

OPTIMAL CONTROL OF INVASIVE SPECIES

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The containment of the invasive species is a widespread problem in the environmental management, with a significant economic impact. We analyze an optimal control model which aims to find the best temporal resource allocation strategy for the removal of an invasive species. We study the existence and uniqueness of the optimal solution when both initial and final conditions on the state variable are fixed. We derive an alternative optimality system in the state and control variables and we use the phase-space analysis to provide qualitative insights into the system dynamics and to analyze the behavior of the optimal solution. Finally, we find the expression of the optimal solution for the free terminal time problem. We apply these techniques to two case studies: the case of feral cats population in Australia, where we assume a logistic growth; the control of wild-boars populations in Italy, where we include an Allee effect in the population growth. This work has been carried out within the H2020 project ‘ECOPOTENTIAL: Improving Future Ecosystem Benefits Through Earth Observations’. The project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 641762.

References

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