

Ensuring Measurements Meet Modellers' Requirements

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Fukushima Recovery**

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science > environment > community



**Ensuring Measurements Meet
Modellers' Requirements**
SOURCES OF EXPERIENCE

Cerro Grande Fire (May 2000)



Rocky Flats Plant (1953 – 1989)



Uravan (1936 – 1984)

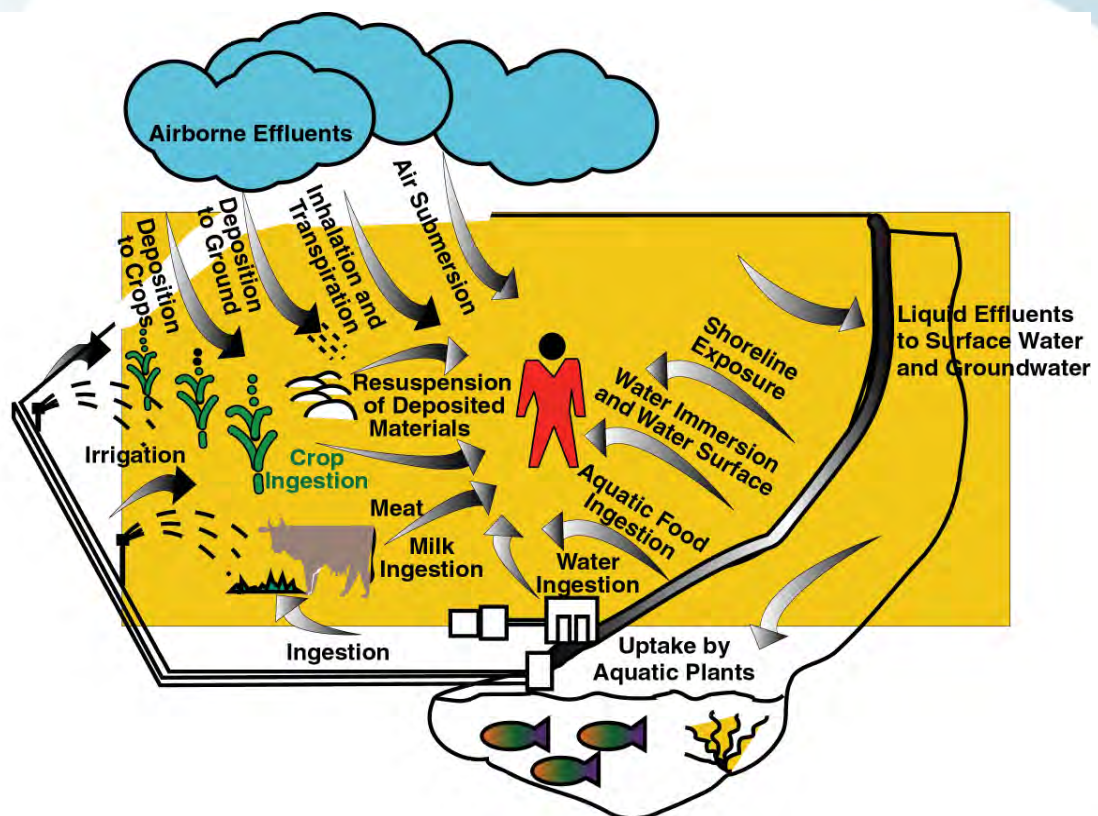


Fernald Feed Materials Plant (1951 – 1988)



Why Do Modellers Need Data? TO CHARACTERIZE THE ENVIRONMENTAL SYSTEM

Environmental System



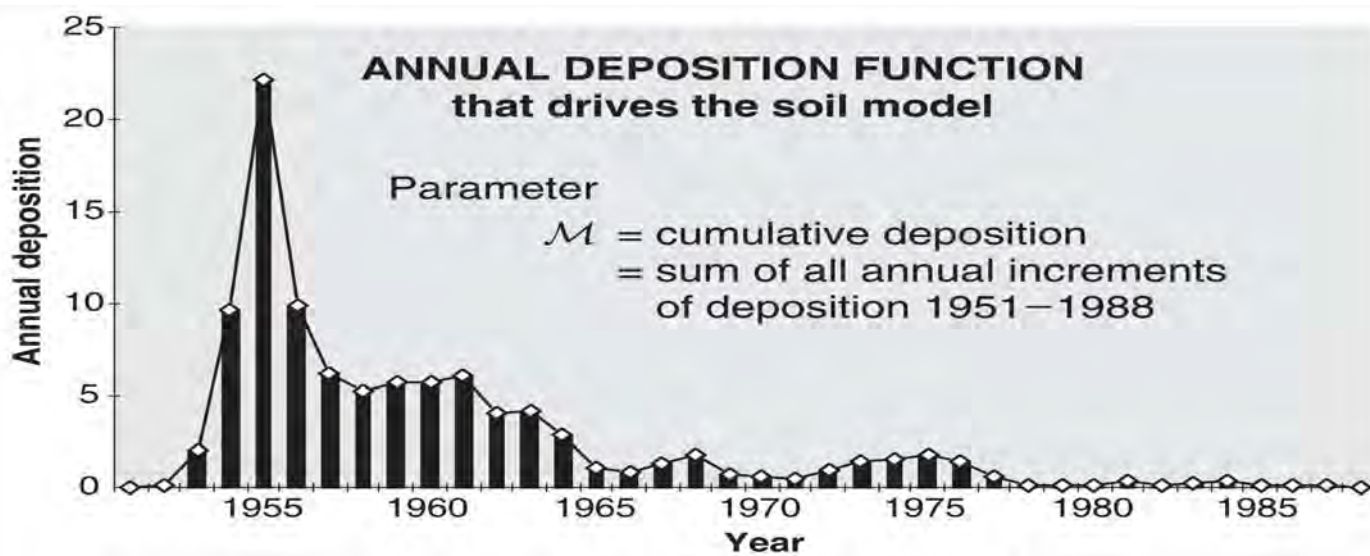
Characterizing the System

- **Meteorology**
 - △ wind speed, wind direction, physical characteristics of land surface, etc.
- **Hydrology**
 - △ precipitation, surface water flow rates, groundwater flow
- **Hydrogeology**
 - △ Characteristics of the soil and underlying strata
- **Chemistry**
 - △ Soil pH, salinity

Why Do Modellers Need Data?

**TO DERIVE INPUT
PARAMETERS TO MODELS**

Fernald Feed Materials Plant



Deposition (1951–1988)

q Fractional allocation $1 - q$

Soluble inventory

Dynamic soil layer compartments
0–10 cm

Insoluble inventory

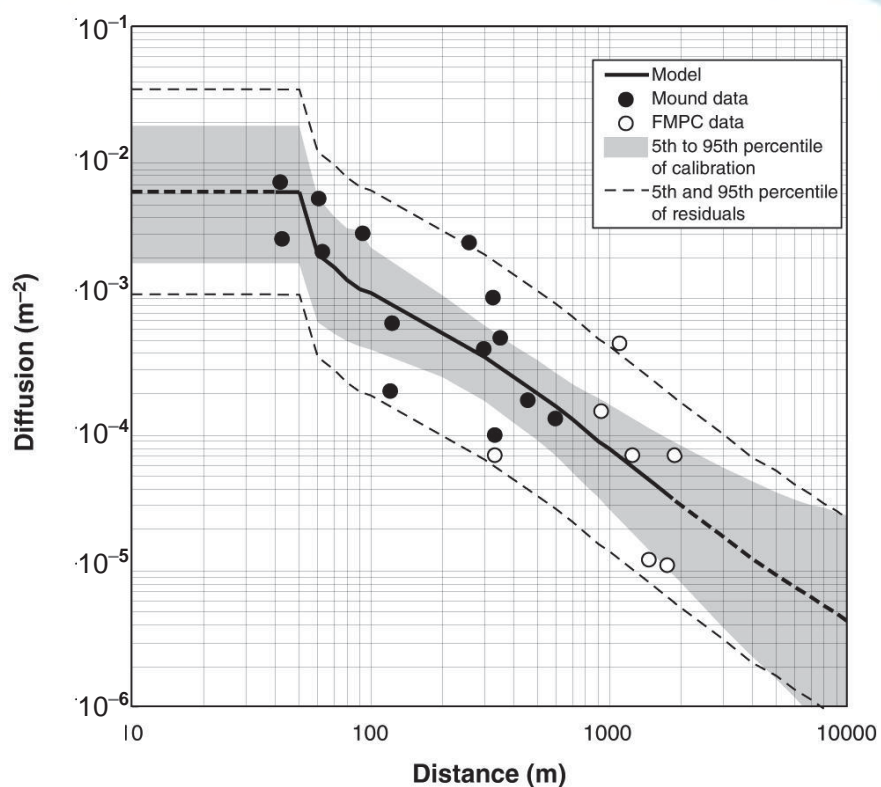
λ_{sol}

Removal by runoff and leaching into deeper soil

λ_{insol}

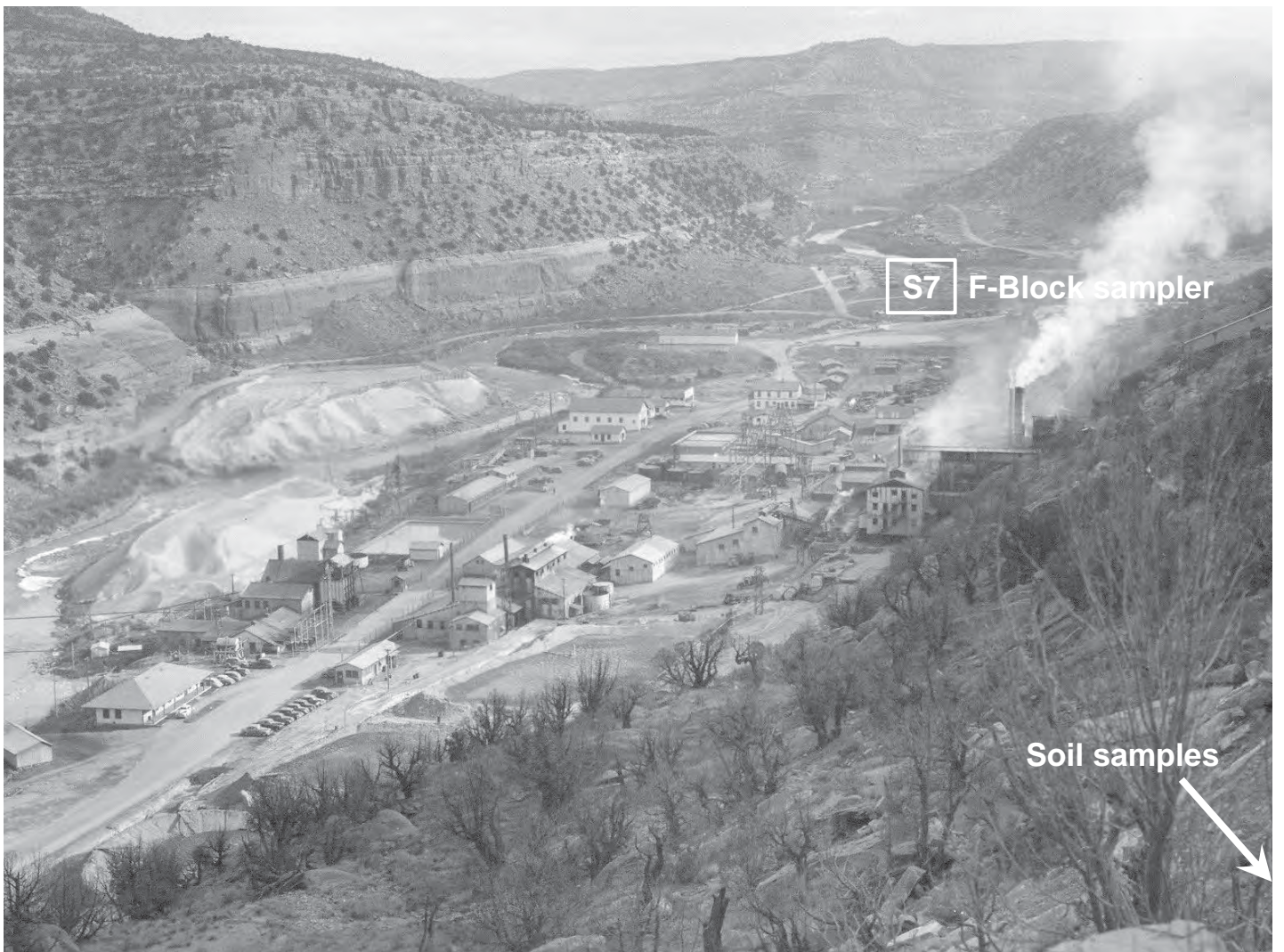
Why Do Modellers Need Data? TO CALIBRATE A MODEL

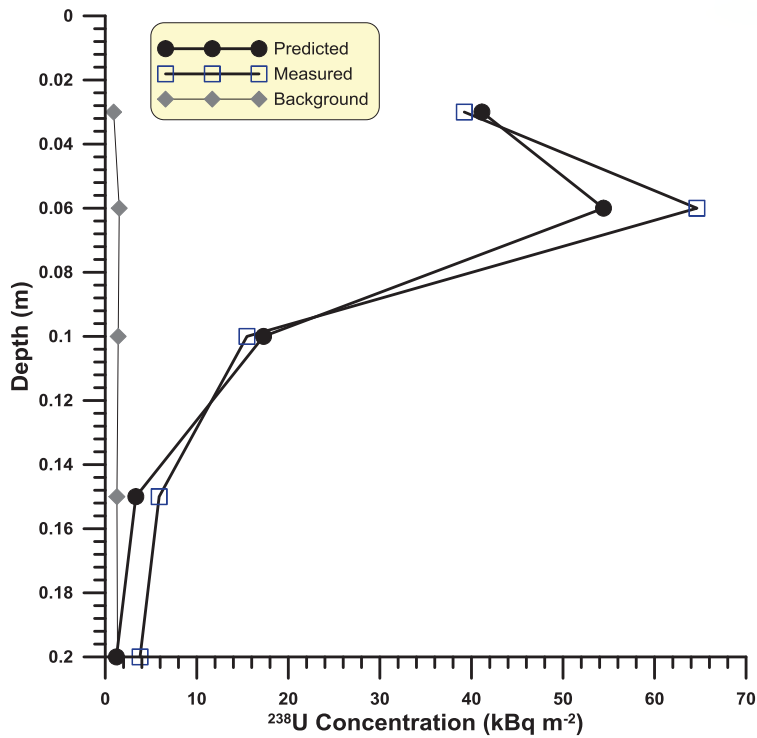
Calibration



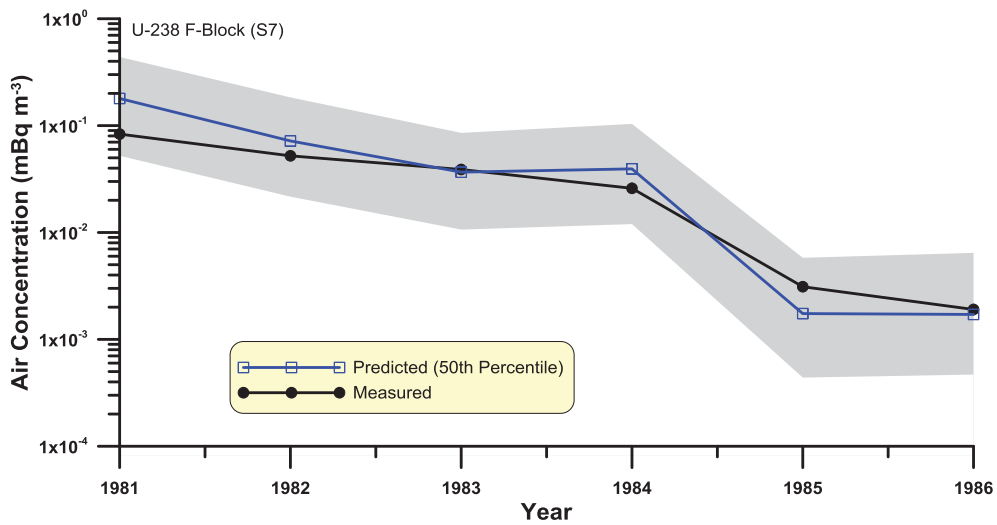
Killough and Schmidt 2000. Uncertainty analysis of exposure to radon released from the former Feed Materials Production Center

Why Do Modellers Need Data? TO VALIDATE A MODEL





Rood, A.S., P.G. Voillequé, S.K. Rope, H.A. Grogan, and J.E. Till. 2008. Reconstruction of atmospheric concentrations and deposition of uranium and decay products released from the former uranium mill at Uravan, Colorado. *J. Env. Radioactivity* 99:1258–1278.



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What Are The Key Measurements Needed by the Modellers?

○ Analytical results

- ‡ Radionuclide concentrations in media (soil, water, air, etc.)
- ‡ Measurement uncertainty and definition (e.g., +/- 2 sigma)

○ Sample collection Information

- ‡ Sample type
- ‡ Location i.e. coordinates
- ‡ Date and time of sampling
- ‡ Other media specific parameters

Essential Additional Information for the Measurements

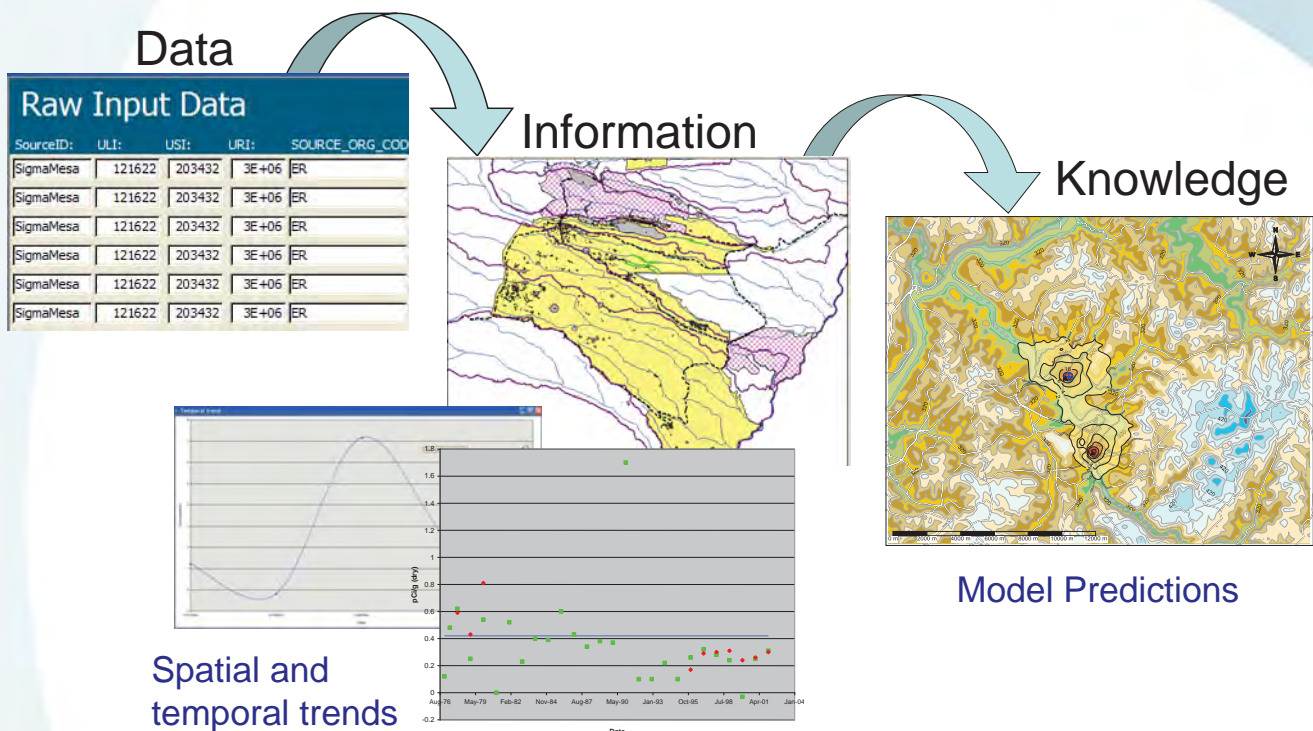
○ Analysis information

- ‡ Measurement technique and analytical method
- ‡ Sample preparation method (e.g., filtered/unfiltered)
- ‡ Measurement detection limit and detection status (i.e., detected or not)
- ‡ Other relevant data qualifiers (e.g., rejected data)

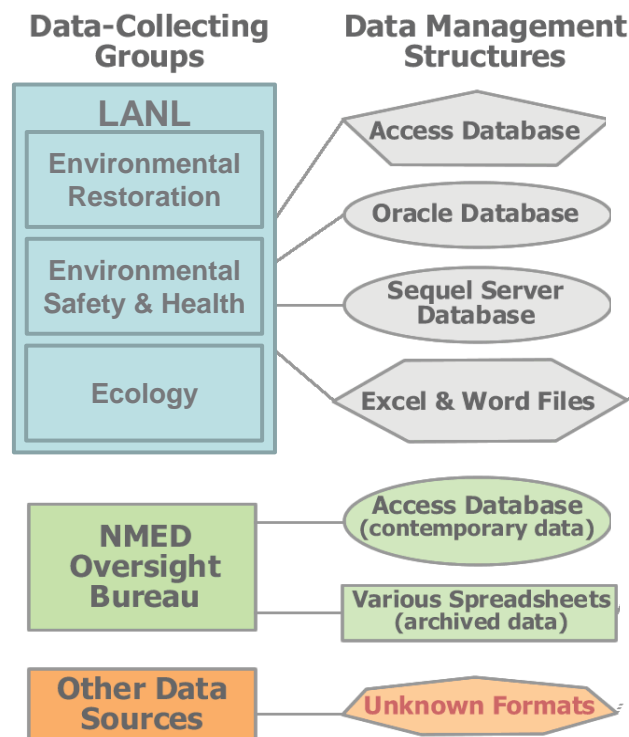
Feedback Examples

- **Minimum detection limit**
- **Inconsistent data**
- **Data gaps**
- **Reporting issues**

Turning Data Into Information and Knowledge

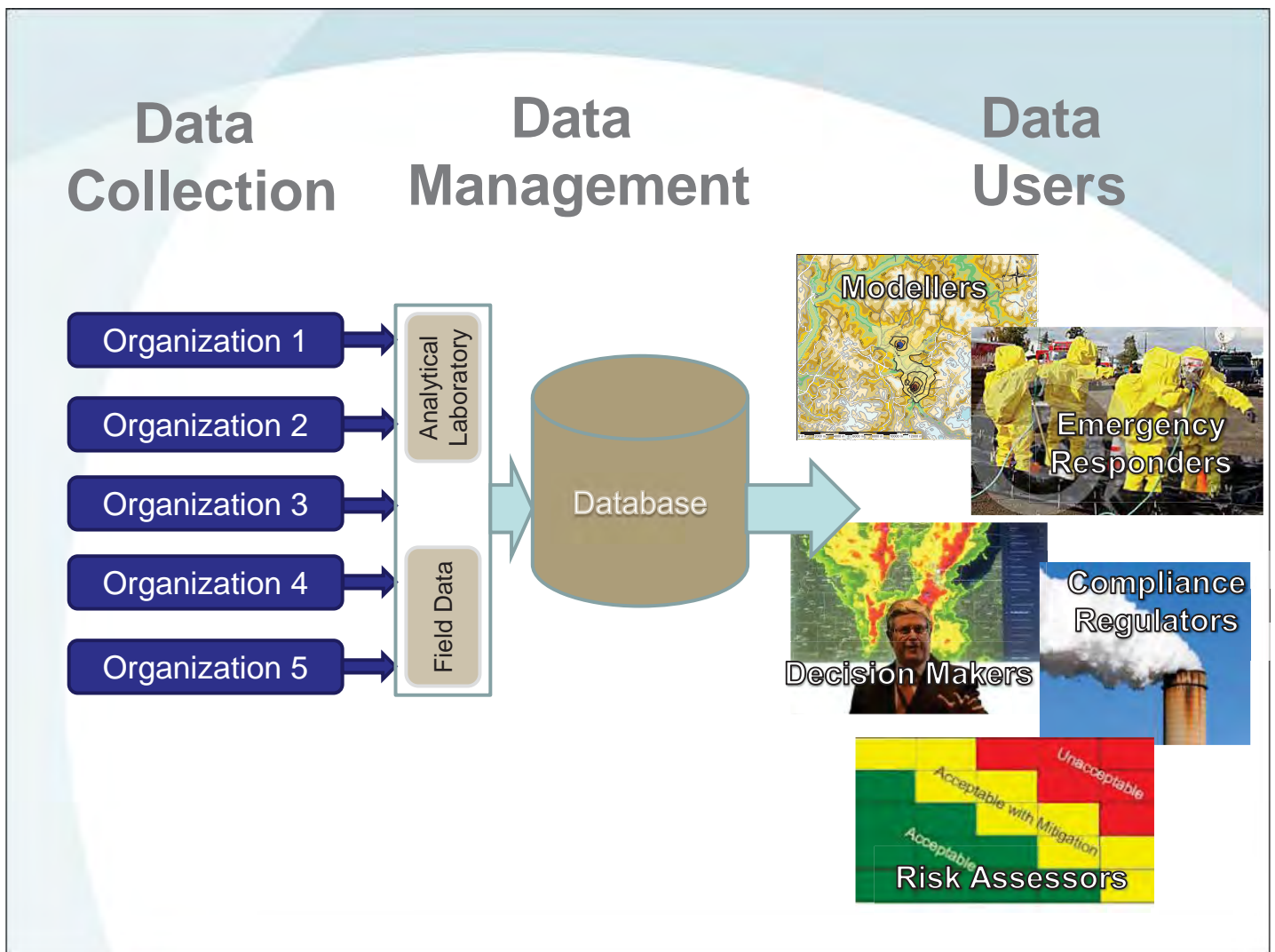


Typical Data Management



Data Management Requires Data Consistency

- **Accessibility**
- **Usability**
- **Efficiency**
- **Value (information)**
- **Knowledge**



Data Analysis Goals

- **Spatial and temporal reference**
 - ▲ Evaluate impacts spatially and over different timescales
 - ▲ Short-term, intermediate, longer term
- **Timeliness**
 - ▲ Make timely decisions based on the best available information
 - ▲ Predefined procedures and exposure scenarios
- **Repeatability and ease of use**
 - ▲ Re-analyze as new information becomes available
- **Flexibility**
 - ▲ Modify analysis to evaluate alternative scenarios
 - ▲ Ability to allow other factors (e.g., economic, cultural, political) to be accounted for in decision making

Data Communication Goals

○ **Transparent**

- ✦ Allow decisions to be traced back to the information they were based upon

○ **Timely**

- ✦ Provide understanding based on current information

○ **Credible**

- ✦ Effectively communicate the basis for understanding and associated decisions

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Fundamentals

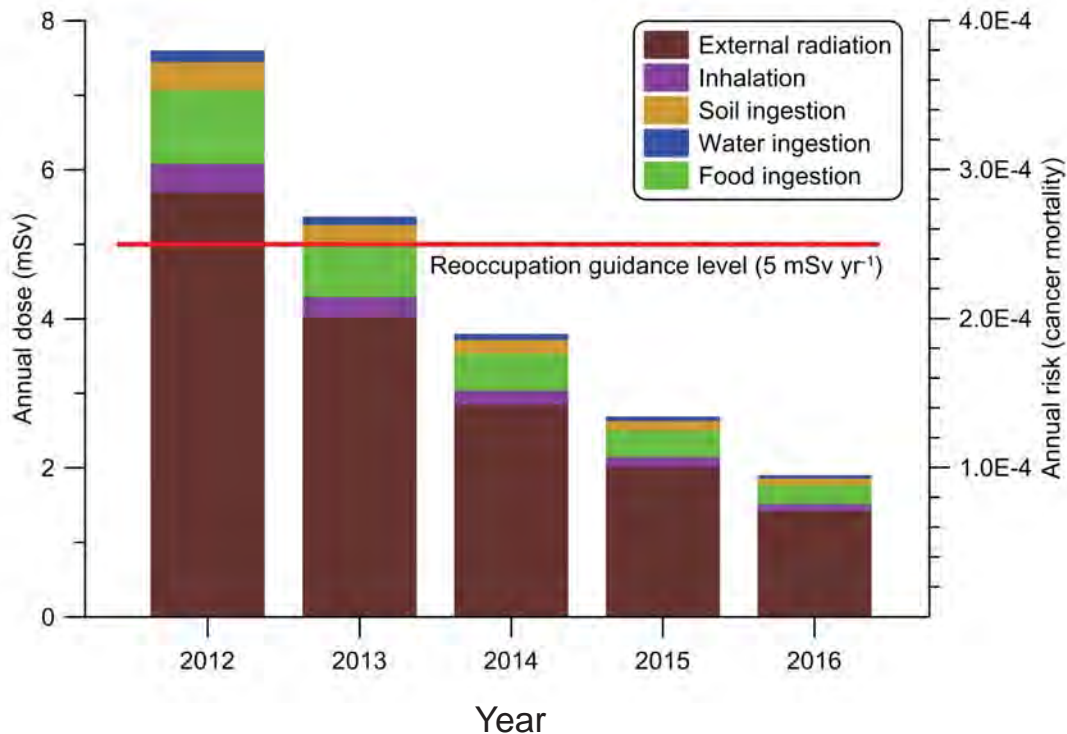
- **Clear objectives**
- **Integrated processes**
- **Flexibility**
- **Open and consistent communication**
- **Consistency**
- **Transparency**
- **Repeatability**
- **Tools to relate data and information to decisions**



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Example – Return of Displaced Residents



Ideas for Future Development to Meet Fukushima Challenges

- **Establish an integrated data management system**
- **Everyone uses the same set of “final” (i.e., validated) data at all times**
 - ✦ Data providers, data managers, modelers, decision makers
- **Any data changes are propagated in the integrated system so that all analyses can be updated efficiently**



Thank you!

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