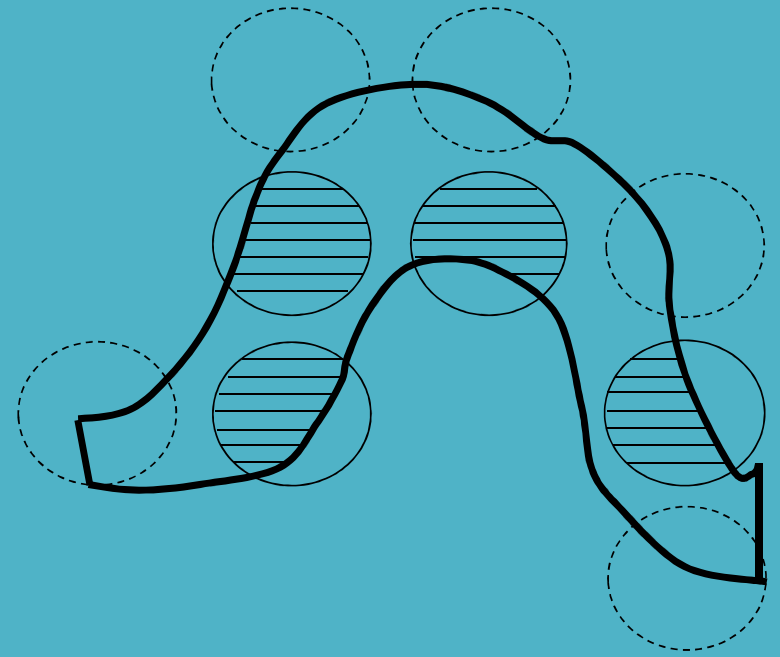
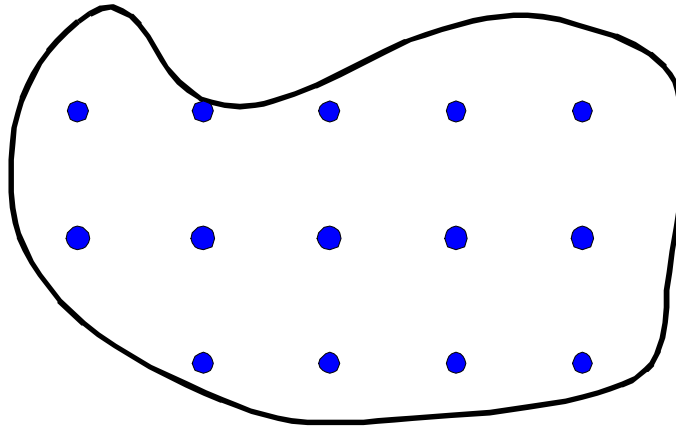


# Edge effects in Survey Design



- Point transects – issues and solutions
- Line transect – issues and solutions

# Point transects

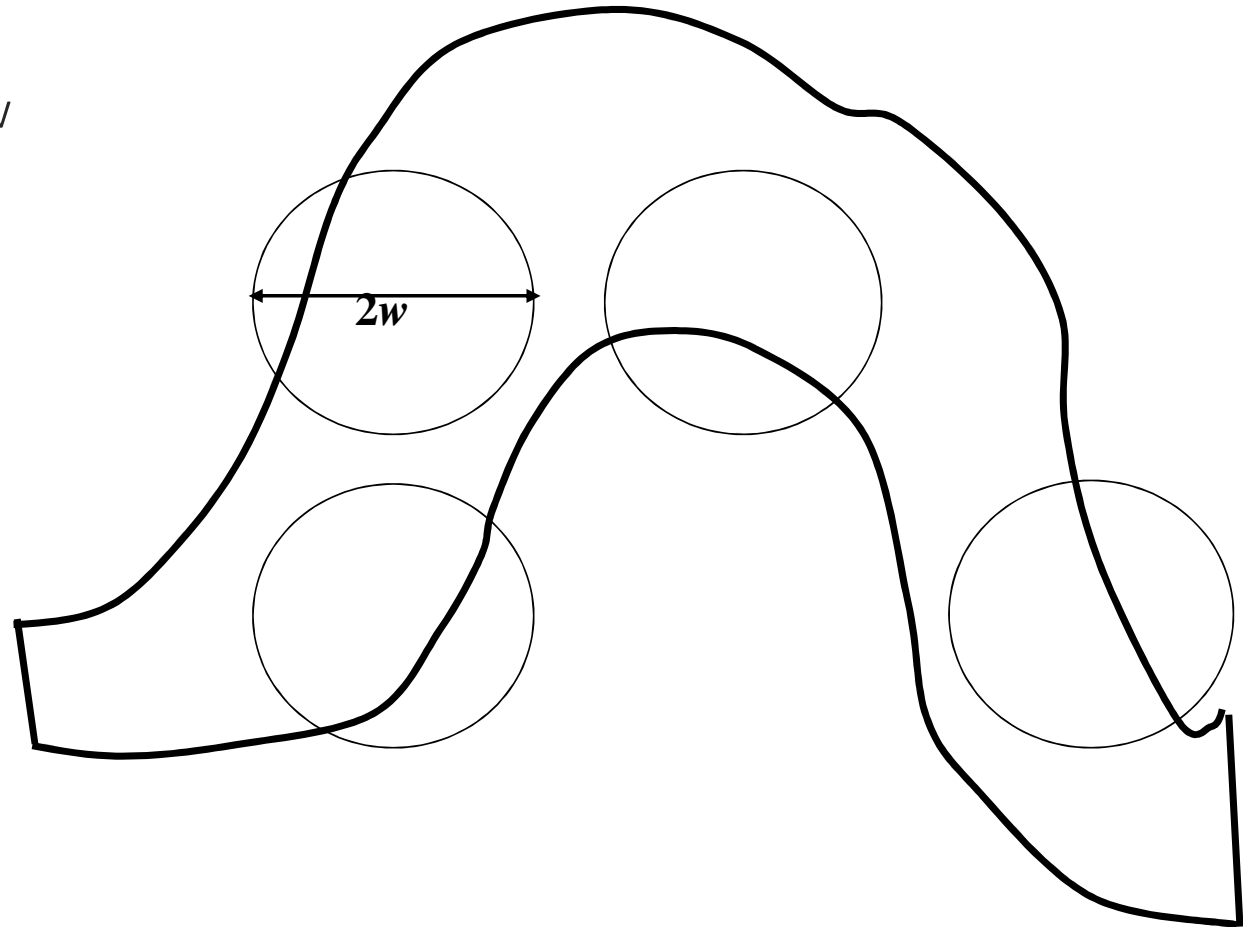


# Edge Effects

A problem if study area is small or narrow relative to  $w$

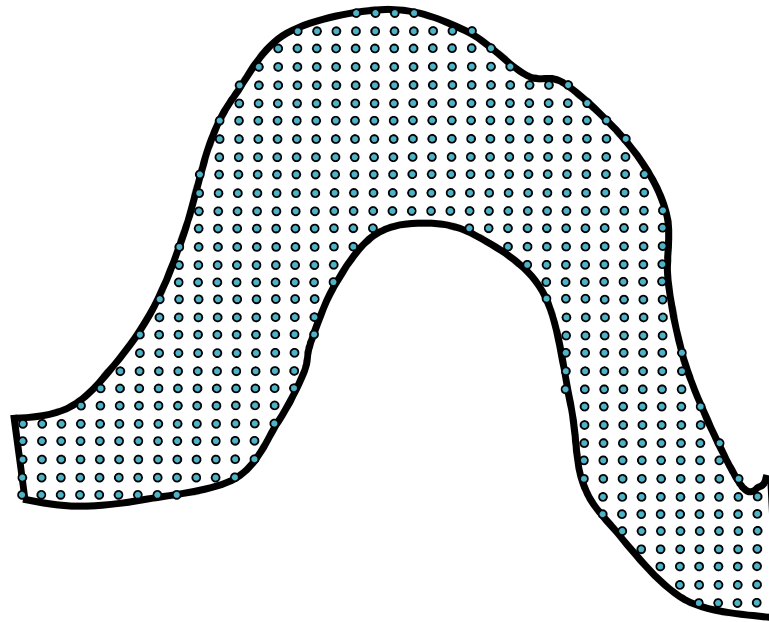
## Issues

- Coverage probability close to the edge
- Animals detected outside the region boundary



**Coverage probability** – probability for a given design that a point within the survey region will be sampled

To calculate the probability, repeatedly sample from the grid using a specific design (eg: 10 random points) and see how frequently a given point is included.



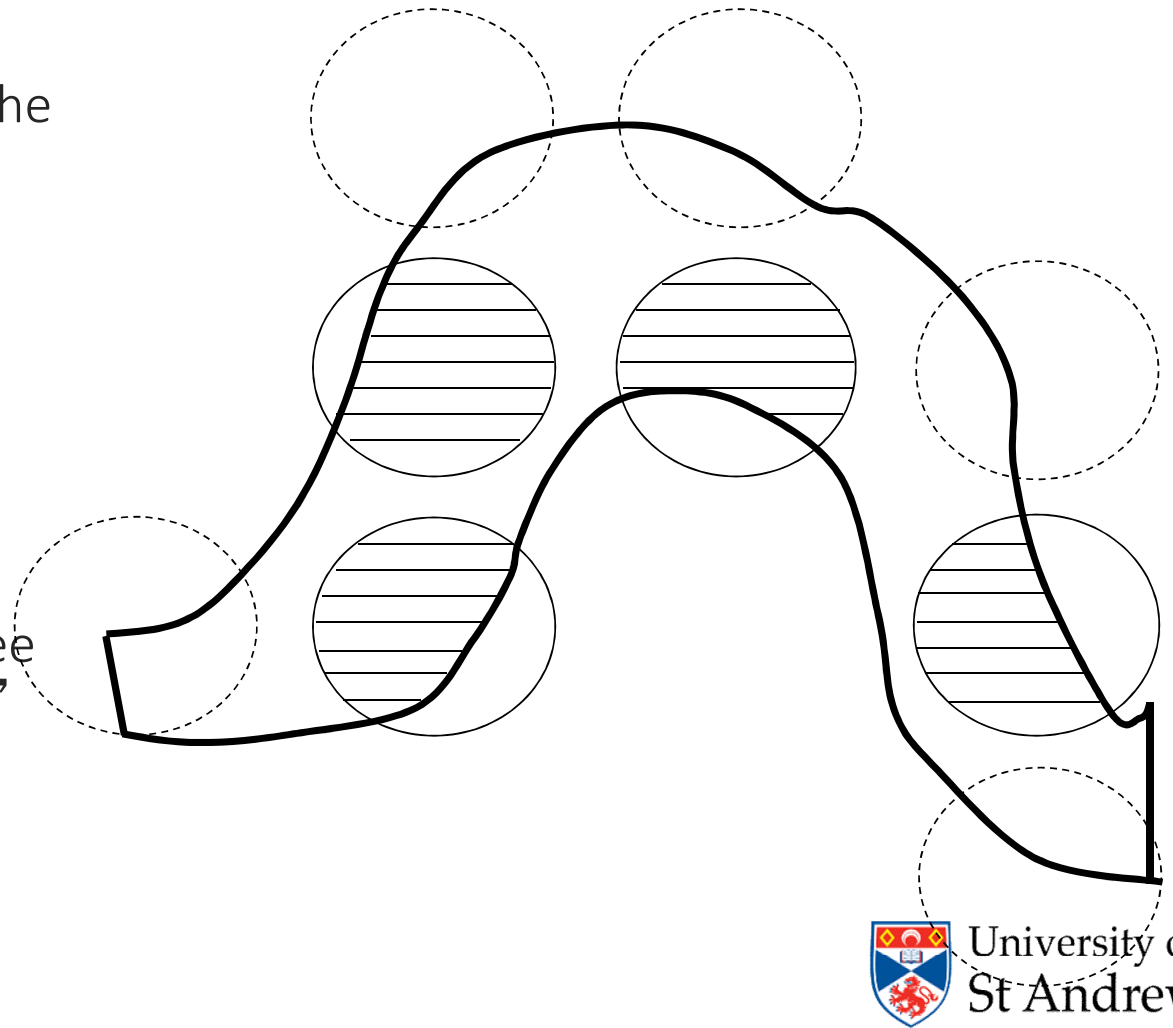
# Minus Sampling

Coverage probability is lower within  $w$  of the edge

## Assumption

Animal density within  $w$  of the survey region boundary is the same as for  $> w$

For data collection and analysis options, see 6.7 of “Introduction to Distance Sampling”



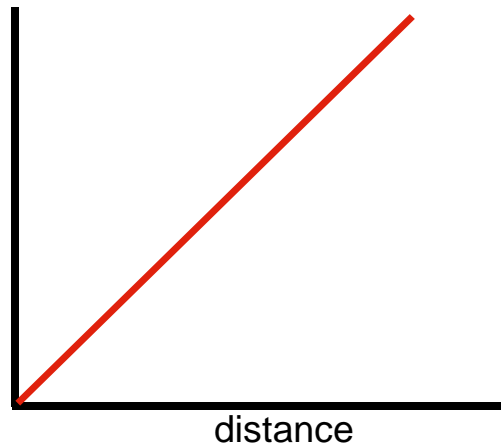
# Minus Sampling

Observed Distribution



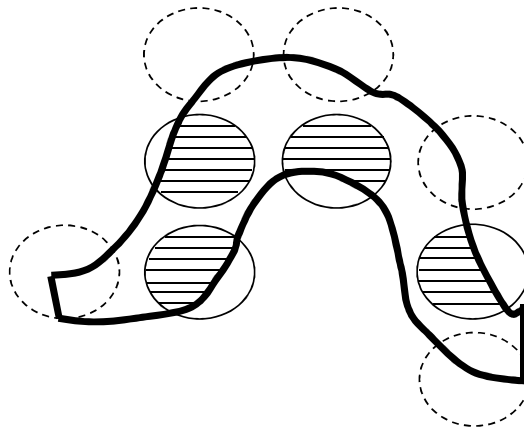
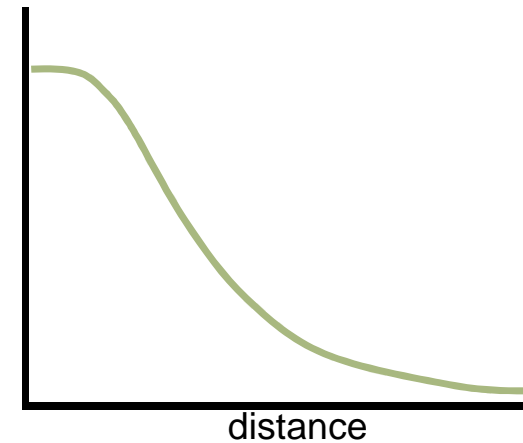
=

Availability



×

Detection Function



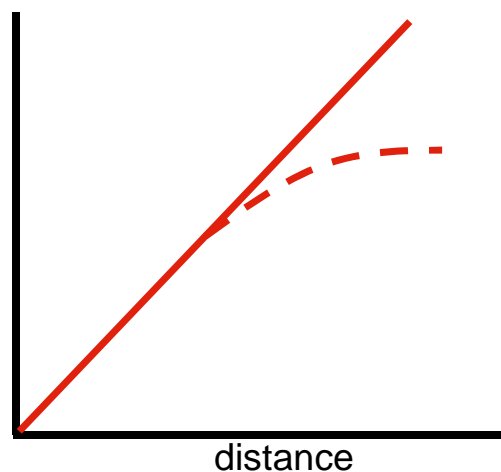
# Minus Sampling

Observed Distribution



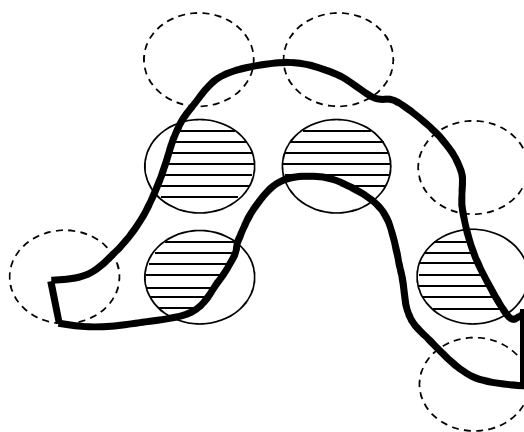
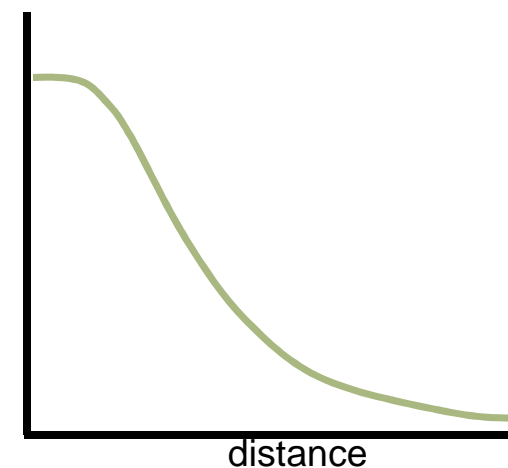
=

Availability



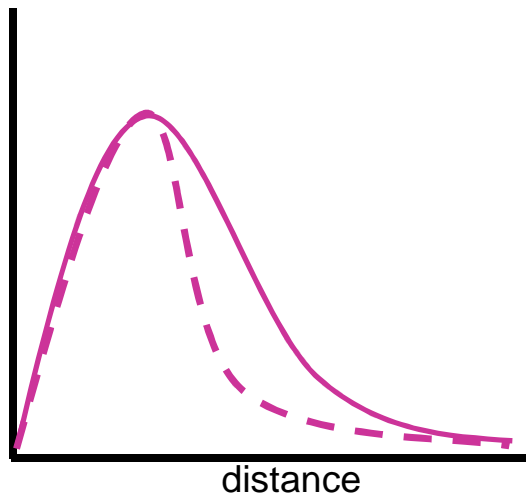
×

Detection Function

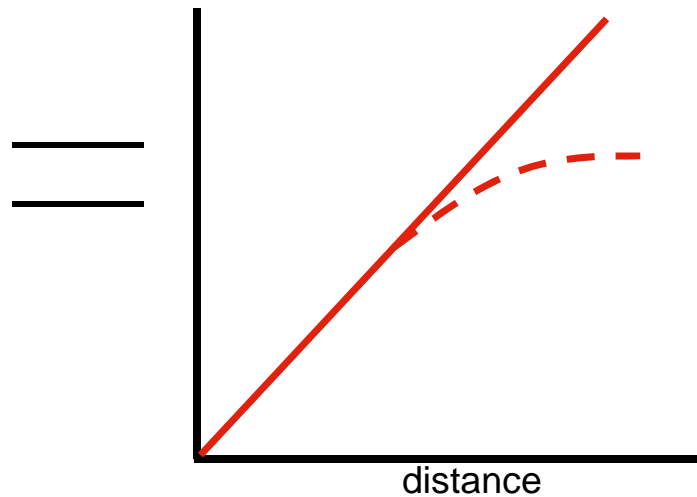


# Minus Sampling

Observed Distribution



Availability

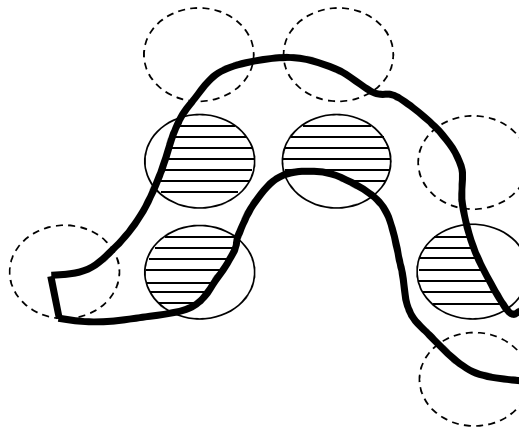


Detection Function



=

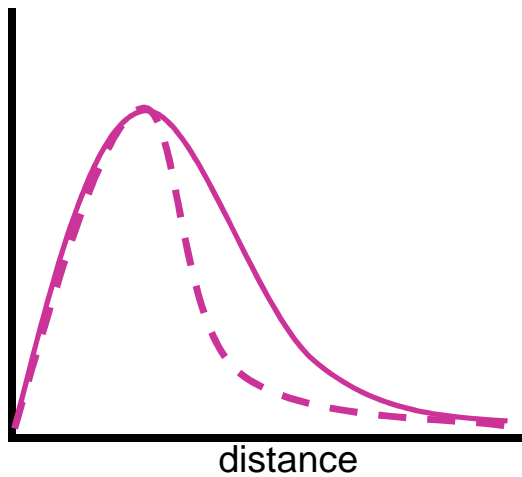
×





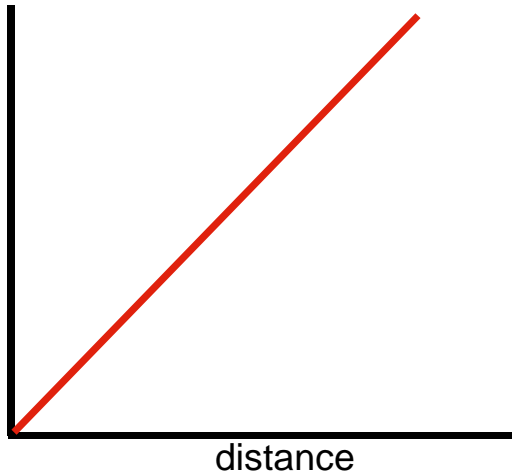
# Minus Sampling

Observed Distribution



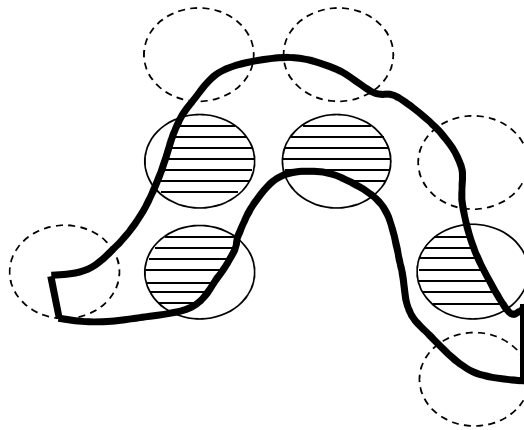
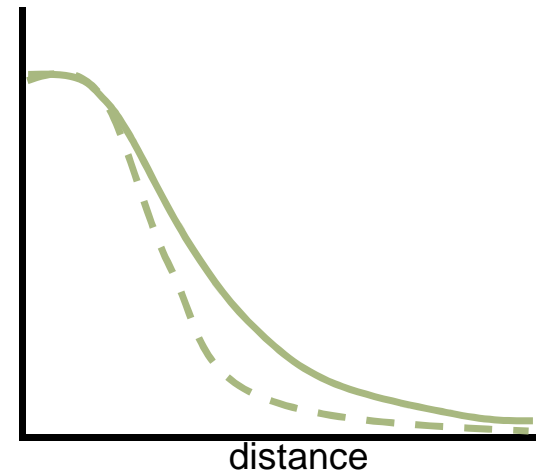
=

Availability



×

Detection Function

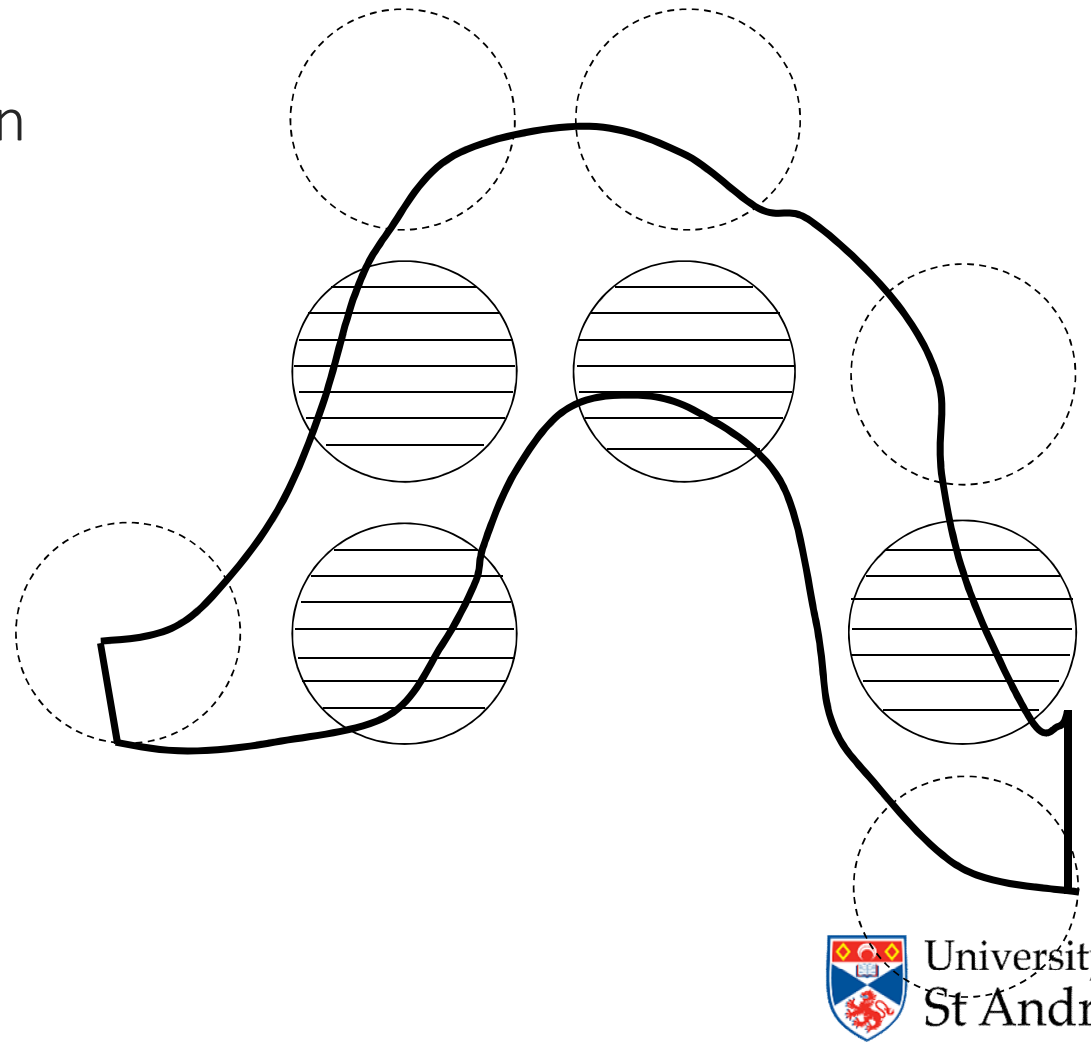


# Minus Sampling

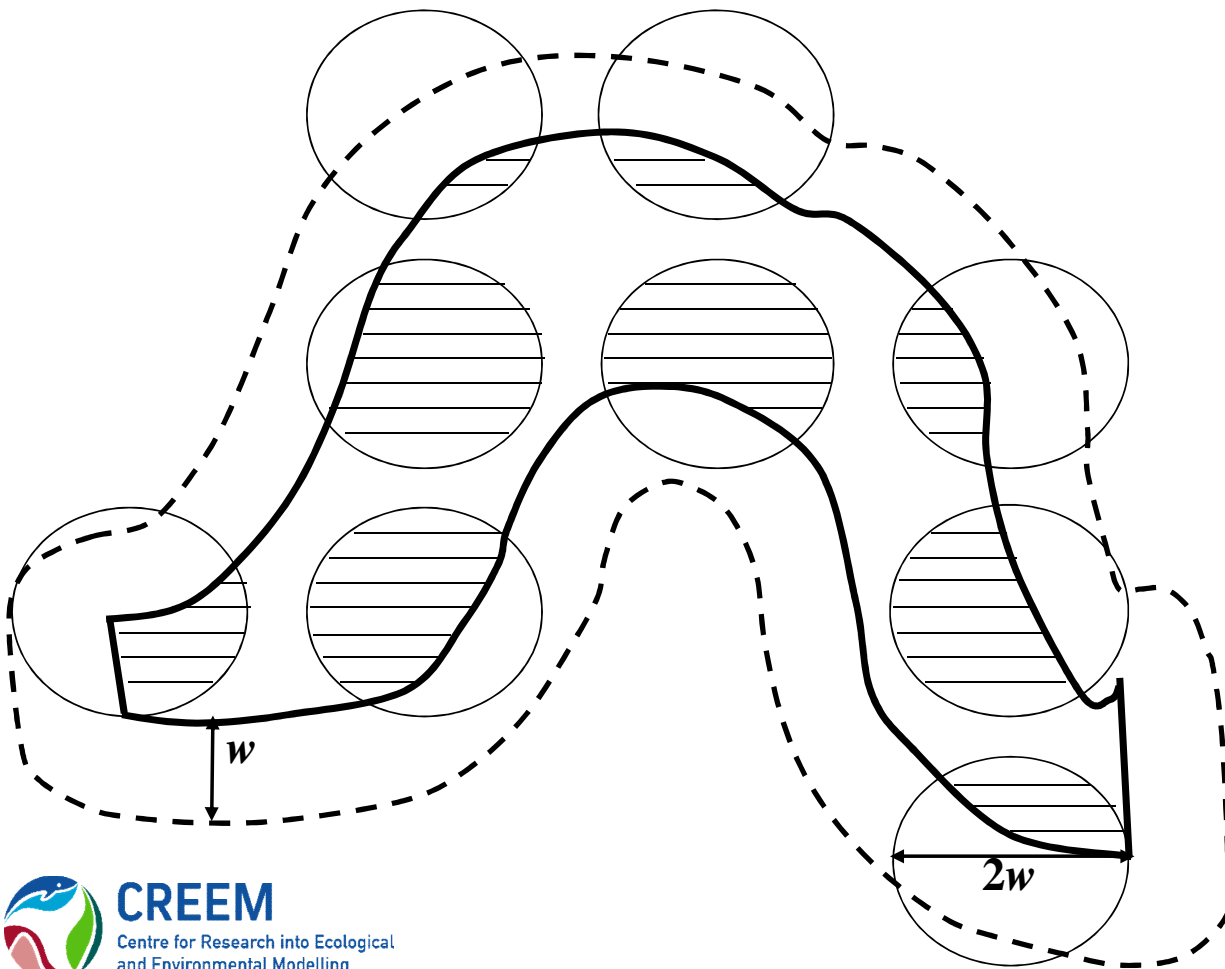
Survey up to distance  $w$  outside region boundary

## Assumption

Animal density is similar either side of the survey region boundary

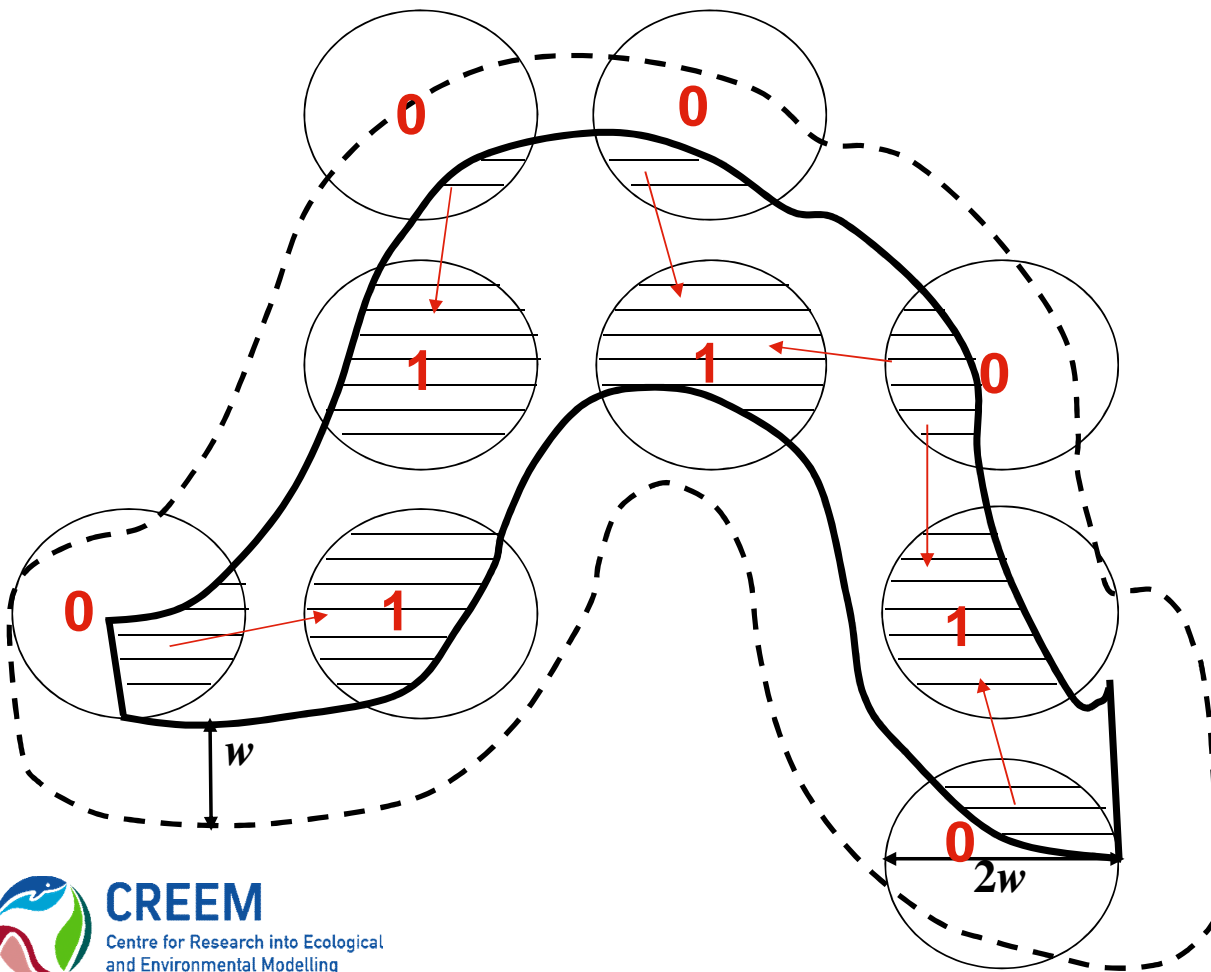


# Plus Sampling



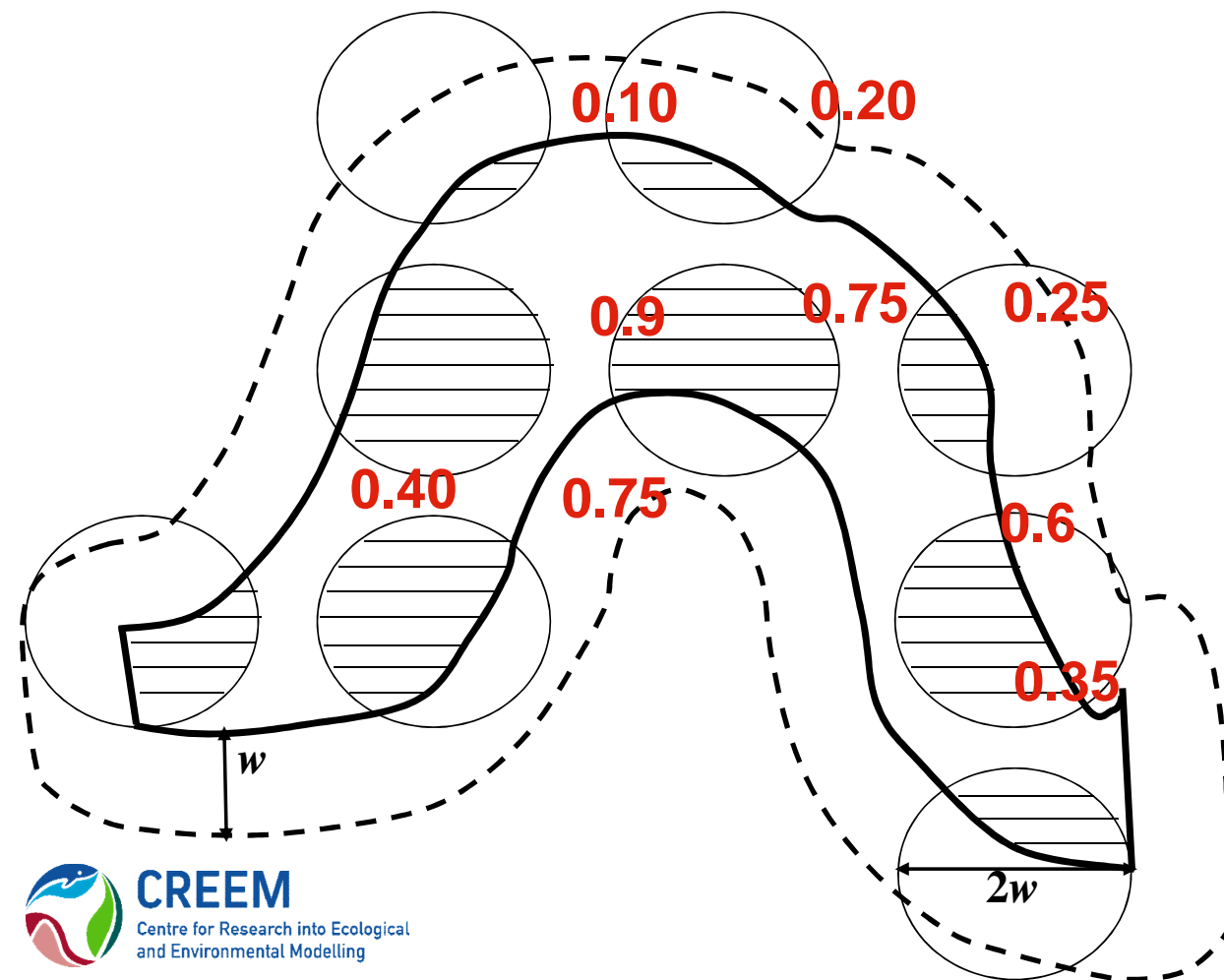
- Sample all points within a buffer  $w$  around the survey region
- Record only animals within the survey region
- Analysis:
  - 0's and 1's
  - Proportions (GIS)

# Plus Sampling



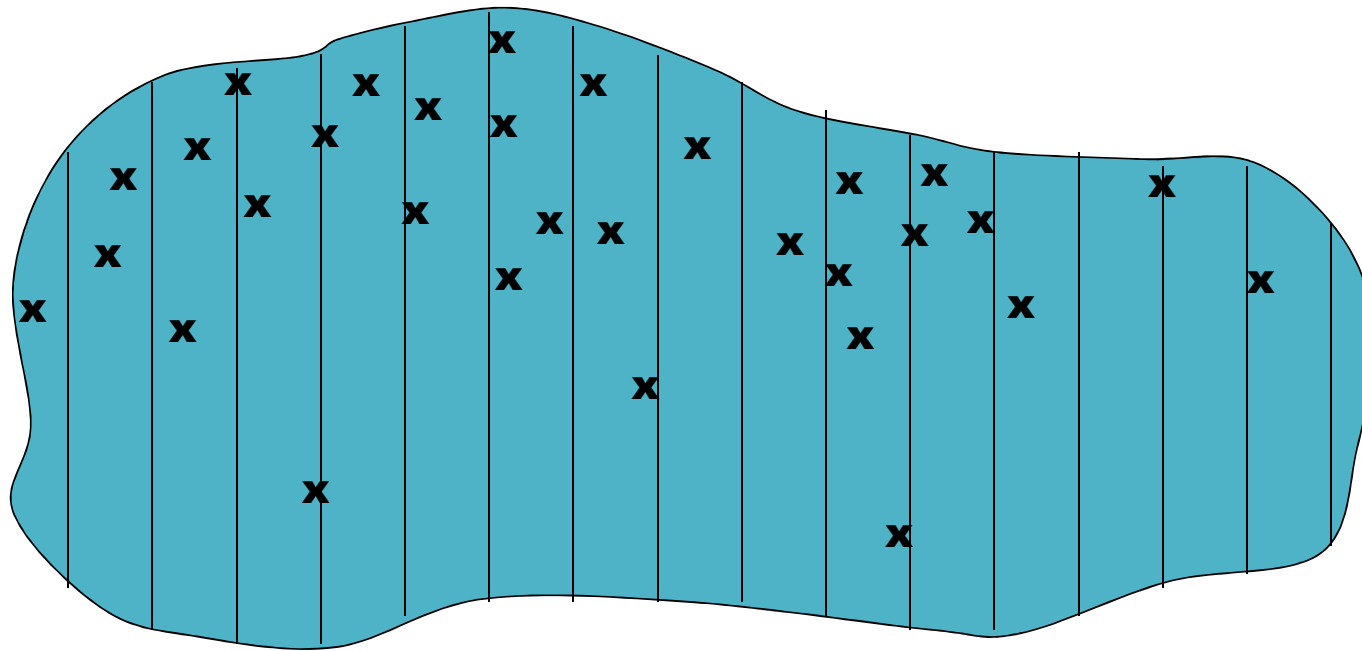
- Sample all points within a buffer  $w$  around the survey region
- Record only animals within the survey region
- Analysis:
  - 0's and 1's
  - Proportions (GIS)

# Plus Sampling



- Sample all points within a buffer  $w$  around the survey region
- Record only animals within the survey region
- Analysis:
  - 0's and 1's
  - **Proportions (GIS)**

# Line transects

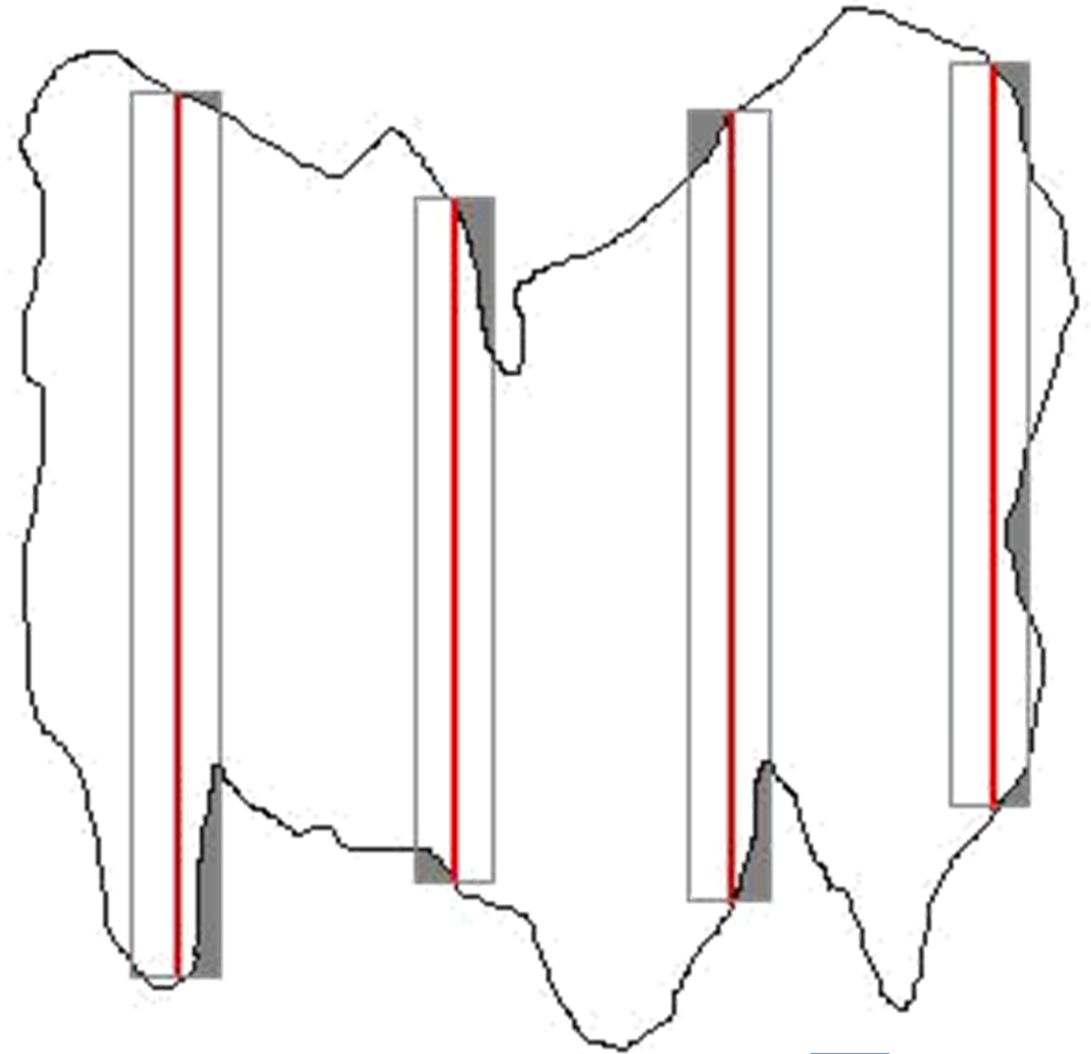


Surveyed area decreases with distance from transect

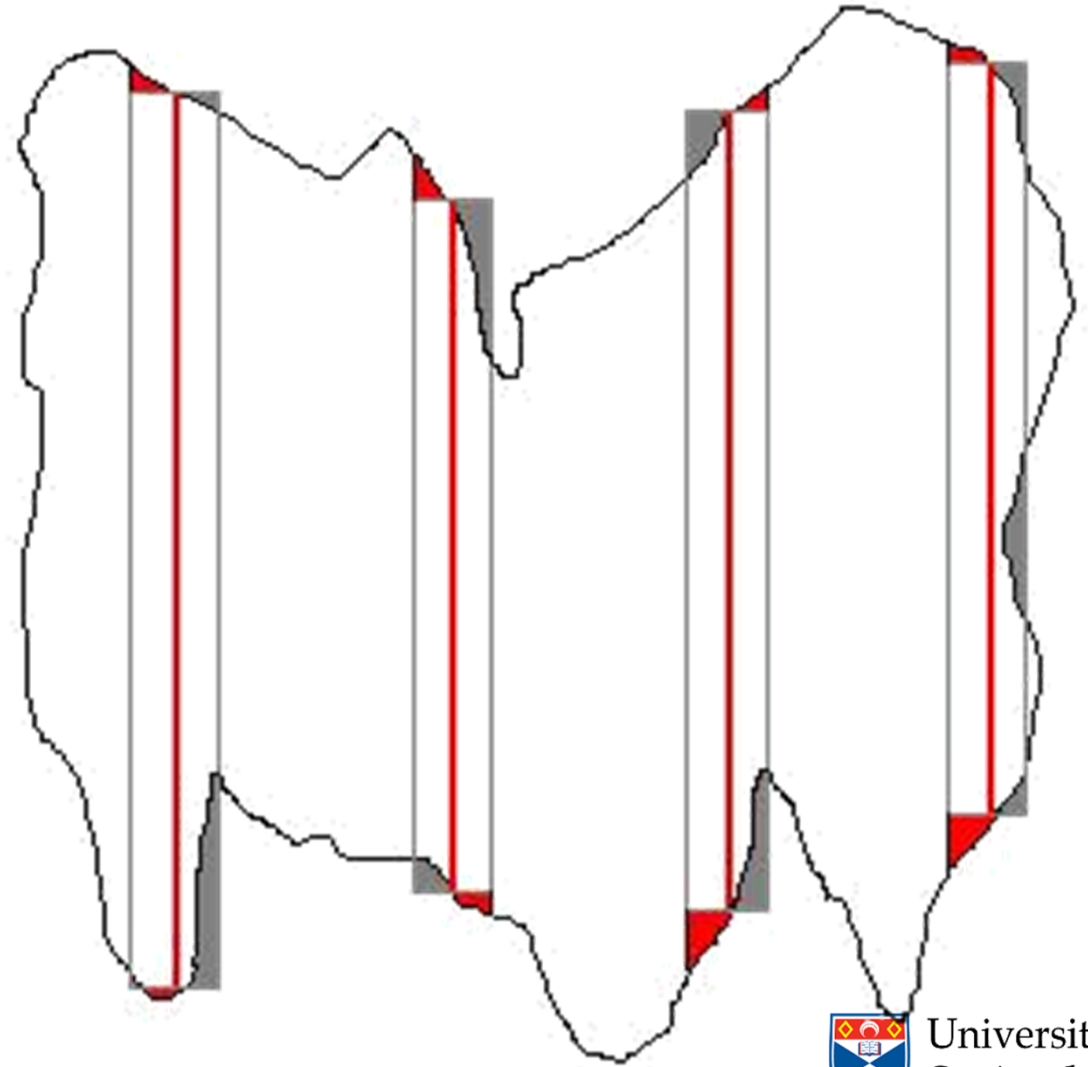
Conventional analysis can give valid density estimate.

Coverage probability lower at edge

See Section 6.7 of Introduction to Distance Sampling, 2001

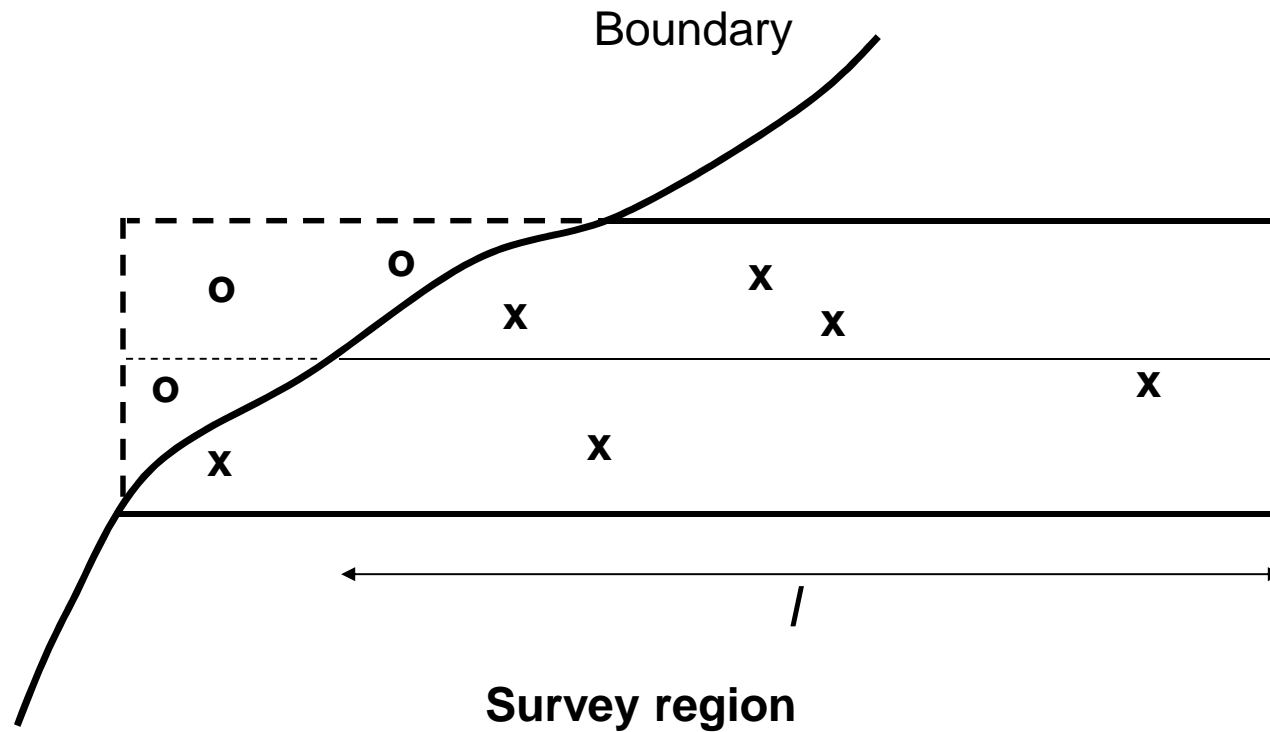


Extrapolate lines beyond boundary  
recording only animals within survey  
region



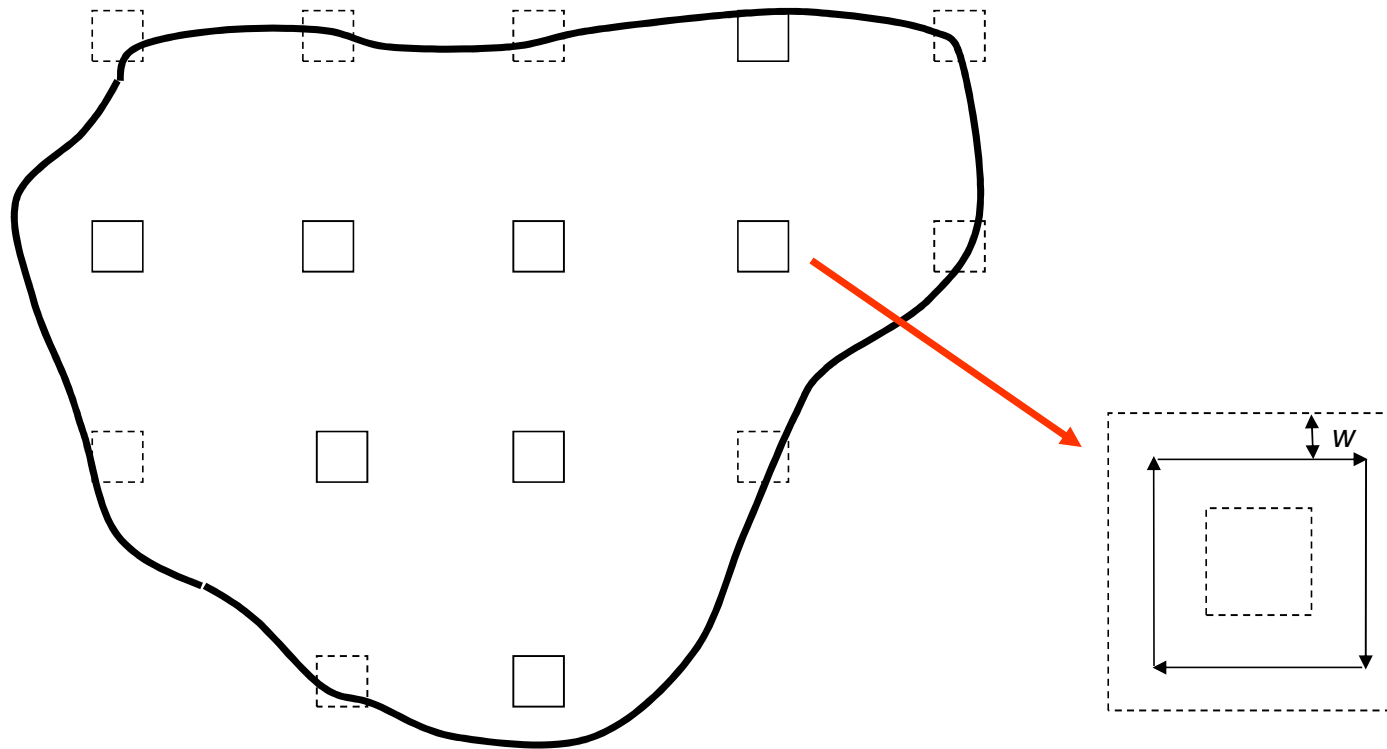


# Use of a buffer zone to eliminate edge effects



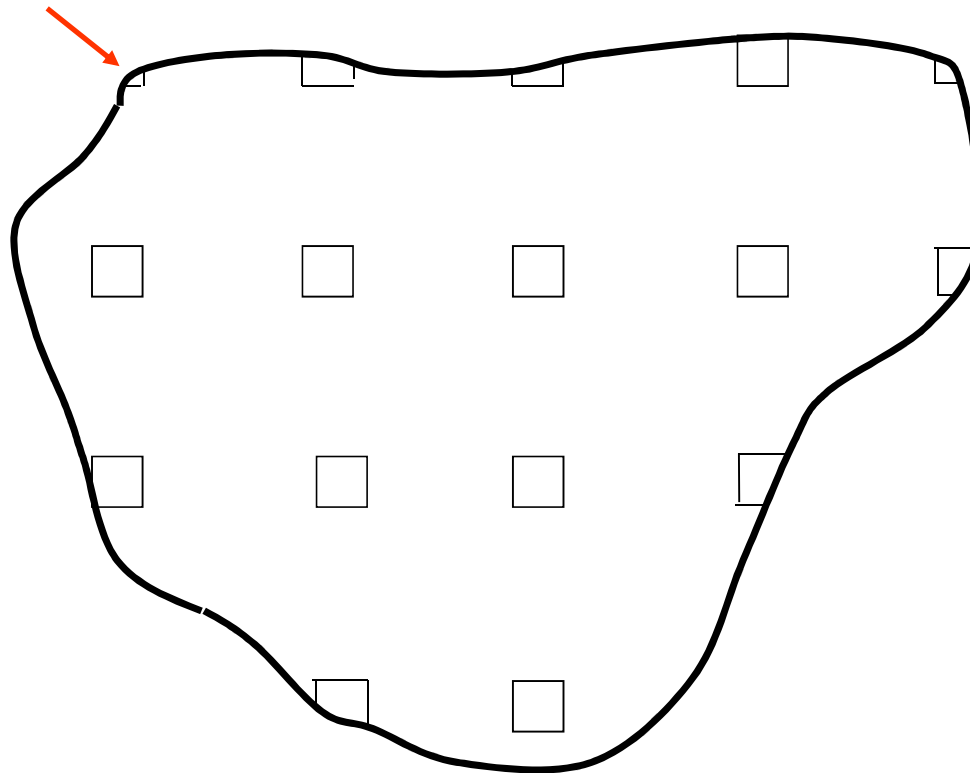
Extend the line beyond the boundary, but don't include the associated effort, and don't record animals detected outside the region (o)

# Circuit designs – edge effects

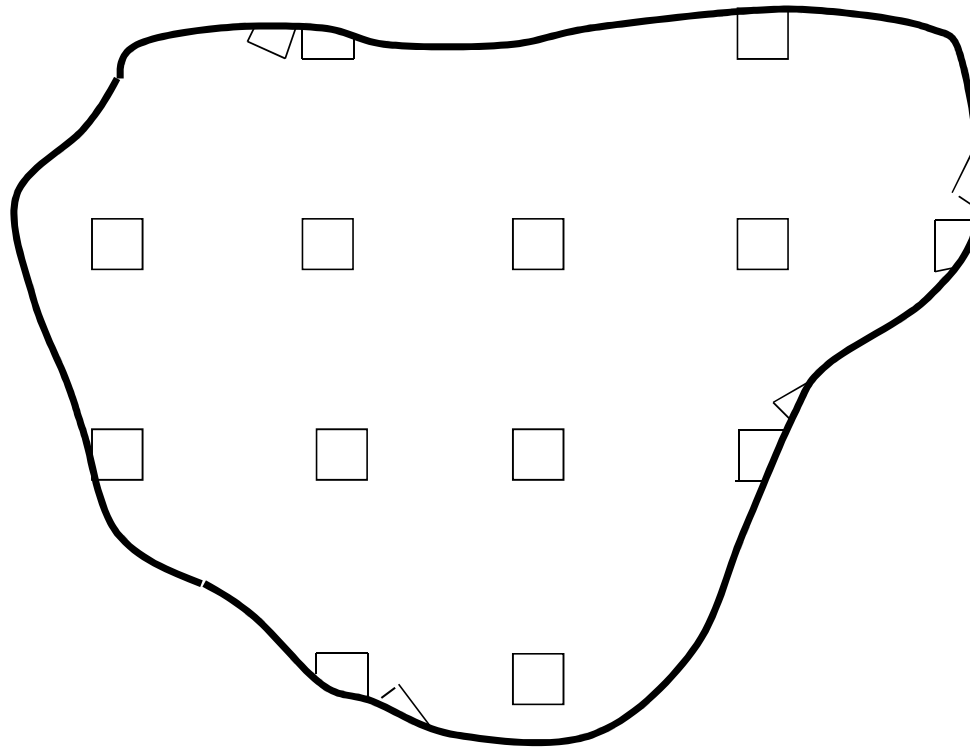


If we remove the circuits that overlap the boundary (dashed) we undersample the edge.

- We can include partial circuits at the edge
- Fine if travelling for a small amount of survey is acceptable



Or delete circuits mostly outside, and reflect and displace remaining edge circuits



# Segment designs – edge effects

Similar issues (and solutions) to circuit designs

