

Nano/micro-plastics effects in agricultural landscapes: an overlooked threat to pollination, biological pest control, and food security

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Nano/micro-plastics (NMP) > plastic particles with diameter $\leq 1 \ \mu m$, or $1 \ \mu m - 5 \ mm$ **Pollinators >** transfer pollen between flowers **Biocontrol agents >** organisms that help resist agricultural pest population

Arthropod ecosystem service providers

Sustainable agriculture & food security

Cross-scale NMP effects on pollinators and biocontrol agents





Roadmap for future researches

Methods to detect NMP in environmental samples.

- Detection of small-sized plastics in real environments and in organisms remains
- Methods to automate sample preparation in NMP research, especially in terrestrial systems
- Standard methods to effectively track NMP and their interaction

Ecosystem Ecotoxicology of NMP.

- Ecotoxicity of NMP on pollinators and biocontrol agents
- Realistic exposure concentrations Systematic perspectives involving various ecosystem agents
- Realistic NMP properties (weathering and degradation)
- Quantified effects on behavior **IR-transparent film** and their ecosystem services on

NMP impact mitigation.

• Vegetation barriers for airborne NMP transfer

Visible light (day/night cycle)

 Mitigation by landscape heterogeneity

Cameras

... ...

Glass lid effects in vivo the semi-field to field scale On-going project: microplastic effects on bumblebee (Bombus 🛉 🕇 IR LEDs 🛉 🛉 *terrestris*) individual behaviors and colonial development, base Nesting room Foraging room on computer-vision, object detection and miniature matrix code detection. Food supply References 1. Klein, A.-M. et al. Proc. R. Soc. B. 274, 303–313 (2007). 2. Costanza, R. et al. Nature **387**, 253–260 (1997). Contact: <u>shengdong@westlake.edu.cn</u> 3. Sheng, D. et al. (2024) DOI: 10.48550/arxiv.2403.04920. Sustainable Agricultural Systems & Engineering Lab

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