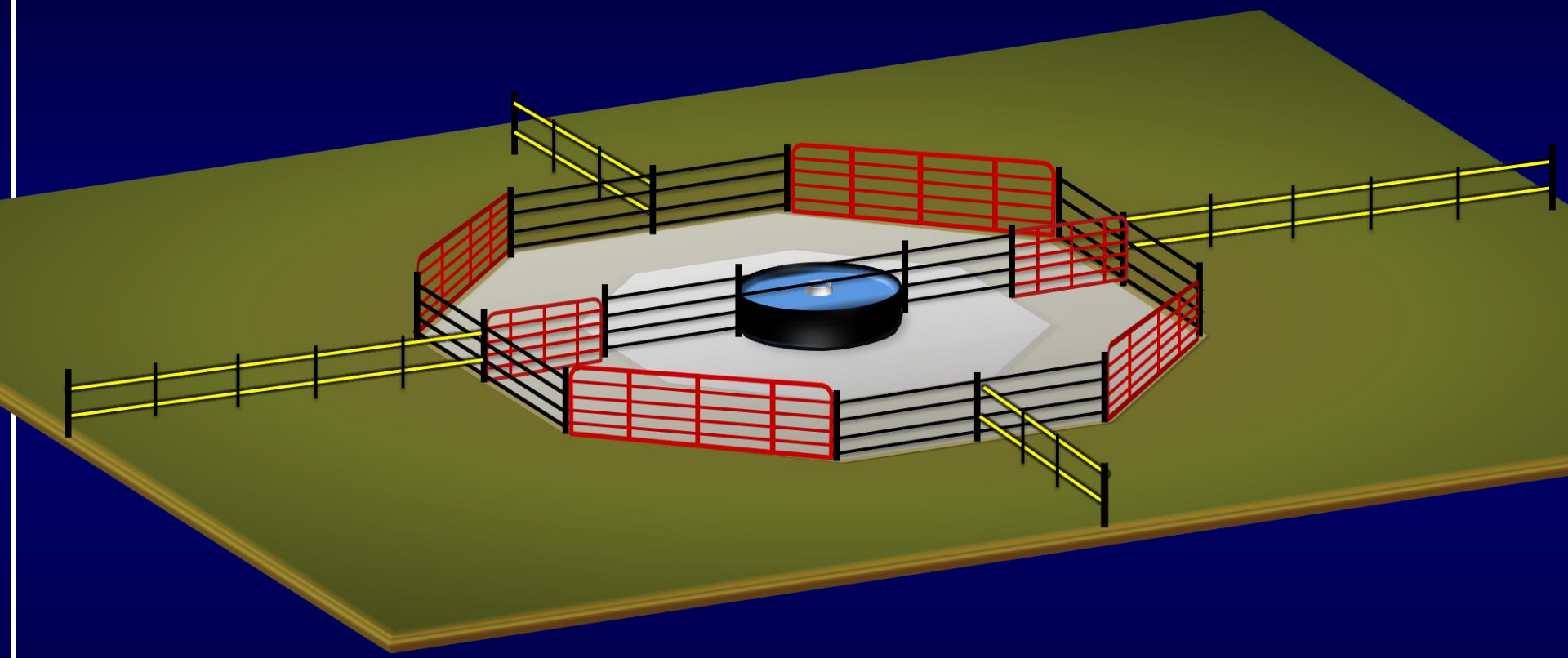
Rotational Grazing Best Design

- Plan for adverse weather conditions
- ~~Sacrifice area~~ Dry lot for extremely wet conditions.
- During drought?
- Shelter from extreme cold/wet conditions
- Shade – during extreme heat



- **Stockpiling**


≈15 acres
≈15 acres
≈15 acres
≈15 acres



Controlled Traffic

Winter and Drought Feeding Areas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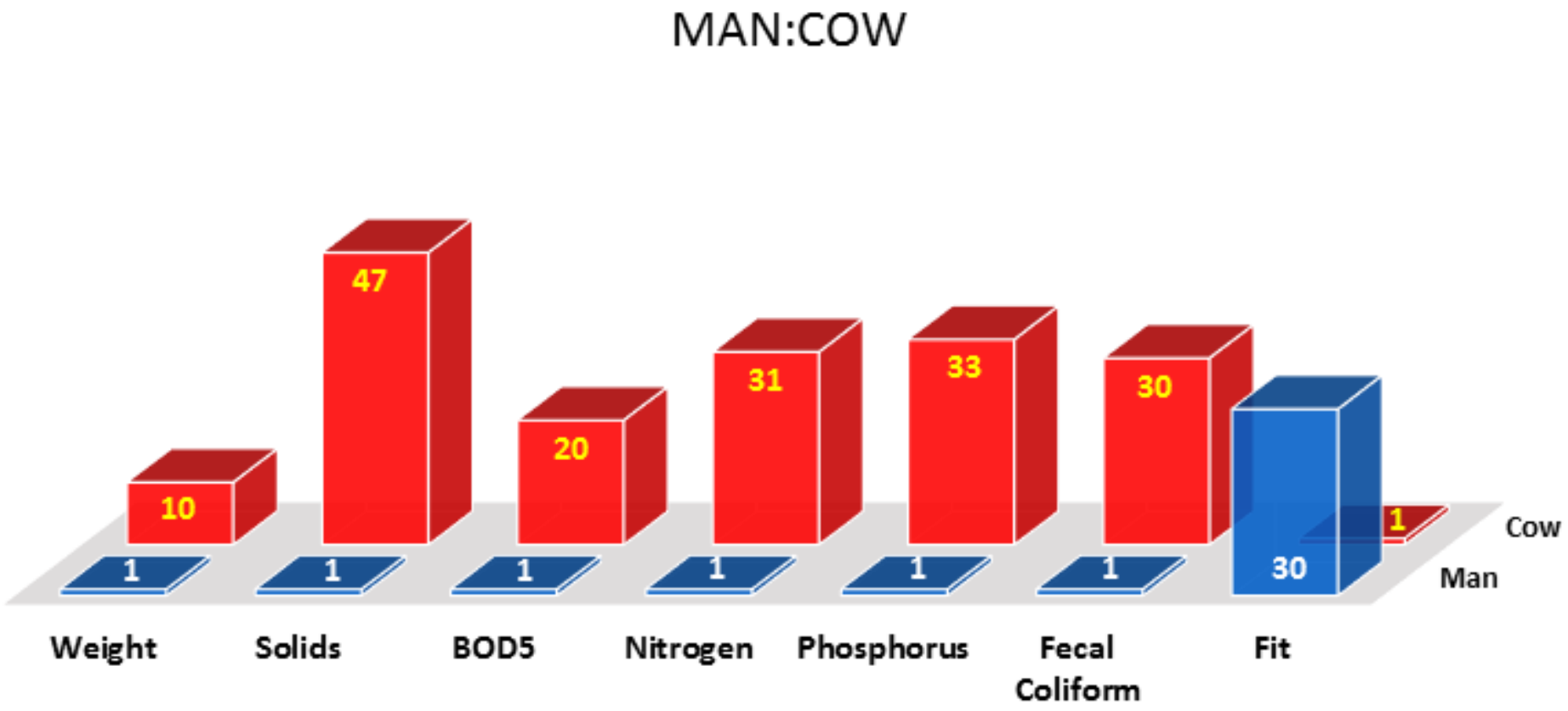
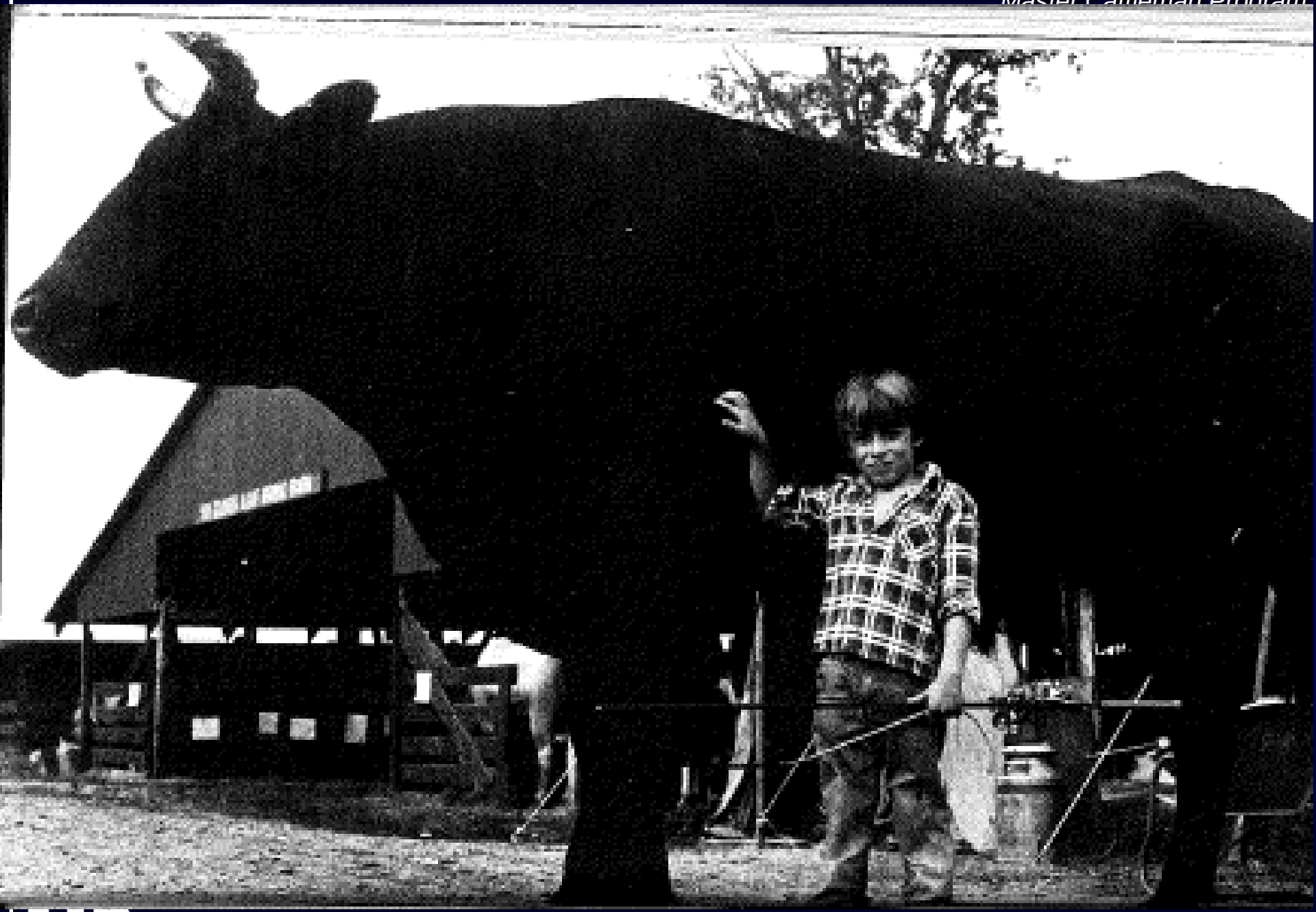
Google earth

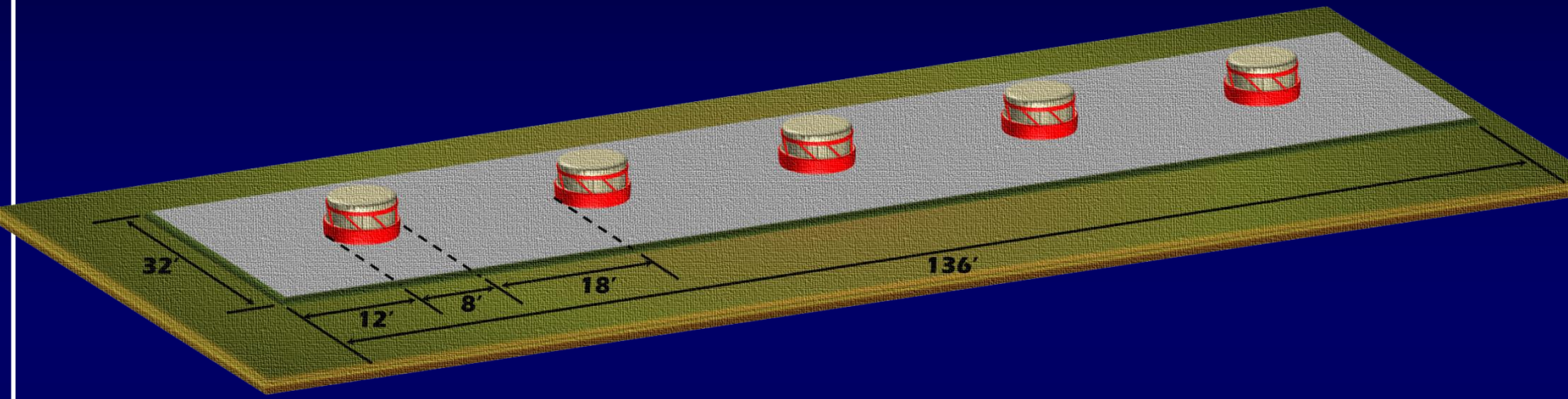

MAN:COW
10
47
20
31
33
30
1
1
1
1
1
1
30
1
Cow
Man
Weight
Solids
BOD5
Nitrogen
Phosphorus
Fecal Coliform
Fit

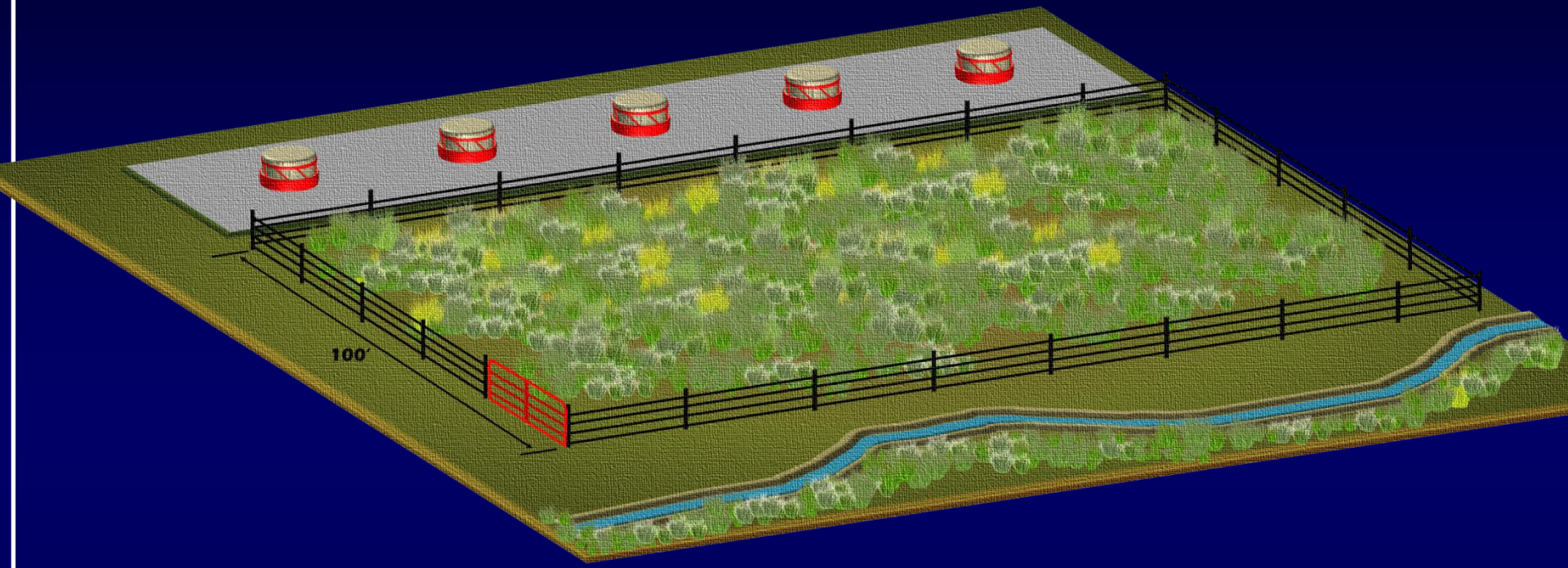

45


(C) Lehmkuhler

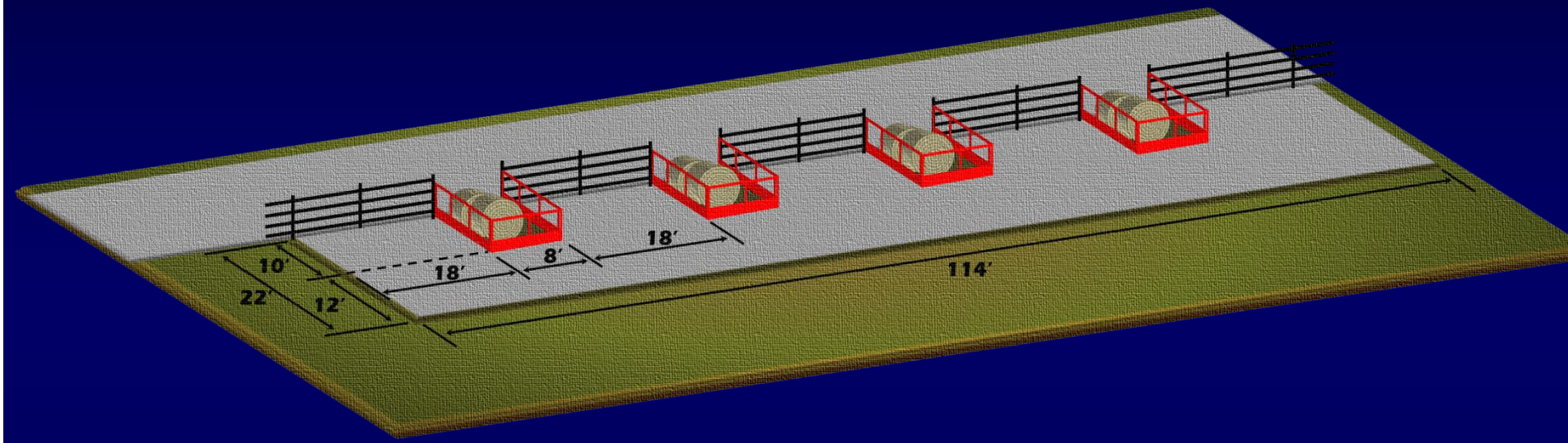

80th Anniversary
NATIONAL WESTERN
1987
FRONTIER




32′
12′
8′
18′
136′


100'

Kim


10′
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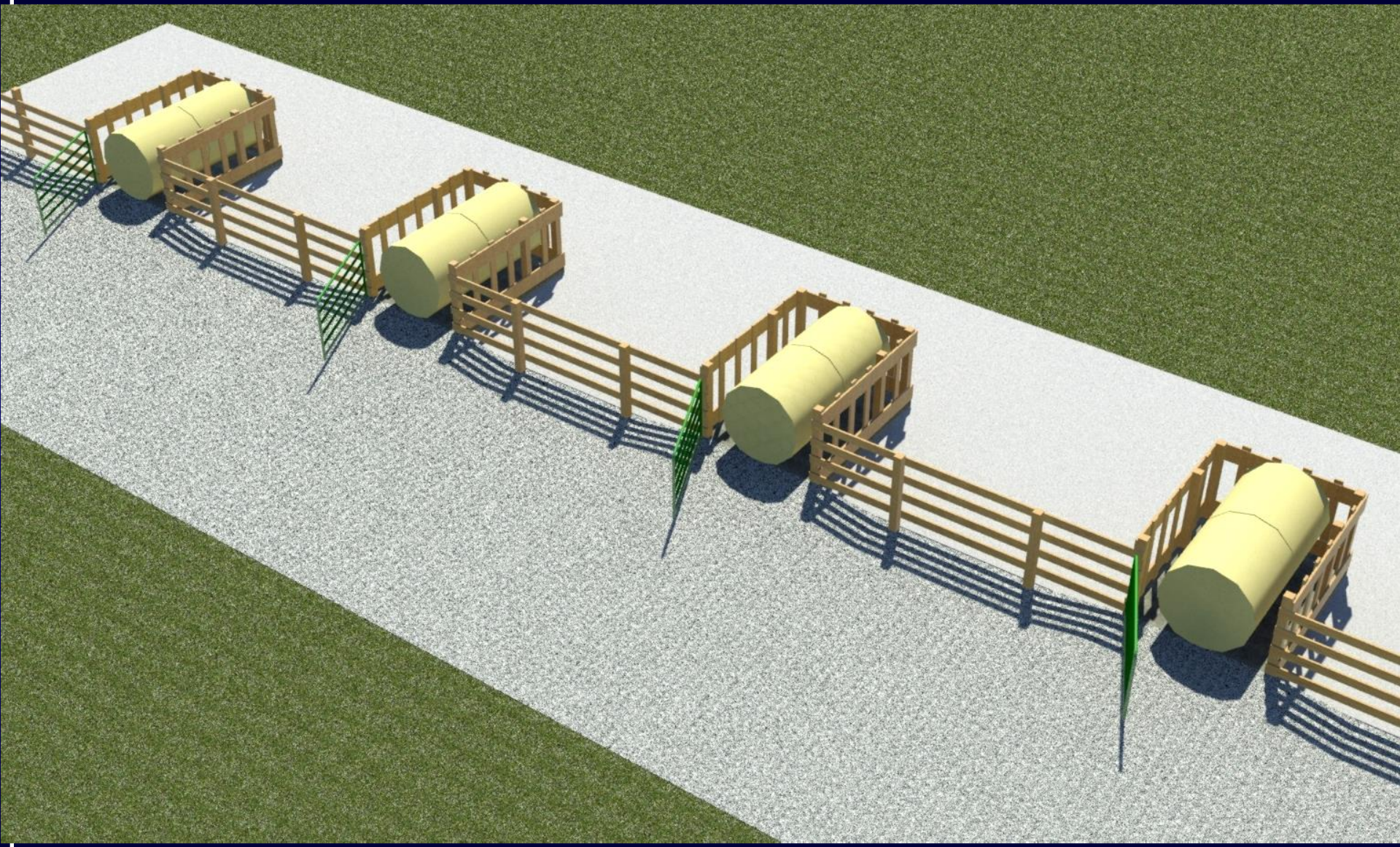
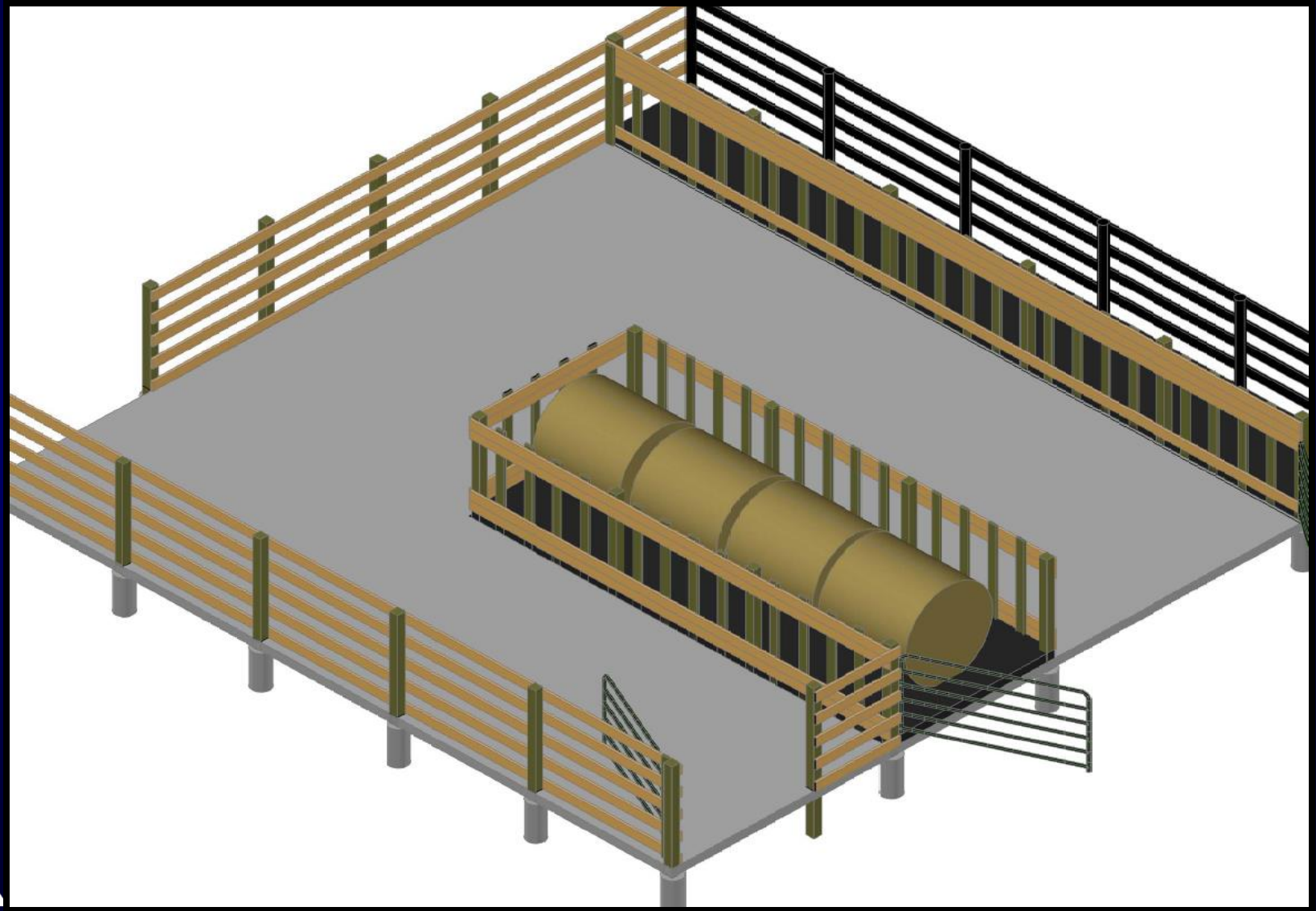
18′
114′



Open Winter Confinement Concrete



Open Winter Confinement

- Saves hay (elevated)
- Saves fuel
- Saves labor
- Saves pastures
- Better manure utilization
- Increased hay production from manure utilization and pasture relief
- Better Water Quality Management

This structure should be used with:

- Proper Grazing Use, and
- Planned Grazing Systems
- Holistic Approach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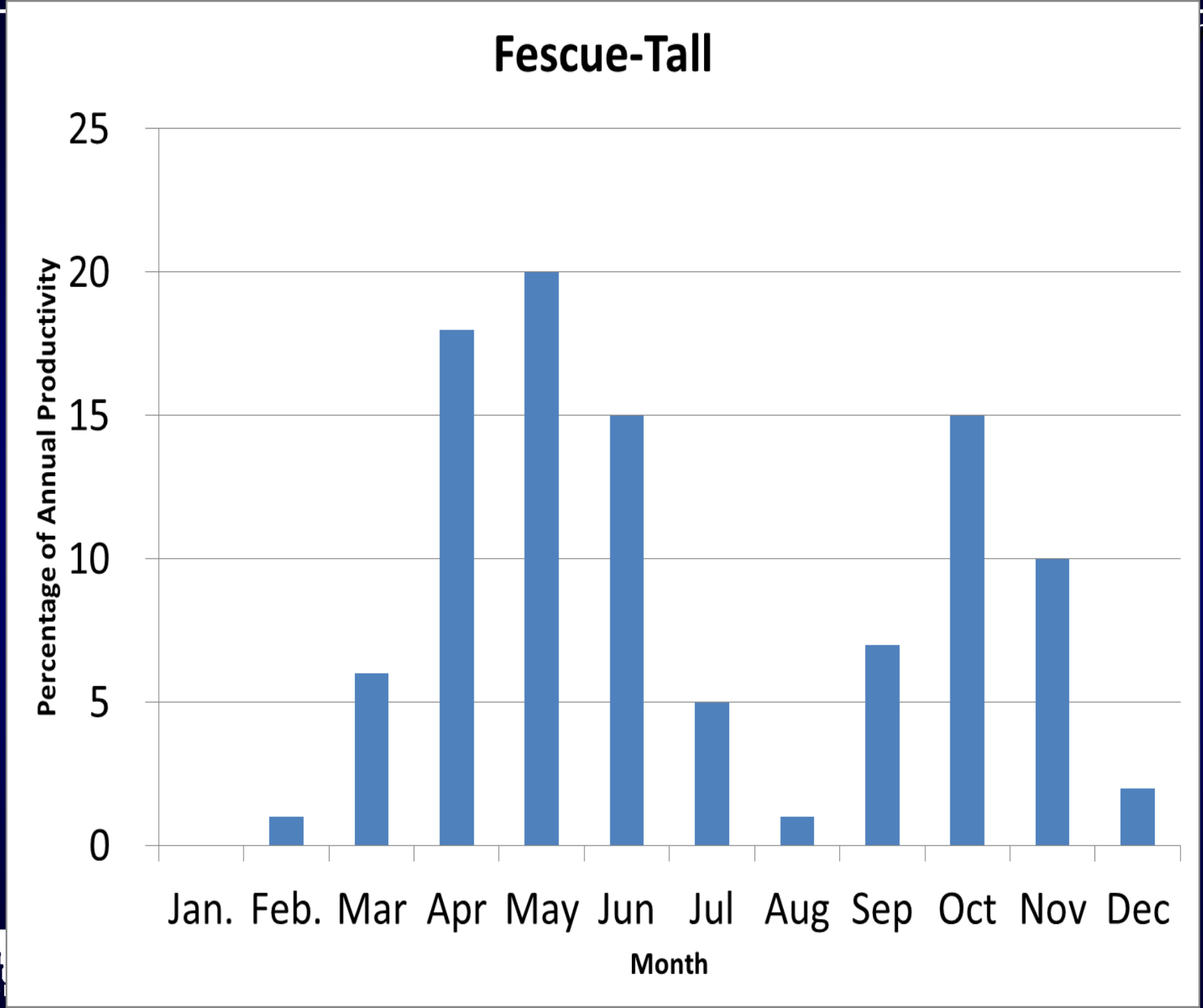
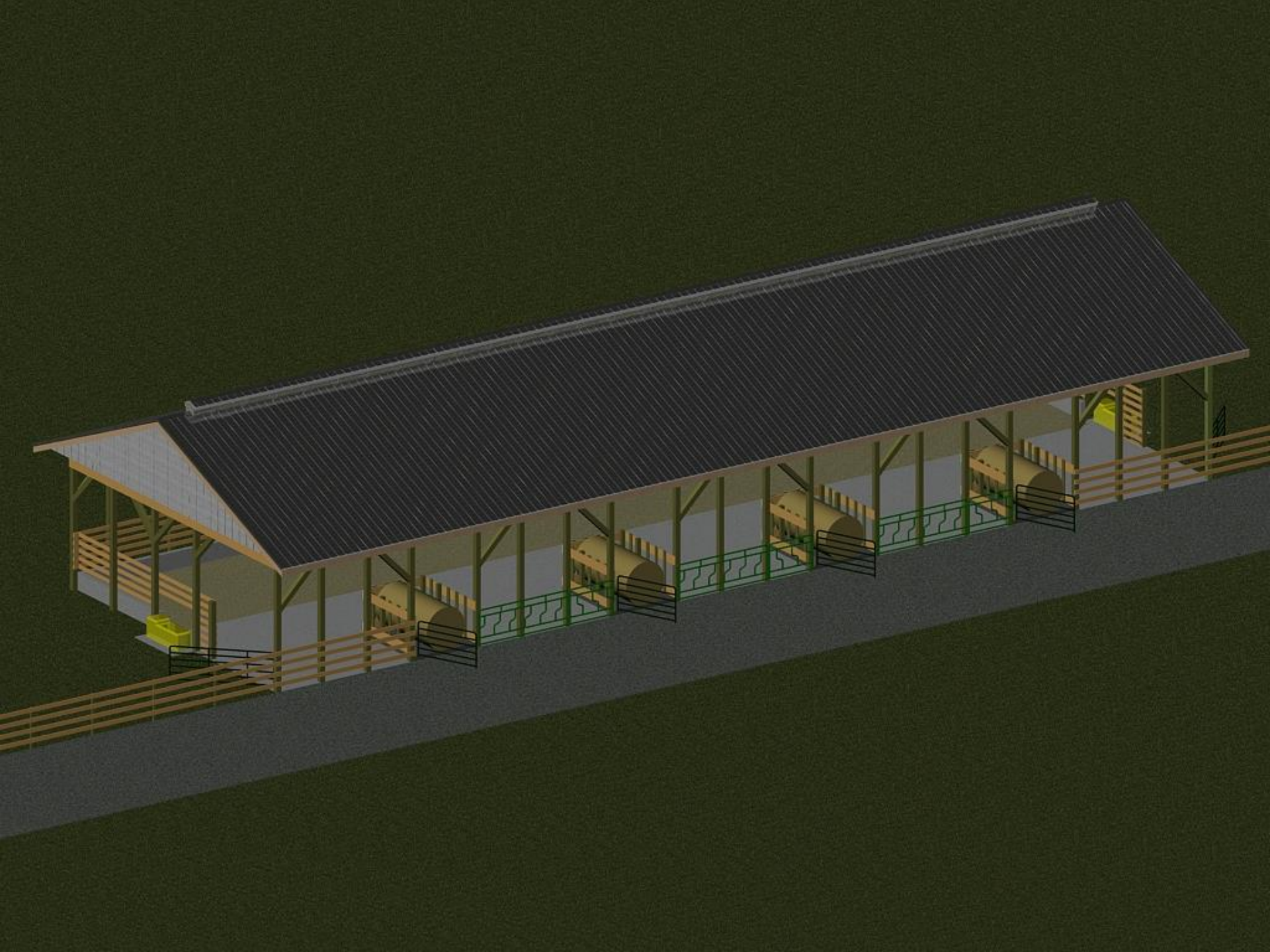
Field #6
Field #1
Field #2
Winter Feeding Area
Field #5
Field #3
Field #4
Red Areas are Gates


Fescue-Tall
25
20
15
10
5
0
Percentage of Annual Productivity
Jan.
Feb.
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month

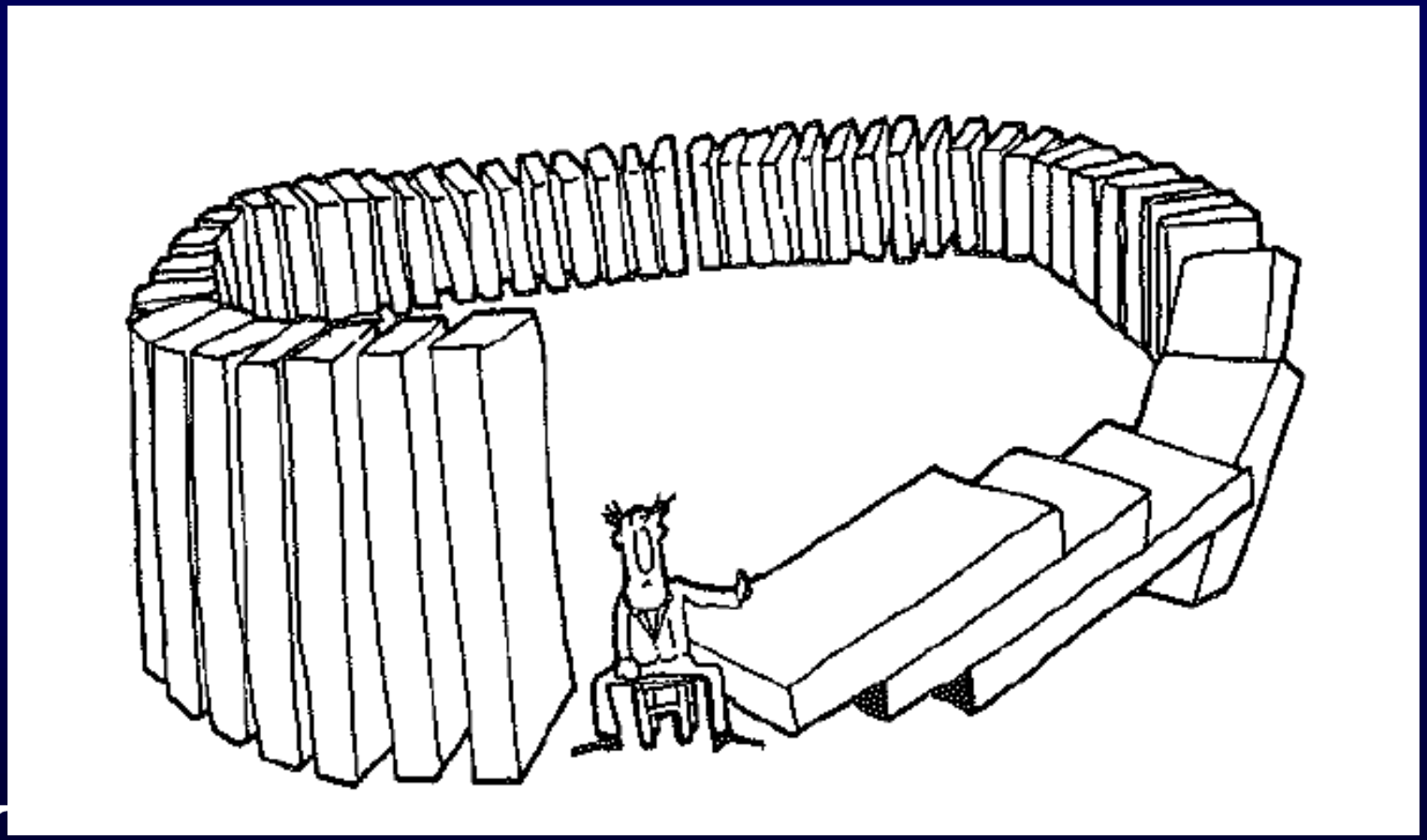


Again, well selected improvements in management can help producers fulfil their aims, while simultaneously increasing the conservation effectiveness of their farming operation.

The Truth is

- **Getting better livestock production (water quality) practices adopted, even when they have obvious advantages, is often very difficult.**

In complex systems, cause and effect are distant in space and time



Like the glass of water, people need to see things from different viewpoints

- **Focus on saving pore spaces, more than saving solid particles.**
- **Emphasize increasing infiltration more than reducing runoff.**
- **Maintaining a cover of plant residues on the soil more than minimizing erosion.**
- **When you see a muddy river during a flood, ask “why so much water?” than to point out the sediment being transported.**
- **Consider Water and Soil Conservation (WSC) rather than Soil and Water Conservation (SWC).**

It helps to have a background knowledge in

- Plant and Soil Sciences
- Climatology
- Animal Behavior
- Veterinary Sciences
- Forestry and Pastures
- Hydrology
- GIS
- Agricultural Engineering
- Ecology
- Communications
- Business Management
- Etc.

Open your mind

UK

Proper Use of Cost Share

Thank you!

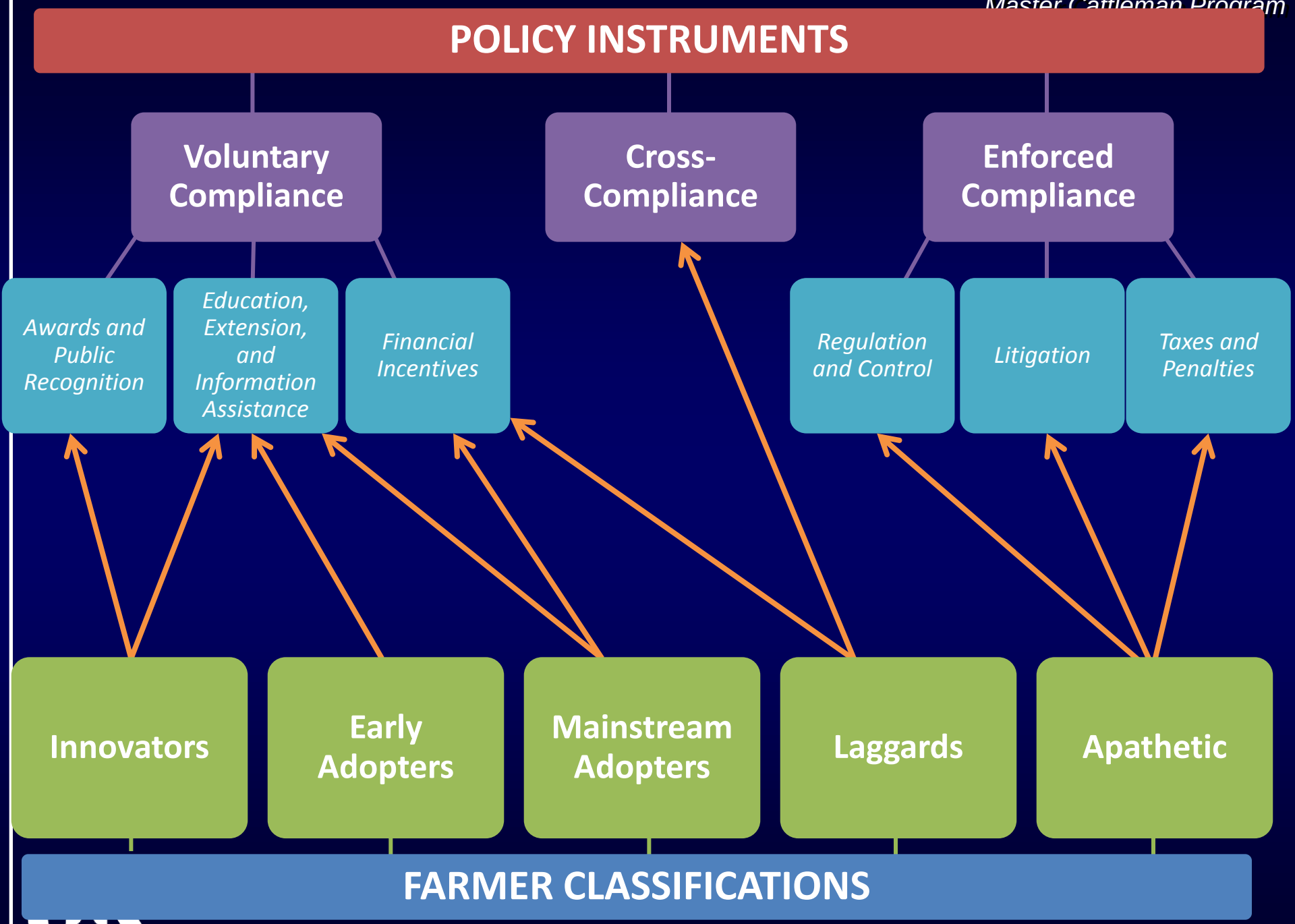
Land Husbandry

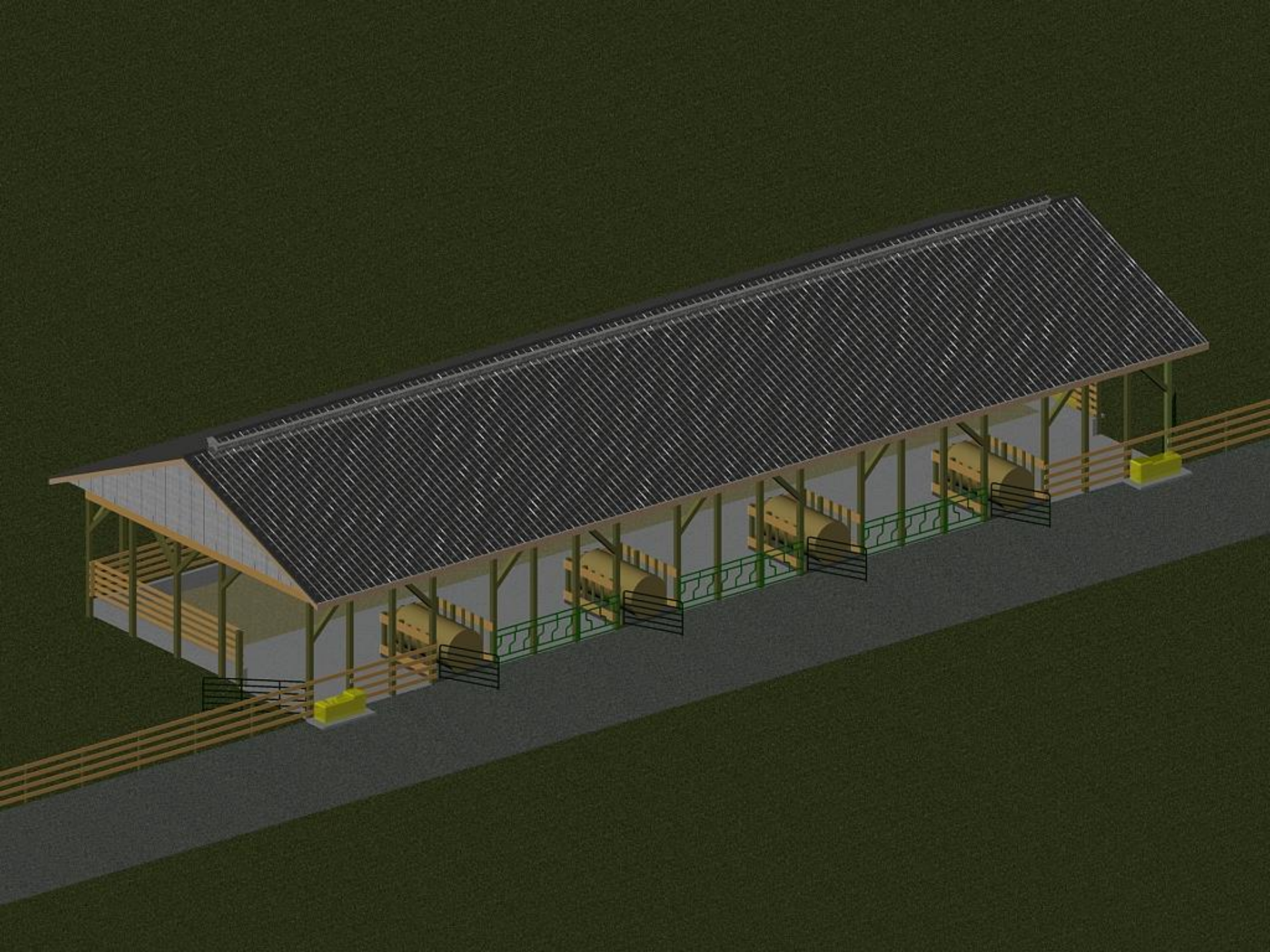
- Rotational Grazing
- Adding Manure
- Reducing Runoff
- Ripping
- Controlled Traffic
- Maintain Cover - Eliminate Erosion
- Conservation
- Increasing Soil Organic Matter

- **To become effective in land husbandry, it is necessary to think and work out what conditions would be optimal in given situations to maintain productivity, self-restoration capacity and usefulness of the land.**

- Keep Fields in Vegetation
  - Erosion is a bad thing
  - Loosing Organic Matter is worse
  - Rotational Grazing
  - Proper Stocking Density
- Provide Alternative Water
- Control Traffic
  - All-Weather Feeding Areas

Diffusion of Innovations (Rogers)


POLICY INSTRUMENTS
Voluntary Compliance
Cross-Compliance
Enforced Compliance
Awards and Public Recognition
Education, Extension, and Information Assistance
Financial Incentives
Regulation and Control
Litigation
Taxes and Penalties
Innovators
Early Adopters
Mainstream Adopters
Laggards
Apathetic
FARMER CLASSIFICATIONS



Smith Cattle Farm - Ag Water Quality Plan

- Livestock BMP 1 – Rotational Grazing
- Livestock BMP 2 – Proper Stocking Density
- Livestock BMP 3 – Riparian Area Protection
- Livestock BMP 4 – Stream Crossings / Alternative Water
- Livestock BMP 10 – Manure Stack Pad
- Livestock BMP 11 – Nutrient Management
- Livestock BMP 13 – Filter Strip
- Livestock BMP 14 – Heavy Use Area Management
- Livestock BMP 15 – Dead Animal Disposal
- Livestock BMP 18 – Stormwater Management

UK

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UK

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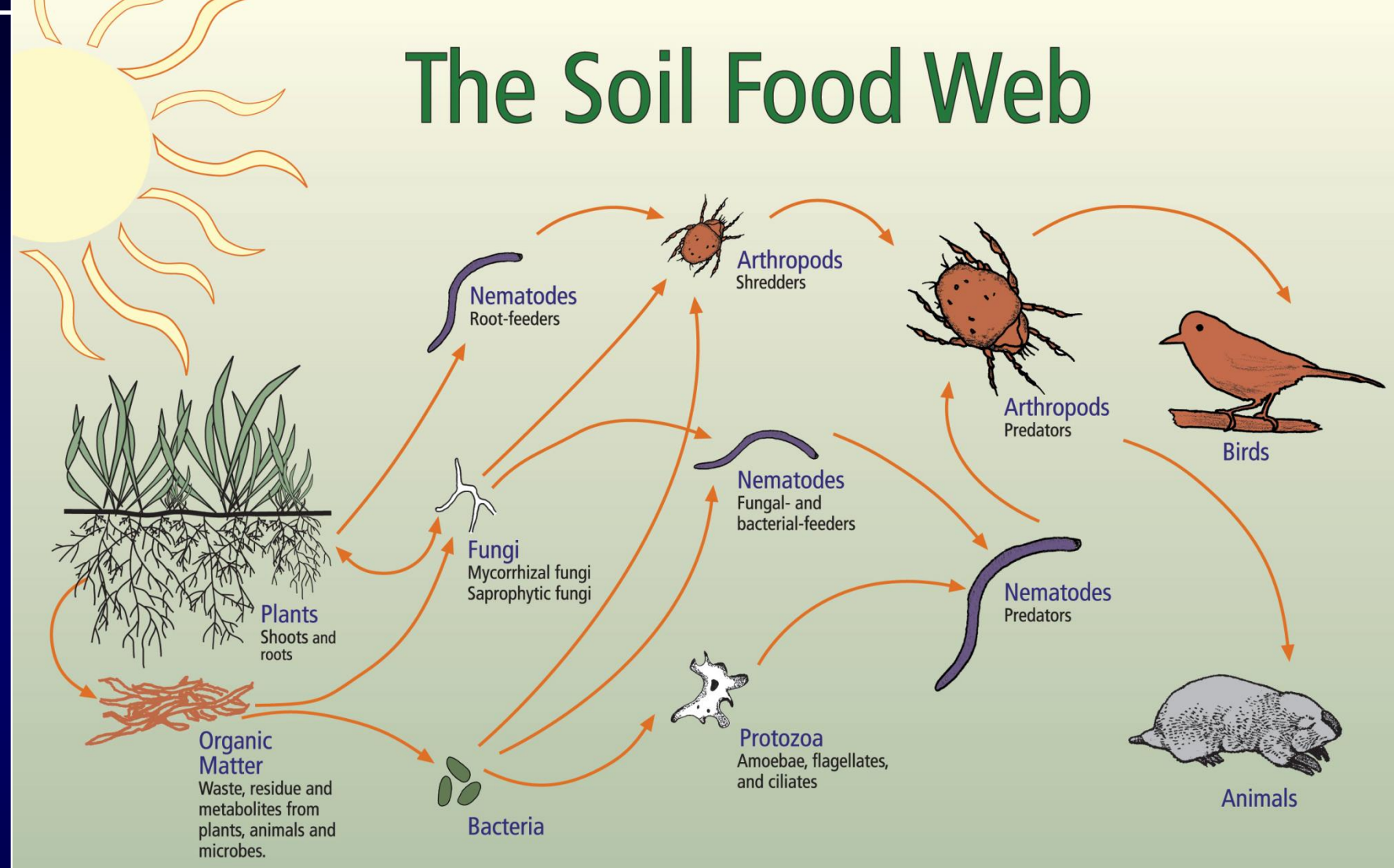
- Livestock BMP 18 – Stormwater Management
- Farmstead BMP 5 – Water Harvesting

Techniques

- Simple, so they can be implemented, demonstrated, and understood.
- Low cost or cost share provided
- Productive, leading to additional benefits, preferably in the first year of operation
- Durable
- Acceptable, practices producers would implement on their own.

The Soil Food Web



First trophic level:
Photosynthesizers

Second trophic level:
Decomposers
Mutualists
Pathogens, Parasites
Root-feeders

Third trophic level:
Shredders
Predators
Grazers

Fourth trophic level:
Higher level predators

Fifth and higher trophic levels:
Higher level predators