**Table 5.15.** Examples of scenarios and models used for invasive alien species management

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| **Biomes** | **Type of action** | **IPBES zones** | **Examples** |
| Terrestrial | Prevention,  containment | The Americas | Spatial model screening the economic cost of programmes preventing the spread of satellite populations of an invasive beetle, under different scenarios of success and simulations of spread, versus the estimated delayed cost of control, under different scenarios of actions as removal, and/or no action. Preventing the establishment of new populations is cost-effective (Kovacs *et al*., 2011). |
| Early detection, containment, eradication | Not stated | Economic simulation model evaluating the cost and success of eradication or containment potential actions under different scenarios of detection rates and search efforts (i.e., early detection; Cacho *et al*., 2010). |
| Eradication, containment | Europe and Central Asia | Simulation population model evaluating percentage of reduction in invasive plant species range under different scenarios of removal of individuals, human density and invasive populations characteristics (Wadsworth *et al*., 2000). |
| Eradication | Asia and the Pacific | Stochastic spatio-temporal model evaluating the rate of spread of invertebrates under different eradication scenarios (Kadoya & Washitani, 2010). |
| Containment | Oceania | Process-based model of the impact of climate change on the distribution change of an invasive shrub based on its physiological tolerances for growth and reproduction (Kriticos *et al*., 2003) |
| Control | The Americas | Epidemiological model to understand the capacity for spread of the pathogen *Phytophthora ramorum* (sudden oak death) and the degree to which this is likely to influence management options *(Filipe et al*., 2012). |
| Control | Oceania islands | Matrix-based population model for estimating the population growth rate of stoats to define dulling strategies that will lead to effective population and impact suppression of this introduced predator of ground nesting birds (C. M. King & Powell, 2011). |
| Control, biological control | Oceania | Multi-level mixed effects and individual based ecological models allowed management strategy ranking based on potential to suppress population size of the invasive plant *Hypericum perforatum* (St John’s wort; Buckley *et al*., 2003b). |
| Control, biological control | The Americas | Bio-economic model to develop a general stochastic optimal control framework for the management of an invasive invertebrate using integrated pest management (Marten & Moore, 2011). |
| Biological control | The Americas | Deterministic and stochastic ecological population model evaluating the 20-year effective biocontrol of citrus red scale (Murdoch *et al*., 2006). |
| Restoration, management | The Americas | Process-based state-transition model evaluating positive and negative impacts of different restoration scenarios of fire, livestock and grazing and invasion rates of non-native plant species (Forbis *et al*., 2006). |
| Freshwater | Prevention | The Americas | Correlative models are used in cost–benefit analyses for prevention efforts, considering various scenarios of lakes at risk of being invaded by crayfish and different actions, from full protection (i.e., all lakes) to few lakes protected. Even with high expenditure on lake protection, net economic benefits were higher (Keller *et al*., 2008). |
| Eradication | Africa | Spatial ecological model evaluating potential management scenarios of pond-breeding frog species considering pond networks, ecotypes (i.e., arboreal, aquatic, terrestrial), access for managers to ponds due land use change (i.e., number of pods targeted) and percentage of individual removal (Vimercati *et al*., 2017). |
| Eradication, Containment | The Americas | Process based model evaluating potential management scenarios that included selective and non-selective removal of fish individuals based on age-group (Chizinski *et al*., 2010). |
| Containment | Asia and the Pacific | Ecological population model evaluating potential management scenarios on abundance of invasive alien species considering river flow conditions for various corridors and containment through commercial fishing or trap removal of individuals (Koehn *et al*., 2018). |
| Control, biological control | Oceania | Correlative hydrological, ecological and epidemiological based spatio-temporal habitat suitability modelling to prioritize future areas for common carp biocontrol in Australia using the virus CyHV-3 (K. Graham *et al*., 2021). |
| Marine | Prevention | Europe and Central Asia | Correlative age-base modelling and hydrodynamic models of surface flow are used to evaluate the risks of spreading of fish and invertebrates, associated with intentional or unintentional discharges of ballast water, and considering scenarios of dispersal (i.e., types spreading of groups of organisms) and connectivity *(*Hansen *et al*., 2015). |
| The Americas | A Bayesian network relative risk modelling is used to detect the areas of a coastal region at greatest risk of invasion. Risk reduction is evaluated under ballast water treatment scenarios considering a decrease in non-native species introductions or their removal after introduction (Herring *et al*., 2015). |
| Eradication; Containment | Not stated | Matrix models are used to explore the efficacy of possible control strategies by removal of crab individuals at critical stage ages and seasons (Z. Zhang *et al*., 2019). |
| The Americas | Correlative models are used to evaluate the success of various fishermen harvest scenarios as control strategies, different levels of interaction complexity among the biotic and abiotic components of the ecosystem and restoration programmes of native species (Ortiz *et al*., 2015). |
| Asia and the Pacific | Process-based spread models are used to forecast areas of potential arrival of invasive crabs through different pathways. These models are complemented with quarantine scenarios preventing transport of crabs by vessels and estimated delayed times of arrival are estimated for areas with greater risk (Koike & Iwasaki, 2011). |