

Threatened predators or exaggerated risks?

DDT in the terrestrial food web at former forest nurseries.

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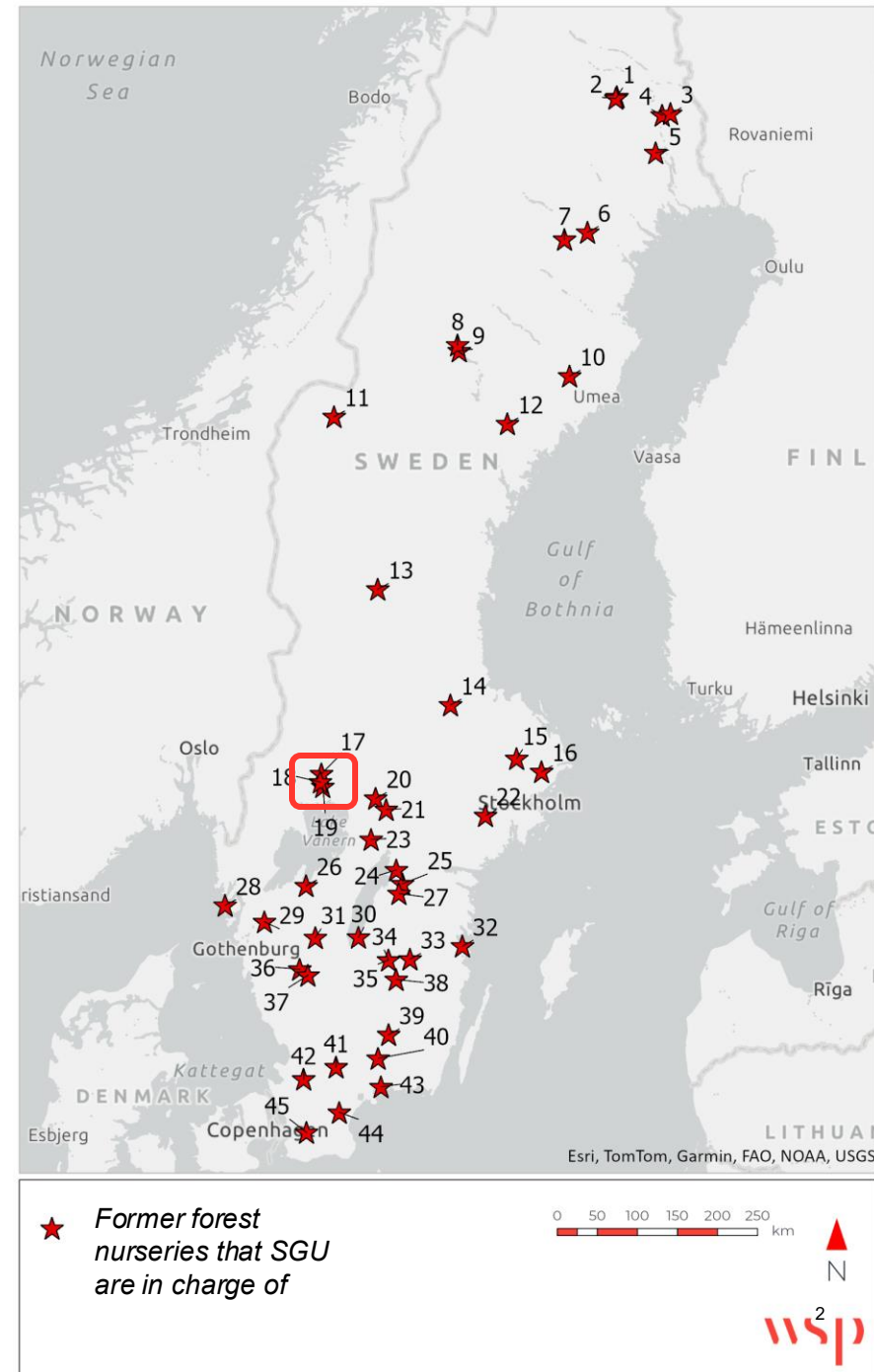
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Why is DDT an issue for SGU?

- DDT was used at Swedish forest nurseries
- Residual contamination remains at many sites
- SGU is responsible for investigations and remediation of former state-owned forest nurseries
- Excavation could damage valuable topsoil and existing habitats
- Ecological risk is therefore a key question for remediation decisions





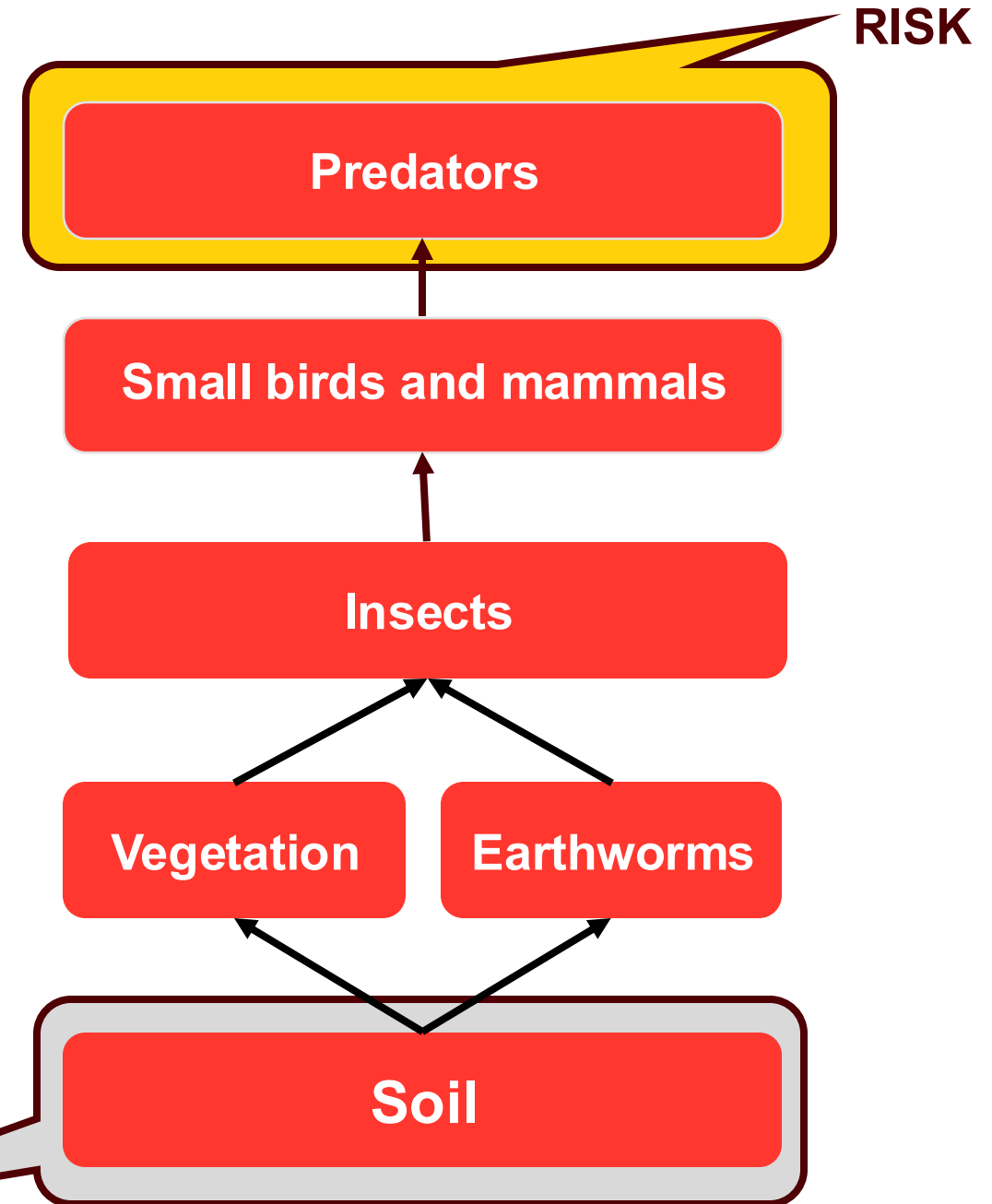
**Can DDT at former
forest nurseries
threaten top predators
today?**

Why is this question so difficult to answer?

Every step adds uncertainty

- Which species are exposed?
- How much DDT is transferred?
- How much of the diet comes from the contaminated area?
- At what level do harmful effects occur?

DATA



Our approach:

Reduce uncertainty where it matters most

Three large red circles are arranged horizontally, each containing white text. The first circle on the left contains the text 'Measure key food-web organism'. The middle circle contains the text 'Build a site specific food web'. The third circle on the right contains the text 'Use probabilistic modelling'.

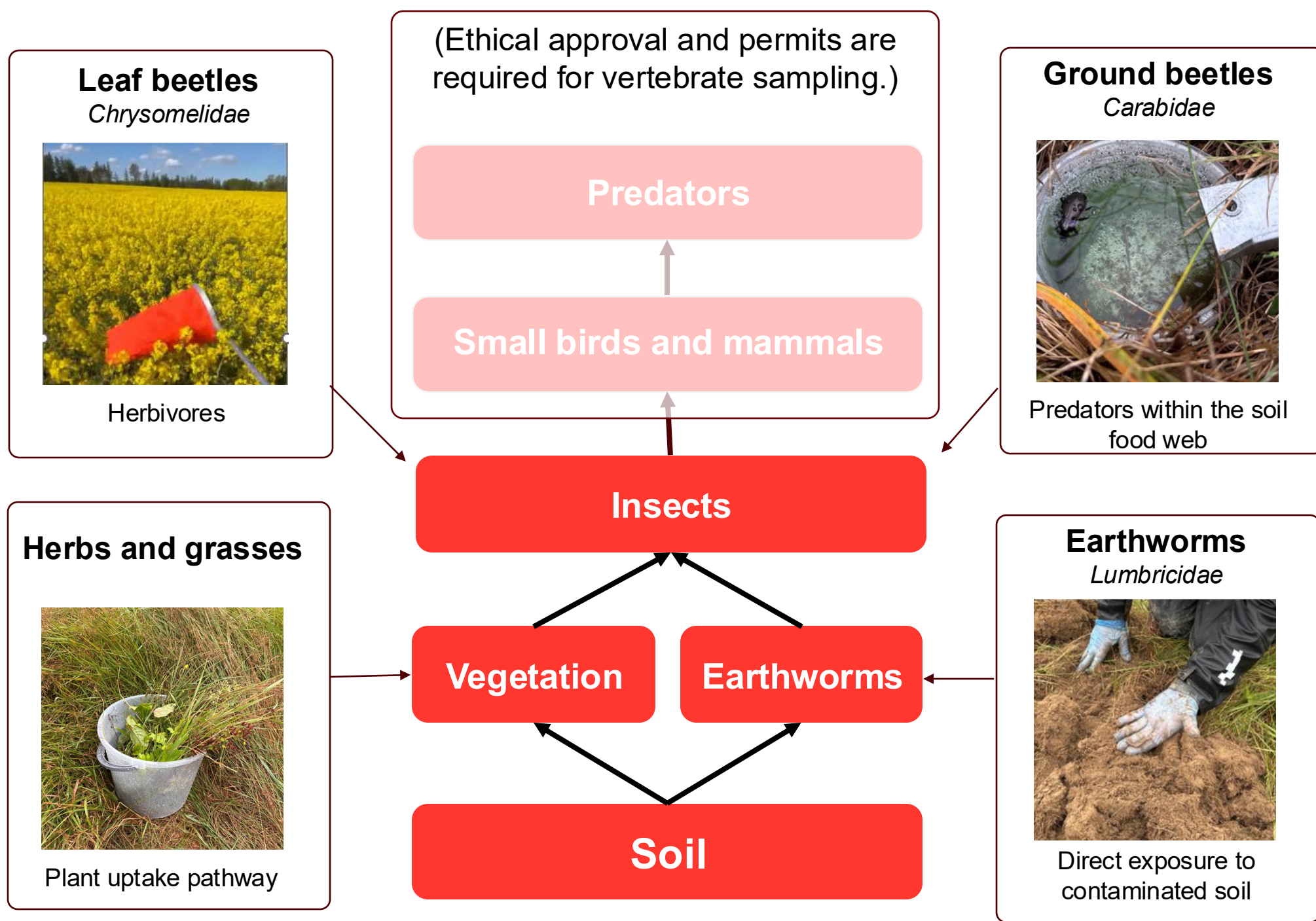
**Measure key
food-web
organism**

**Build a site
specific food
web**

**Use
probabilistic
modelling**

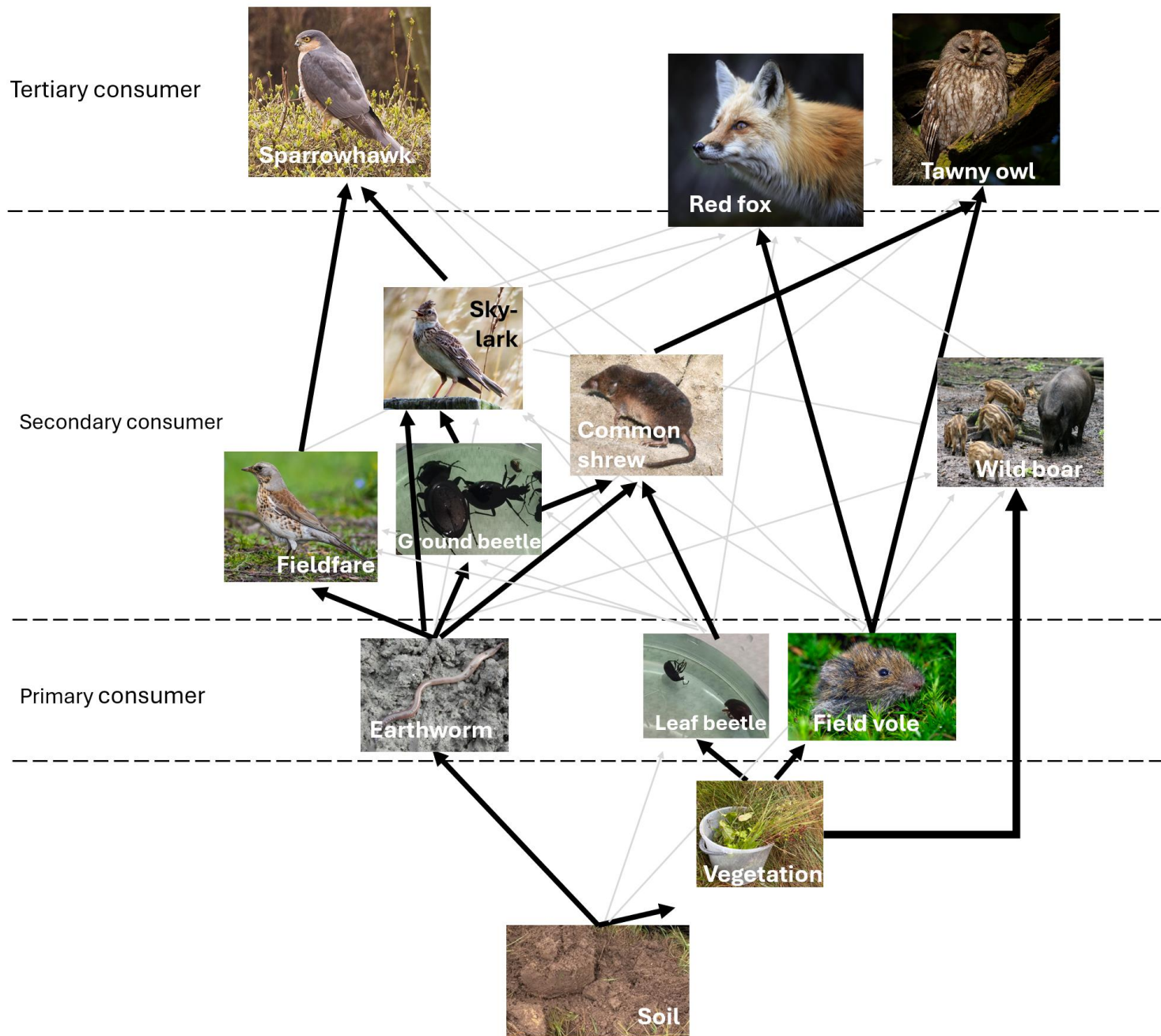
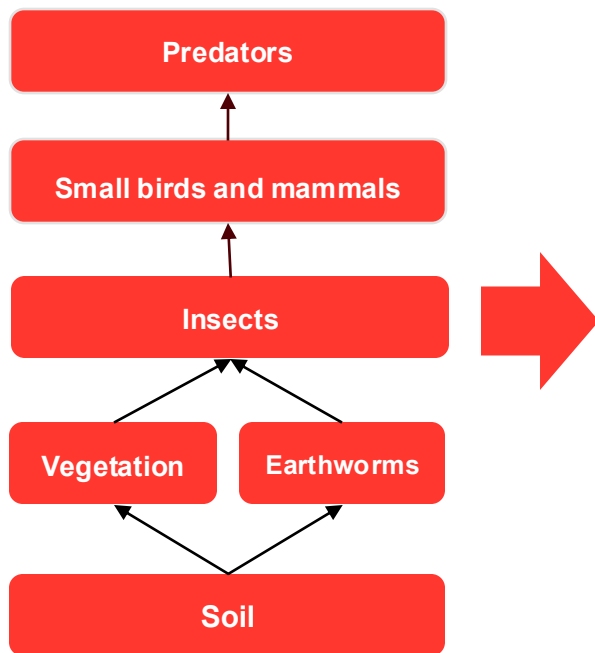
What did we measure?

Measure key
food-web
organism



The Deje food web

Build a site specific food web



From food web to risk assessment

Use probabilistic modelling



Traditional approach

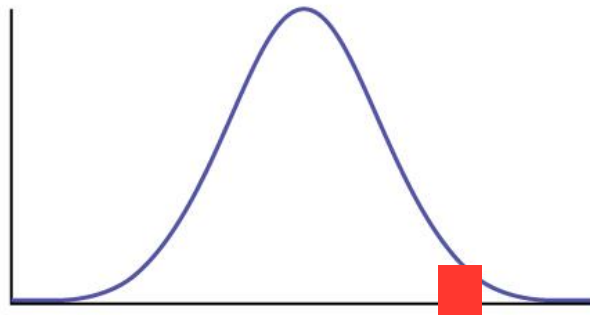
"Deterministic"

- One value in
- One risk estimate

vs

Probabilistic approach

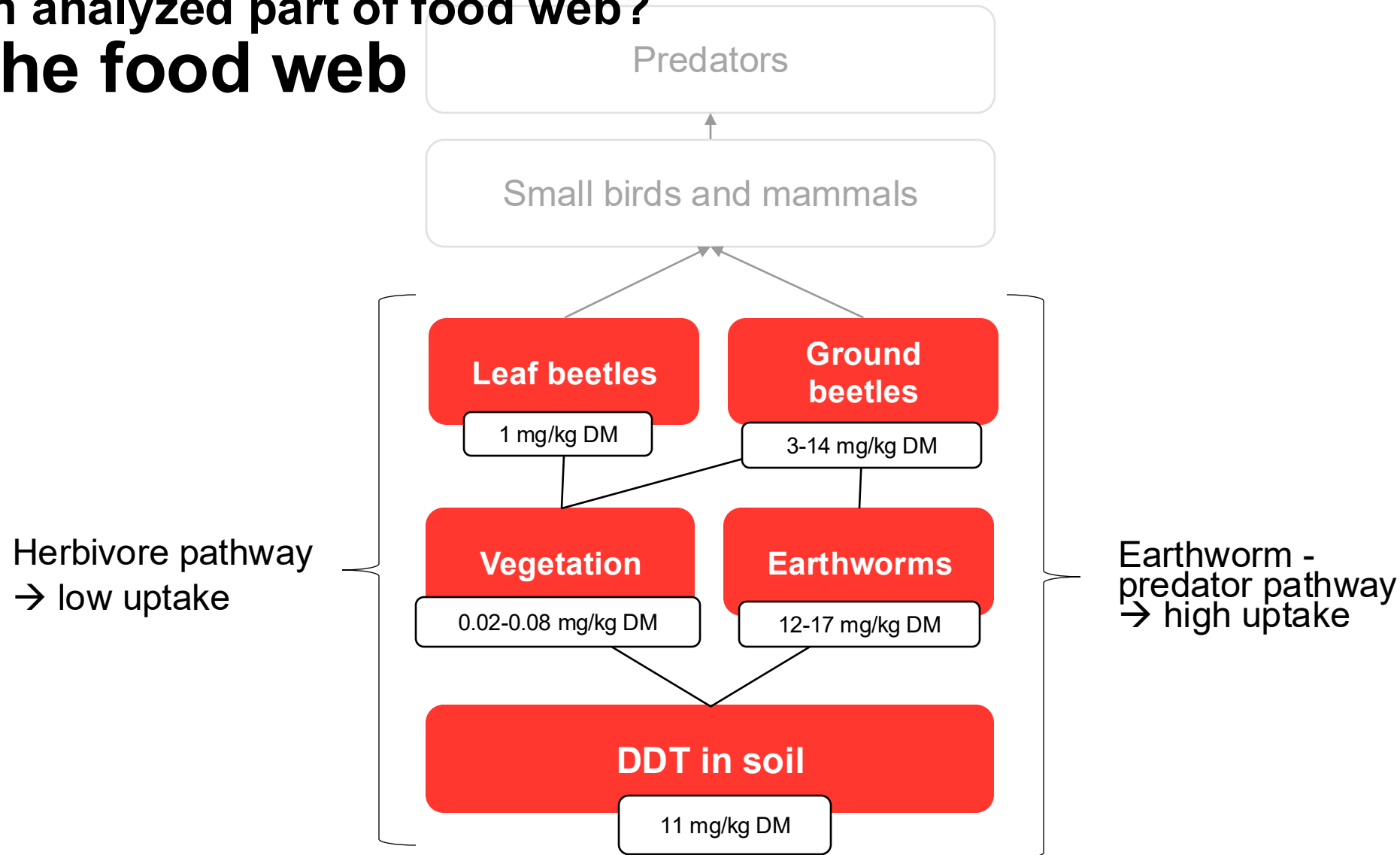
- Ranges in
 - Monte Carlo simulation
- A distribution of possible risks



Uncertainty is quantified, not hidden in conservative assumptions

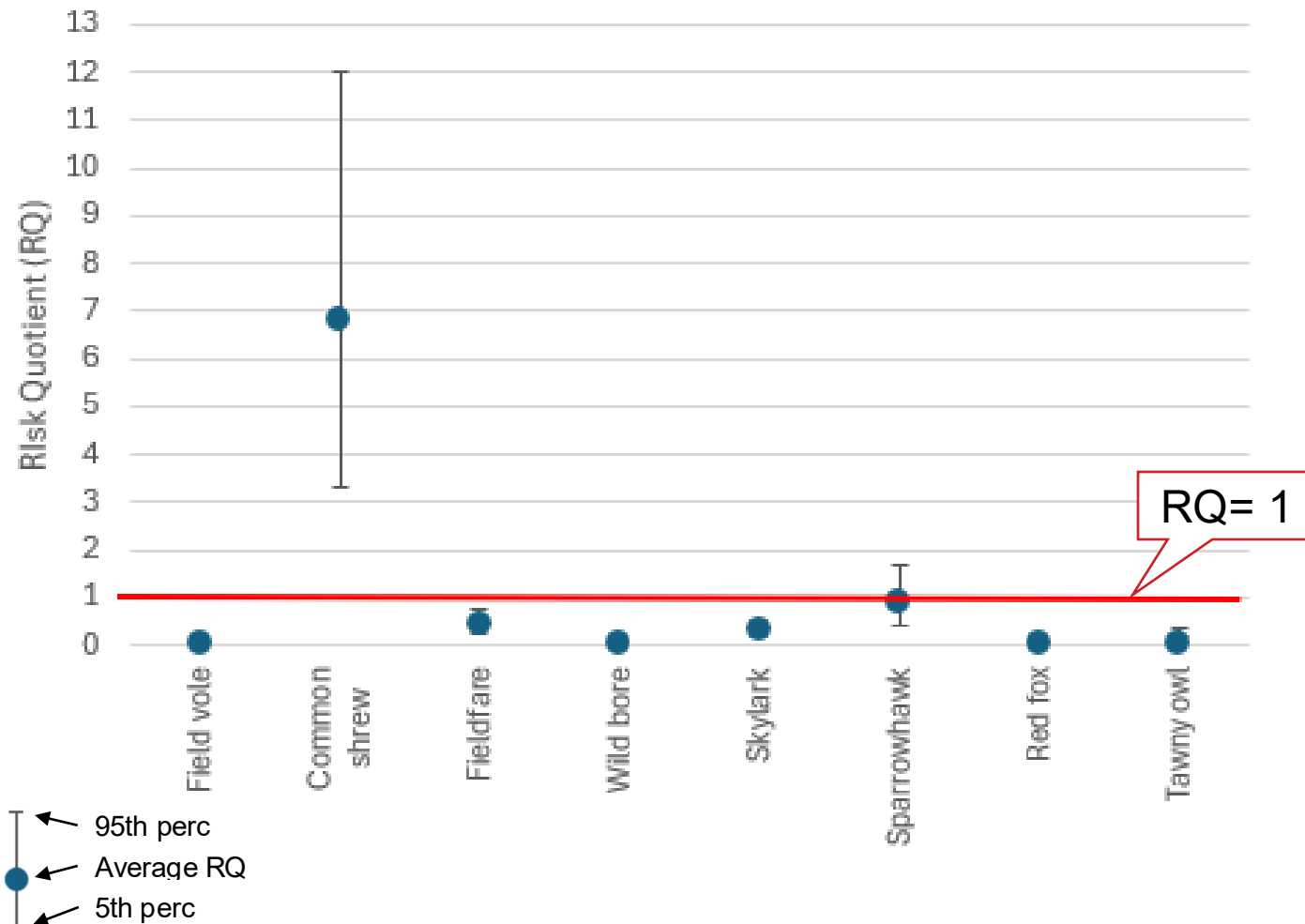
What did we find in analyzed part of food web?

DDT enters the food web



$\Sigma(\text{DDT}, \text{DDD}, \text{DDE})$

Which species were predicted to be most at risk?



Common Shrew (*Sorex araneus*)

SE: vanlig näbbmus | NO: vanlig spissmus | DK: almindelig spidsmus | FI: metsäpäästäinen | IS: ranaoddi

Risk was concentrated to a few species rather than the entire food web.

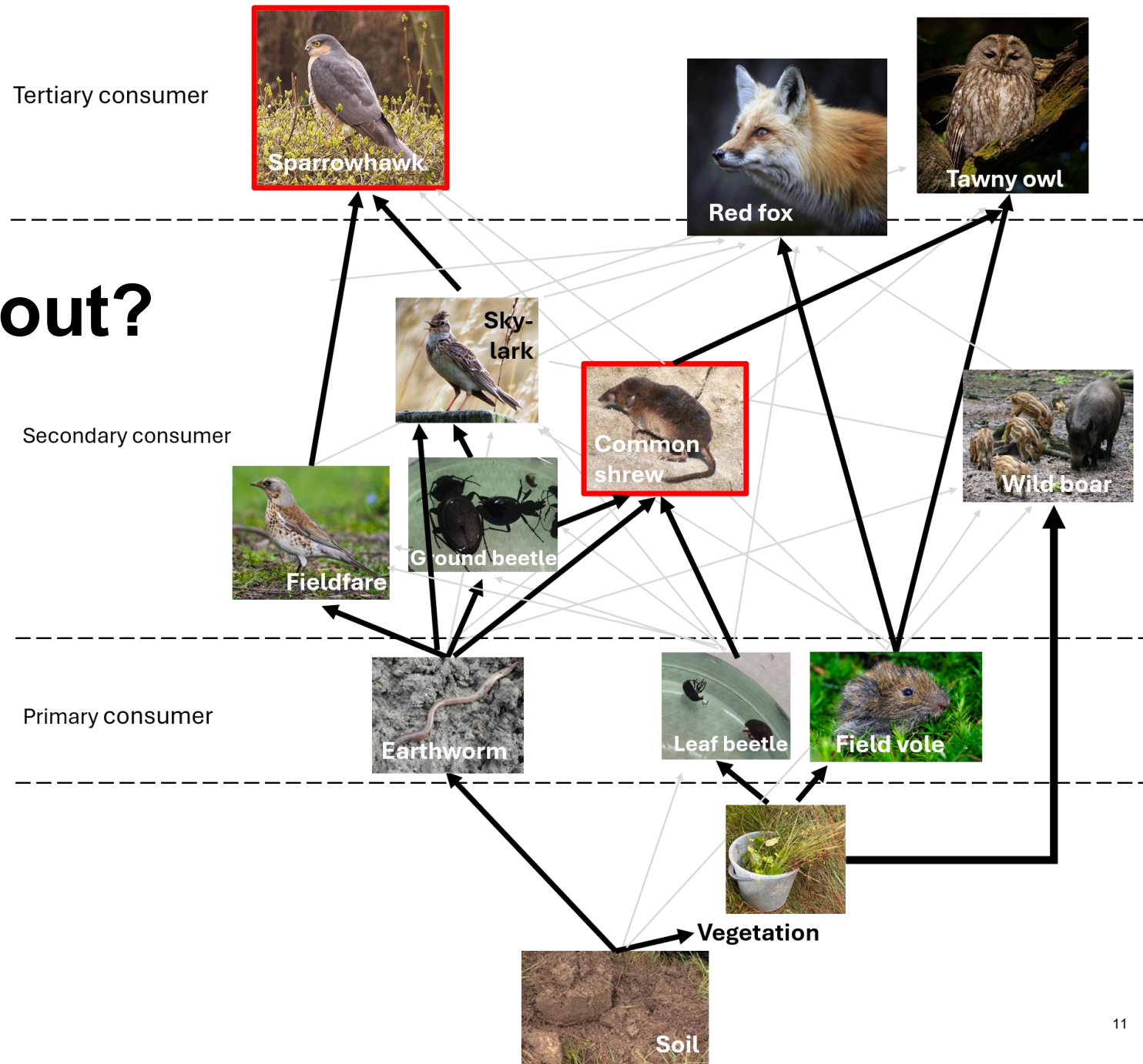
Why did shrews and sparrowhawks stand out?

Common shrew (*Sorex araneus*)

- Small body, big appetite

Eurasian sparrowhawk (*Accipiter nisus*)

- At the top of the food web



How certain are these results?

Key sources of uncertainty

- DDT-concentrations in invertebrates
- Food-web structure and diet composition
(*"Who eats who, and how much?"*)
- Bioaccumulation between trophic levels
(*"How much DDT follows the food up the chain?"*)
- Toxicity reference values
(*"How toxic is DDT for different animals?"*)

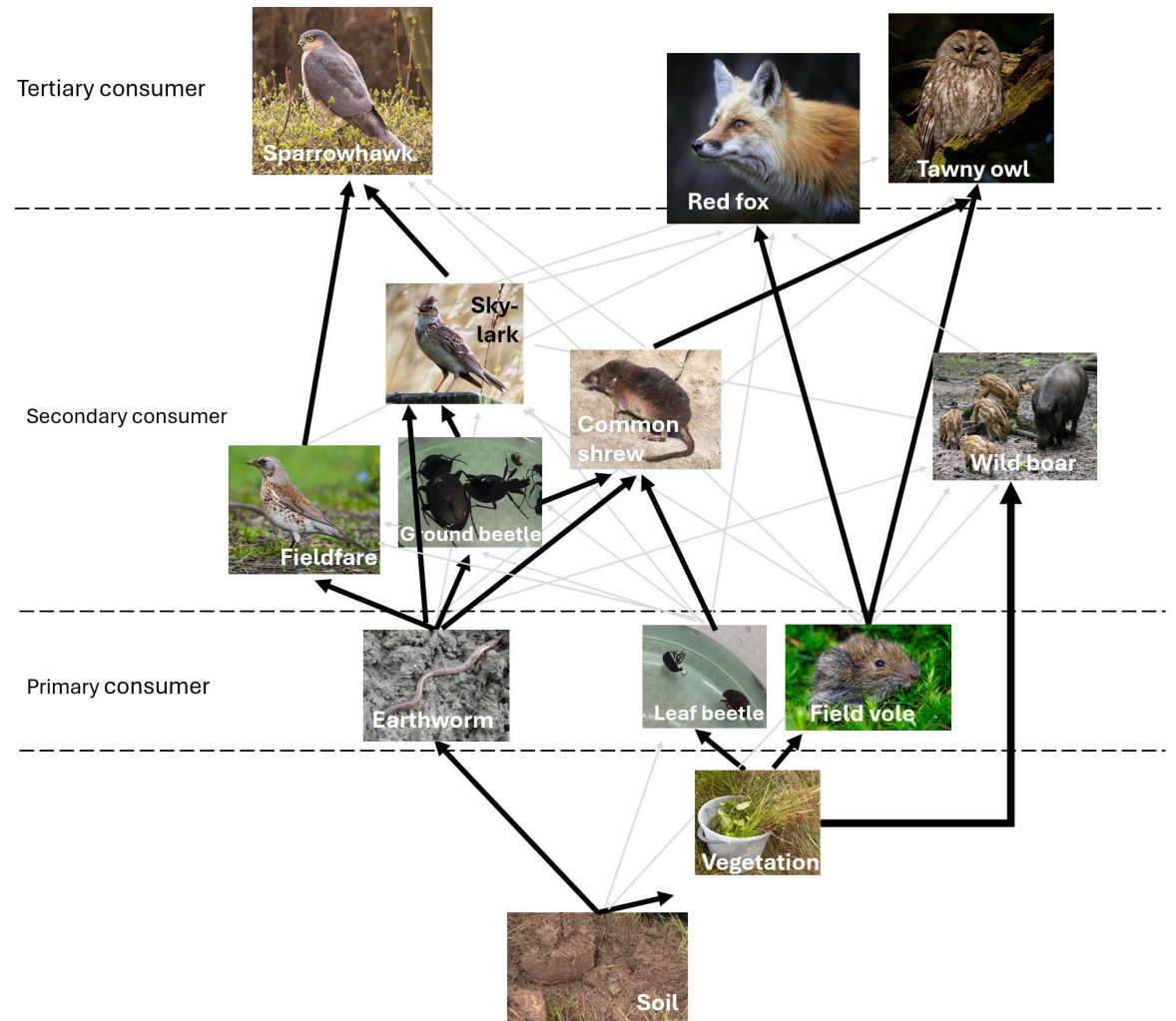
Key drivers – species at risk:

Common shrew (*Sorex araneus*)

- DDT concentration in ground beetles
- Food intake

Eurasian sparrowhawk (*Accipiter nisus*)

- Food intake
- Bioaccumulation factors



What can we take away from this?

From this project:

- **Risk was concentrated to a few species, not the whole food web**

DDT is transferred through the terrestrial food web – confirmed by analysis in earthworms and beetles, but model only showed predicted risk for shrew (and maybe sparrowhawk).

For your next risk assessment:

- **Analyze the food web, not just the soil**

Direct analysis reduce the number of steps you have to guess.

- **Not all uncertainties matter equally**

Sensitivity analysis shows which parameters actually drives the decision, and where to spend the next sampling budget.

A sharp-shinned hawk is perched on a thick, textured tree branch. The hawk has a dark cap, a bright orange-red eye, and a yellow beak. Its plumage is a mix of brown, grey, and white, with a prominent barred pattern on its chest. The background is a soft-focus green forest.

Can DDT at former forest nurseries threaten top predators today?

You don't have to reduce every uncertainty, you have to identify the ones that drive the decision.



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