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Integrating field observations and mapping with model outputs (pesticides) to help identify ecologically vulnerable areas and determine suitable field site locations in the Great Barrier Reef

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Abstract: Combining ecological field observations and mapping with model outputs is a powerful approach for understanding complex marine and coastal systems. In our study over three wet seasons, we used the eReefs 1 km resolution marine model to simulate the dispersal of diuron, a pesticide commonly found in river catchments that flow into the Great Barrier Reef (GBR) marine environment. By mapping the model outputs together with observed coastal coral reef and seagrass beds, we were able to determine the areas of the GBR, seagrass and coral where diuron plumes exceeded ecologically toxic concentrations (1400, 175 and 60 km2 respectively). This information can guide decision-making processes by producing a more comprehensive understanding of the catchment and ocean dynamics within the region. Moreover, marine model outputs using scenarios of agricultural runoff can be used to make predictions about potential changes such as increased pesticide use and its impact on ecologically sensitive areas. By providing a more complete understanding of complex ecological systems, this approach can help decision-makers make more informed decisions and better manage sediment, nutrient, and pesticide runoff from catchments.

In addition, once ecologically vulnerable marine areas have been identified, models such as the eReefs marine model can be used to determine the best field site locations for monitoring and collecting ecological data. For example, models can predict where certain species are likely to occur and where river plumes converge, guiding the selection of field sites. By using models to guide field site selection, researchers can maximize the efficiency and location of their data collection efforts and obtain a more comprehensive understanding of the marine ecosystem.

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