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Optimal spatio-temporal control of invasive plant in protected areas

We develop a modelling approach for the optimal spatiotemporal control of invasive species in natural protected areas of high conservation value. The proposed approach, based on diffusion equations, is spatially explicit, and includes a functional response (Holling type II) which models the control rate as a function of the invasive species density. We apply a budget constraint to the control program and search for the optimal effort allocation for the minimization of the invasive species density. Both the initial density map and the land cover map used to estimate the habitat suitability to the species diffusion, have been generated by using very high resolution satellite images and validated by means of ground truth data. The approach has been applied to the Alta Murgia National Park, one of the study site of the on-going H2020 project ECOPOTENTIAL: Improving Future Ecosystem Benefits Through Earth Observations' (http://www.ecopotential-project.eu) which has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 641762. All the ground data regarding Ailanthus altissima (Mill.) Swingle presence and distribution are from the EU LIFE Alta Murgia Project (LIFE12 BIO/IT/000213) titled Eradication of the invasive exotic plant species Ailanthus altissima from the Alta Murgia National Park funded by the LIFE+ financial instrument of the European Commission.

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C.M. Baker, F. Diele, C. Marangi, A. Martiradonna, S. Ragni, Optimal control governed by a diffusion PDE with Holling type II reaction term and budget constraint, 2018, under review.