



PADDOCK DESIGN FENCING WATER SYSTEMS

2018 California Cattle Grazing School

FIRST THINGS FIRST

- Paddock design, fencing and stockwater systems (on their own) WILL NOT INCREASE PROFIT!
- If your bulls are infertile, fencing will not fix the problem!
- Fencing will not solve family relationship problems!
- Fencing and stockwater systems CAN help address:
 - Livestock distribution problems
 - Labor costs
 - Ability to rest pastures

CELL DESIGN

Re-designing your ranch with managed
grazing principles in mind!

**DESIGN FOR WHAT
YOU WANT!**

BUILD YOUR PLAN IN PHASES!

**USE YOUR
IMAGINATION!**

WILL YOUR INVESTMENT IN INFRASTRUCTURE PAY FOR ITSELF?!

- What are the benefits of investing in well-designed paddocks and water systems?
 - Forage production
 - Livestock distribution and forage utilization
 - Labor efficiency
 - Better control of livestock
- How do you calculate return on this investment?
 - Simple payback period
 - Cost of fence
 - Gross margin per cow
 - Increase in stocking rate

SIMPLE PAYBACK PERIOD

1 mile portable electric fencing (w/ energizer) – \$1,500

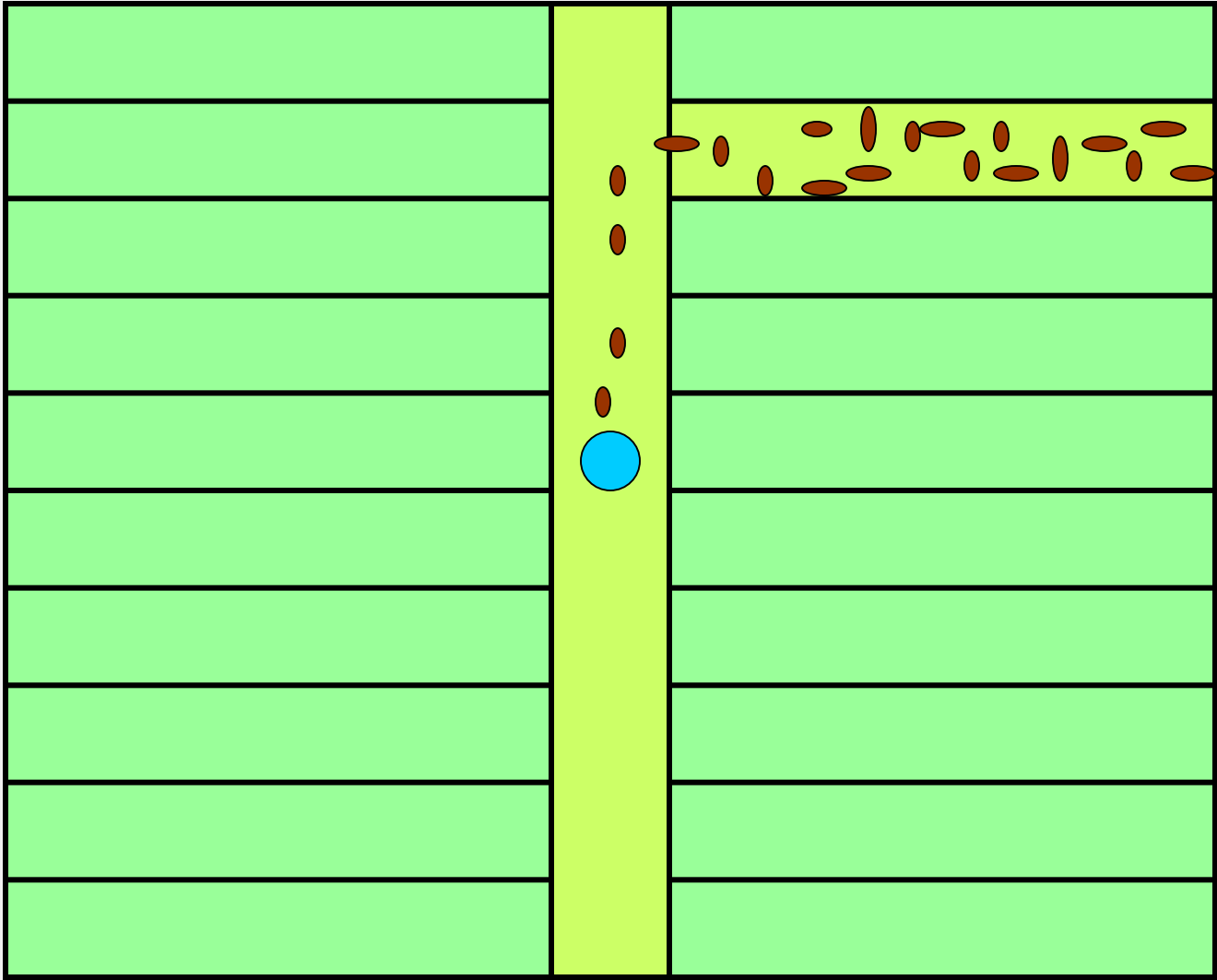
Gross margin per cow – \$250

Increase stocking rate by 4 cows

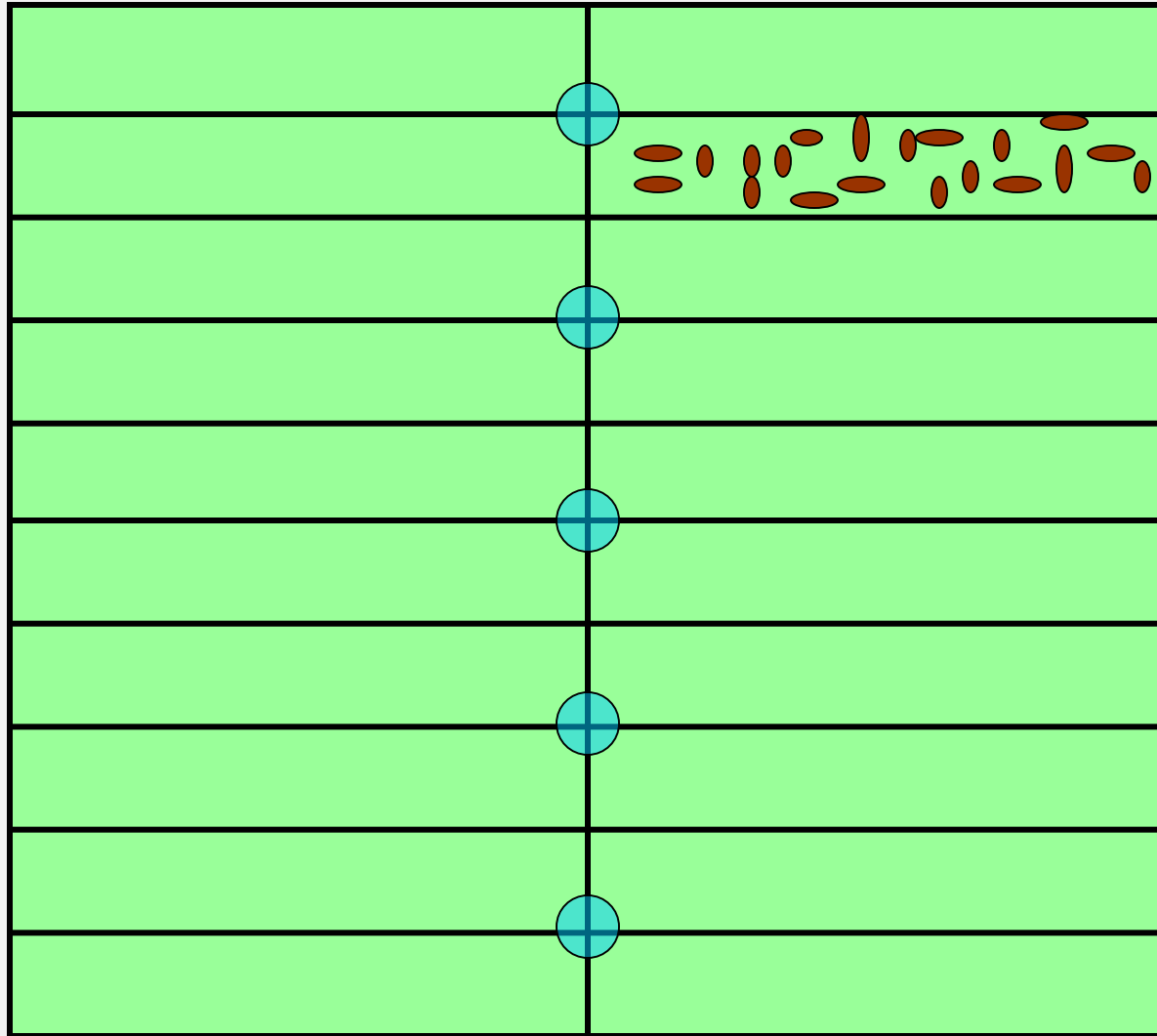
Simple Payback Period = 1.5 years

Alternatively, what if fencing reduced labor by 10 hours/month?

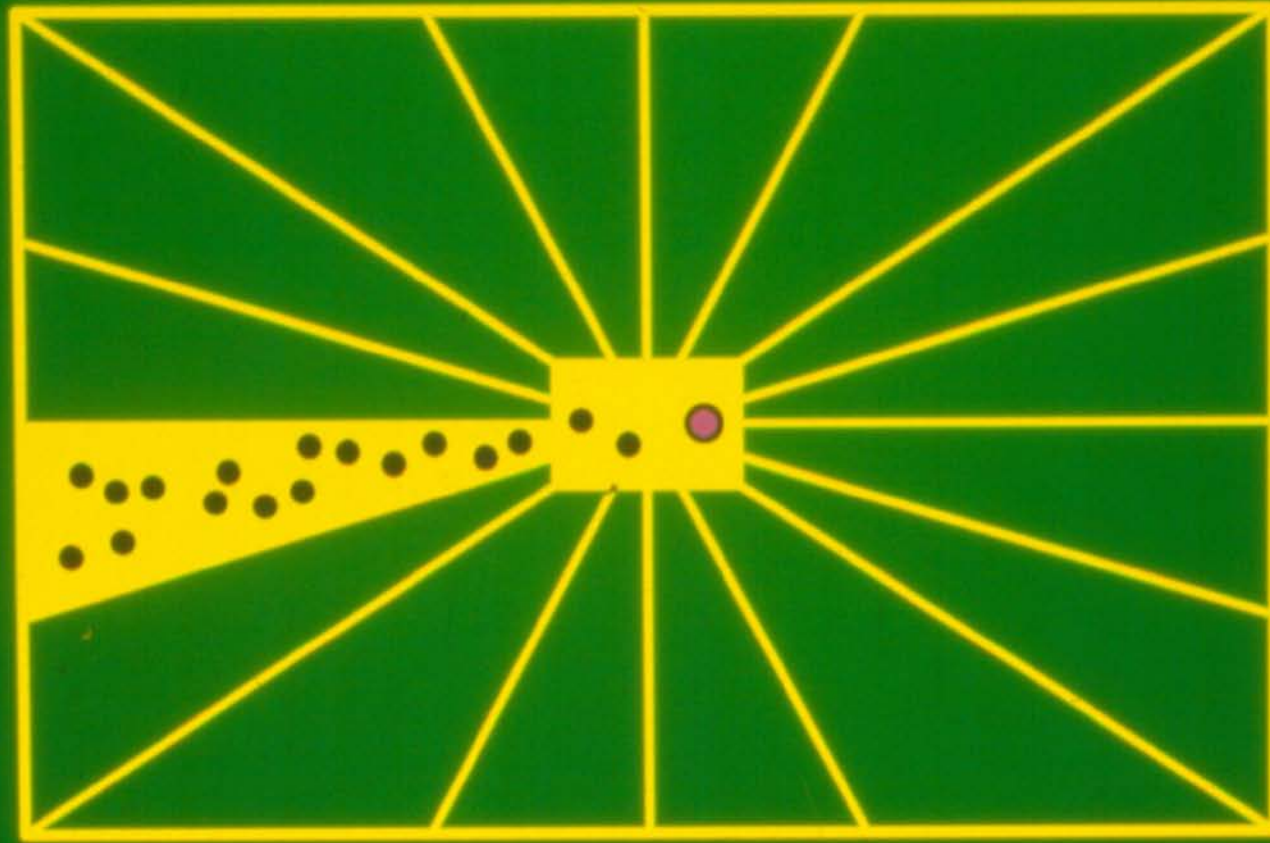
Block Design

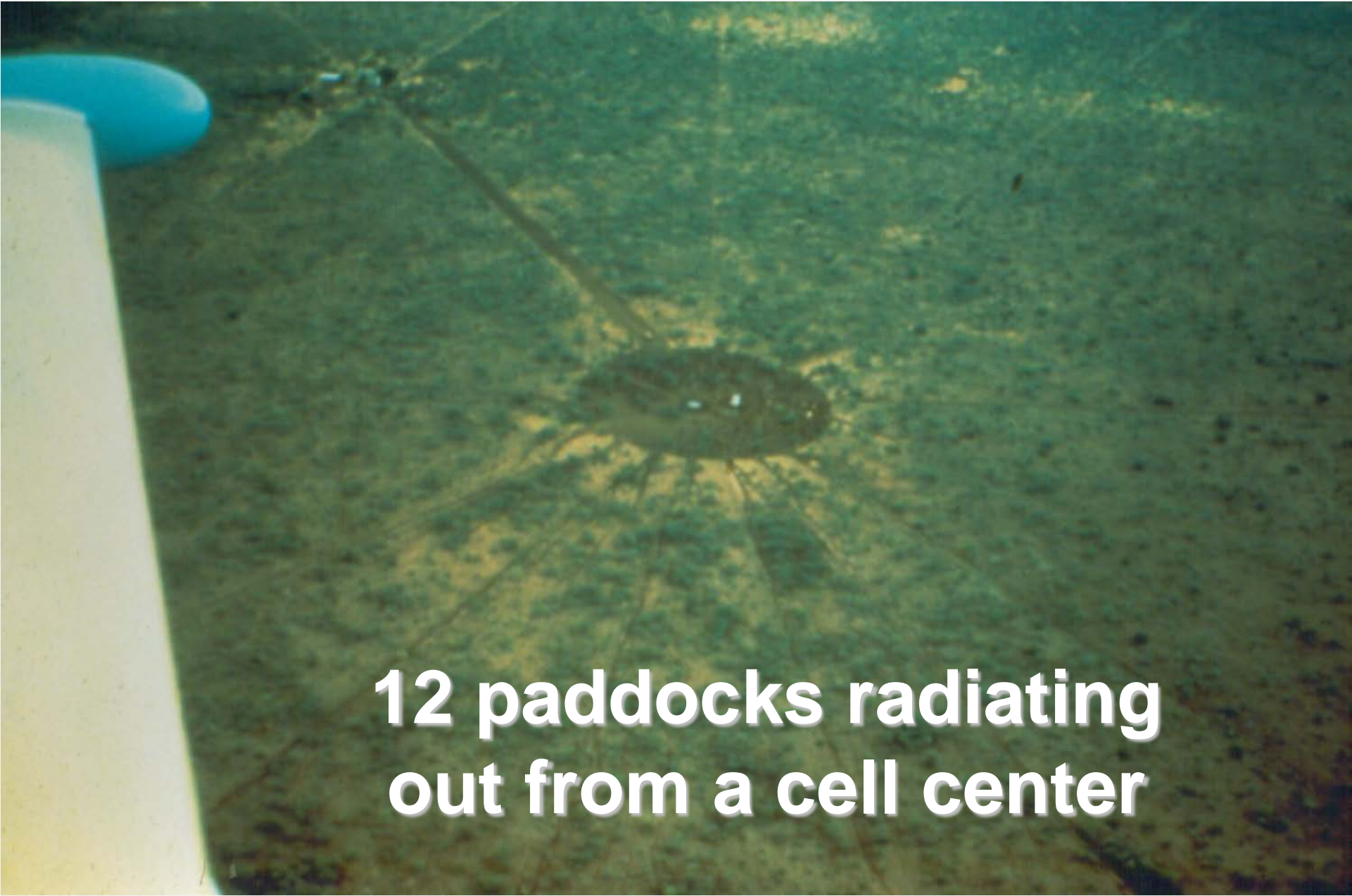


Block Design



Wagon Wheel Design





**12 paddocks radiating
out from a cell center**

8 paddocks radiating out from a cell center with a water point.



5 acre cell center.

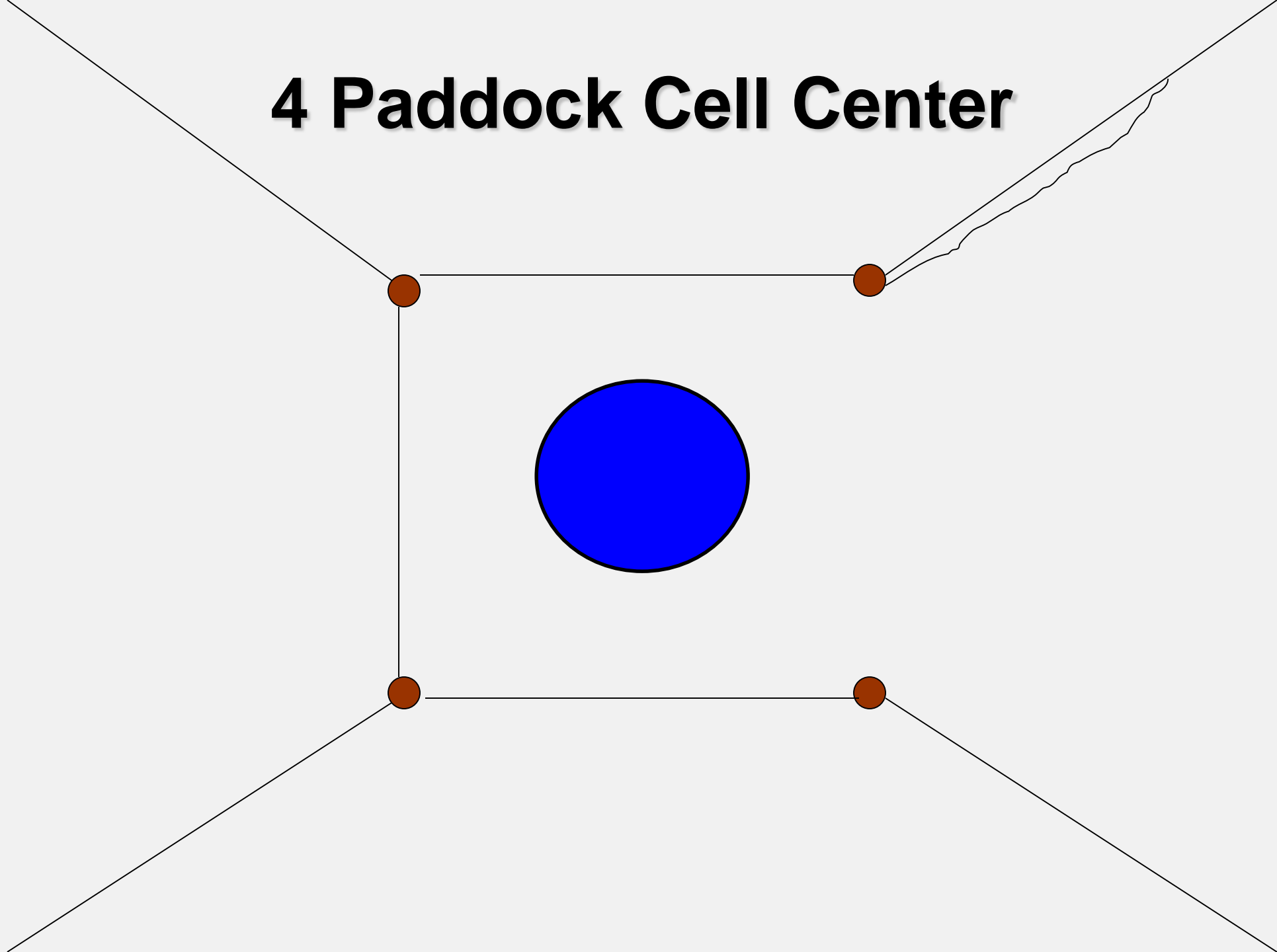
**TOO
BIG!**



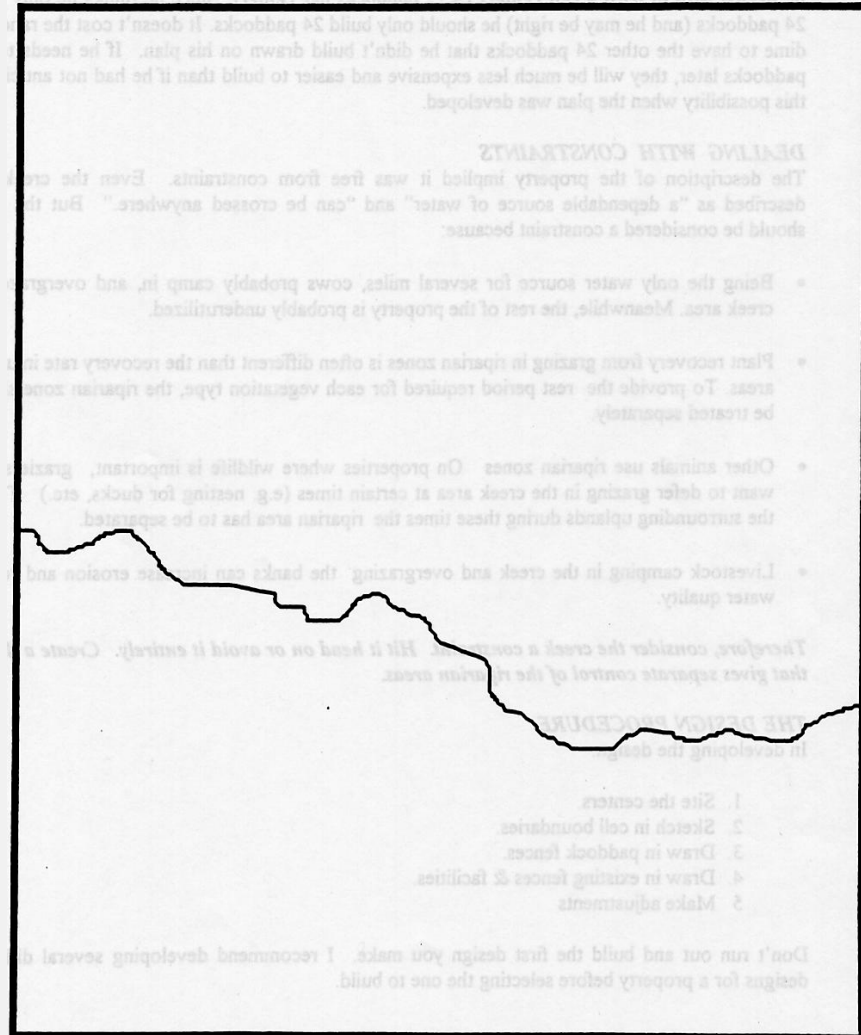
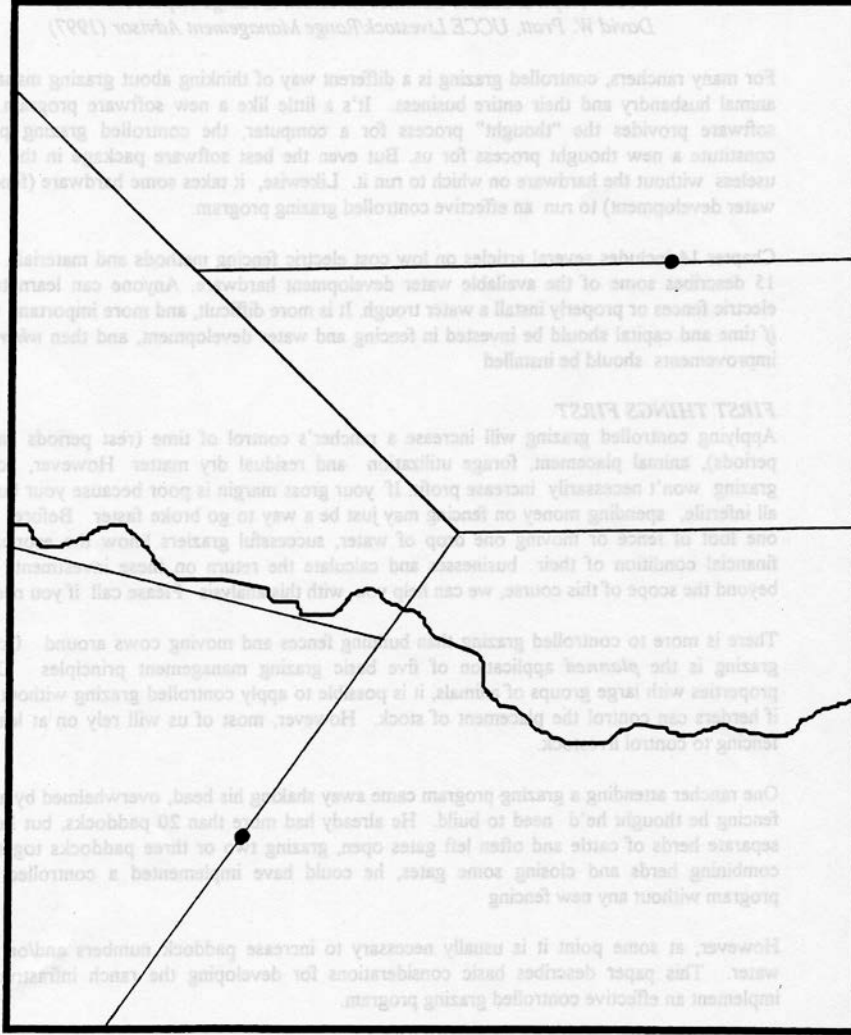
**Cell center perimeter
≈ 5 yards from
trough.**



4 Paddock Cell Center



Ignore Existing Facilities



**Cell center built
around existing
water trough?**

**Ignore existing
facilities!**



HOW MANY CELLS?

- Number of herds
- Size and carrying capacity of the property
- Physical constraints
- Management Constraints

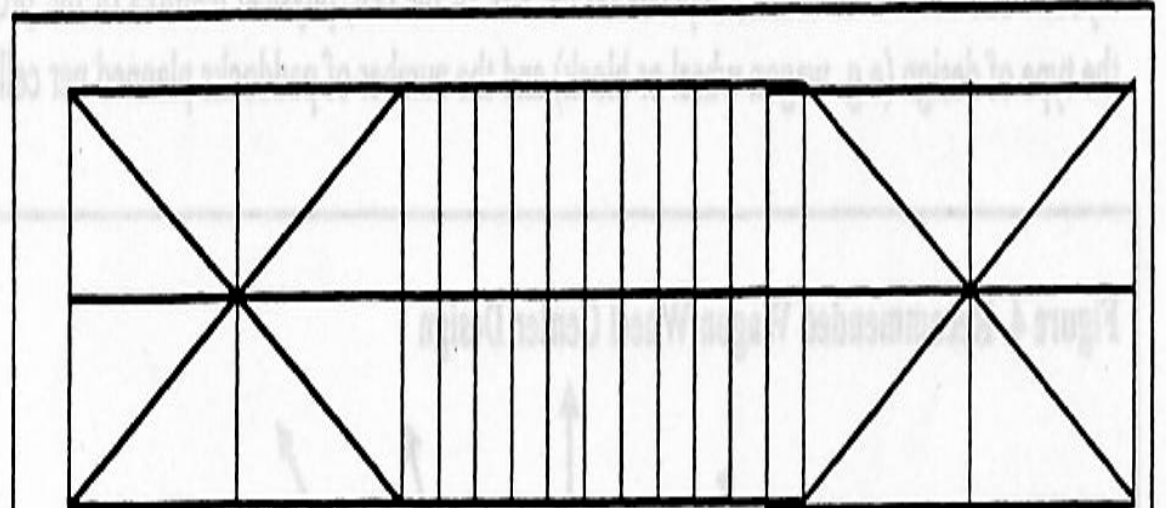
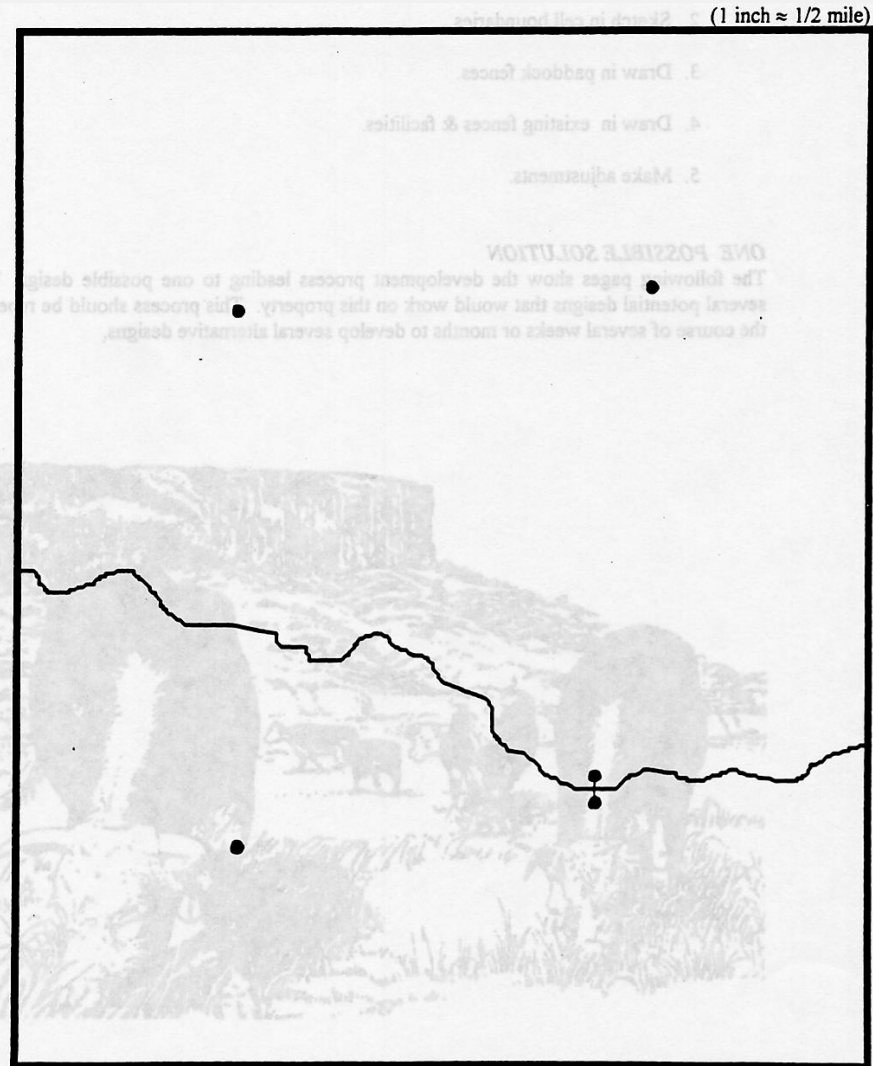


Figure 3. How many cells are in this design?

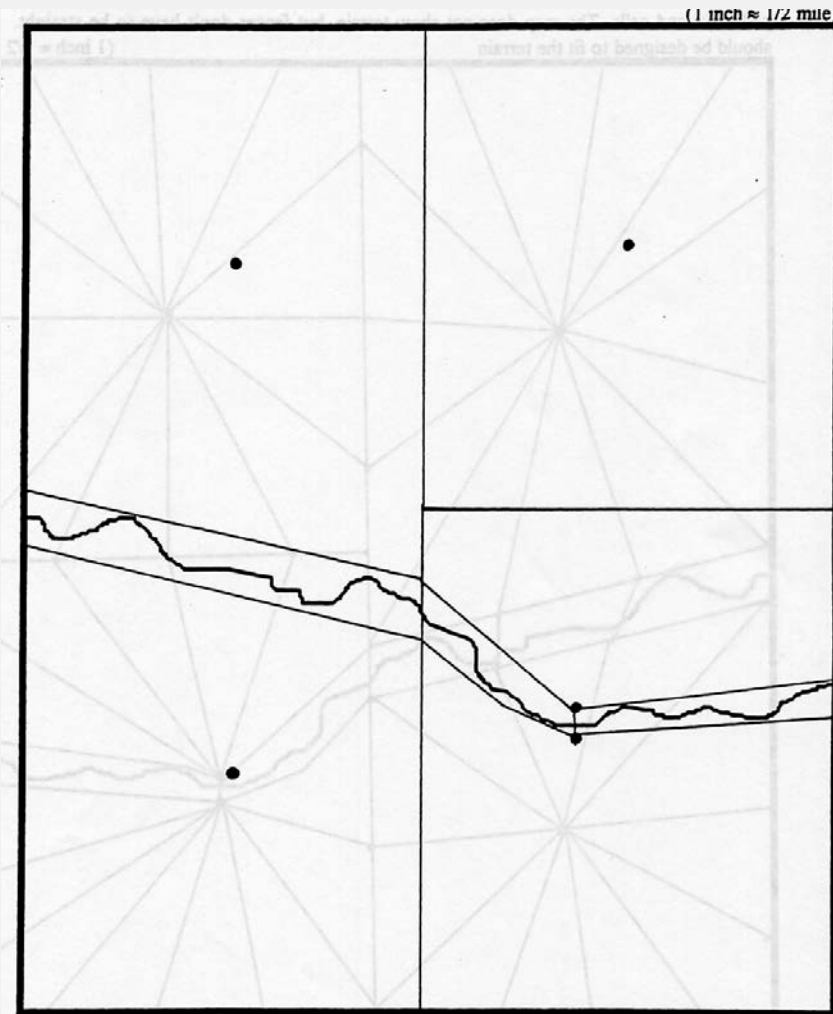
DESIGN PROCEDURE

- Site the centers
- Sketch in the cell boundaries
- Draw in paddock fences
- Draw in existing fences and facilities
- Make adjustments

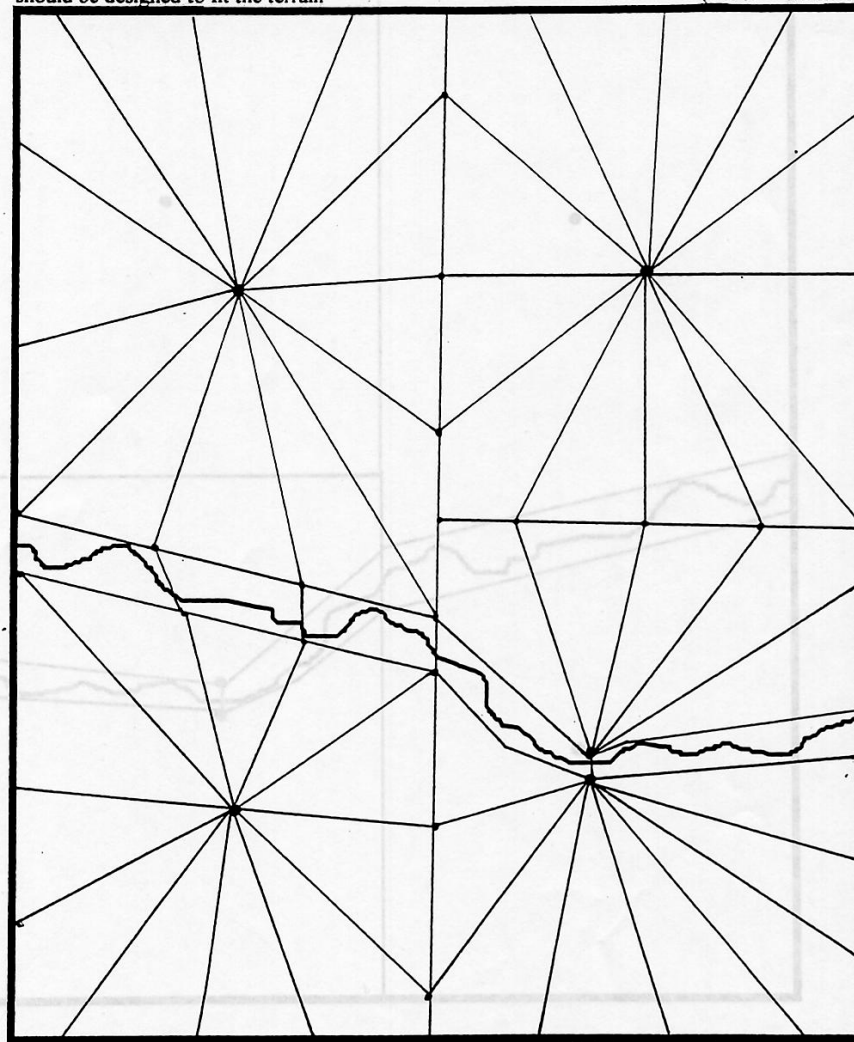
DESIGN PROCEDURE – SITE CENTERS



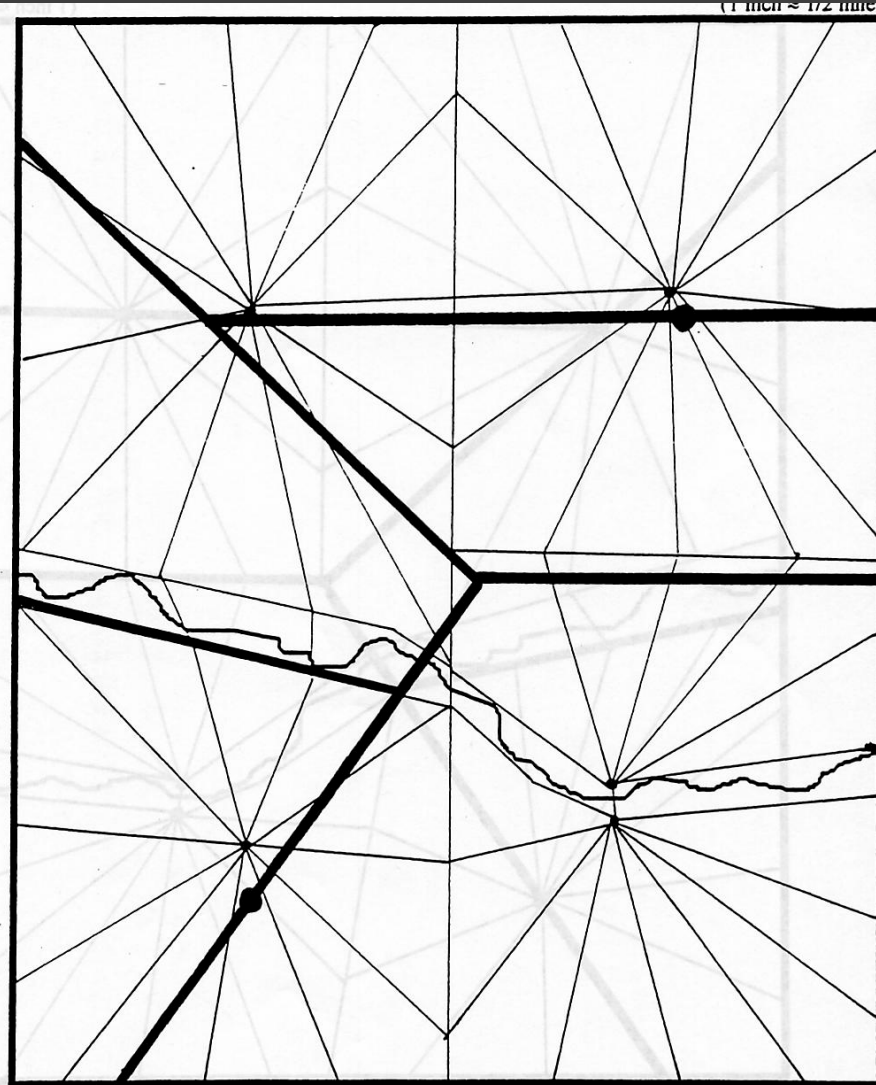
SKETCH CELL BOUNDARIES



DRAW IN PADDOCK FENCES

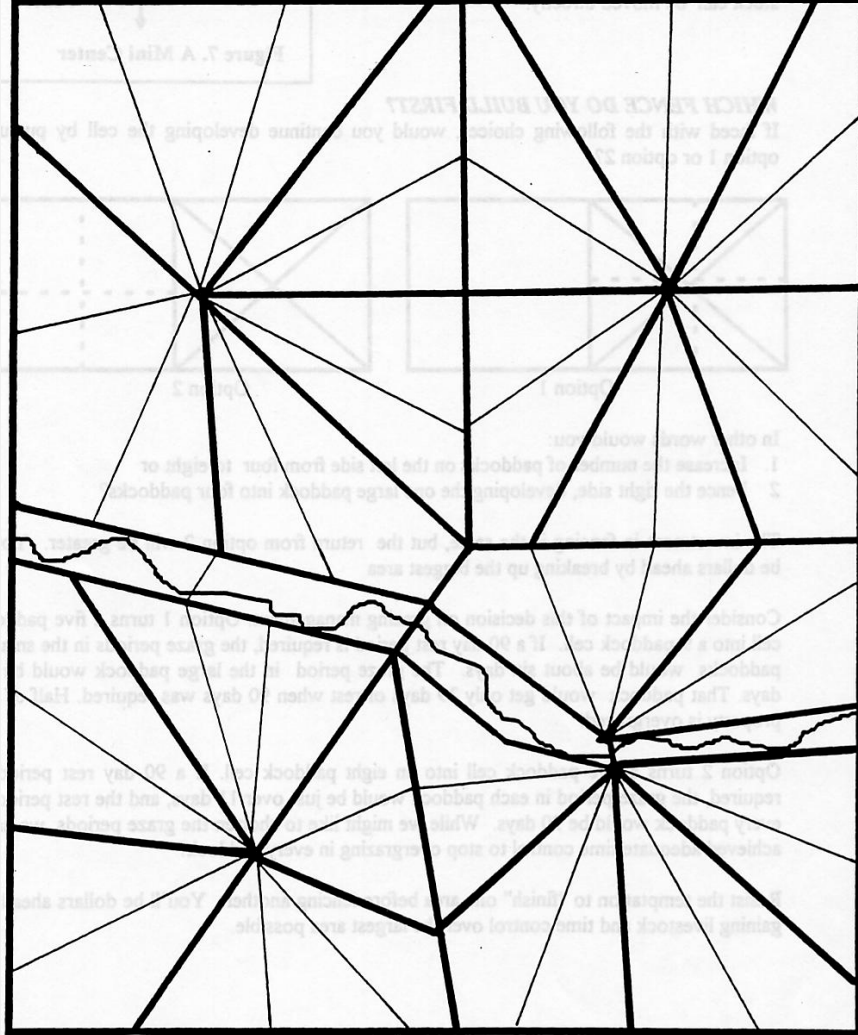


DRAW IN EXISTING FENCES



MAKE ADJUSTMENTS

other fences can be built if more development is needed. (1 inch \approx 1/2 mile)



FENCING SYSTEMS

Portable and Permanent
Fencing Options

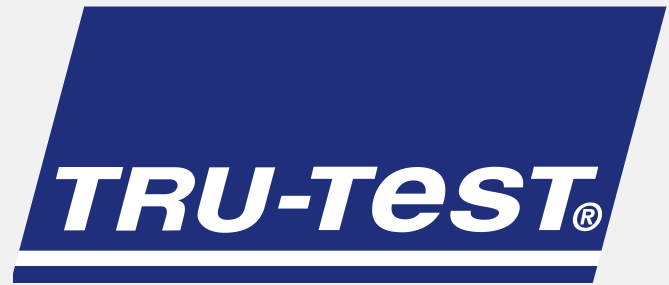
ELECTRIC FENCING SYSTEMS

The effectiveness of any electric fence depends on the ability of that fence to deliver a painful shock to animals that touch it.

- Effective electric fencing systems:
 - Energizer
 - Grounding system
 - Fence design
 - Training the animals

FENCE THE DESIRE!

There's never been a fence in the history of mankind that could keep a hungry animal contained where there is no feed!



ELECTRIC FENCE 101

Learning the Basics of Electric Fencing



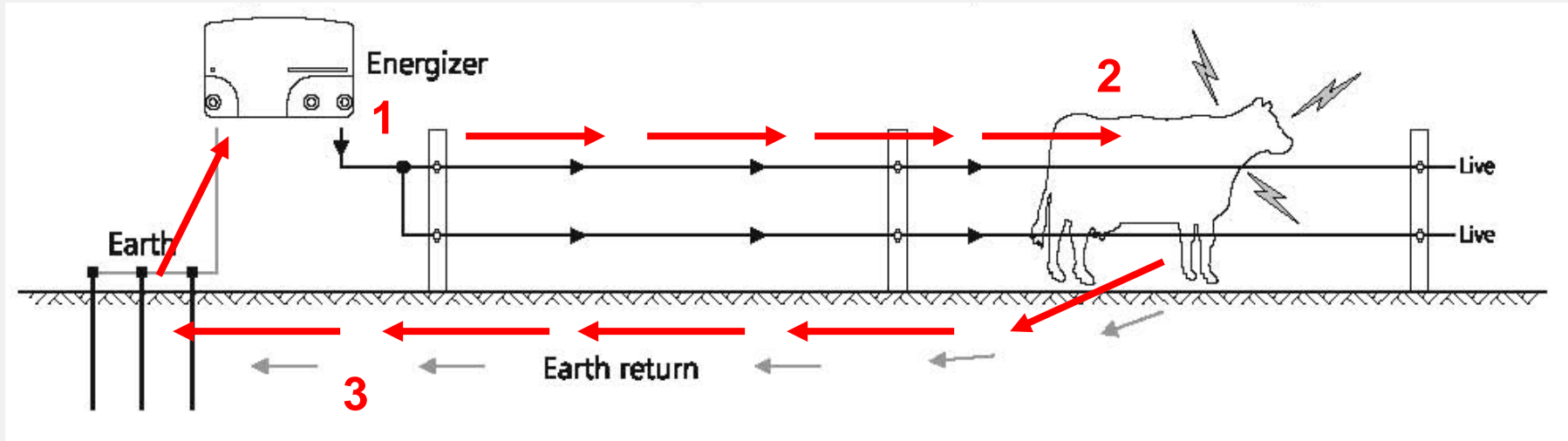
BASIC ELECTRICAL TERMS

- AC – Alternating current, mains, 110/220v plug
- DC – Direct current, battery
- Amps – electrical rate of flow $1 \text{ amp} = 1 \text{ volt} / 1 \text{ ohm}$
- Ohms – electrical resistance $1 \text{ ohm} = 1 \text{ volt} / 1 \text{ amp}$
- Volts – electrical pressure $1 \text{ volt} = 1 \text{ ohm} \times 1 \text{ amp}$
- Watts – rate of doing the work $1 \text{ watt} = 1 \text{ amp} \times 1 \text{ volt}$
- Joules – electrical energy (*measure of the power of an energizer*)
- Output Joules – energy delivered to fence (*usually about 1/3 less than stored joules*)
- Stored Joules – energy in the energizer

BASIC ELECTRICAL TERMS (CONT.)

- Load – loss of voltage, anything that draws power from the energizer, measured in ohms
- Short – large energy loss from fence line to the earth (ground). Total short circuit = 0 ohms.
- Leakage – small energy loss from fence (*i.e., weeds touching the line, faulty insulator, etc.*)
- Low impedance – In effect, the internal resistance of an energizer. Allows maximum energy to be transferred to the fence.

HOW AN ELECTRIC FENCE WORKS



1. Energizer generates high voltage pulses
2. Animal touches live wire
3. Animal receives painful shock by completing the electrical circuit back to the energizer via the earth (ground) system

Whole process takes about 0.3 milliseconds!

FENCE ENERGIZER

- Regulates the flow of electricity
- Electrons are stored and then released in a pulse
- Good energizer will have a pulse lasting for .0003 seconds
- Low impedance energizers resist leakage of current
- Power source can be AC or DC
- Overcome loads – fence network itself and animals or vegetation touching the fence

HOW MANY JOULES DO YOU NEED?

| Minimum Recommended Joule Rating | Miles of electrified wire |
|---|--------------------------------------|
| 1 | 6 |
| 2 | 12 |
| 3 | 18 |
| 4 | 24 |

ENERGIZER PERFORMANCE



| Model | 1000 | 36000RS |
|---------------|-------------|-------------|
| Output | 1J | 36J |
| Size | Small-Range | Large-Range |
| Range | 40 acres | 2,500 acres |
| Open Circuit | 9,800V | 9,500V |
| 1000 ohm load | 7,000V | 8,800V |
| 500 ohm load | 5,300V | 8,500V |
| 100 ohm load | 1,800V | 8,000V |

NOTE: Both energizers will produce over 8,000 volts. The difference is the amount of load (resistance) that each energizer can overcome. A larger energizer produces more energy to overcome bigger loads.

*** An electric fence is like a water pump (*energizer*) and a pipe (*fence wire*) with water (*voltage*) flowing through it!**

VOLTMETERS



GROUNDING

Figure 1A.
Soil Ground Return

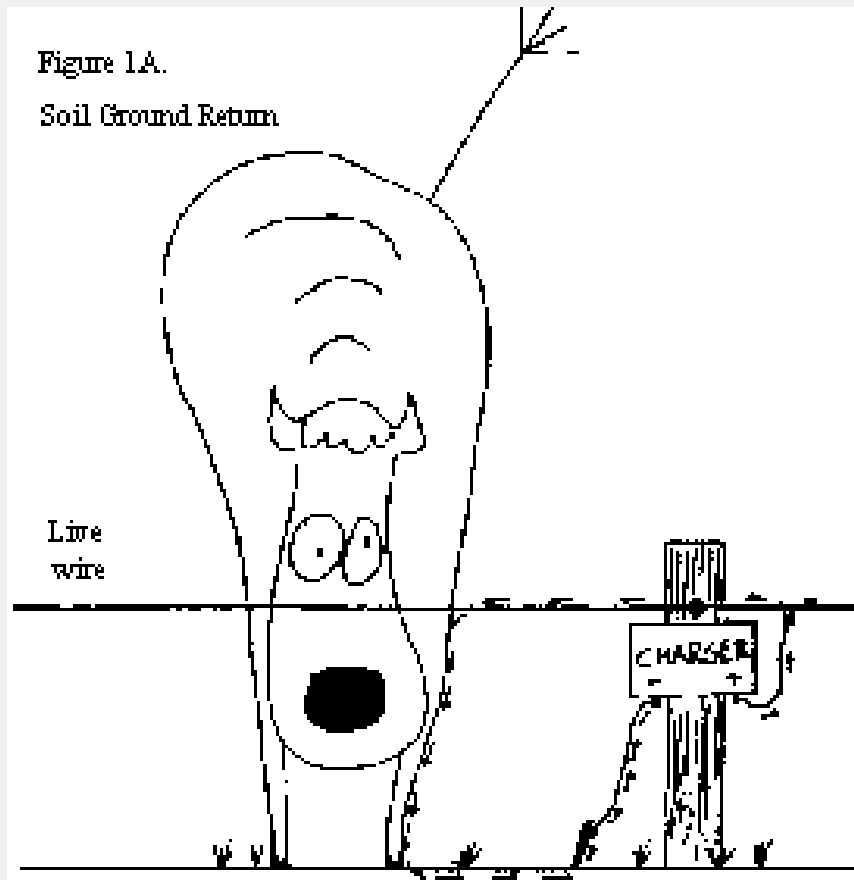
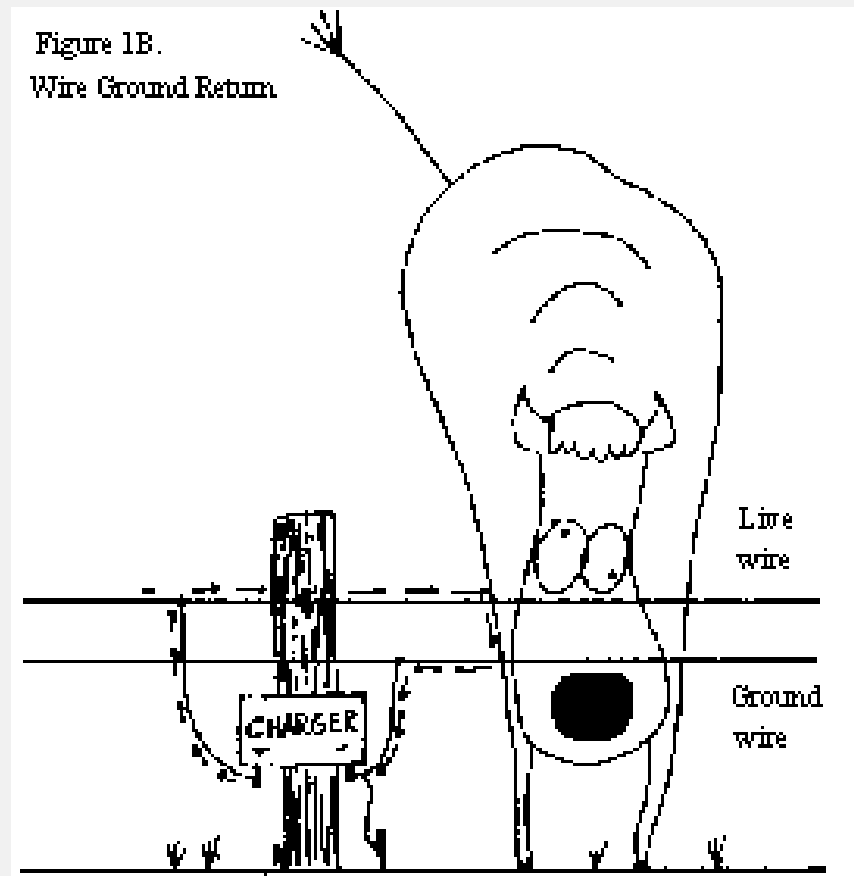
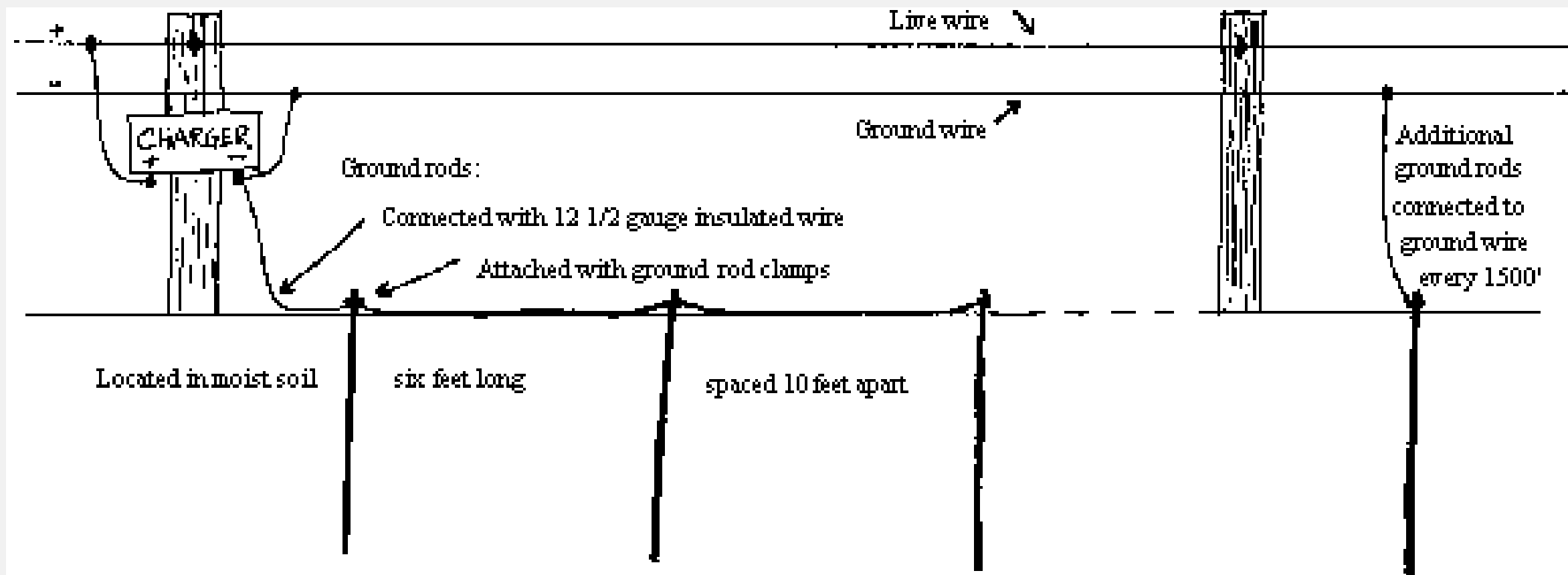


Figure 1B.
Wire Ground Return

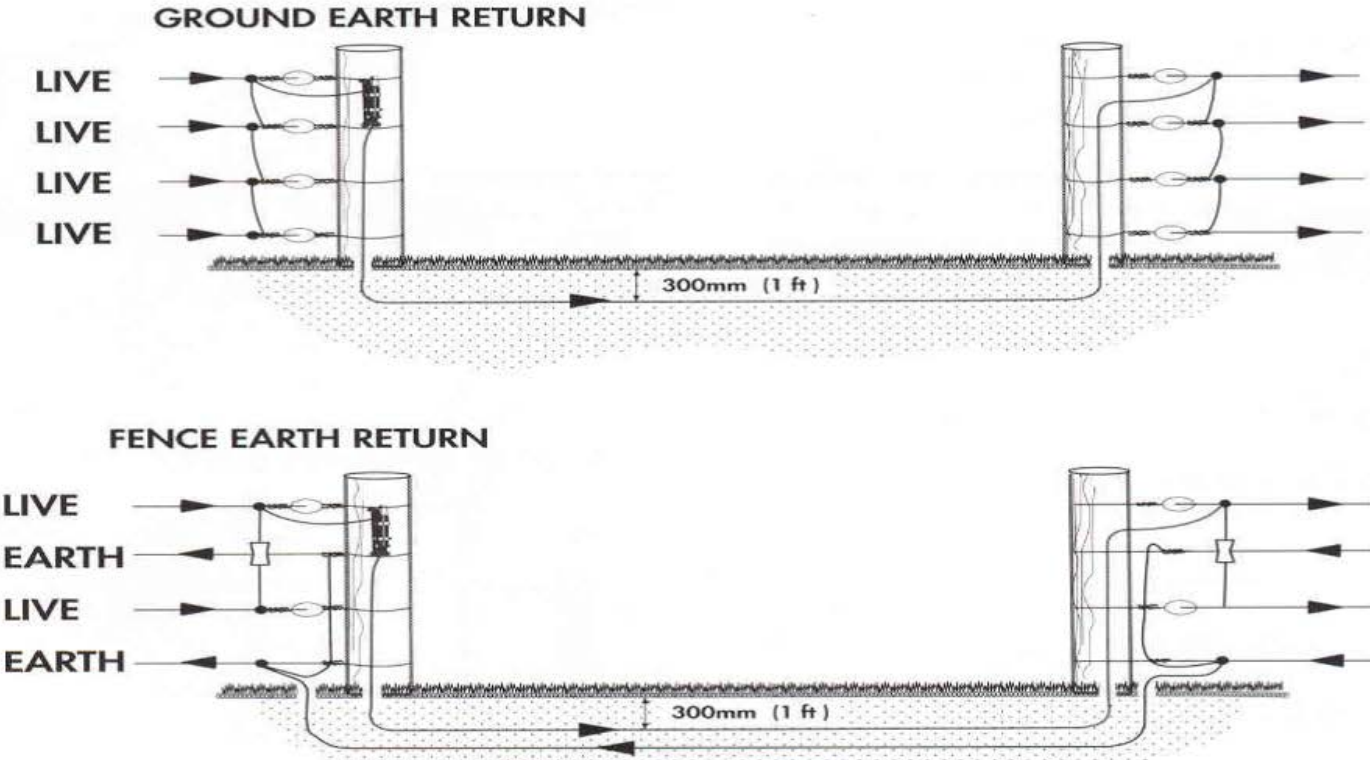


GROUNDING

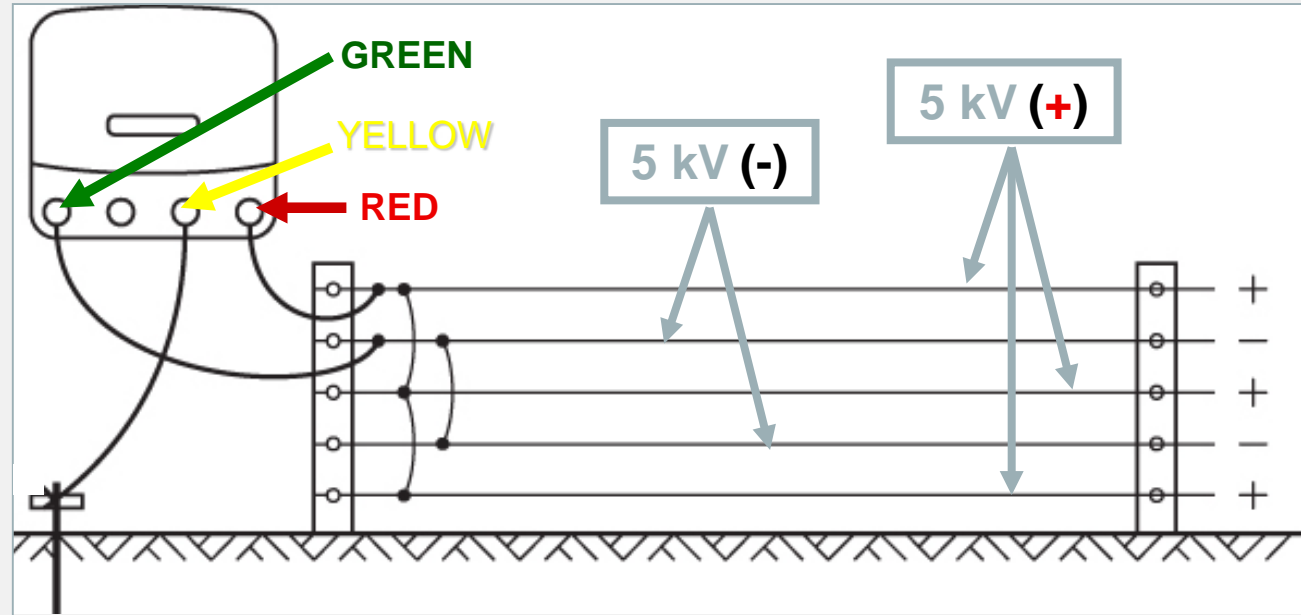


POWER UNDER GATES

Always use 2.5mm cable / more conductive than 1.6



BI-POLAR GROUNDING



- Reduces ground system requirements to 1 ground rod
- Excellent control in even poor / dry soil conditions
- 100% delivery – all available energy goes into shocking animal
- No neutral wires – animal always shocked (*5kV one wire / 10kV two wires*)
- Delivers the SAME shock in the worst soil conditions that would be available in the best soil conditions with conventional grounding

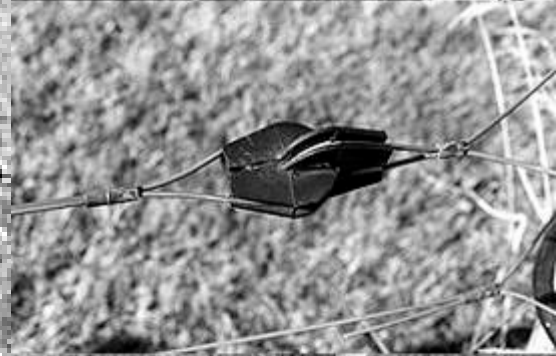
FENCE MATERIALS

- Hi-Tensile Wire (galvanized) – 12.5 and 16 gauge – larger the diameter, less resistance and better carrying capacity
- Hi-Tensile Fixed Wire
- Polywire
- Polytape
- Polyrope
- Netting

HI-TENSILE WIRE



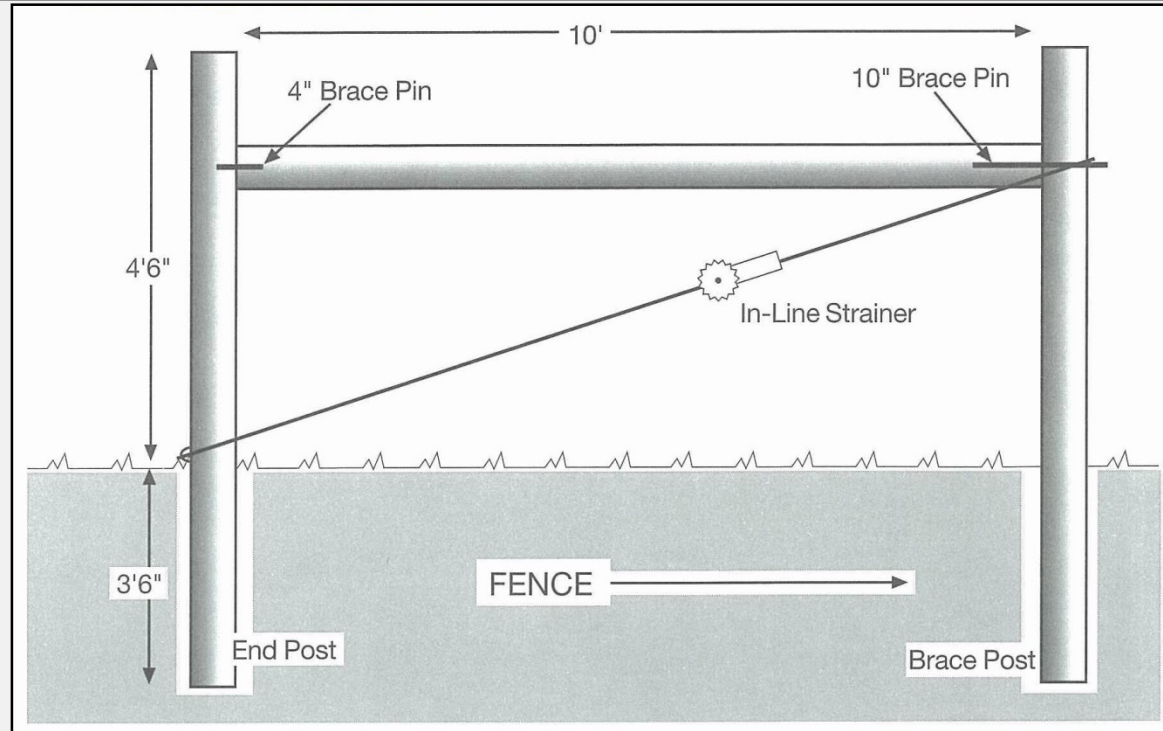
HI-TENSILE WIRE







BASIC CONSTRUCTION - BRACE



- Post Type – Wood, Metal Pipe
- Wire Type – 12.5 ga. high tensile
- Use on corners and along line – line braces should be no more than 1320 ft apart

QUICK T POST BRACE



QUICK T POST BRACE



QUICK T POST BRACE



QUICK T POST BRACE



QUICK T POST BRACE



US FOREST SERVICE BRACE



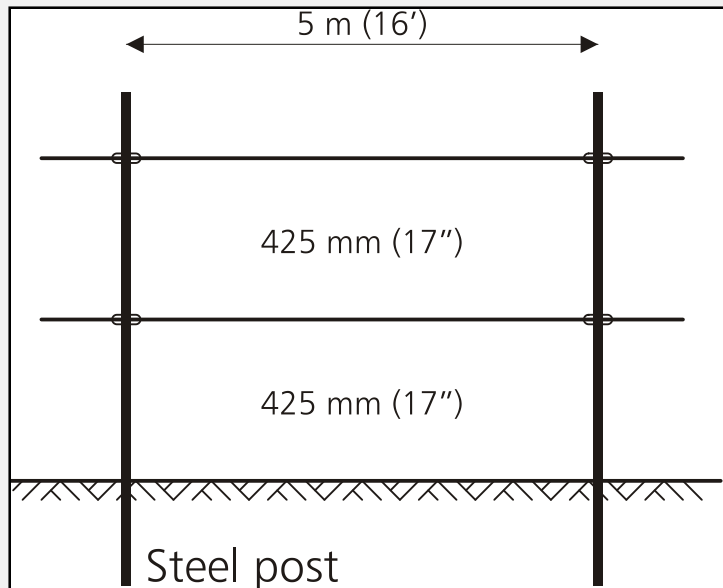
PERMANENT FENCES

- Perimeter, boundary
- Lasts 30-40 years
- Typically steel wire
- Short or long distance
- 2-7 wires depending on livestock/predator type
- Corner braces – wood or metal pipe
- Line – t-posts, rod, wood
- Renovate existing conventional fences with offsets/extenders

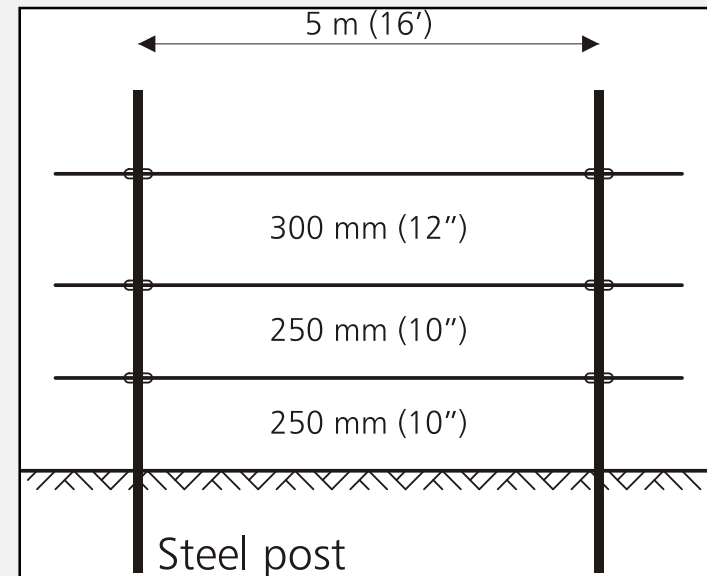


BASIC CONSTRUCTION – SPACING

Cattle / Horses



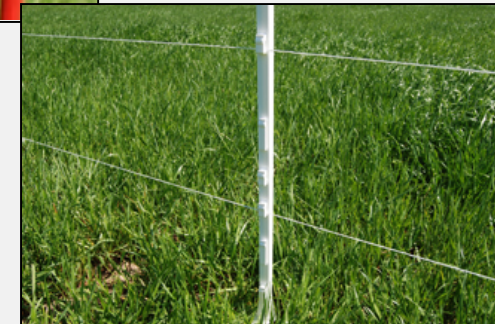
Goats / Sheep



- Line Post – Wood, Metal Pipe, T-Post
- 15' – 30' between posts – depending on terrain, number of turns in fence line, or use of stays/droppers
- Smaller spacings for smaller animals

TEMPORARY FENCES FOR CATTLE

- Divide pasture/paddock
- Portable
- Poly – wire, tape, etc.
- Short distances
- 1-3 wires
- Pigtail / plastic tread-ins
- Rotational grazing, protect hay bales, graze wheat fields / corn stalks, riparian pastures
- Quick & easy to build



POLYTAPPE AND WIRE



ELECTRO-NETTING



LIVEWIRE FENCE – PENN VALLEY

530-432-8028

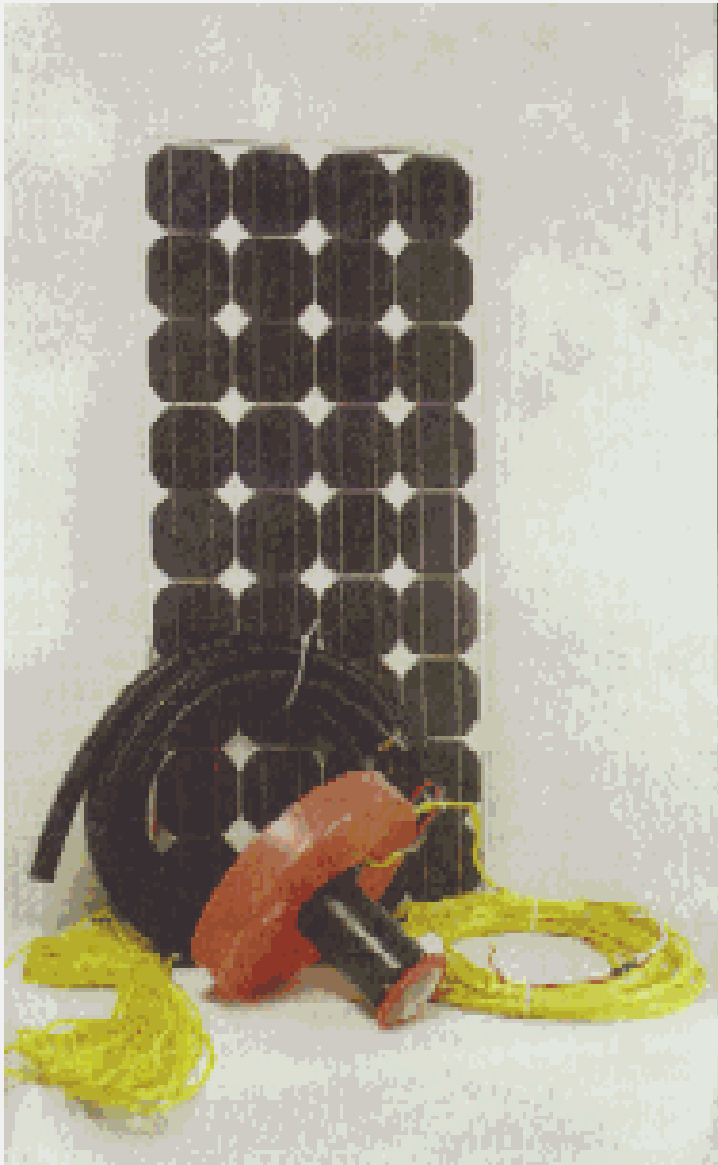


STOCKWATER SYSTEMS

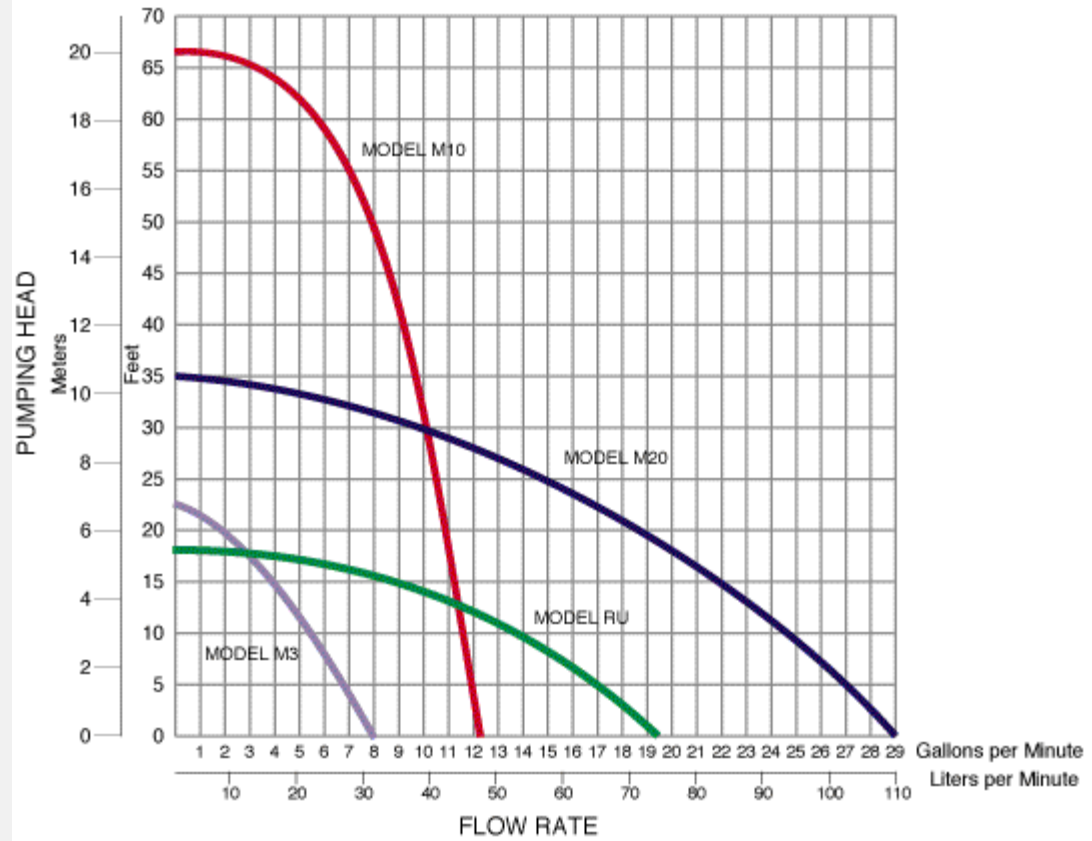
Improving Utilization and Distribution
through Stockwater Development

PUMPING WATER





SUNMOTOR FLOATING SUBMERSIBLE PUMPS



| Model | Power Required |
|-------|-----------------------|
| M20 | (300 watts, 30 volts) |
| M10 | (300 watts, 30 volts) |
| RU | (150 watts, 15 volts) |
| M3 | (75 watts, 16 volts) |

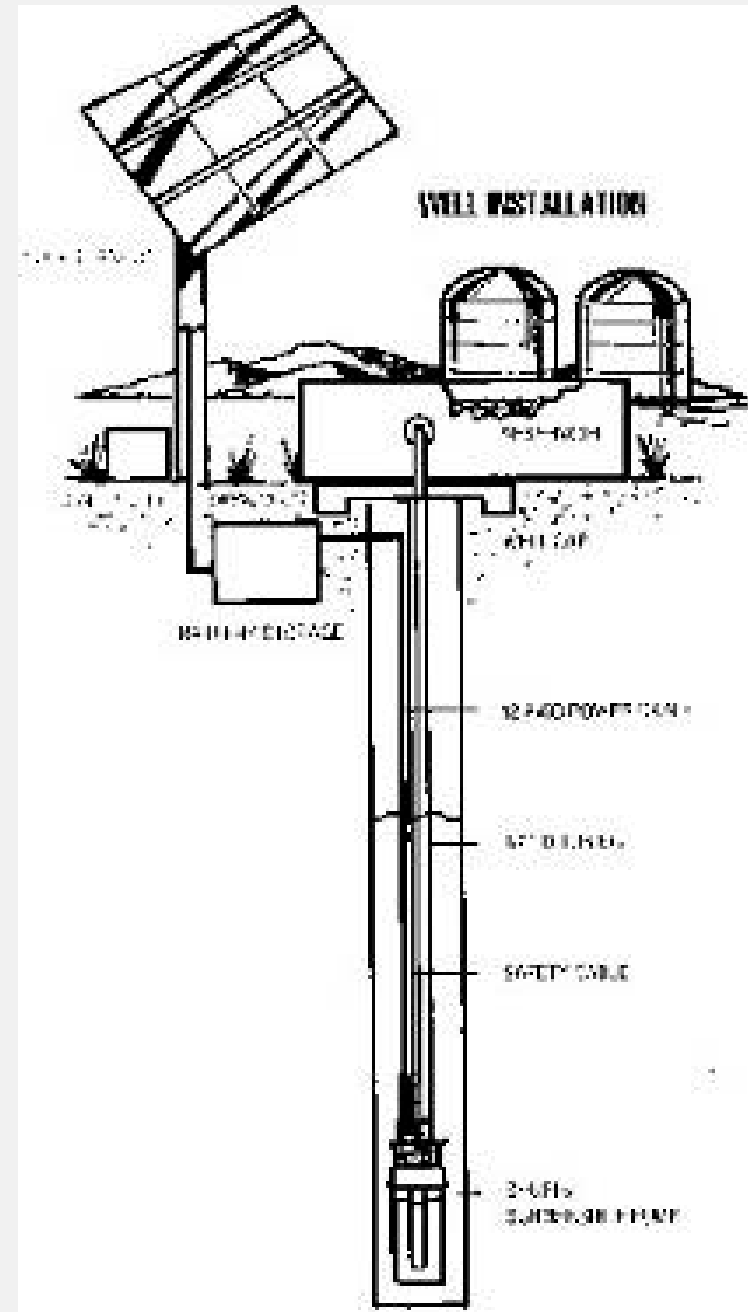
SUNMOTOR INTERNATIONAL LTD.

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 Olds, Alberta, Canada
 T4H 1R8

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Fax: (403) 556-7799

Email: sunmotor@telusplanet.net



RAM PUMPS



NOSE PUMP



WATER PUMP AND TROUGH



WATER LOCATION

- Cattle can travel 1.5 – 2 miles in gentle terrain and 1 mile in steep terrain to water with minimal stress
- When distances to water are over 1000 feet, the forage utilization will not be evenly distributed
- Less than 1000 feet to a water point will result in animals watering individually
- The greater the distance past 1000 feet, the tendency will be for the whole herd to water

WATER QUANTITY

| Cattle Wt | 40°F | 50°F | 60°F | 70°F | 80°F | 90°F |
|--------------------------------|------------|------------|------------|------------|------------|------------|
| LACTATING COWS | | | | | | |
| 900-1200 LBS | 11.4 g/day | 12.6 g/day | 14.5 g/day | 16.9 g/day | 17.9 g/day | 18.2 g/day |
| DRY COWS | | | | | | |
| 1100 LBS | 6.0 g/day | 6.5 g/day | 7.4 g/day | 8.7 g/day | 9.1 g/day | 9.3 g/day |
| MATURE BULLS | | | | | | |
| 1600+ LBS | 8.7 g/day | 9.4 g/day | 10.8 g/day | 12.6 g/day | 14.5 g/day | 20.6 g/day |
| GROWING HEIFERS, STEERS, BULLS | | | | | | |
| 400 LBS | 4.0 g/day | 4.3 g/day | 5.0 g/day | 5.8 g/day | 6.7 g/day | 9.5 g/day |
| 600 LBS | 5.3 g/day | 5.8 g/day | 6.6 g/day | 7.8 g/day | 8.9 g/day | 12.7 g/day |
| 800 LBS | 7.3 g/day | 7.9 g/day | 9.1 g/day | 10.7 g/day | 12.3 g/day | 17.4 g/day |

- Source: 1996 NRC Nutrient Requirements of Beef Cattle
- Water intake is a function of dry matter intake and ambient temperature. Water intake is constant up to 40°F.

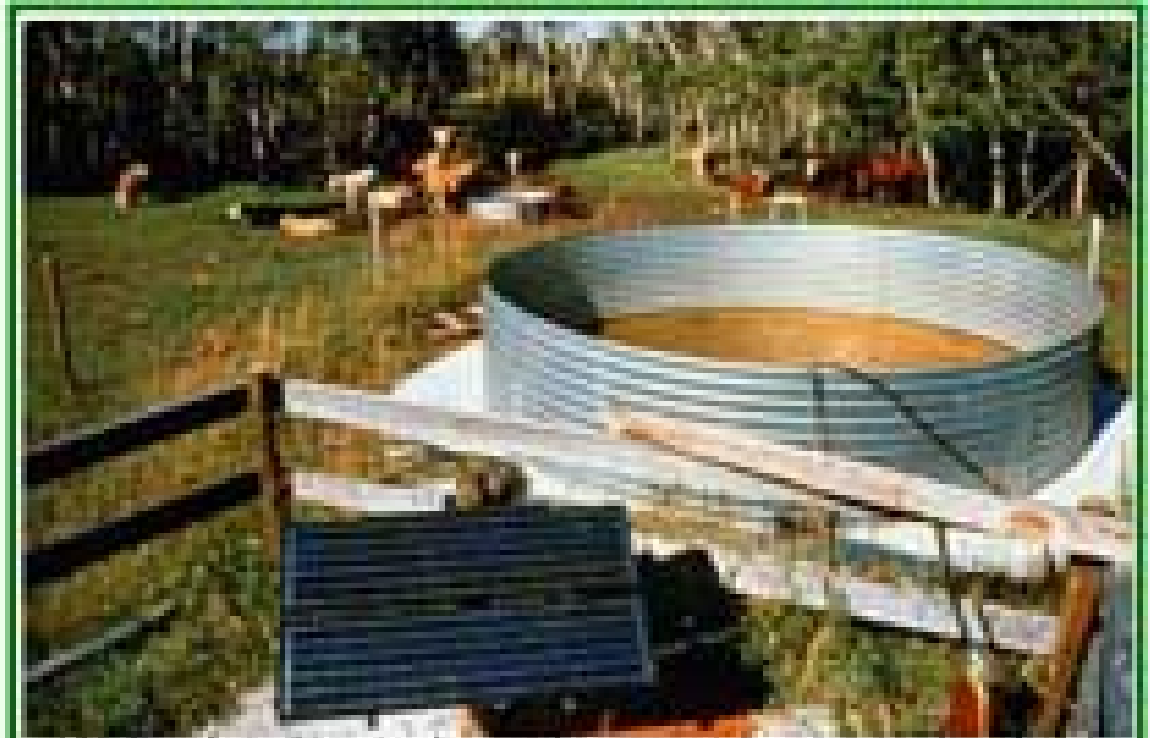
DESIGN CONSIDERATIONS

- Storage capacity
 - In trough
 - Additional tank or storage
- Recharge rate – how fast will the trough refill?
- Space – how many animals are likely to drink at the same time
 - Can be managed by distance between troughs
 - Provide 27- 39” of trough space per head expected to drink at one time.
 - Round troughs provide more storage, rectangular troughs provide more drinking space.

WATER STORAGE



Polyethylene tank mounted on a truck with attached trough



Water stored in steel grain bin rings above trough in field

WATER QUALITY

- Potential Problems
 - High concentration of minerals
 - High concentration of nitrogen
 - Bacterial contamination
 - Algal growth
 - Toxic chemical spills

WATER TROUGHS



WATER TROUGHS

