

# How do Soil Protection Mechanisms (SPMs) impact soil health in residential spaces?

## The Protection Levels of Urban Soils (PLUS) Framework

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### Background

Urban soil health is crucial for managing water, cooling cities, and supporting ecosystems. Compacted soil reduces **water infiltration**, **increases runoff**, and **raises urban temperatures**. The PLUS framework is intended to evaluate soil protection through mechanisms that limit human impact, while also considering factors like soil sensitivity and exposure. By combining these elements, we can **identify vulnerable areas** and **apply effective solutions to improve soil quality**.

### Soil Protection Mechanisms (SPMs)

SPMs are **structures or practices** that **deter or prevent human interaction** with soil to reduce compaction. There are four main types:



### Hypotheses

- More SPMs = Lower compaction, higher rates of water infiltration, and healthier soil.
- Sites with multiple SPMs will optimize soil’s physical, biogeochemical and hydrologic properties.
- At scale, SPMs can meaningfully improve the ecological performance of an urban landscape

### Protection Levels

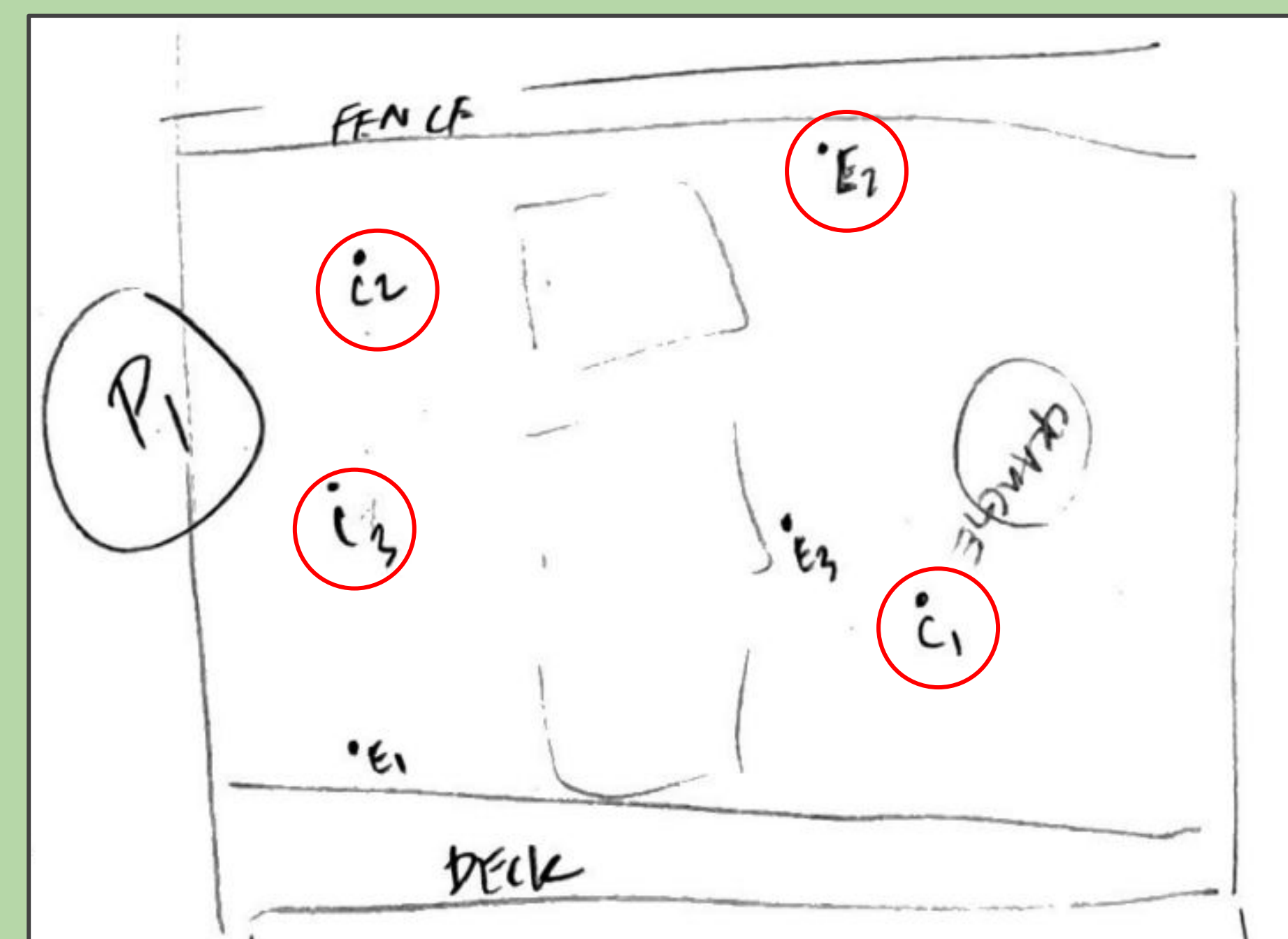
Protection Level	Criteria	Examples
Low (1)	No/few SPMs, high human impact	Open spaces, exposed soil, social areas
Medium (2)	Some SPMs deter movement but do not fully prevent it	Taller grasses, decorative borders, pathways
High (3)	Strong deterrents or barriers that prevent soil interaction	Crop/garden beds, dense plantings, fences

### Example Protection Assessment



Cross-referencing a site photo with a site map helps accurately assess the protection level of a patch. This map and picture come from TreePeople’s LARLD Study which assessed ecological diversity in residential areas. The circled dots (below) represent points of data collection, assessing water infiltration, compaction, and other soil health indicators.

Points C1, 2, 3 and E2 have Level 3 Protection because there is a designated pathway (**built**) lined with aesthetic plants (**psychological**) tall enough to form a small border (**ecological**), protecting the four circled points from compaction.



### Sensitivity & Exposure



While not included in the initial protection evaluation, **sensitivity** (ground cover, ie. vegetated, grass lawn, or non-bio) and **exposure** (patch location, ie. front yard, back yard, side yard, or parkway strip) consider **soil resilience** and human **interaction**, improving future land management.

### Putting it Together

1. Identify SPMs in the area.
2. Assess protection levels (low, medium, high).
3. Evaluate sensitivity (based on ground cover).
4. Assess exposure (based on point location).

Combining these elements gives a more comprehensive view of a soil’s **vulnerability** or **resilience**, allowing us to identify areas at risk and apply more **effective soil management strategies**.

### Next Steps

When applied with accurate data, the PLUS Framework can reveal insights into soil vulnerability, guiding targeted interventions to improve soil quality and resilience. **Future research** could focus on refining data collection methods, expanding the framework to diverse environments, and using it to assess the long-term impact of soil management strategies.