

Plant Bioindicators: What, Why, and How

Chris — Centre for Agroecology, Water and Resilience, Coventry University

Ecology · Soil health · Practical methods

INTRODUCTION

Setting the scene

Given at the cusp of spring, this talk moves away from the loaded term 'weeds' toward the more neutral framing of plant bioindicators — though the speaker acknowledges both terms have their place depending on context.

The session covers the essentials in around 20 minutes, leaving room for questions. Research findings are offered as a bonus if time allows, but the core 'what, why, how' framework takes priority.

DEFINITION

What is a plant bioindicator?

"A species or group of species whose function, population, or status can reveal the qualitative status of the environment."

Three key ideas within this definition:

Species vs. community. Don't fixate on one striking plant — look at the whole community for a collective signal.

Function over ancestry. Focus on what a plant does (root structure, nutrient cycling) rather than its genus or family.

Condition, not judgment. 'Condition' is preferred over 'good vs. bad' — soil ecosystems are always in transition. Describe before you manage.

THE SIGNALS

Three common plants as examples

Rushes Juncus spp. Signal a 'hydric' (wet) environment — compaction or poor drainage.	Poppies Ruderal strategists. Emerge from the seed bank — where they can wait over 100 years — after major soil disturbance.	Broadleaf dock Rumex obtusifolius A trap: literature links it to compaction, high nitrates, and high fertility — a profile shared by many plants. Which signal do we trust?
---	---	---

The answer lies in niche breadth. Wide-niche plants (like Shepherd's Purse) tolerate many conditions and make poor indicators alone. Comparing 5–10 abundant species in a field reveals where signals overlap — those overlaps point to the true soil condition.

WHY BOTHER

Reasons to use plant bioindicators

Cost & autonomy	Cheaper than lab testing; makes you an active knowledge holder rather than a passive data receiver.
Ecological literacy	Builds long-term reading of your land over time.
System design	Understanding what a weed does lets you replace it with a beneficial plant sharing the same functional traits.
Yield balance	High weed diversity (20+ species) can result in a lower yield penalty than 5–6 dominant, aggressive weeds.

HOW-TO

A four-step survey process

1 Prepare

Build a list of local plants so you aren't spending the whole survey identifying them.

2 Plan

Walk a consistent W or M pattern across the field to ensure even coverage.

3 Survey

Estimate coverage of different plants at 10 random stops to build a community picture.

4 Triangulate

Do a physical soil test (e.g. spade test) to see whether soil structure matches what the plants are telling you.

Best done in May, June, or July when plants are flowering. The method is semi-quantitative — it won't give absolute figures like a lab test, but it encourages deliberate engagement with the land.

Q&A;

Questions and discussion

QUESTION

Duncan — Do weeds replace lab soil analysis?

They work best in tandem. Lab tests and plant indicators often tell us different things. For example: a lab might show low phosphorus while the plants present thrive in high-phosphorus conditions — meaning the plants are accessing 'locked' phosphorus the chemical test can't detect. Plants are sophisticated instruments that measure nutrient quality and availability in ways that would be extremely costly to replicate in a lab.

QUESTION

Debby — How do time-pressed farmers act on this?

"The best fertilizer you can put on your land is your shadow."

Reframe observation as a core part of the job, not a luxury. One or two surveys a year offer a high return on investment. The method is low-tech, low-cost, and fits naturally alongside a spade test. Doing it with neighbours also builds shared ecological knowledge of the territory.

QUESTION

Evie (farmer) — I see plants changing, but then what?

For low-intervention systems, this method deepens your relationship with the land's own process. Even so, knowing the functional traits of your weeds helps identify blockages in the system and shows which beneficial plants might actually survive if introduced — based on what's already thriving.

Alex added: the fact that Evie's plants are changing already shows the soil is moving along a spectrum — a positive sign of transition.

RESOURCES & NEXT STEPS

Further reading and access

Plant Bioindicator Database — Accessible via a feedback form link shared in the session.

Braiding Sweetgrass by Robin Wall Kimmerer — Highly recommended for a deeper look at our reciprocal relationship with plants.

Future plans — Hopes to bring Chris to Scotland for a hands-on field analysis day.

KEY TAKEAWAY

Don't just look for an answer — look for a conversation with the land. The plants are already speaking; we just need to learn the vocabulary.