

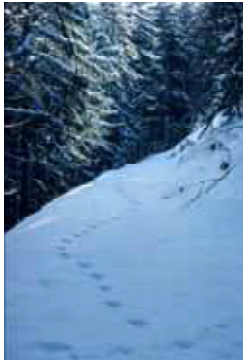


How many lynx?



Aims, Principles, and Concepts of Monitoring



Urs Breitenmoser

1. Why monitor?
2. What can be monitored?
3. How to monitor
 1. Principles of monitoring
 2. Concept of stratified monitoring
 3. Biases and pitfalls
4. Who should monitor? – The network



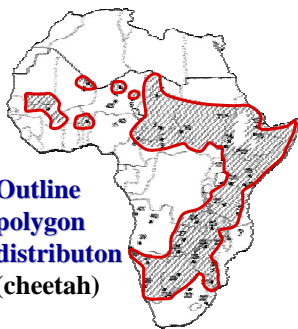


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| <div data-bbox="577 1303 1002 1865" data-label="Complex-Block"><h3>Guidelines for the Monitoring of Lynx</h3><p>Prepared by Urs Breitenmoser Christine Breitenmoser-Würsten Manuela von Arx Paolo Molinari Andreas Kysner Anja Molinari-Jobin Fridolin Zimmermann Adrian Siegenthaler Christof Amgt John Linnell Jean-Marc Weber</p><p>for the Workshop on the Conservation and Monitoring of the Balkan lynx Mavrovo National Park, FYRo Macedonia, 15-17 November 2005</p></div> | | | |
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| <p>How can we know...?</p> <ul style="list-style-type: none"> ... what the status and distribution of a species is? ... what we have to do to conserve it? ... that we do the right things? ... that the conservation measures are effective? <p>→ monitoring, monitoring, monitoring...!</p>   | | | |

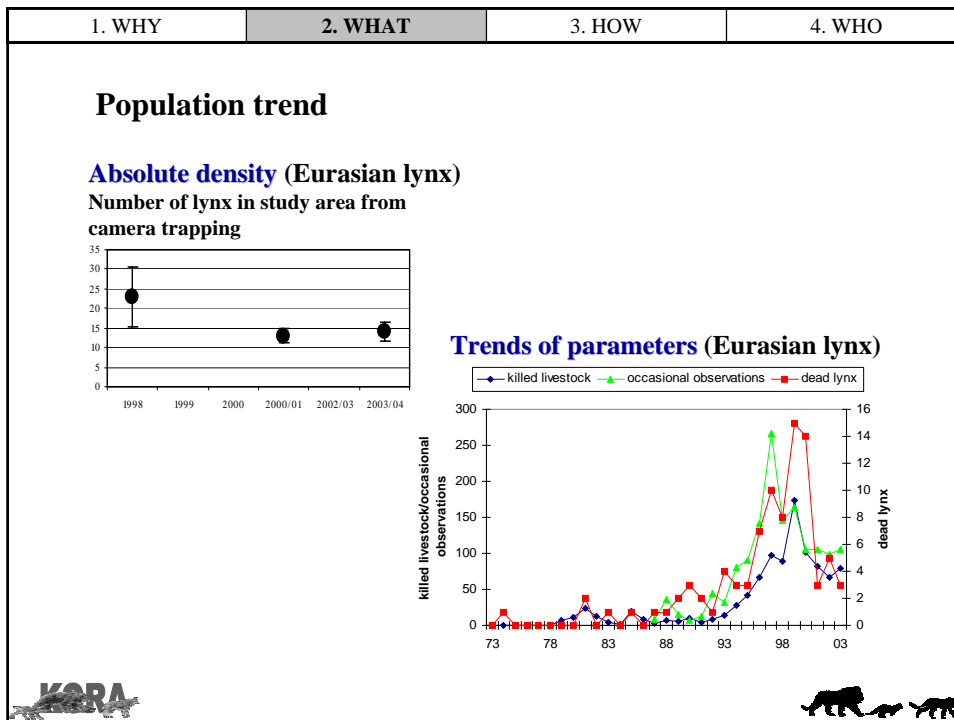
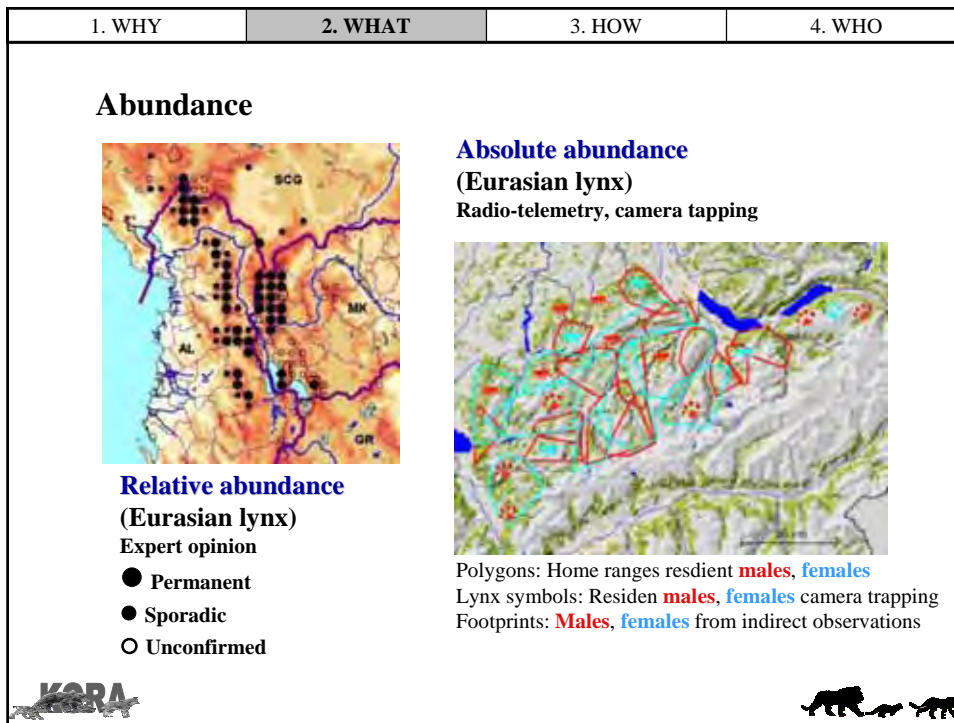
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| <p>Definitions:</p> <p>Survey: Compilation of qualitative or quantitative information through standardized procedures to define status.</p> <p>Surveillance: Series of surveys to reveal a dynamic process (e.g. surveillance of epidemics).</p> <p>Monitoring: Regular and structured surveillance to assess the effect of a (conservation) measure in respect to a goal to be reached (e.g. recovery of an endangered species).</p>   | | | |

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| <p>What can be monitored?</p> <p>Distribution: Presence/absence; outline polygon of area; raster distribution; distribution of chance observations; areas of reproduction</p> <p>Abundance: Relative/absolute density; capture-recapture methods; frequency of representative parameter (standardised method)</p> <p>Population trend: Relative/absolute changes of population in time; frequency of observations/parameters over years</p> <p>Health and Genetics: Incidence of pathogens; spread of epidemics; genetic variability; genetic drift</p> | | | |

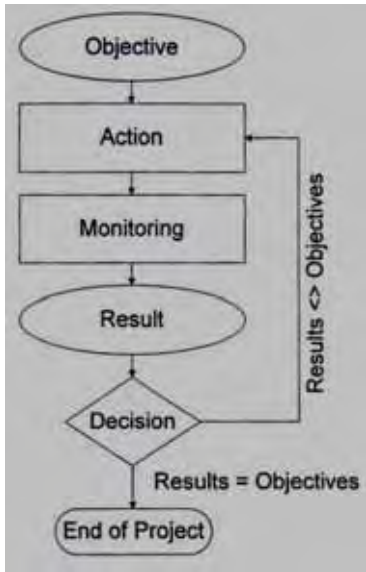






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| <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Distribution</p>  <p>Outline polygon distribution (cheetah)</p> </div> <div style="width: 45%;"> <p>Point distribution (Eurasian lynx)</p> <ul style="list-style-type: none"> ▲ Chance observation ● Kills  </div> </div> <div style="margin-top: 20px;"> <p>Raster cell distribution (Iberian lynx)</p> <ul style="list-style-type: none"> ■ Occupied □ Not occupied  </div> | | | |









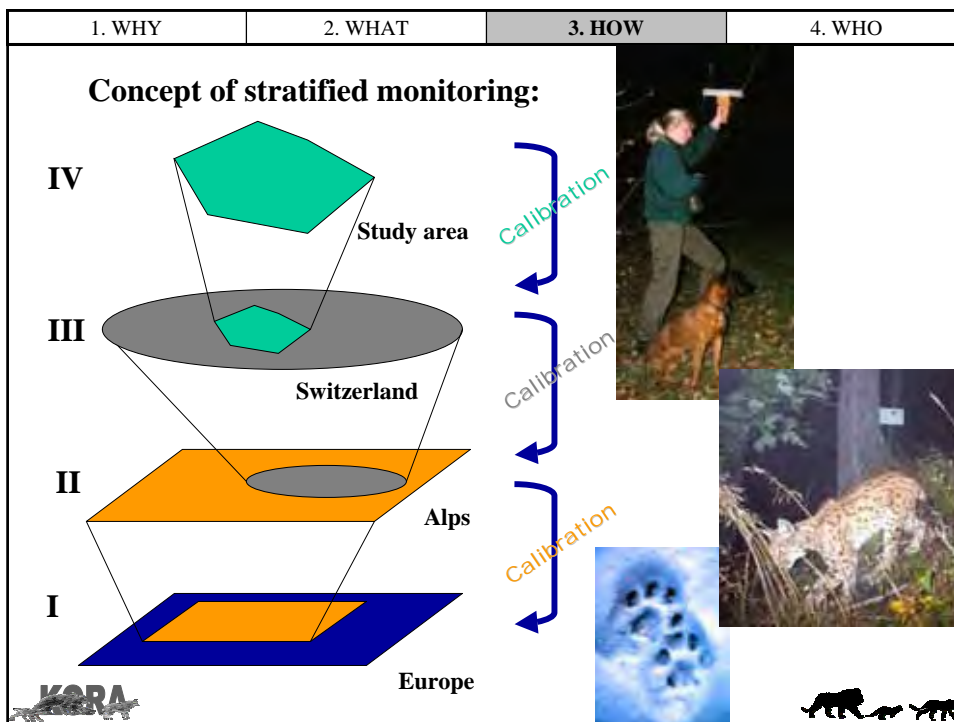
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| Health and Genetics | | | |
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| <p>Principles of monitoring:</p> <ol style="list-style-type: none"> 1. Define the goals to be reached. 2. Measure (repeatedly) control parameters to describe the dynamics of the process being monitored. 3. Evaluate of the outcome of the measuring against the goals and decide on (a) the adjustment of the actions and (b) the continuation of the monitoring. | |  | |
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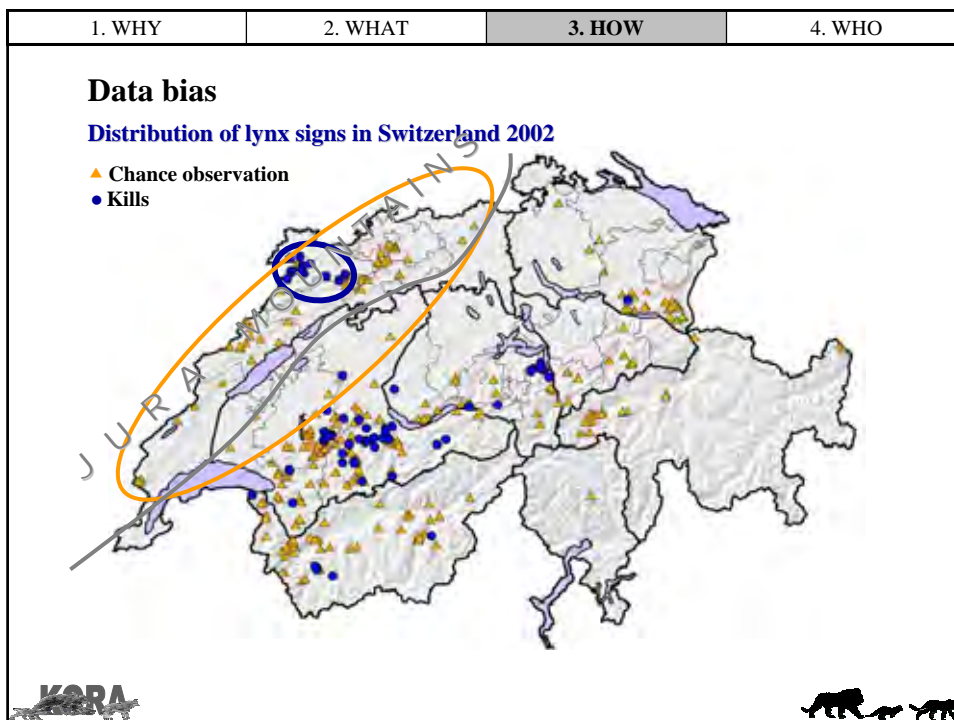
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| <p>Principles of monitoring:</p> <p>Purpose. What is the aim of the monitoring project? What questions need to be answered?</p> <p>Method: How can this be achieved? Which parameter(s) do we need to measure? Which method(s) can be used to collect the data needed?</p> <p>Analysis: What analyses and statistical tests will be used? What sample size, quality or accuracy of data is needed, and what is the best repeat frequency?</p> <p>Interpretation: What might the data mean? Will the interpretation approve decisions and allow the adjustment of the actions if needed?</p> <p>Fulfilment: When will the objective of the actions be achieved?</p> | | | |
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| <p>Concept of stratified monitoring:</p> <ul style="list-style-type: none"> • Large carnivore populations often distributed over several countries. • Many administrative units, GOs, NGOs and scientists involved (difficult communication). • Means (funding) are too limited to survey whole area with the same intensity. • The status of a population can vary between regions. • Time scale is unpredictable. Recovery and expansion of a population may take a long time. | | | |
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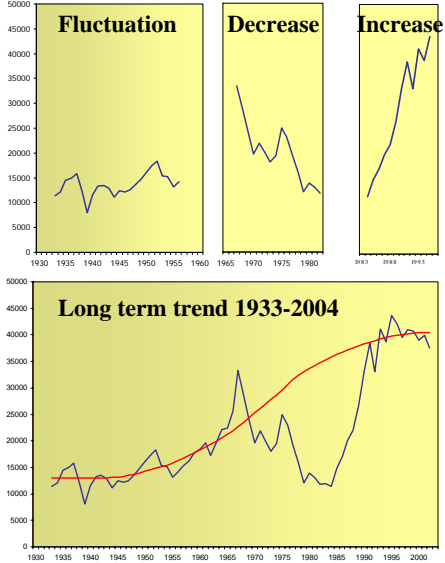


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| Concept of stratified monitoring: | | | |
| <i>Level</i> | <i>Range</i> | <i>Questions</i> | |
| I | Species range, area Europe | Distribution, range, taxonomy | ↓ QUESTIONS ↑ ANSWERS, CALIBRATION |
| II | Population, meta-poulation Alps, Carpathians | Distribution, dynamics, status, fragmentation, conservation | |
| III | (Sub-)Population Country, „compartment“ | Dynamics, abundance, status, conflicts, conservaiton | |
| IV | Part of a population Study area | Ecology, land-tenure system, densit, diet, conflicts | |
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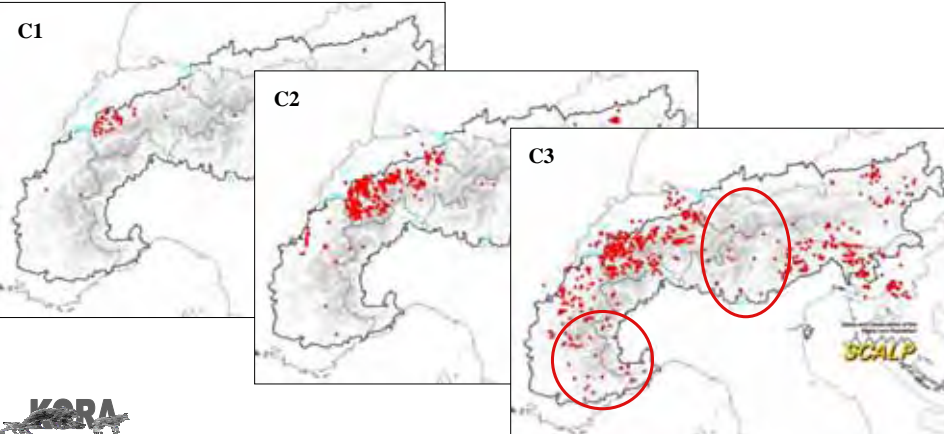

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| <p>Biases and pitfalls:</p> <p>Data bias: The data collected are not representative or not adequate for the question asked.</p> <p>Sampling sites: The sampling area is not representative for the entire population (too small, wrong habitat).</p> <p>Time scale: The duration of data collection does not allow the determination of the dynamic process (short-term fluctuations <i>versus</i> longer-term trends).</p> <p>Interpretation: The interpretation of the results is wrong or not generally accepted.</p> | | | |





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| Sampling site bias | | | |
|  <p>Above timberline: Easy observation, but untypical habitat</p> | |  <p>Forest: Difficult observation in typical habitat</p> | |
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| Time scale bias | | | |
| <p>Red fox hunting bag in Switzerland</p> | | | |
|  <p>The figure consists of four line graphs showing the red fox hunting bag in Switzerland from 1930 to 2004. The y-axis represents the number of foxes, ranging from 0 to 50,000. The x-axis represents the year, from 1930 to 2004. The first graph, 'Fluctuation', shows the hunting bag from 1930 to 1960, with values between 10,000 and 20,000. The second graph, 'Decrease', shows the hunting bag from 1965 to 1980, with values between 10,000 and 35,000. The third graph, 'Increase', shows the hunting bag from 1985 to 2004, with values between 10,000 and 45,000. The fourth graph, 'Long term trend 1933-2004', shows the overall trend from 1933 to 2004, with a red line indicating a steady increase from approximately 10,000 to 40,000.</p> | | | |
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| <p>Interpretation pitfall</p> <ul style="list-style-type: none"> • The interpretation does not match the data and observations. • The interpretation is not accepted by stakeholders. | | | |
|  | | <p>→ Review of monitoring results and interpretation</p> <p>→ Discuss and agree interpretation and consequences of monitoring results in advance</p> | |
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| <p>Biases and pitfalls:</p> <p>Different power and reliability of data sets → SCALP criteria:</p> <p>Category 1 (C1): „Hard facts“: dead lynx, pictures, genetic samples</p> <p>Category 2 (C2): Confirmed data: kills, tracks, etc. confirmed by trained staff</p> <p>Category 3 (C3): Unconfirmed kills, tracks, not confirmable data like direct observations, sounds</p> | | | |
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| <p>The monitoring-partnership</p> <ul style="list-style-type: none"> • GOs, NGOs, and scientists must work together. • A network of observers and reporters needs to be established. • Interests groups (hunters, foresters, veterinarians, etc.) and the public must be informed. <p>The monitoring-network</p> <ul style="list-style-type: none"> • Professionals and volunteers must be trained in identifying field signs, methods and reporting. • Member of the network must get a feedback! • Co-ordinators are responsible for the group identity and need to communicate on a regular basis or to organise reunions. <div style="display: flex; justify-content: space-between; align-items: flex-end;">   </div> | | | |