An tSeirbhís Páirceanna Náisiúnta agus Fiadhúlra
National Parks and Wildlife Service

Precision Livestock Management (Virtual Fencing) – a pioneering study in Ireland



Dr. Barry O'Donoghue

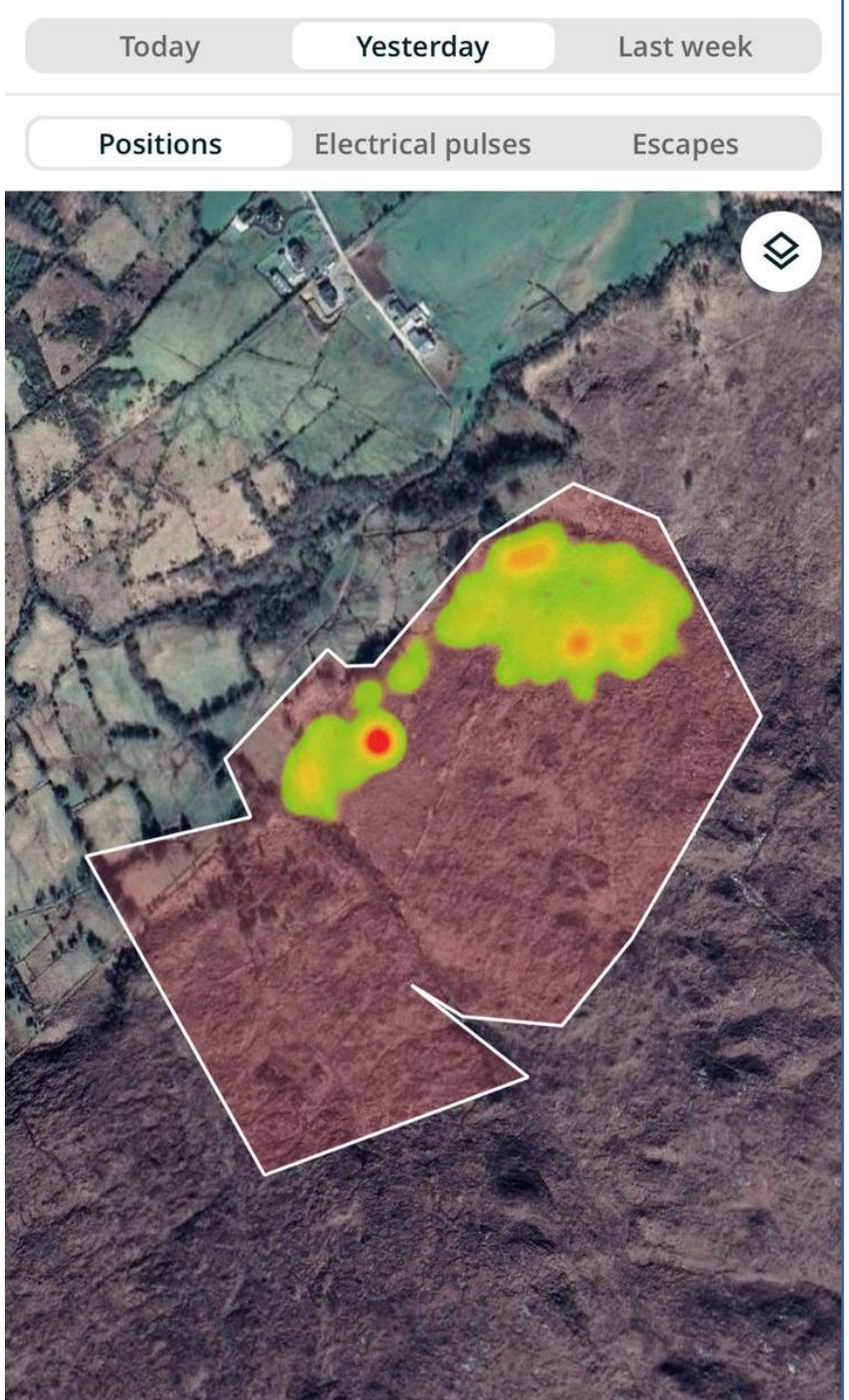
Scientific Advice and Research, NPWS

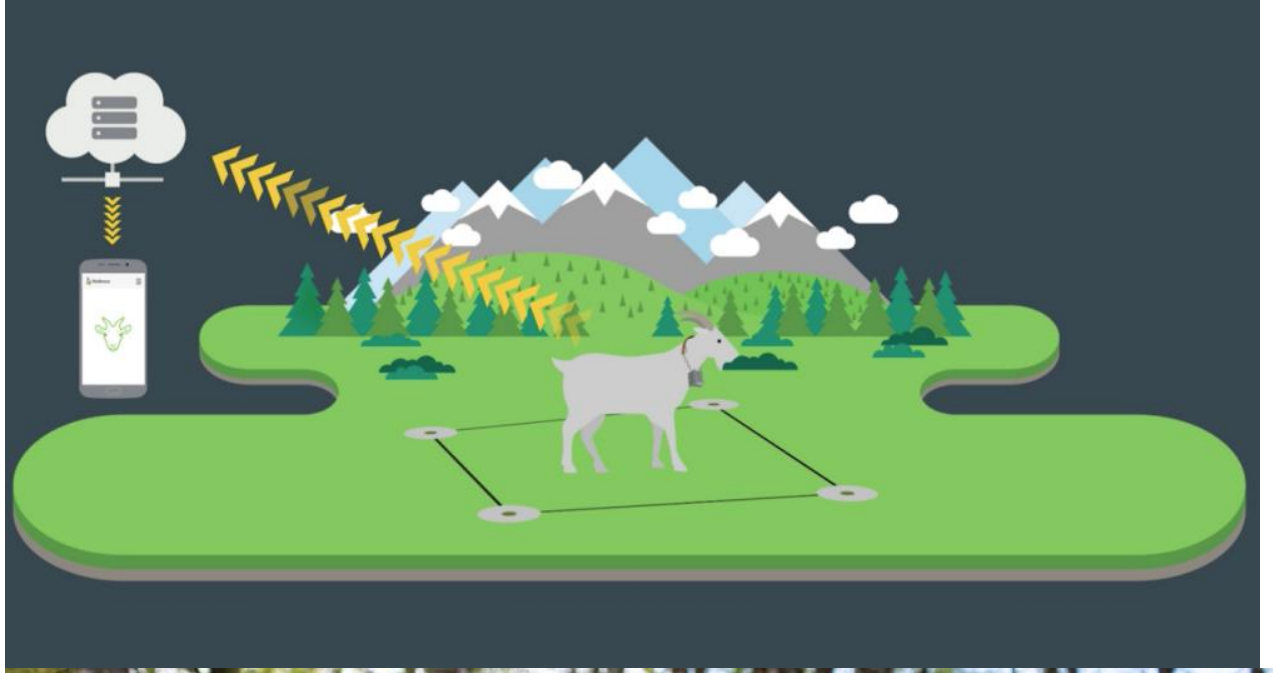

The Céide Fields

Slide 3

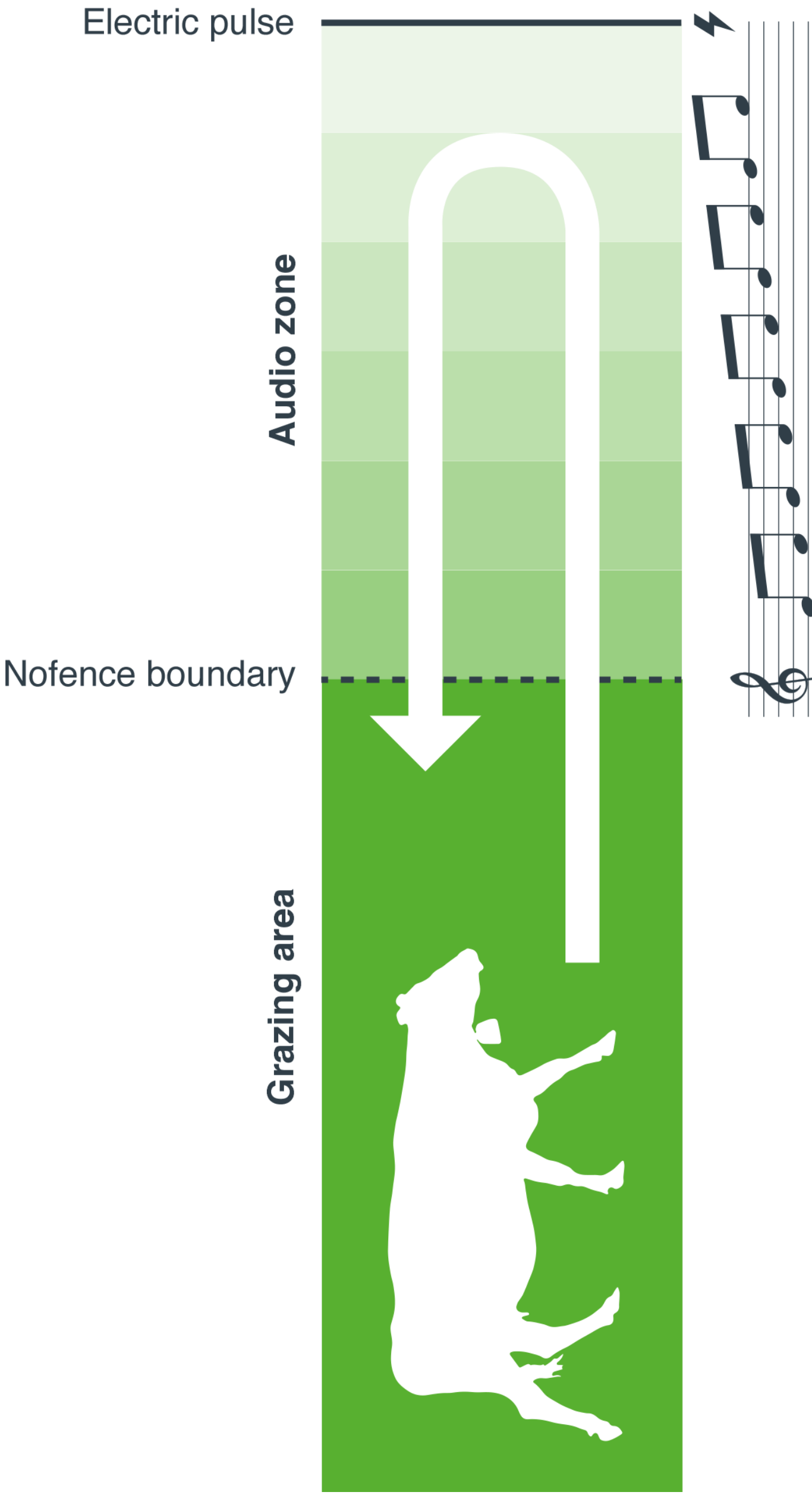





Today
Yesterday
Last week
Positions
Electrical pulses
Escapes






Electric pulse
Audio zone
Nofence boundary
Grazing area

First and foremost

- Animal welfare a very significant consideration, treated with due diligence
- Extensive background research
- Literature review
- This research was not researching the technology, but its application in an Irish context (see research objectives)
- Advance discussion with practitioners
- Advance discussion with HPRA animal welfare regulations and standards
- Advance discussion with suppliers
- Advance discussion with farmers here
- Project Planning
- Team formation (15 plus more)
- Training
- Mentoring
- Support network (multi-directional)



Research objectives

- To provide an objective feasibility study, across a variety of farms, farm models, breeds, terrains, habitats, environments, etc.
- To break new ground for other parties who may be interested in adopting this cutting-edge approach to land management
- Examine the application of the technology in managing important habitats and safeguarding sensitive soils, which in turn are important for carbon, water and biodiversity
- Record user experience
- Consider the technology from an animal's point of view
- Provide SWOT analyses
- Provide conclusions and a set of recommendations



Period of the study

2019 – background research, planning and preparation

Summer 2020 – deployment of first collars

Winter 2022 – report published (Irish Wildlife Manual 140)

Ongoing – engagement with farmers in longitudinal study

Findings: Animal

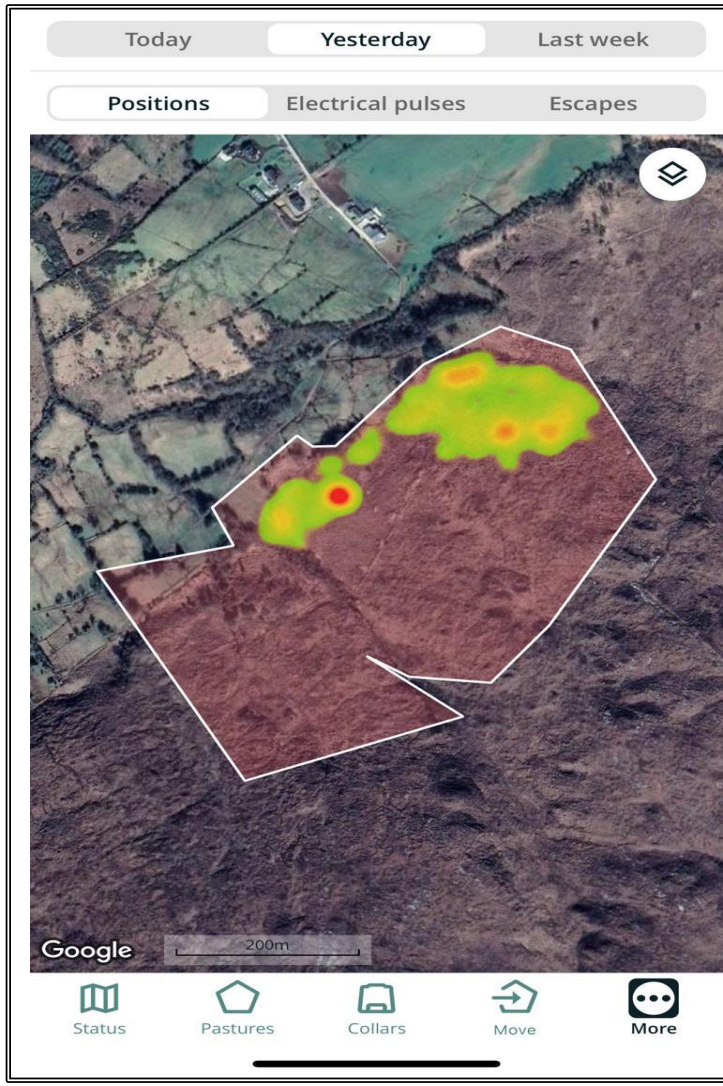
- **Proper training absolutely essential – for animal and carer**
- Very regular monitoring and observations during training and during active phase
- Each individual is an individual
- Herd dynamics, timing, social structure, bonds
- ‘Learning’
- Safe from dangerous locations
- Location regularly reported (provided 2G reception) (calf saved)
- Physical fencing should still be at necessary locations
  e.g. roadsides, farm perimeter, etc.

- All needs to be in tandem with close on-the-ground inspection/ monitoring and knowledge



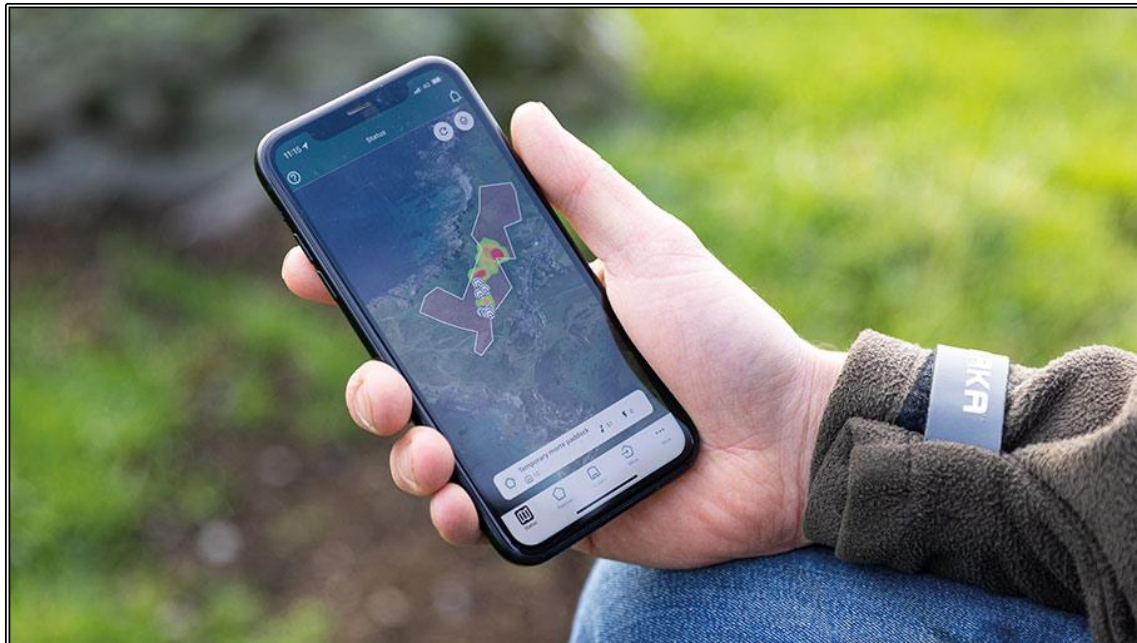
Findings: Environment

- Avoiding physical fencing can be a positive
- Observing habitat use / resource utilisation
- Allows for proactive and adaptive planning of grazing
- Locations (to target and avoid), timing, duration, intensity
- Specific habitats e.g. coastal grassland, uplands, wet grasslands, rivers
- Breeding birds
- Mosaics
- Sensitive soils (soil health, water, climate, biodiversity)
- All needs to be in tandem with close on-the-ground inspection/monitoring and knowledge



Findings: Farmer/Herd Manager

- Technology should ultimately exist to make life easier
- Helps, particularly in relation to time, and peace of mind
- Cost-benefit analysis € - time and physical fencing, permissions, terrain, etc.
- Ratings
- Overall positive
- Caveats, risks and failures



Issues

- Complete failure of device
- Issues in relation to reporting location (2G reception and device issues)
- Registering to new pasture
- Locational drift
- Audio failure
- Failure to emit pulse
- Inadequate training
- Individual/herd/flock behaviour

SWOT (Animal)

Strengths	Weaknesses
• **For the majority that adapt and 'learn', clear understanding in relation to where they can and cannot access.** • **Livestock manager can react to any issues more readily than might otherwise be possible without remote knowledge of animal location.** • **Animals can be kept away from dangerous locations.** • **The electrical pulse an animal may receive is less than that which may be received from a physical fence.**	• Studies have shown virtual fencing technology is not 100% effective at keeping animals within defined boundaries • Any technology is fallible – GPS drift, failure of collars, non-communication with app and unexplained occurrences were all encountered during this pilot. • Disorder may arise where not all animals are collared, particularly where there is an existing bond between collared and uncollared animals of the same flock or herd. The proportion of a flock or herd that will need to carry collars in order to maintain herd/flock integrity and unity is unknown and may vary, but is expected to be high. • Some animals may not adjust to the technology.
Opportunities	Threats
• **Ability for multiple users to monitor animals** • **Data and experience provides opportunities to adjust grazing regime to suit animals** • **Animals 'born into' a system using virtual fencing may adjust more readily to the technology** • **Experience gained in Ireland and elsewhere can add to training and protocols to ensure animal welfare is to the fore of all considerations**	• Livestock managers using the technology without appropriate training. • Livestock managers feeling the technology is a substitute for good stock keeping. • Livestock managers considering all animals have the same characteristics/abilities/personalities. • Collars active on mothers at weaning time • Inappropriately designed virtual pastures. • Technological failure. • Improper care of collars. • Failure to check technology and correlate what the app is showing with what is happening on the ground. • Considering virtual fencing for external boundaries, roads or public areas.

SWOT (Environment)

Strengths	Weaknesses
• **Negates the need for physical infrastructure (for the most part, physical fencing was still required at outer boundaries and roads, etc.). Physical fencing of posts and wire could impact negatively on habitats by dividing areas in a manner that is not in line with habitat or grazing requirements. They can also lead to increased trafficking (livestock walking) along the inside of the fence or pinch-points, where animals may congregate e.g. between 'paddocks', by gates or by water troughs. They can also pose a threat to birds, which may collide with fences or fragment or alter the territories of other animals such as mammals. They can also alter the physical or aesthetic appearance of an area which has traditionally remained open and undivided. Physical fencing can also be very costly and in particular cases, may require planning permission and associated environmental assessments.** • **The ability to keep animals out of sensitive areas (habitats, waterbodies, nesting areas, etc.) and the ability to ensure appropriate grazing in areas that might otherwise have been avoided or over selected.** • **The ability to adjust grazing in real time, to suit the habitat and the ground conditions or prevailing weather.** • **The ability to review and correlate grazing patterns with habitat quality, to inform approaches to grazing in future seasons to improve habitat quality.**	• Studies have shown virtual fencing technology is not 100% effective at keeping animals within defined boundaries. • Any technology is fallible – GPS drift, failure of collars, non-communication with app and unexplained occurrences were all encountered during this pilot. • Where internet reception is poor, user capabilities will be diminished. • The ecological results of the grazing managed by virtual fencing is as good or as weak as the ecological understanding of the person managing the virtual fencing and the grazing effort.
Opportunities	Threats
• **Integration of the technology to agri-environmental management plans and schemes (with an accredited training course focussing on appropriate use of the technology and its applications in conservation grazing).** • **Ready adaption to various environmental challenges; from safeguarding ground-nesting birds to appropriate grazing levels, to safeguarding soils and waterbodies.** • **A greater understanding of how animals use various sites and the reaction of the receiving environment to that use.** • **Data collation.** • **Landscape approaches, including commonage management.**	• Livestock managers using the technology without appropriate training or sufficient understanding of environmental objectives. • Livestock managers feeling the technology is a substitute for good stock keeping. • Inappropriately designed virtual pastures. • Technological failure. • Failure to respond to real time changes (e.g. ground conditions becoming saturated, shifts in weather, location of nests, etc.)

SWOT (Farmer/Herd Manager)

Strengths	Weaknesses
• **Reduction of labour hours and expense in erecting, moving and maintaining fences, often in difficult terrain.** • **The ability to keep animals away from dangerous areas (e.g. bog pools, steep crags, cliffs, etc.). It should be noted that virtual fencing should not be treated as an absolute in this regard.** • **The ability to know the location of animals (at 15 minute intervals), wherever the farmer is.** • **A safety system (to a degree) where walkers might leave gates open.** • **The closer consideration and analysis of how the animals use the lands which they have access to.** • **The ability to direct animals to graze in areas that they may not otherwise have grazed, leading to an increase in the forage area available. Animal welfare should at all times remain a priority and at no time were animals directed to an area where they did not have sufficient quantity and quality of forage.** • **The ability to improve habitat quality and consequently payments, where active in result-based agri-environmental schemes.**	• Studies have shown virtual fencing technology is not 100% effective at keeping animals within defined boundaries. • Any technology is fallible – GPS drift, failure of collars, non-communication with app and unexplained occurrences were all encountered during this pilot. • Where internet reception is poor, user capabilities will be diminished. • The proportion of a flock or herd that will need to carry collars in order to maintain herd/flock integrity and unity is unknown and may vary, but is expected to be high. • Cost of procuring collars and paying for subscription. • Animal locations are recorded every 15 minutes and should not be taken as equivalent to real time.
Opportunities	Threats
• **A grant scheme to support the wider uptake of this technology.** • **An accredited training course focussing on appropriate use of the technology and its applications in conservation grazing** • **Data collation.** • **Landscape approaches, including commonage management.** • **Experience and knowledge exchange between those utilising the technology.**	• Livestock managers using the technology without appropriate training. • Livestock managers feeling the technology is a substitute for good stock keeping. • Livestock managers considering all animals have the same characteristics/abilities/personalities. • Inappropriately designed virtual pastures. • Technological failure. • Improper care of collars. • Failure to check technology and correlate what the app is showing with what is happening on the ground. • Considering virtual fencing for external boundaries, roads or public areas.

Recommendations

- Is this for you/your organisation?
- Clear, justifiable goals and plan
- Understand the animals
- Understand the land
- Understand the technology
- Development of national standards
- Accredited training course, which covers all relevant aspects of the collars and their application in the field
- Have an identified and approved mentor, who is able to provide effective advice in an efficient manner
- Data
- Farming discussion groups/Knowledge Exchange Groups/Co-operation Projects, EIPs, etc.
- Other applications e.g. different technology, adaptations, intensive farming, other farming models etc., require further research (e.g. VirtuGraze, Super-G).

Conclusions

- Independent, objective study ahead of the curve
- Foundations laid for future use
- Individual and collective experience and reflections
- Recommendations arising
- Potential to be a game changer
- But only with **proper planning, standards, training and monitoring**

Acknowledgements

- The animals
- The farmers/herd managers and their families
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- Tony Waterhouse (Scottish Rural Upland College)
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- James Owens (Oran Ecology)
- John Gallogly (Philip Farrelly & Associates)

- Search 'NPWS virtual fencing'