

# **Collection and Analysis of Natural Sounds Data in National Parks**

**Jason C. Ross**

**Harris Miller Miller & Hanson Inc.**



# Presentation Outline

<http://www.hmmh.com/>

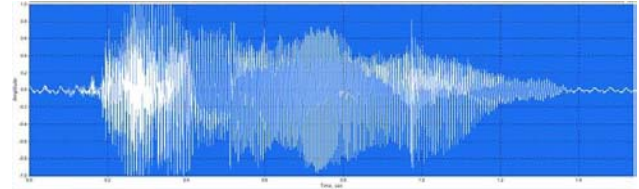
- **Types of data collected**
- **Measurement equipment**
- **Data collection protocol**
- **Noise sources in our National Parks**
- **Data Analyses**

# Types of Data Collected

<http://www.hmmh.com/>

## Acoustic Data

- Digital recordings
- Overall sound levels
- 1/3-octave band sound levels



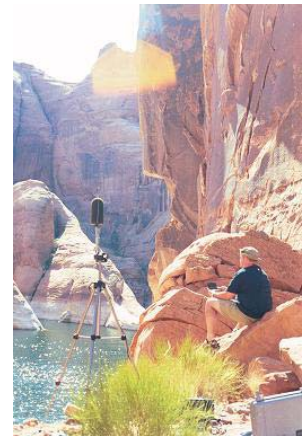
## Atmospheric Data

- Local and regional conditions
  - Temperature
  - Wind Speed / Direction
  - Relative Humidity
  - Rainfall



## Reference Data

- Observer-based source identification logging
- Photographic or video documentation
- GIS data
- Biological data
- Equipment performance data



# Equipment in Remote Environments

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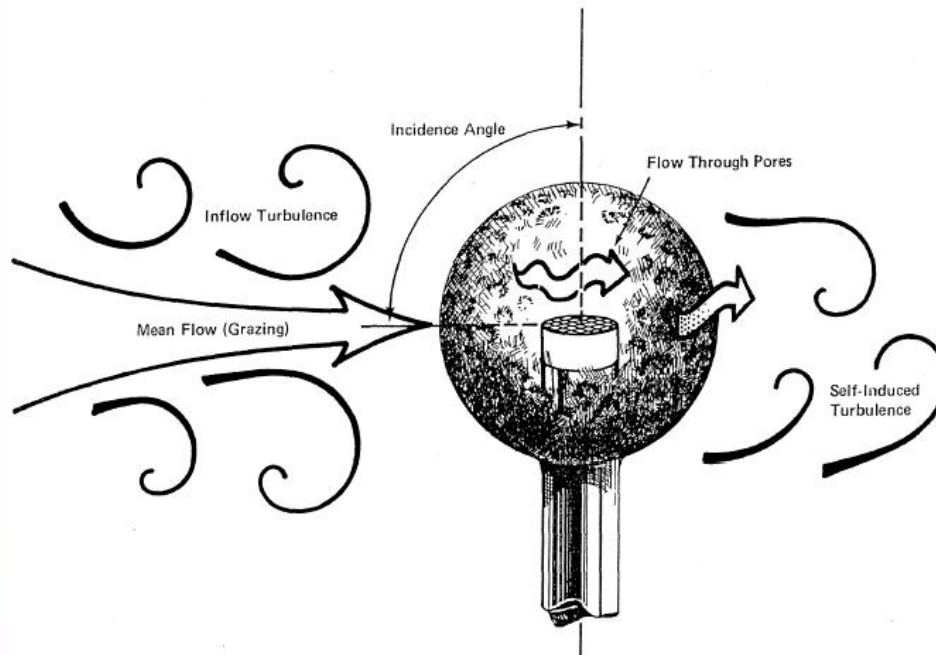
- **Requirements**
  - Portable
  - Durable
  - High-memory capacity
  - Low power-consumption



# Equipment in Low-noise Environments

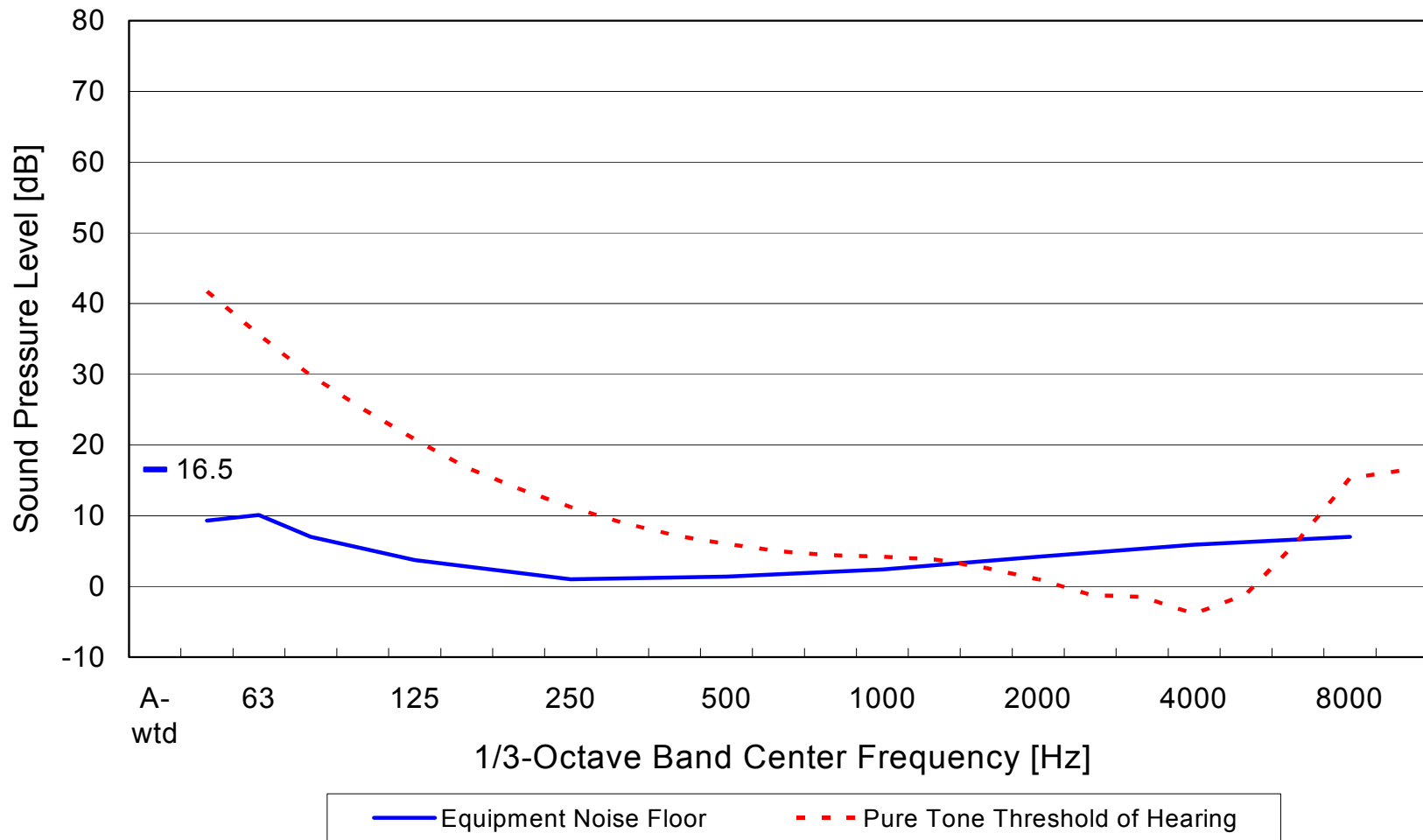
<http://www.hmmh.com/>

- **Limit wind-induced noise on the microphone**
  - Dual-stage windscreen
  - 30-cm diameter windscreen
  - Ultrasonic anemometer



# Equipment in Low-noise Environments

- **Need for a low equipment noise floor**



# Equipment in Low-noise Environments

<http://www.hmmh.com/>

- **Very low-noise measurement equipment**
  - Noise floor well below human threshold
  - Higher power-consumption
  - More susceptible to elements
  - Equipment used for shorter durations (days)



**Bruel & Kjaer Type 4179**

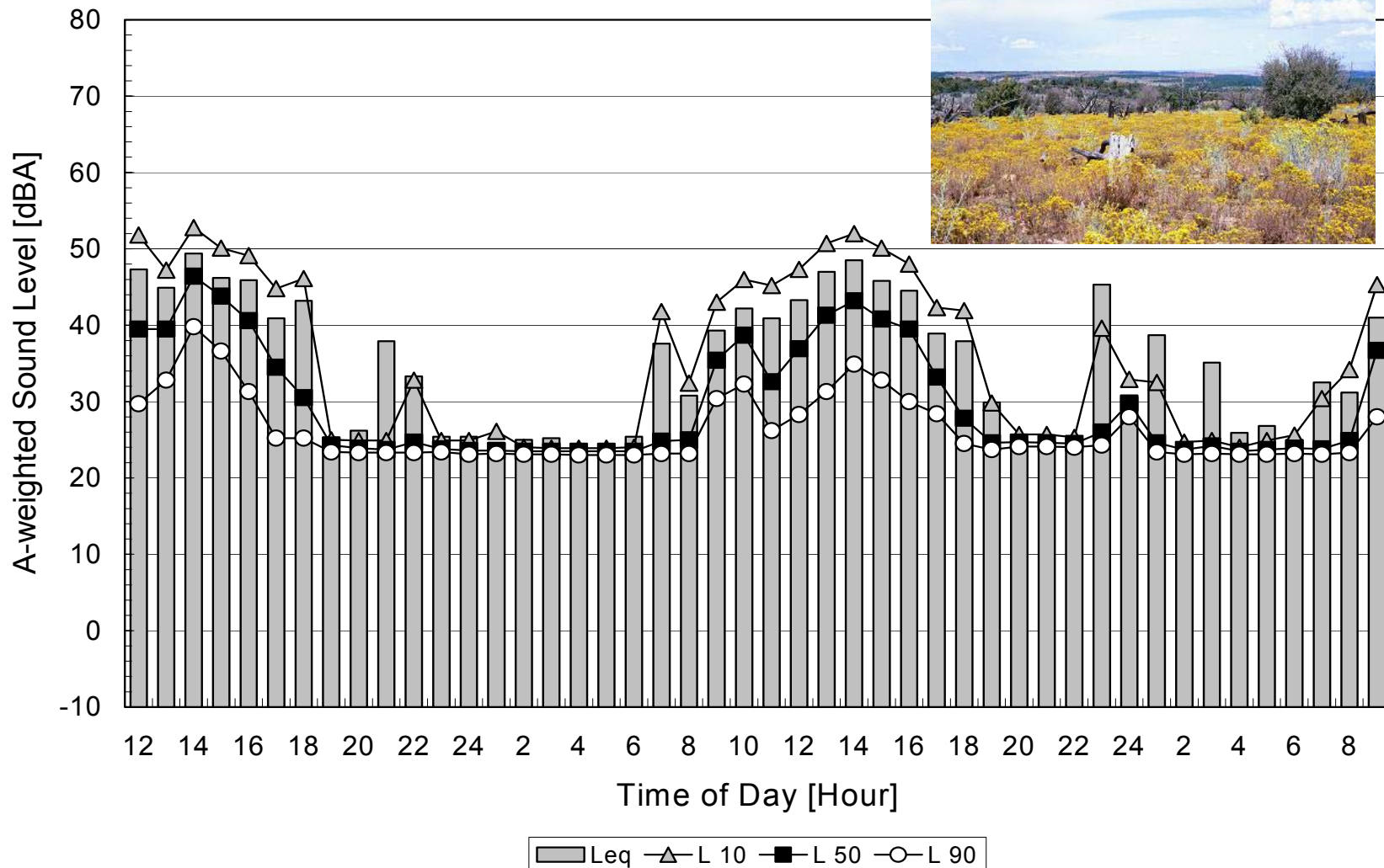


**GRAS TYPE 40HF**



# Measurements in Low-noise Environments

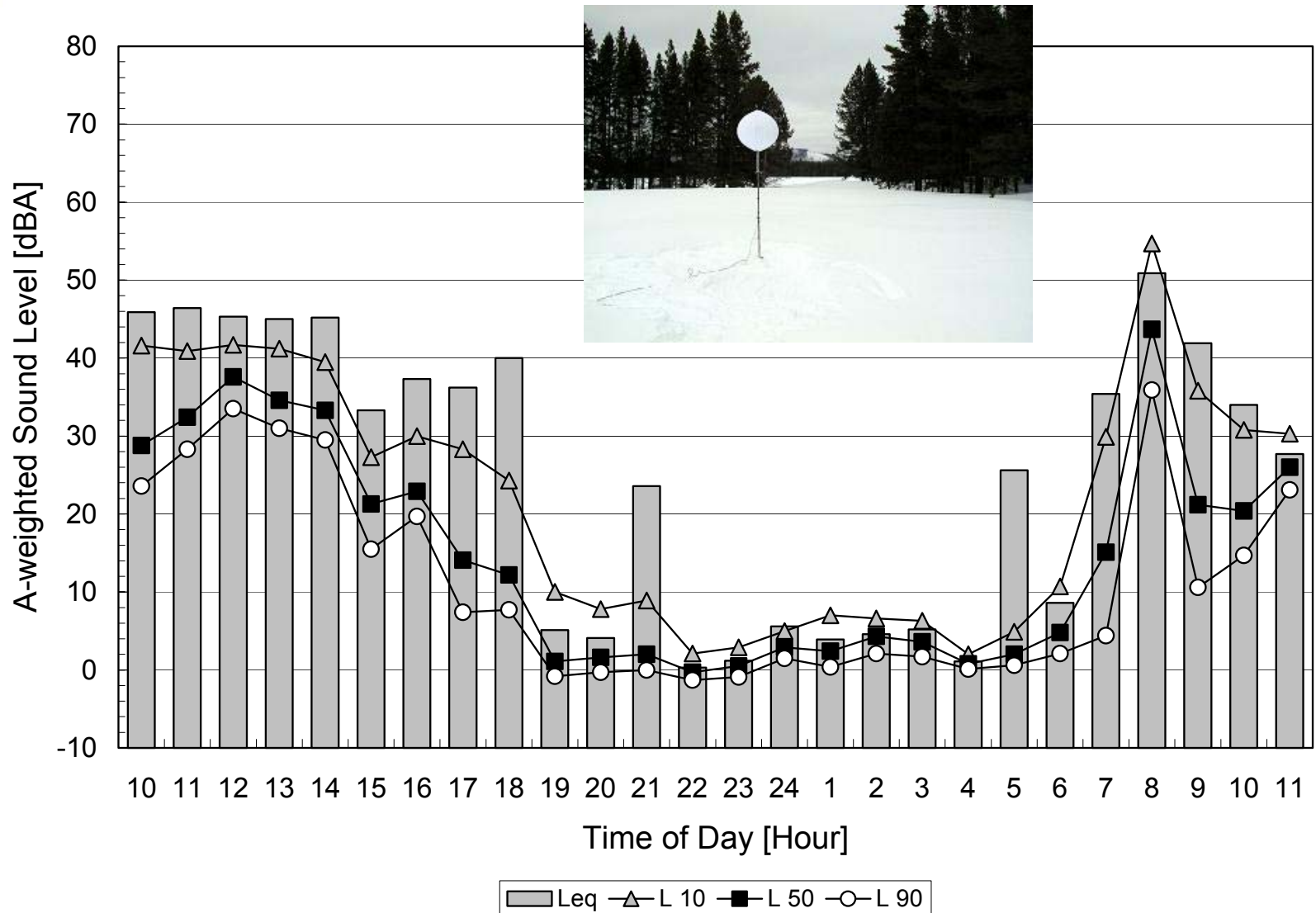
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# Measurements in Low-noise Environments

<http://www.hmmh.com/>



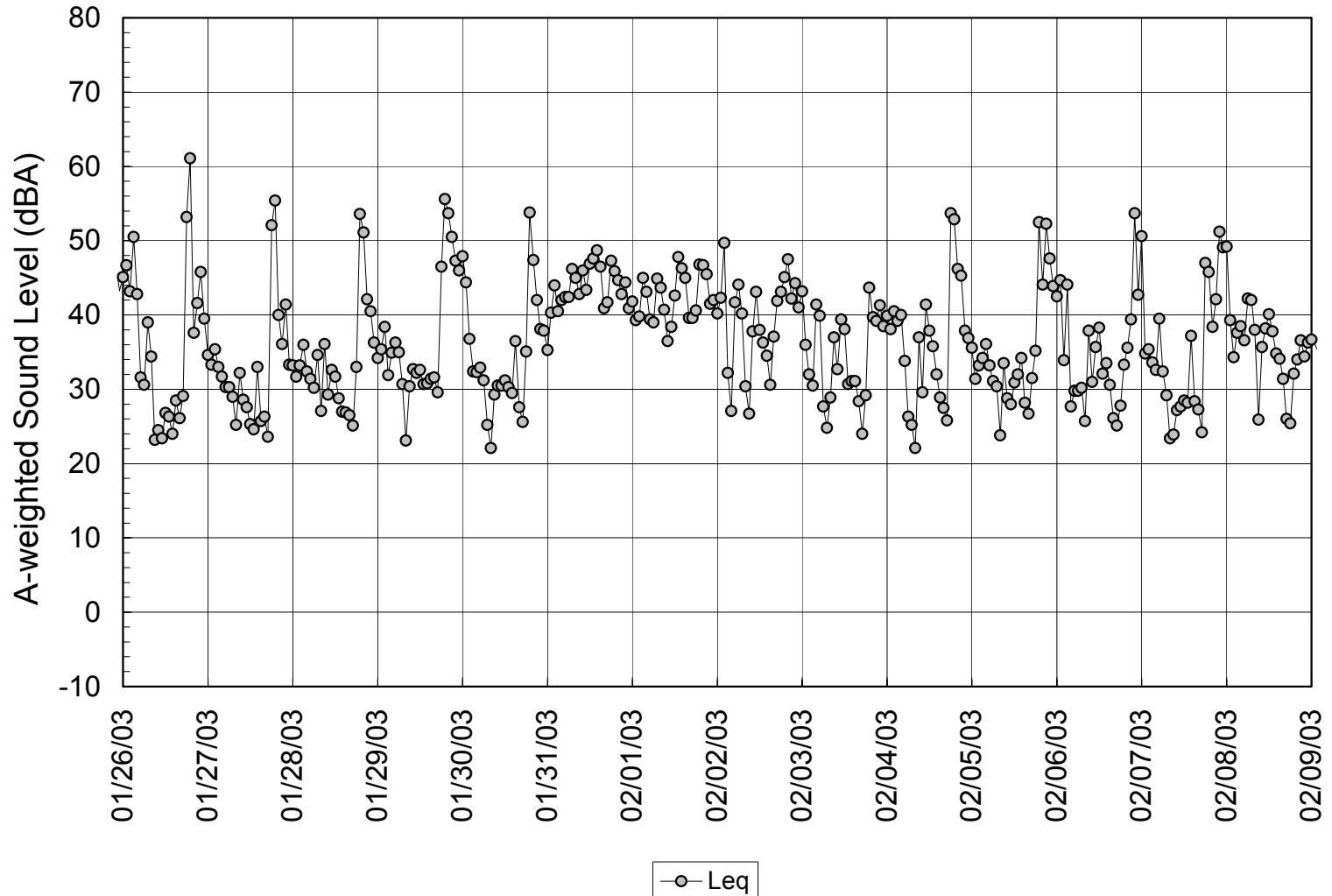
# Data Collection Protocol

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- **Test equipment prior to being in a remote harsh environment**
- **Have spare equipment**
- **Personnel**
  - Park rangers
  - Acousticians
- **Identify measurement locations**
  - Define “Acoustic Zones” - areas within a park with similar:
    - Topography
    - Meteorological conditions
    - Vegetation
    - Animals
    - Water Sources
    - Intrusive Sources

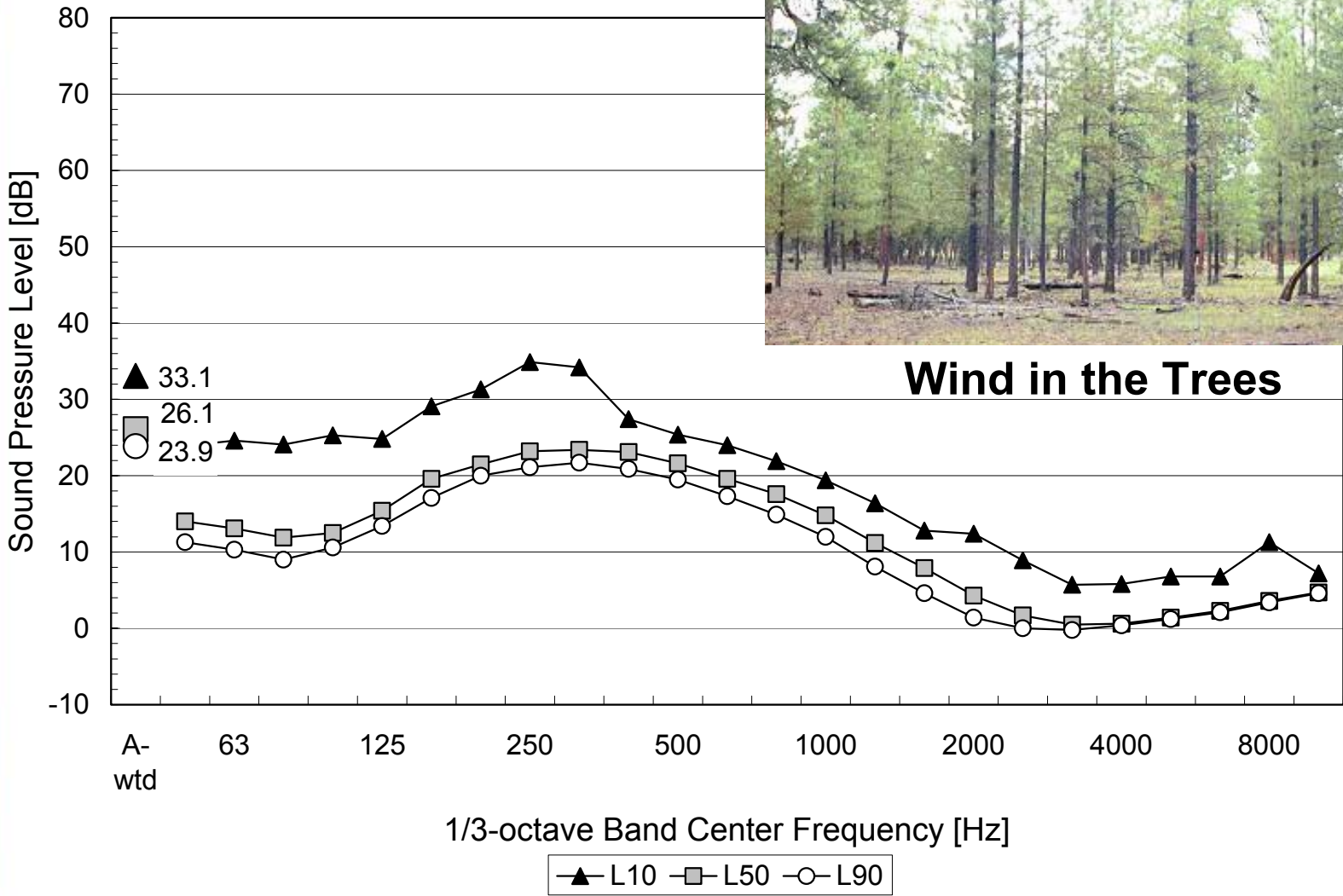


- **How long to measure?**



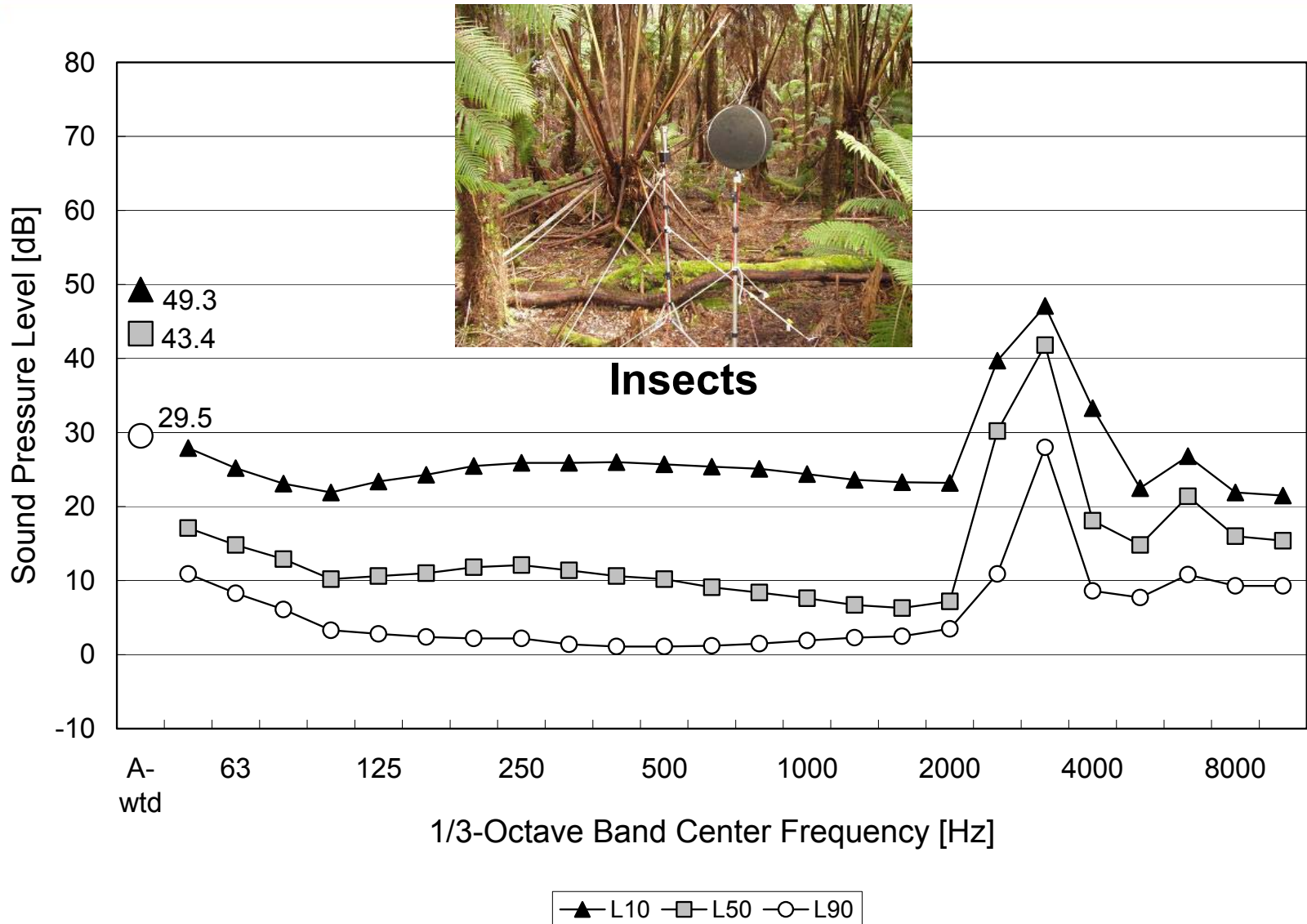
# Natural Noise Sources

## Wind in the Foliage



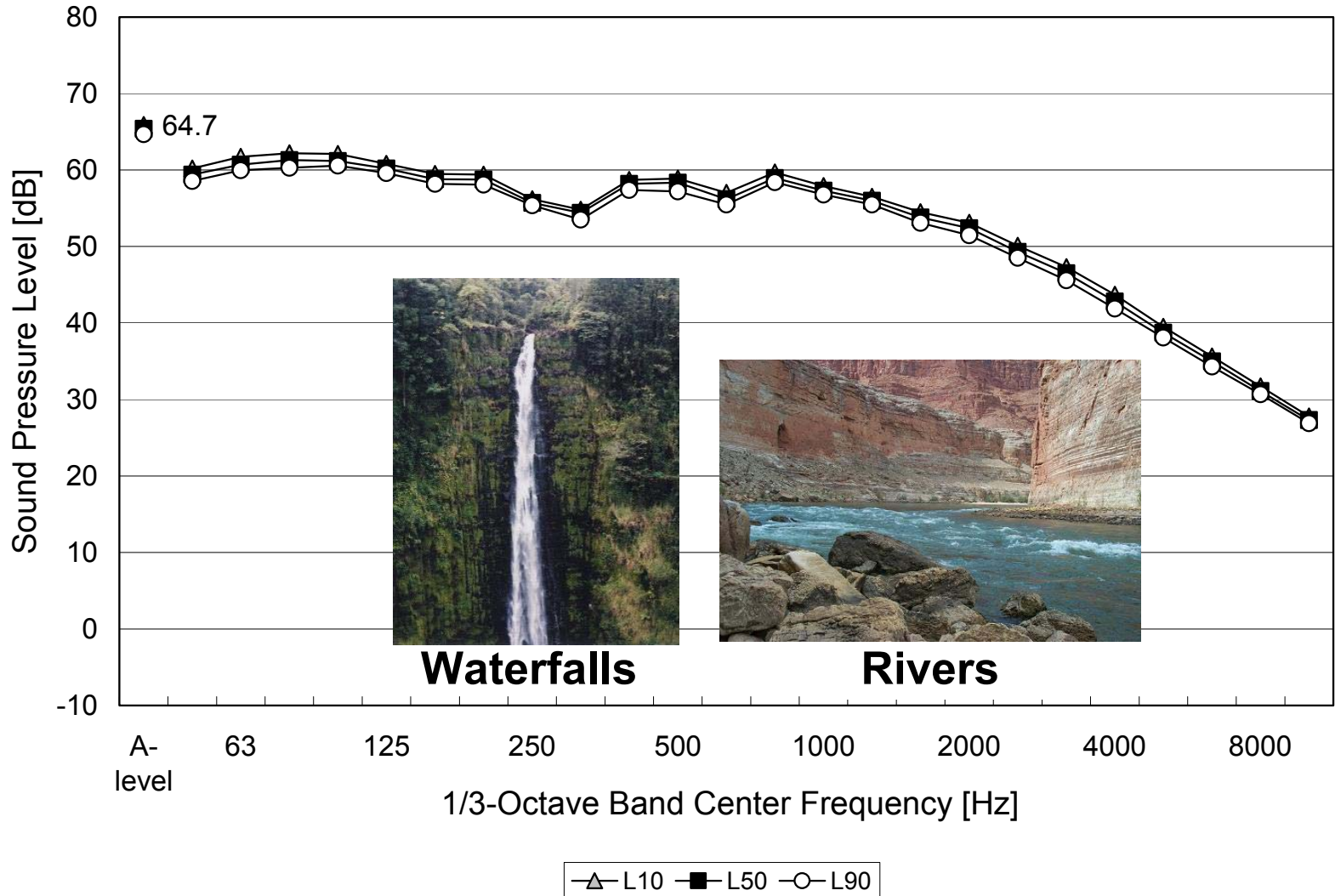
# Natural Noise Sources

## Insects, Birds and Mammals



# Natural Noise Sources

## Moving Water Sounds



# Intrusive Noise Sources

<http://www.hmmh.com/>



**Airplanes**



**Helicopters**



**Snowmobiles**



**Personal Watercraft**

# Analysis of Natural Sounds Data

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- **Data analysis tools**
  - Large volumes of data and unique investigations require custom programming rather than existing applications
- **Soundscape analyses**
  - Characterization of acoustic zones
  - Determine audibility of intrusive noise sources
- **Measurement analyses**
  - Study measurement variation
  - Assess measurement error
- **Assist modeling efforts**
  - Compare measurements with modeling
- **Research and development**
  - Automated noise source identification system





# Summary

- **Many different types of data need to be collected**
  - Acoustic, atmospheric and reference data
- **Special equipment requirements for remote and low-noise environments include**
  - Limiting wind-induced noise on microphone
  - Low equipment noise floor
- **Data collection protocol requires**
  - Definition of “Acoustic Zones”
  - Determining how long to measure
- **Noises in our National Parks come from many different natural and intrusive sources**
- **Data analyses typically include**
  - Characterizing the soundscape
  - Examining the quality of collected data
  - More advanced research and development work

