

1	Invasive species management will benefit from social impact assessment
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3	Sarah L. Crowley ¹ , Steve Hinchliffe ² and Robbie A. McDonald ^{1*}
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5	¹ Environment and Sustainability Institute, University of Exeter, Penryn TR10 9FE.
6	² Geography, University of Exeter, Exeter EX4 4RJ.
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10	*Correspondence. Email: r.mcdonald@exeter.ac.uk
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18 Summary

- Invasive species management aims to prevent or mitigate the impacts of
 introduced species but management interventions can themselves generate
 social impacts that must be understood and addressed.
- 22 2. Established approaches for addressing the social implications of invasive
 23 species management can be limited in effectiveness and democratic
 24 legitimacy. More deliberative, participatory approaches are emerging that
 25 allow integration of a broader range of socio-political considerations.
 26 Nevertheless, there is a need to ensure that these are rigorous applications of
 27 social science.
- 3. Social Impact Assessment offers a structured process of identifying,
 evaluating and addressing social costs and benefits. We highlight its potential
 value for enabling meaningful public participation in planning, and as a key
 component of integrated assessments of management options.
- 4. Policy Implications: As invasive species management expands, social impact
 assessment provides a rigorous process for recognising and responding to
 social concerns. It could therefore produce more democratic, less conflict prone and more effective interventions.
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37 Keywords

Environmental impact assessment, interdisciplinary sciences, non-native species,
social feasibility, wildlife management

40 Introduction

The management of invasive species is extending in scale and complexity in 41 response to the growing impacts of introduced species (Hulme 2006) and as 42 technical advances enable increasingly ambitious projects that tackle multiple 43 species and use more sophisticated methods (Glen et al. 2013; Campbell et al. 44 2015). Many such initiatives successfully achieve their targets (Simberloff 2008, 45 2013) but as ambitions grow, attempts to eradicate or control invasive species 46 continue to generate controversy and conflict (Estévez et al. 2015). Even on 47 48 uninhabited islands, the 'social dimensions' of invasive species management (ISM) can significantly affect outcomes. Opposition, conflict, political and legal struggles, or 49 simple non-compliance, can incur expenditure, delays and failures. 50

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Social impacts can arise from all issues associated with a policy, plan or project that 52 directly or indirectly affects humans and human communities (Vanclay et al. 2015). 53 54 International guidance for invasive species management states that interventions should be "socially, culturally and ethically acceptable..." (IUCN & Species Survival 55 Commission 2000) and practitioners, many of whom are ecologically trained, are 56 now commonly encouraged to attend to 'social', or 'human' dimensions of biological 57 invasions (White et al. 2008). While this can often be with a view to preventing or 58 59 circumventing opposition to management (Blackburn et al. 2010; Estévez et al. 2015), there are important reasons for assessing social impacts that go beyond their 60 potential to complicate project logistics. Proactive assessment of social impacts has 61 62 the potential to make management more democratic (increasing public engagement and scientific citizenship), more socially legitimate and, ideally, more effective. 63 Currently, there are few tools with which to make such social assessments 64

65 (Campbell et al. 2015), leading to their frequent omission from planning (Dawson et al. 2014) and so here we discuss established and emerging approaches to social 66 issues associated with ISM. First, we highlight some drawbacks of established, often 67 top-down, approaches to management. We identify the emergence of more 68 deliberative, democratic models of public engagement, and some of the challenges 69 associated with them. Finally, we propose that Social Impact Assessment could 70 make a valuable contribution to ISM and identify how it might complement and be 71 72 integrated into wider management planning processes.

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74 Social impacts of invasive species management

Invasive species management aims to prevent introductions, eradicate or contain 75 76 populations, or mitigate their negative environmental, economic and social impacts (Simberloff et al. 2013). Interventions include legislation, trade regulation, border 77 controls, eradication, population controls and restoration. Clearly such interventions 78 79 will generate positive and negative impacts of their own; some human communities may benefit from damage reduction or increases in native biodiversity while others 80 might be negatively affected by trade restrictions or the loss of valued animals or 81 plants. Such impacts are rarely evenly distributed and can result in inequity where 82 83 certain groups are disproportionately affected by action (Norgaard 2007; Marshall et 84 al. 2011) or inaction (Binimelis, Monterroso & Rodríguez-Labajos 2007). The governance and processes of management can themselves create social impacts. 85 Excluding stakeholders from meaningful participation in deliberation and decision-86 87 making can produce distrust and animosity, as well as anxiety if affected communities feel they lack control over decisions that affect them (Kahn et al. 1990; 88 89 Zalom et al. 2013). Reliance on experts and contractors to plan and conduct projects 90 can generate similar resentment amongst stakeholders who feel excluded (Parkes,
91 Macdonald & Leaman 2002; Rikoon 2006).

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93 Established approaches

Concerns about invasive species management are often attributed to deficits in 94 understanding or insufficient awareness of 'the problem'. The response to this 95 apparent knowledge deficit has often been attempts to better inform or educate 96 stakeholders. Educational campaigns can increase awareness of problems and 97 98 might increase support for management, at least in the abstract (García-Llorente et al. 2011), and amongst 'naïve' publics (Hindman & Tjaden 2014). However, this 99 100 strategic 'public education' or 'information deficit' model has been repeatedly 101 criticised as ineffective, and for disempowering lay publics (Callon 1999; Owens 2000). This is not to suggest that ecological knowledge is unimportant, but rather 102 that its top-down promulgation may be inadequate for gaining acceptance and 103 104 support. Educational campaigns are also limited in their ability to respond to opposition and, if dissenting views are characterised as poorly informed or invalid, 105 could exacerbate conflicts (McEntee 2007). These risks can be amplified where 106 campaigns use hyperbole, emotive language and selective evidence, which can 107 108 incite distrust of a project and its proponents.

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The Global Invasive Species Programme (GISP; Wittenberg & Cock 2001) has previously advocated *social marketing* as a means of increasing public engagement in invasive species management. This and related frameworks focus directly on eliciting behaviour changes in individuals and/or communities (Michie, van Stralen & West 2011), rather than assuming that shifts in knowledge and attitude will 115 automatically produce these changes. Behaviour change models could play a role in some areas of invasive species management, for example, implementing biosecurity 116 practices and encouraging reporting of recent arrivals. However, in their will to 117 achieve pre-set goals through manipulation of social desires, and in the absence of a 118 political or deliberative process, they may well be as paternalistic or anti-political as 119 the top-down policy models they purport to replace. Furthermore, management 120 activities targeting established species or recent introductions, which are often the 121 122 focus of social disputes, infrequently require specific behaviours or behavioural 123 change on the part of affected communities: rather, they require communities to engage with, support, or at least accept, management interventions (often delivered 124 125 by others).

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Social feasibility assessments can be used to predict how likely stakeholders are to 127 accept interventions and to evaluate whether a project is deliverable, risky or 128 129 untenable. Judgments about socio-political acceptability are commonplace but often occur as a tacit component of policy and management planning. Managers and 130 policy-makers may avoid bringing forward projects on the basis of anticipated 131 opposition. Whilst preventing investment in unworkable ideas, this might also 132 133 preclude opportunities for deliberation and innovation. Internal judgements of 134 feasibility may therefore lack transparency and wider participation. This means that not only can powerful interests dominate 'behind the scenes', but also that when 135 'feasible' projects are implemented, those excluded may seek to make their voices 136 137 heard in other ways, such as legal action, generating negative publicity, protesting or active disruption. Consequently, where social feasibility judgements are internal, 138 139 powerful or vocal minorities can disproportionately influence outcomes. Social 140 feasibility assessments are becoming more explicit, systematic and evidence-based and Gobster (2013) has proposed a model to help predict human responses to 141 management projects. However, even explicit social feasibility assessments are 142 143 limited because they incorporate no means of addressing the challenges they reveal: a feasibility assessment might find, for instance, that 80% of pre-defined 144 stakeholders support a proposal, and indicate why 20% oppose, but offers no means 145 146 of addressing that opposition or understanding the ways that the opposing voices may be mobilized in future. 147

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149 **Emerging approaches**

Established, technocratic approaches to environmental management draw heavily 150 151 on ecological and technical expertise but can risk excluding those people most affected. In recognition of this, environmental governance models have increasingly 152 turned towards more deliberative and participatory processes (Owens 2000). Whilst 153 154 no panacea, these approaches are arguably more in keeping with democratic principles than are technocratic strategies (Stirling 2008; Hinchliffe, Levidow & 155 Oreszczyn 2014). Democratically produced projects may also carry greater societal 156 legitimacy than those proposed by technicians or politicians (Pellizzoni 2001), and 157 158 can grant a 'social licence to operate' (Vanclay et al. 2015).

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160 This broader movement towards more deliberative and/or democratic models of 161 public engagement is becoming evident in invasive species management, and 162 promising examples of effective community involvement in the design and delivery of 163 management projects are emerging (Saunders *et al.* 2007; Bryce *et al.* 2011). 164 Management that engages citizens in deliberation and planning could also enhance societal awareness of and responsibility for biological invasions (Nowotny 2003). However, a review of public participation in Australian invasive vertebrate management projects found that educational and top-down approaches to participation were still more prevalent than deliberative and democratic models (Ford-Thompson *et al.* 2012).

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171 An example of a democratic approach to ISM is co-management (or adaptive co-172 management; Armitage et al. 2009). This is a collaborative governance model in 173 which power and responsibility for decision-making and implementation are shared between interested parties, including governments, organisations and affected 174 communities (Moon, Blackman & Brewer 2015). Whilst some examples of co-175 176 management are emerging in relation to established invasive species (Robinson & Wallington 2012), this approach may be less suitable for rapid response control, or 177 projects encompassing large regions or wider publics. 178

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Structured decision making (SDM) sits between technocratic (analytic) and fully 180 deliberative decision-making - it is therefore referred to as an *analytic-deliberative* 181 approach (Burgess et al. 2007). SDM assumes that a decision needs to be made 182 183 and that a single body, or a group of open-minded decision-makers, is willing to 184 critically assess a range of alternatives (Runge, Grand & Mitchell 2013). The analytic side involves collection and processing of technical and ecological data, which is fed 185 into iterative, participatory processes. SDM utilises a range of tools, often 186 187 incorporating multi-criteria decision analyses (MCDA; Estévez, Walshe & Burgman 2013), but also citizen juries, workshops, and deliberative mapping. SDM could have 188 189 extensive application for invasive species management (Estévez et al. 2015), but is 190 not without challenges. First, analytic-deliberative tools normally require an understanding and prediction of potential social, environmental and economic 191 impacts of management alternatives before they can be evaluated and compared. 192 193 Social impacts can be difficult to measure, and may be poorly represented in the MCDA process (Estévez, Walshe & Burgman 2013). Second, some social impacts 194 arise in response to procedural issues (rather than as consequences of an 195 intervention). SDM can therefore run the risk of creating unintentional social impacts 196 197 through its implementation, especially where there are histories of distrust or tension 198 among stakeholders and authorities.

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200 Social Impact Assessment

201 Social Impact Assessment (SIA) was developed alongside Environmental Impact Assessment (EIA) (Esteves, Franks & Vanclay 2012). While both assess the 202 potential impacts of development projects, and are used to inform planners, they 203 204 differ in philosophy and procedure. SIA focuses on human and community impacts of interventions rather than 'environmental' impacts, although close interconnections 205 206 between humans and their environments mean that social and environmental impacts can rarely be cleanly differentiated. SIAs are also initiated earlier than EIAs, 207 208 as it is assumed that environmental impacts won't occur until projects start, whereas 209 it is recognised that social impacts can arise simply in response to rumour and discussion (Vanclay 2012). Most substantially, EIA is largely completed before a 210 project begins, so the assessment is a product that informs decision-makers. SIA 211 212 can be conducted in this manner but is better implemented as a multi-stage social process comprising prospective assessment, mitigation during delivery and 213 214 retrospective appraisal of outcomes (Vanclay et al. 2015). SIA therefore now comprises "the processes of analysing, monitoring and managing the intended and unintended social consequences, both positive and negative, of planned interventions" (Vanclay 2012). 'Planned interventions' have elsewhere comprised large-scale development projects, urban planning and nature reserve designation, and we suggest that invasive species management might be subject to the same due diligence as would be expected of other such civic and private initiatives.

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222 A key advantage of SIA is its flexible structure. SIA promotes a deliberative approach 223 to management, recommending community engagement from the start. As such, it has features in common with SDM, and we suggest that SIA could be integrated with 224 relative ease into governance structures based on an SDM model. Indeed, SIA could 225 226 facilitate effective SDM: contemporary SIA is highly reflective, and scoping procedures include consideration of how management planning processes, and the 227 SIA itself, might affect and be received by concerned publics. SIA can also be 228 229 adapted to risk-based governance structures, where it could be used to augment 230 existing risk assessment/management procedures.

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SIA also widens the definition of 'success' in management. Rather than focusing on whether proximate goals are achieved, e.g. eradication completed, SIA aims to increase the shared value of projects and to build trust between parties (Esteves, Franks & Vanclay 2012). This could help produce more collaborative projects that work towards wider social and environmental goals. Whilst risk-based and deliberative tools end at decision-making, SIA processes continue throughout project implementation, enabling management to adapt to changing conditions.

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Next, we present an adapted framework for SIA of invasive species management, in five stages: scoping, assessment, decision-making, implementation and appraisal (Figure 1). We are not suggesting that SIA should replace existing strategies, but wish to highlight its value as (a) a complementary tool for identifying and evaluating social impacts of management alternatives, which can inform decision-making, and (b) a broader process through which management planning can be made more democratic, adaptive, and reflective.

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248 **1. Scoping**

Scoping is an early-stage activity that identifies the social risks and opportunities of 249 management. It assumes that a management problem or issue has been broadly 250 251 identified, but does not require it to be tightly defined. Scoping can be conducted as a general and/or context-specific exercise. General scoping might include a desk-252 based review of past approaches to the problem, can identify a range of 253 254 management alternatives and potential impacts. For example, Gardener, Atkinson & Rentería (2010) reviewed plant eradication efforts on the Galapagos and identified 255 important socioeconomic constraints, including inadequate permissions to access 256 property, personal attachments to plant species and inadequate funding. Nimmo and 257 258 Miller (2007) reviewed four historical cases of feral horse management and found 259 that contemporary controversy surrounding culling followed the pattern of previous cases so closely that it could readily have been foreseen from a literature review 260 alone. Scoping can be restricted by a paucity of accessible accounts of failures and 261 262 successes (Simberloff 2008), compounded by the routine omission of social issues from natural science literature. Case studies can be found in interdisciplinary, social 263 264 science, and humanities journals and some post-project appraisals can be found in the 'grey' literature of management and policy publications (e.g. IUCN 2013; Zalom *et al.* 2013).

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268 Context-specific scoping should include identification of concerned publics and an initial assessment of the 'social area of influence' of the problem. This early 269 engagement enables a deeper and more contextual understanding of risks and 270 opportunities, and is a key step in building trust. This stage is also important for 271 272 identifying any cultural differences or existing tensions that may make subsequent 273 SIA processes more challenging, and provides opportunities to adapt the process to local conditions. Scoping studies need to actively explore socio-political contexts and 274 the local as well as broader implications of interventions. Existing inequities and 275 276 tensions, or historical events and relationships (including historical management 277 efforts), can affect the emergence, distribution and intensity of social impacts. For example, discussions about invasive species are frequently entangled with wider 278 279 histories and debates surrounding nativeness, immigration, and colonialism (Lien 2005; Trigger 2008; Coates 2013). Insensitivity to these issues risks inadvertently 280 creating social impacts, such as unintentional replication of imperialist narratives 281 (Bhattacharyya & Larson 2014). 282

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284 **2. Assessment**

The assessment stage likely involves the greatest investment of resources, particularly where numerous or significant social impacts have been identified by scoping. Frameworks have been developed to assess the social impacts of invasive species (Binimelis, Monterroso & Rodríguez-Labajos 2007; Marshall *et al.* 2011) and a similar approach can be taken to assess their management. Indeed, both 290 assessments could be made in tandem to compare active management alternatives with 'do nothing' options. Assessments should start with a 'stakeholder' or public 291 analysis (see Reed et al. 2009), ideally using a participatory method, that identifies 292 293 the interests, needs, aspirations and concerns of affected communities. Analyses should take into account the composition and geographies of communities, the 294 relationships between them and their varying degrees of vulnerability and power. 295 296 The assessment should then aim to map and forecast positive and negative social 297 impacts of management alternatives, including how these would be distributed 298 across various groups (Maguire 2004). Whilst there is no single 'checklist', broad 299 areas for assessment might include impacts on health and wellbeing (e.g. actual or 300 perceived health threats of control agents, distress), 'liveability' (e.g. environmental 301 quality), economic circumstances (e.g. income, property value), culture (e.g. 302 heritage, sacred spaces), and community (e.g. tension, identity) (Vanclay 2002). Potential impacts can be explored using a wide range of methods, including surveys, 303 304 focus groups, interviews, participatory mapping and scenario-building.

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306 3. Decision-making

This is the stage at which SIA feeds into existing governance structures, and may fit 307 308 particularly with analytic-deliberative models. Management alternatives might be 309 evaluated against one another in an integrated manner, drawing on multiple analyses or assessments (as in structured decision making) of economic, 310 environmental and social impacts, and technical feasibility. Multi-criteria decision 311 312 analyses, for example, are useful where problems have complex, multiple or competing objectives (Estévez, Walshe & Burgman 2013), and have been trialed in 313 314 relation to invasive species management, with promising results (Liu et al. 2011). A 315 well-designed SIA could increase the likelihood that social impacts are successfully captured and translated into MCDA processes. Whilst SIA is well-suited to exploring 316 and elucidating social considerations, it may reveal significant socio-political 317 318 challenges that reach beyond the management problem and cannot be easily or immediately addressed. Equally, however, extensive or intensive deliberation may 319 not be necessary: consensus, or at least strong preference, towards a particular 320 321 option could emerge during the preceding engagement procedures, rendering the 322 decision-making step straightforward.

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324 **4. Implementation**

The SIA process does not end with decision-making. Responding to unexpected 325 326 social impacts throughout project lifetimes can be more valuable than predicting them (Vanclay 2012) and given that invasive species managers are often required to 327 respond to dynamic scenarios, a capacity to adapt is all the more valuable (Prévot-328 329 Julliard et al. 2011). Key functions of SIA in the implementation stage are to ensure that interventions remain adaptive and responsive to emerging issues, and to 330 maintain active engagement between managers, affected communities and 331 interested publics. The creation of diverse, inclusive project management and 332 333 delivery groups could help achieve this. Managers should also ensure that feedback 334 mechanisms are in place throughout delivery. Simple measures to maintain open 335 communication include establishing project helplines, interactive websites and social media presence. 336

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338 **5. Appraisal**

Regardless of their perceived success or failure, upon completion (or cessation) 339 management projects should be subject to an appraisal evaluating outcomes against 340 341 aims and predictions. This should incorporate expected, observed and managed social impacts, as well as technical challenges and environmental outcomes. This 342 enables project managers to reflect and report on their experiences, and SIA tools to 343 344 be adapted and improved. Appraisals should be published and permanently accessible, to inform the scoping of future projects. There are examples of post-345 346 project evaluations in the literature, however, these can be time-consuming to find and vary in accessibility. Dedicated, open-access publication spaces for both post-347 management appraisals and pre-project scoping reviews would enable wider sharing 348 349 of experiences.

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351 Challenges to adoption

352 Perhaps the greatest challenge to incorporating SIA into invasive species management is that this is not a method for gaining social acceptance of pre-353 determined projects. Consequently, should this process be adopted there will be 354 occasions where initiatives, at least in their original form, will be rejected because 355 356 they create unacceptable social impacts. This may be challenging for advocates of 357 particular projects, but is more democratic than relying on authority or secrecy. It is also worth reiterating that SIA directly allows for the positive social impacts and 358 opportunities of management to be explored and maximised. 359

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361 There are other challenges to adopting SIA. First, measuring social impact is hard: 362 some issues are difficult to express, let alone quantify. Consequently, assessments 363 may be inclined to focus on impacts that can be counted, and therefore risk missing the impacts 'that count' (Vanclay 2012). This is particularly true of cultural or 364 personal, often emotional, attachments to places, species, and individual organisms, 365 366 the strength and significance of which should not be underestimated. However, methods to assess and express cultural, personal and ethical values are being 367 developed (Chan et al. 2012) and applied to management planning (Lynn 2012; 368 Context 2015). Second, whilst frameworks can be devised and adapted, there is no 369 370 universally applicable SIA. Social impacts could include just about anything people 371 are interested in or care about, and operational necessity may inadvertently exclude novel or unexpected issues. We have emphasized the importance of appraisal and 372 sharing experiences, but adaptation and adjustment of the process will need to be 373 374 continuous. Third, for SIA to be effective, managers need to develop trusting relationships with stakeholders and affected communities, which includes 375 recognising and working to address power imbalances. Previous failures, or existing 376 377 animosity, can increase the perceived risks of management and decrease confidence in its potential for success (Evans, Wilkie & Burkhardt 2008). Early, 378 meaningful public engagement may therefore be vital in achieving sustainable 379 outcomes for invasive species management (Ford-Thompson et al. 2012; Moon, 380 Blackman & Brewer 2015), and SIA provides a practical mechanism for delivering 381 382 this.

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In conclusion, many invasive species management projects receive widespread societal support and achieve successes that protect economies, public health, biodiversity and ecosystems. However, like any environmental intervention, invasive species management can create negative social, economic and environmental impacts that need to be evaluated against alternatives. Social impact assessment is constructive, pragmatic, flexible, and well placed to contribute to democratic decision-making. As the 'deliberative turn' (Parkins & Mitchell 2005) in environmental management picks up pace, we propose that social impact assessments could very usefully be incorporated into invasive species management.

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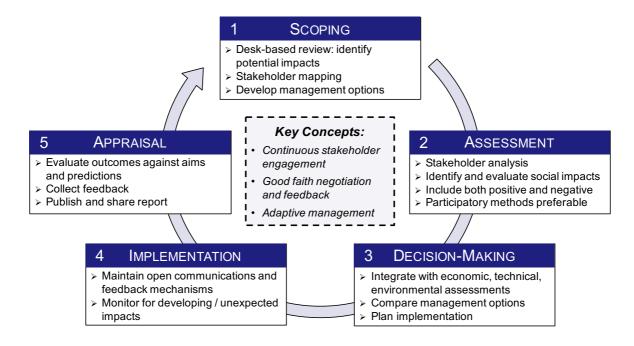
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- 572 Figure 1. Social Impact Assessment framework, adapted for application to invasive
- 573 species management.