

Monitoring and Management: Concept and Application for Birds at Los Fresnos

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Outline

Monitoring

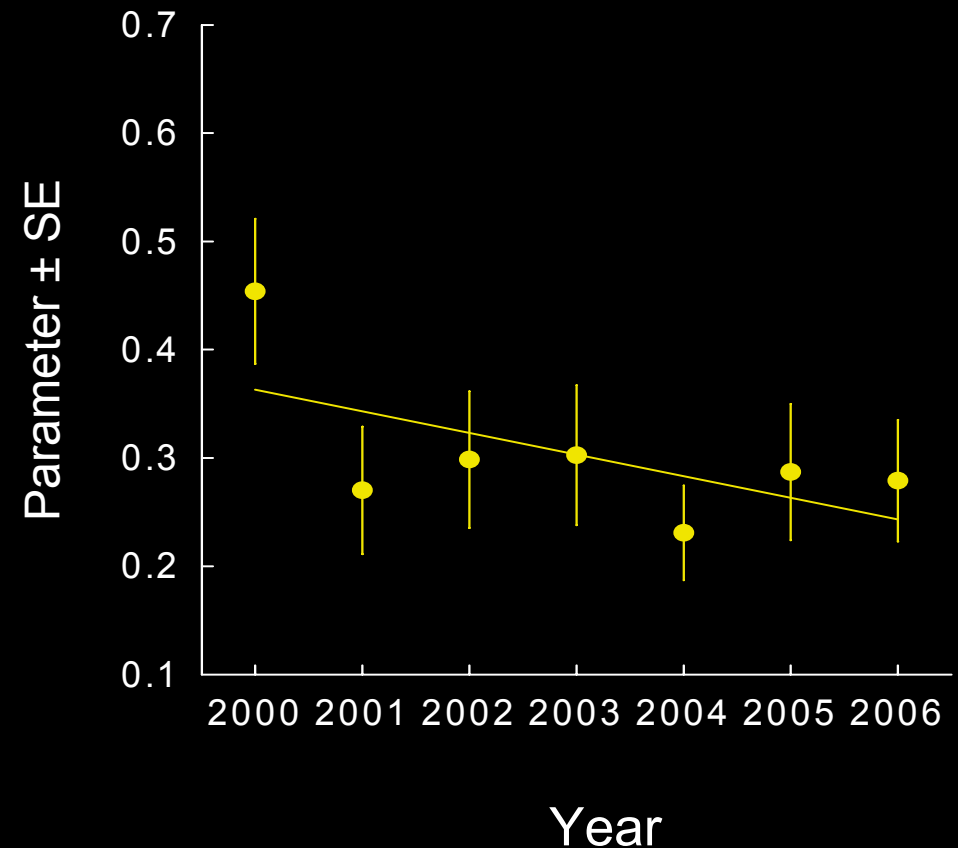
- What is it?
- Why monitor
 - Links to management
- Considerations
 - What
 - How
 - Where
 - When
- Techniques for Birds
- Conversation



What is biological monitoring?

Repeated measurements over time

- Detect trends
 - Presence
 - Direction
 - Magnitude



Monitoring Considerations

Select

- Goals
- Subject or focus
- Methods
- Sampling design
- Sample sizes
- Data analysis
- Effort



Why monitor?

To assess resource conditions

- Passive management
 - Assess conservation goals



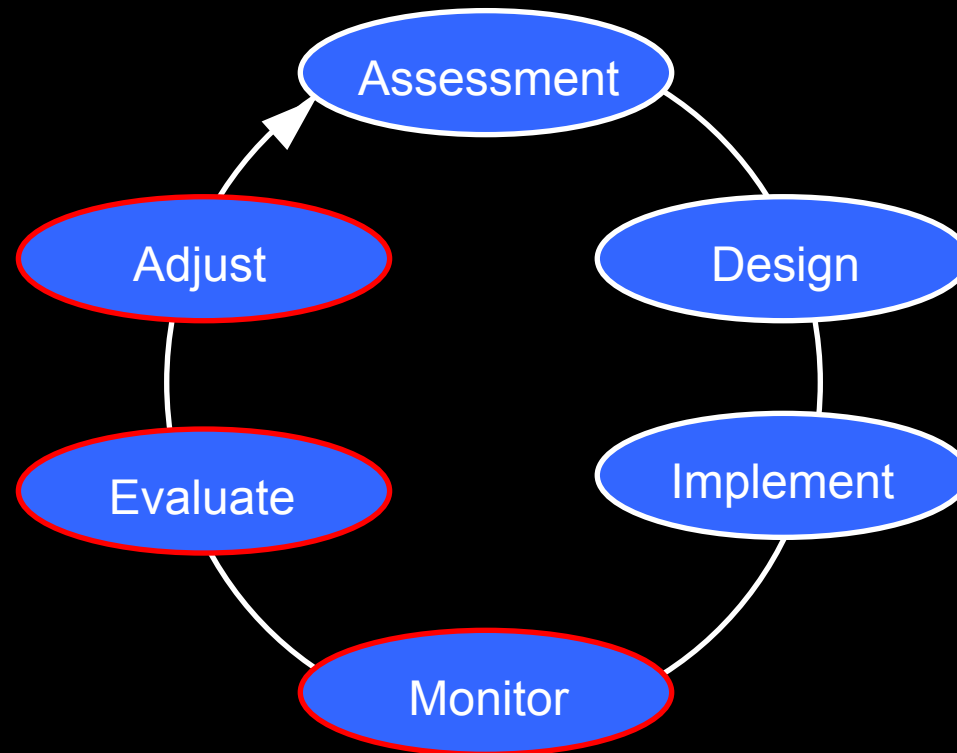
Why monitor?

- Active management
 - Assess techniques for reaching objectives
 - Mistakes are expensive!
 - Lots of options but only one may work
 - Nature is complex
 - High uncertainty and variation



Management and Monitoring

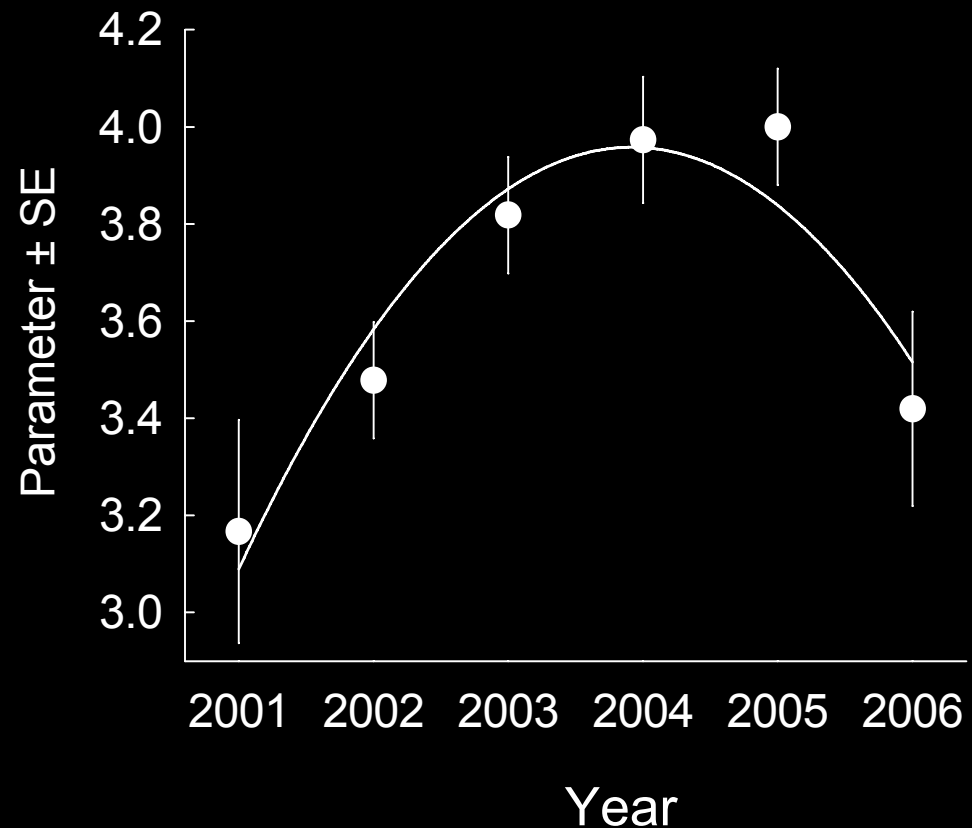
Feedback – Adaptive connections



What to Monitor

Parameter - subject of inference across time

- Two groups
 - Population
 - Community



Population Parameters

Examples

- Occupancy
- Abundance
- Demographics (productivity, nest success, survival)
- Diet
- Movement patterns (home range size)
- Gene frequencies



Community Parameters

Examples

- Richness
- Evenness
- Diversity
- Guild structure
- Energy flow

Often based on population parameters



Parameter Selection

Considerations

- Ecological relevance
- Conservation value and threat
- Sampling efficiency
- Value for guiding management



Ecological Relevance

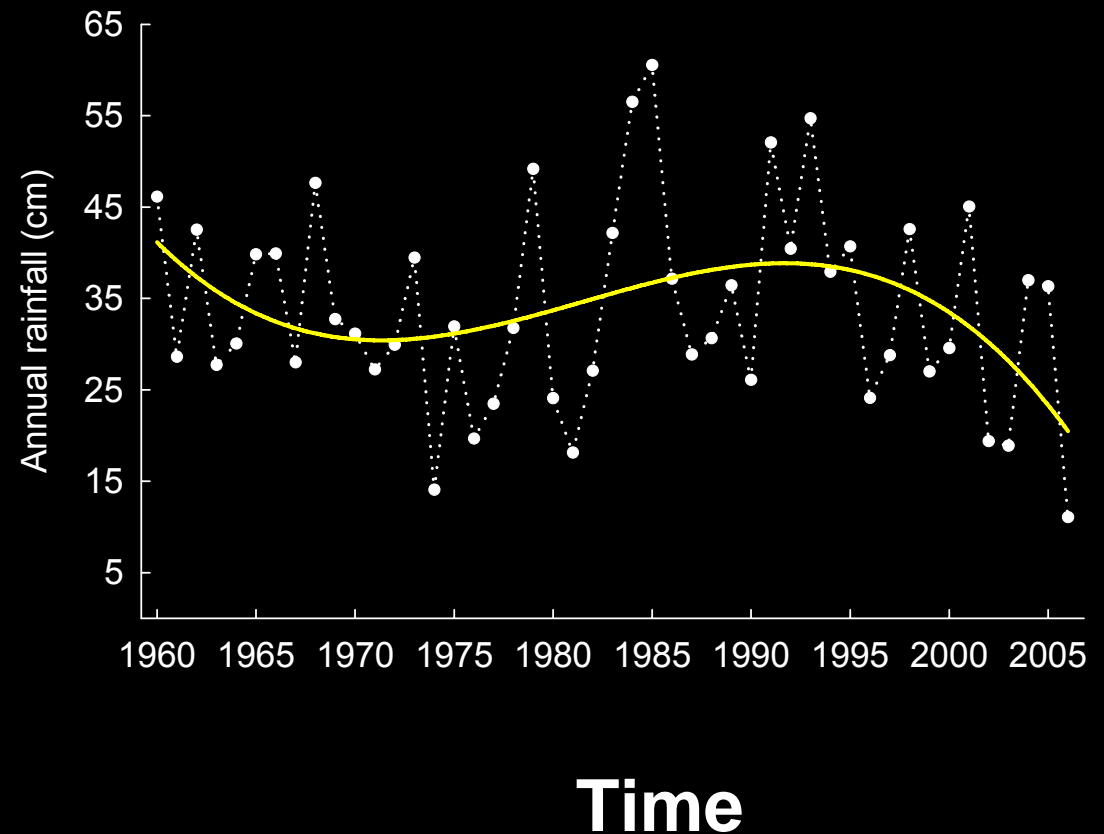
Considerations

- Connection between parameter and larger system
 - Responsiveness
- Parameter responds quickly
 - Small lag time
 - Rapid changes

Sampling Efficiency

Considerations

- Methods
- High detection rate
- Low natural variation
- Low sampling error
- Time and \$

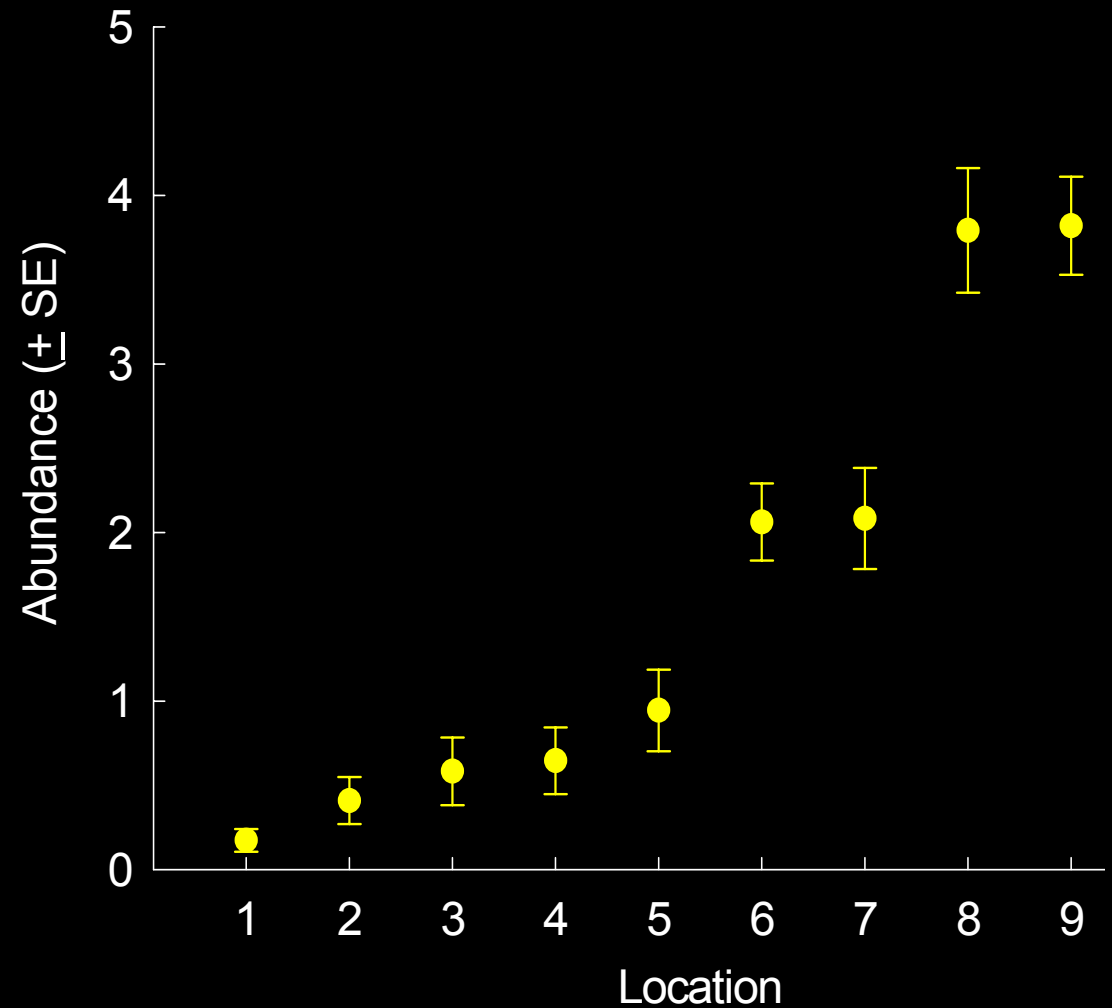


Sampling Efficiency

Considerations

- Low natural variation

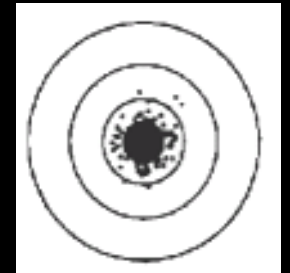
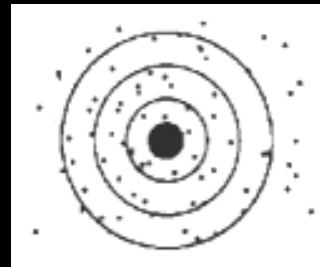
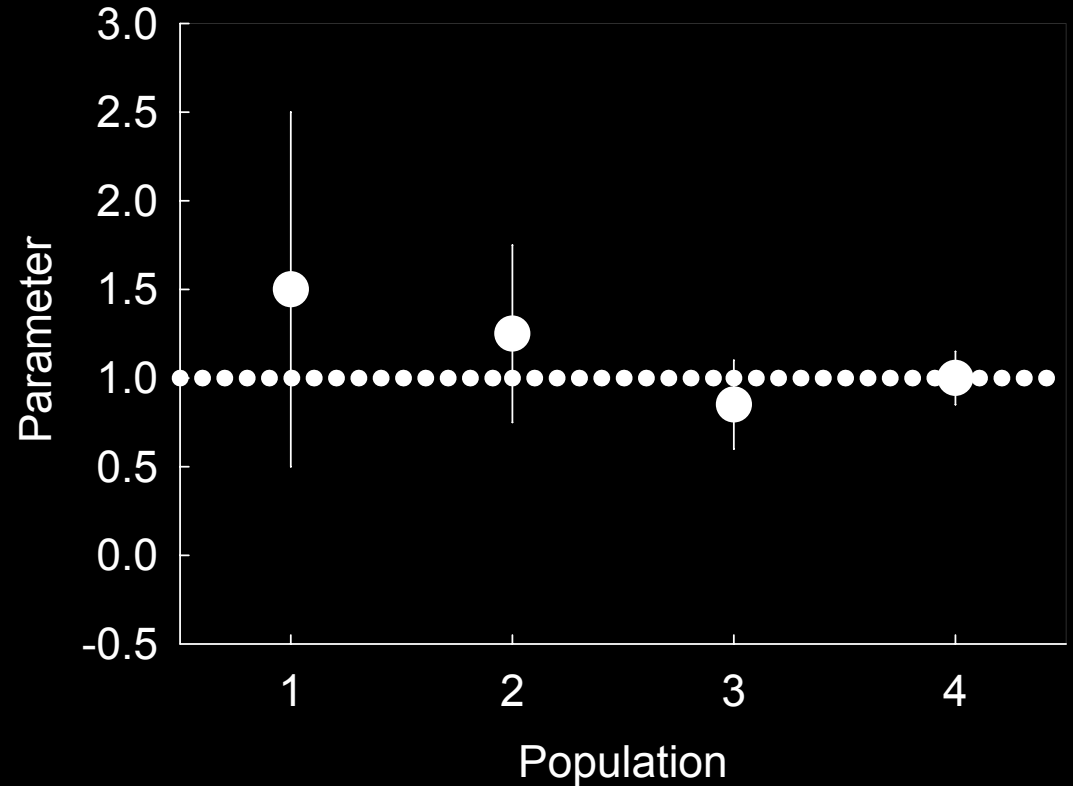
Space



Sampling Efficiency

Considerations

- Low sampling error



Management Application

Considerations

- Are changes relevant to management objectives
- Triggering management actions
- Evaluating and revising management plans

Birds and Monitoring

Bird parameters often efficient to monitor

- Respond predictably
- Good indicators of environment
- Conspicuous, small home ranges, detectable
- Standard survey methods
- Low cost relative to other species



Common Bird Parameters

- Occupancy (presence vs. absence) (0 or 1)
 - % sites occupied
- Abundance (or density) (0, 1, 2, 3... ∞)
 - Population size
- Demographics
 - Nest success
 - Productivity
 - Breeding status



Detectability

*“Probability of detecting an individual
provided it is present”*

Some individuals present but undetected

- False negatives

No adjustment = biased estimates

Parameters vs. Indices

Unadjusted parameters are indices

- Presence vs. Undetected
 - % of sites where found
- Relative abundance
 - Total count

$$\hat{N} = \frac{C}{\hat{p}}$$

Monitoring Indices ☹️

Problems

- Changes in population size unknown
- Changes in detectability big problem
- Comparisons among species not possible

Changing Detectability

Is detectability here....



Changing detectability

Same as detectability here....

No Way!



Monitoring and Detectability 😊

Estimate and adjust for detectability

- Many methods available
 - Observational
 - Capture-recapture



Observational Methods

- Distance sampling
- Repeated sampling
- Marked subsets
- Double observers



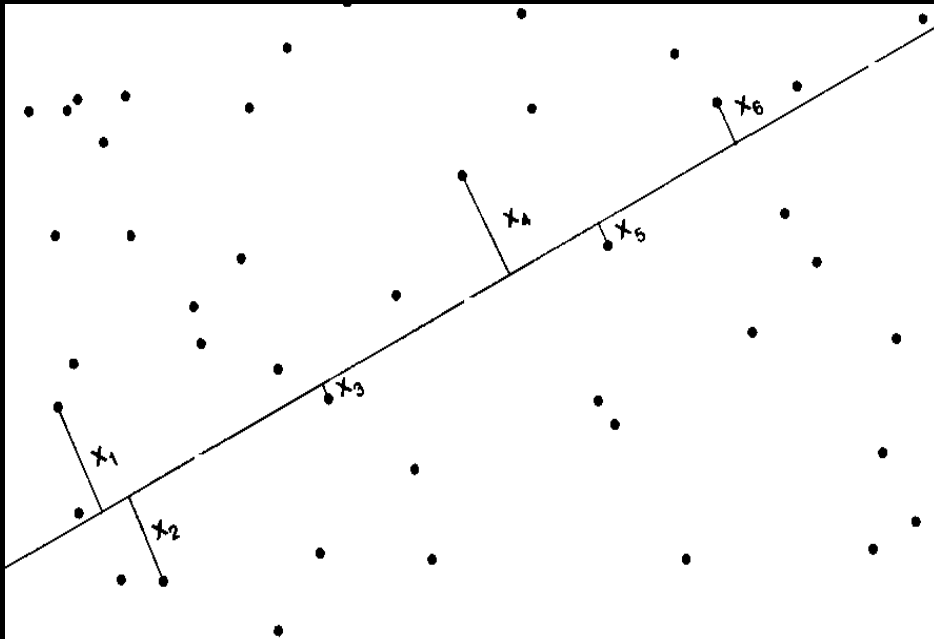
Distance Sampling for Birds

Parameter = Abundance

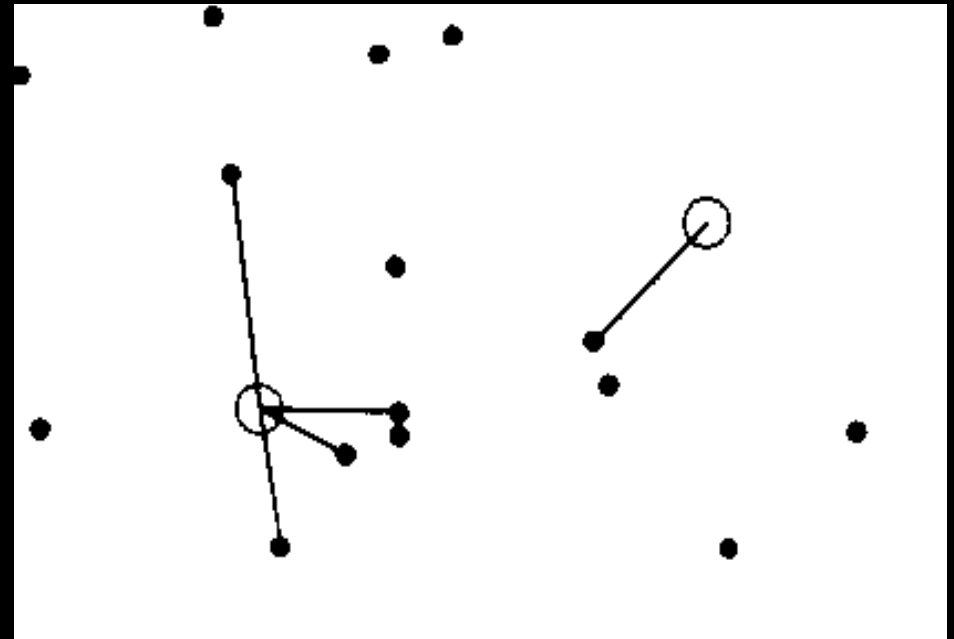
- Estimate distance to all birds from point or line
- Identify species seen or heard
- Fixed time period
- Repeated counts across time

Distance Sampling Method

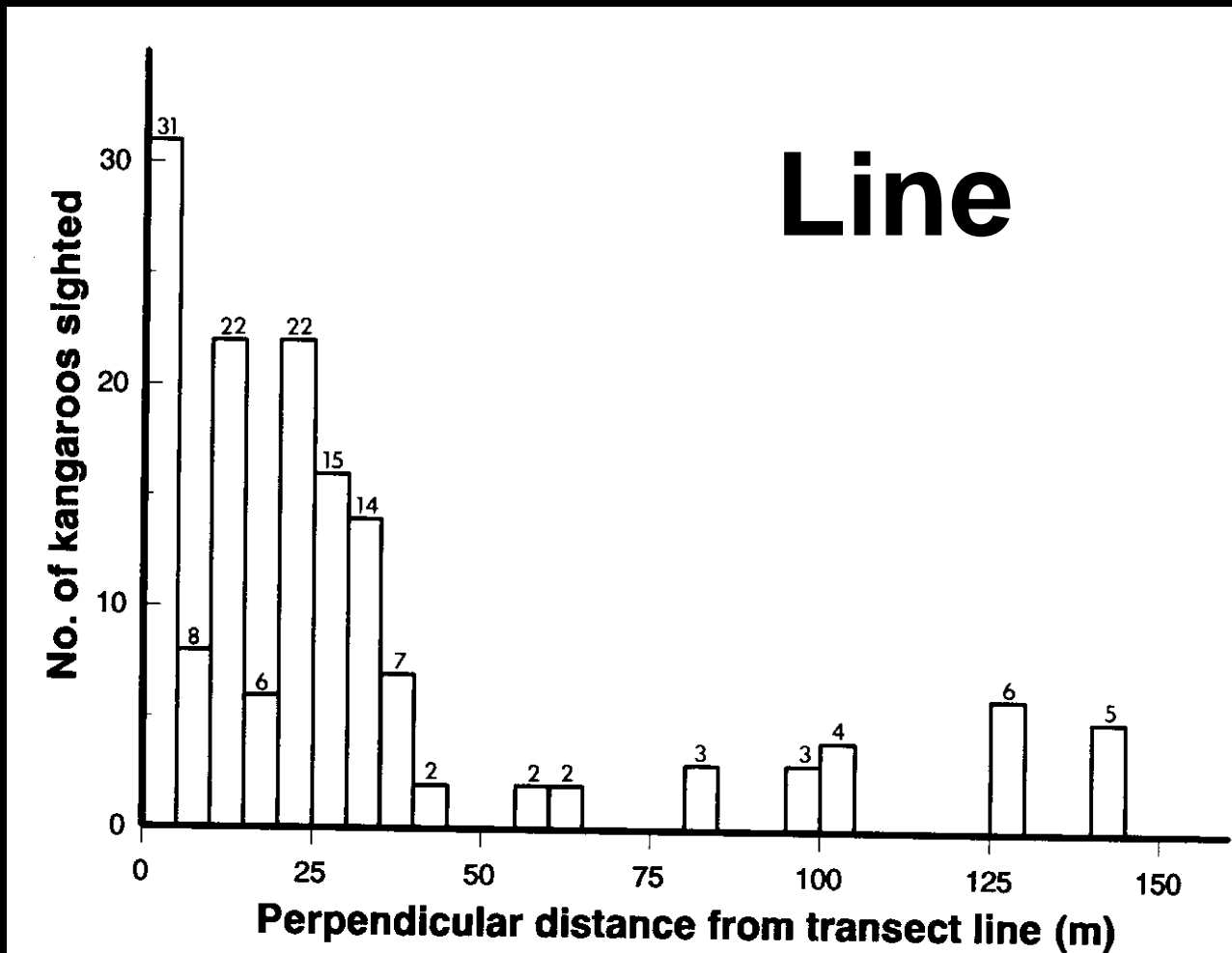
Line



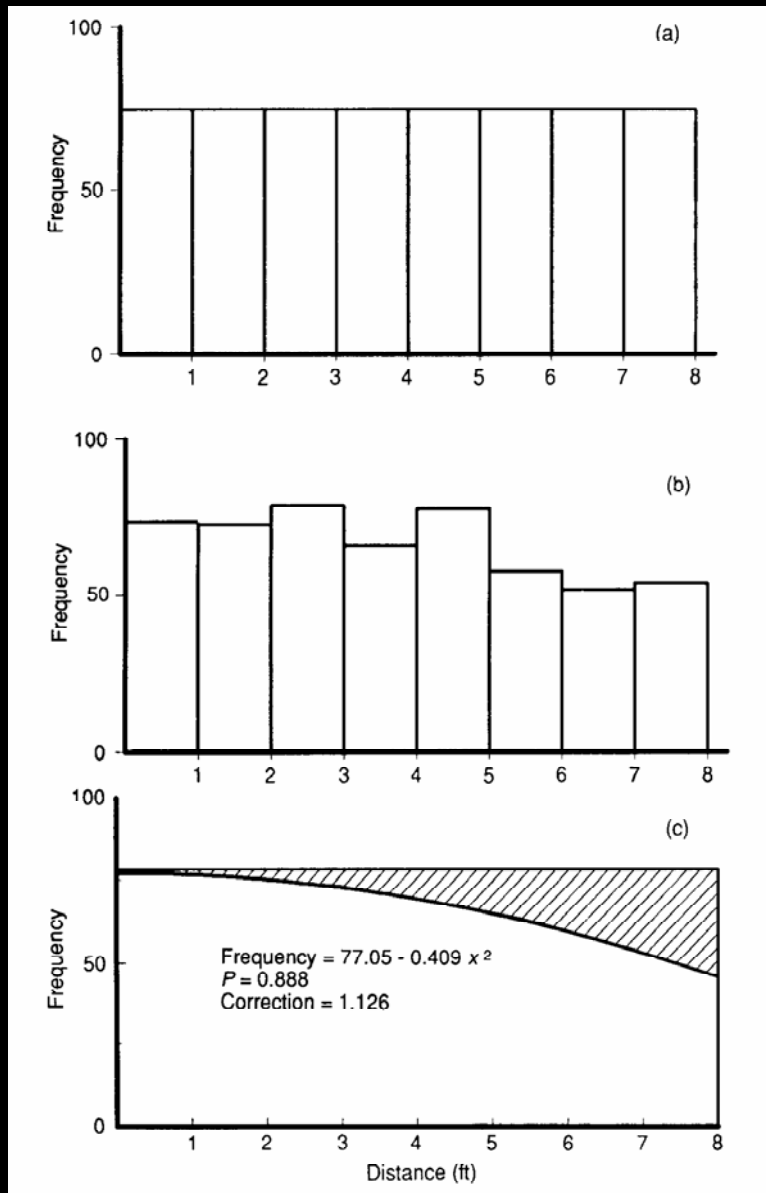
Point



Distance Sampling Data



Distance Sampling Analysis



All animals detected

Some animals undetected

Estimate number of animals undetected

Distance Sampling at Los Fresnos

Design and Arrangement

- Depends on scale of question

Small Scale



Large Scale



Monitoring at Los Fresnos

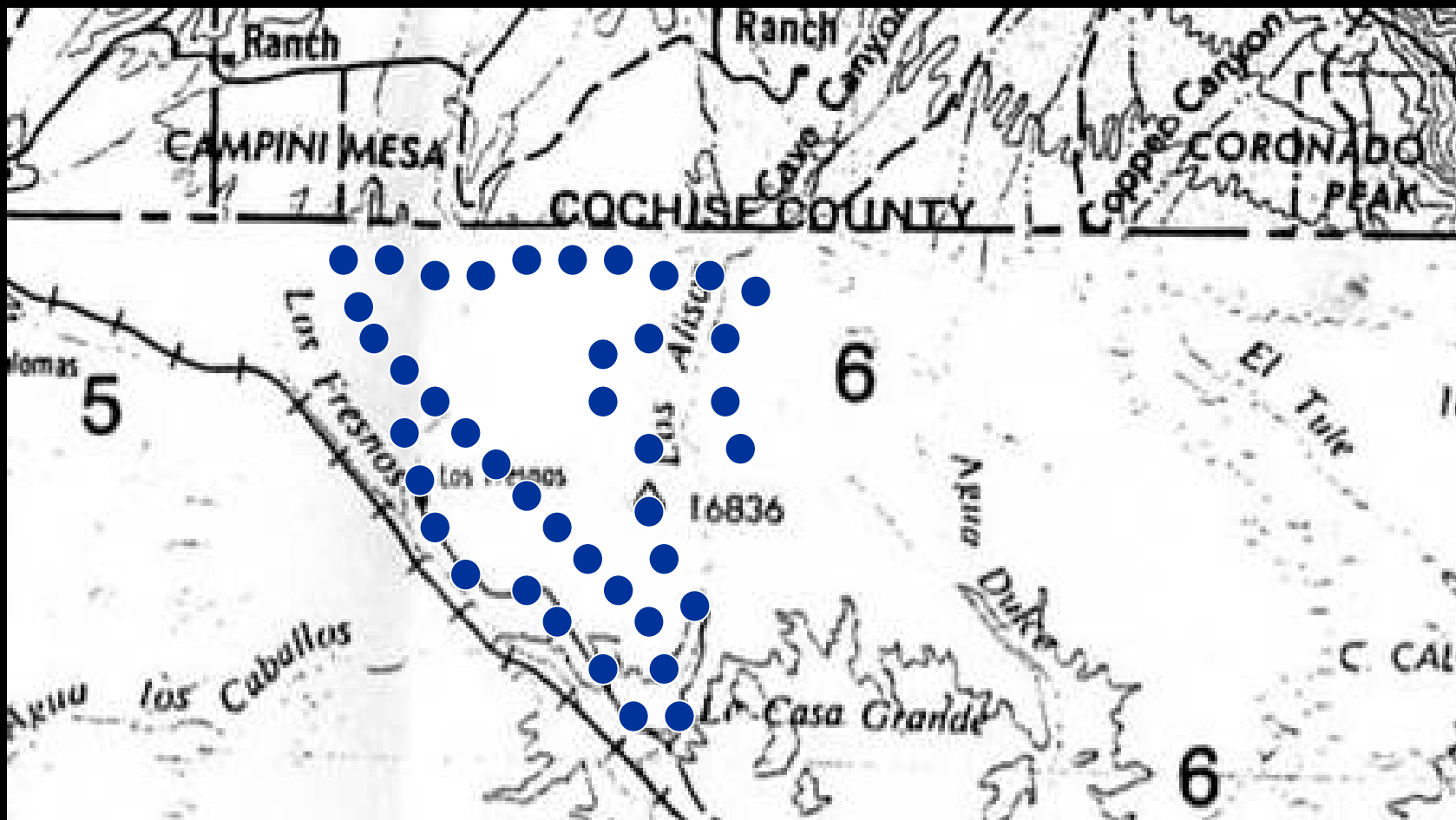
Large scale

Use distance sampling to:

- Estimate and monitor bird abundance
- Assess fire effects on bird abundance
- Assess other management actions
- Efficient – 1 day, 19 stations, 263 indiv. of 38 species

Monitoring at Los Fresnos

Use roads to access stations



Monitoring at Los Fresnos

Questions to discuss

- Species, Timing, Frequency
 - Riparian
 - Grassland
- Locations – Los Fresnos or surroundings
- Small scale questions and management
- Parameter = Abundance or others

Grassland Birds - Buenos Aires

Species	1997 Total Detections	1998 Total Detections	% change in 1998
Scaled Quail	112	98	-12.5
Gambel's Quail	157	124	-21.0
Masked Bobwhite	22	33	+50.0
Mourning Dove	133	113	-17.7
Western Kingbird	142	82	-42.3
Loggerhead Shrike	88	130	+47.7
Pyrrhuloxia	88	85	-3.4
Blue Grosbeak	145	182	+25.5
Cassin's Sparrow	549	919	+67.4
Botteri's Sparrow	91	265	+191.2
Grasshopper Sparrow	43	23	-46.5
Black-throated Sparrow	157	92	-41.4
Rufous-crowned Sparrow	66	38	-42.4
Rufous-winged Sparrow	42	47	+11.9
Eastern Meadowlark	195	227	+16.4
Total Detections (all species)	2794	3081	+10.3