

1 **Invasive species management will benefit from social impact assessment**

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16 1 Figure

17 58 References

18 **Summary**

- 19 1. Invasive species management aims to prevent or mitigate the impacts of
20 introduced species but management interventions can themselves generate
21 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.
- 28 3. Social Impact Assessment offers a structured process of identifying,
29 evaluating and addressing social costs and benefits. We highlight its potential
30 value for enabling meaningful public participation in planning, and as a key
31 component of integrated assessments of management options.
- 32 4. *Policy Implications:* As invasive species management expands, social impact
33 assessment provides a rigorous process for recognising and responding to
34 social concerns. It could therefore produce more democratic, less conflict-
35 prone and more effective interventions.

36

37 **Keywords**

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

40 **Introduction**

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

51

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

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

73

74 **Social impacts of invasive species management**

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

92

93 **Established approaches**

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

109

110 The Global Invasive Species Programme (GISP; Wittenberg & Cock 2001) has
111 previously advocated *social marketing* as a means of increasing public engagement
112 in invasive species management. This and related frameworks focus directly on
113 eliciting behaviour changes in individuals and/or communities (Michie, van Stralen &
114 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
116 some areas of invasive species management, for example, implementing biosecurity
117 practices and encouraging reporting of recent arrivals. However, in their will to
118 achieve pre-set goals through manipulation of social desires, and in the absence of a
119 political or deliberative process, they may well be as paternalistic or anti-political as
120 the top-down policy models they purport to replace. Furthermore, management
121 activities targeting established species or recent introductions, which are often the
122 focus of social disputes, infrequently require specific behaviours or behavioural
123 change on the part of affected communities: rather, they require communities to
124 engage with, support, or at least accept, management interventions (often delivered
125 by others).

126

127 *Social feasibility assessments* can be used to predict how likely stakeholders are to
128 accept interventions and to evaluate whether a project is deliverable, risky or
129 untenable. Judgments about socio-political acceptability are commonplace but often
130 occur as a tacit component of policy and management planning. Managers and
131 policy-makers may avoid bringing forward projects on the basis of anticipated
132 opposition. Whilst preventing investment in unworkable ideas, this might also
133 preclude opportunities for deliberation and innovation. Internal judgements of
134 feasibility may therefore lack transparency and wider participation. This means that
135 not only can powerful interests dominate 'behind the scenes', but also that when
136 'feasible' projects are implemented, those excluded may seek to make their voices
137 heard in other ways, such as legal action, generating negative publicity, protesting or
138 active disruption. Consequently, where social feasibility judgements are internal,
139 powerful or vocal minorities can disproportionately influence outcomes. Social

140 feasibility assessments are becoming more explicit, systematic and evidence-based
141 and Gobster (2013) has proposed a model to help predict human responses to
142 management projects. However, even explicit social feasibility assessments are
143 limited because they incorporate no means of addressing the challenges they reveal:
144 a feasibility assessment might find, for instance, that 80% of pre-defined
145 stakeholders support a proposal, and indicate why 20% oppose, but offers no means
146 of addressing that opposition or understanding the ways that the opposing voices
147 may be mobilized in future.

148

149 **Emerging approaches**

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

159

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

165 societal awareness of and responsibility for biological invasions (Nowotny 2003).
166 However, a review of public participation in Australian invasive vertebrate
167 management projects found that educational and top-down approaches to
168 participation were still more prevalent than deliberative and democratic models
169 (Ford-Thompson *et al.* 2012).

170

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
174 between interested parties, including governments, organisations and affected
175 communities (Moon, Blackman & Brewer 2015). Whilst some examples of co-
176 management are emerging in relation to established invasive species (Robinson &
177 Wallington 2012), this approach may be less suitable for rapid response control, or
178 projects encompassing large regions or wider publics.

179

180 *Structured decision making* (SDM) sits between technocratic (analytic) and fully
181 deliberative decision-making – it is therefore referred to as an *analytic-deliberative*
182 approach (Burgess *et al.* 2007). SDM assumes that a decision needs to be made
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
185 side involves collection and processing of technical and ecological data, which is fed
186 into iterative, participatory processes. SDM utilises a range of tools, often
187 incorporating multi-criteria decision analyses (MCDA; Estévez, Walshe & Burgman
188 2013), but also citizen juries, workshops, and deliberative mapping. SDM could have
189 extensive application for invasive species management (Estévez *et al.* 2015), but is

190 not without challenges. First, analytic-deliberative tools normally require an
191 understanding and prediction of potential social, environmental and economic
192 impacts of management alternatives *before* they can be evaluated and compared.
193 Social impacts can be difficult to measure, and may be poorly represented in the
194 MCDA process (Estévez, Walshe & Burgman 2013). Second, some social impacts
195 arise in response to procedural issues (rather than as consequences of an
196 intervention). SDM can therefore run the risk of creating unintentional social impacts
197 through its implementation, especially where there are histories of distrust or tension
198 among stakeholders and authorities.

199

200 **Social Impact Assessment**

201 Social Impact Assessment (SIA) was developed alongside Environmental Impact
202 Assessment (EIA) (Esteves, Franks & Vanclay 2012). While both assess the
203 potential impacts of development projects, and are used to inform planners, they
204 differ in philosophy and procedure. SIA focuses on human and community impacts of
205 interventions rather than 'environmental' impacts, although close interconnections
206 between humans and their environments mean that social and environmental
207 impacts can rarely be cleanly differentiated. SIAs are also initiated earlier than EIAs,
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
210 discussion (Vanclay 2012). Most substantially, EIA is largely completed before a
211 project begins, so the assessment is a product that informs decision-makers. SIA
212 can be conducted in this manner but is better implemented as a *multi-stage social*
213 *process* comprising prospective assessment, mitigation during delivery and
214 retrospective appraisal of outcomes (Vanclay *et al.* 2015). SIA therefore now

215 comprises “the processes of analysing, monitoring and managing the intended and
216 unintended social consequences, both positive and negative, of planned
217 interventions” (Vanclay 2012). ‘Planned interventions’ have elsewhere comprised
218 large-scale development projects, urban planning and nature reserve designation,
219 and we suggest that invasive species management might be subject to the same
220 due diligence as would be expected of other such civic and private initiatives.

221

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
224 has features in common with SDM, and we suggest that SIA could be integrated with
225 relative ease into governance structures based on an SDM model. Indeed, SIA could
226 facilitate effective SDM: contemporary SIA is highly reflective, and scoping
227 procedures include consideration of how management planning processes, and the
228 SIA itself, might affect and be received by concerned publics. SIA can also be
229 adapted to risk-based governance structures, where it could be used to augment
230 existing risk assessment/management procedures.

231

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

239

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

247

248 **1. Scoping**

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

265 the 'grey' literature of management and policy publications (e.g. IUCN 2013; Zalom
266 *et al.* 2013).

267

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

283

284 **2. Assessment**

285 The assessment stage likely involves the greatest investment of resources,
286 particularly where numerous or significant social impacts have been identified by
287 scoping. Frameworks have been developed to assess the social impacts of invasive
288 species (Binimelis, Monterroso & Rodríguez-Labajos 2007; Marshall *et al.* 2011) and
289 a similar approach can be taken to assess their management. Indeed, both

290 assessments could be made in tandem to compare active management alternatives
291 with 'do nothing' options. Assessments should start with a 'stakeholder' or public
292 analysis (see Reed *et al.* 2009), ideally using a participatory method, that identifies
293 the interests, needs, aspirations and concerns of affected communities. Analyses
294 should take into account the composition and geographies of communities, the
295 relationships between them and their varying degrees of vulnerability and power.
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).
303 Potential impacts can be explored using a wide range of methods, including surveys,
304 focus groups, interviews, participatory mapping and scenario-building.

305

306 **3. Decision-making**

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

323

324 **4. Implementation**

325 The SIA process does not end with decision-making. Responding to unexpected
326 social impacts throughout project lifetimes can be more valuable than predicting
327 them (Vanclay 2012) and given that invasive species managers are often required to
328 respond to dynamic scenarios, a capacity to adapt is all the more valuable (Prévo-
329 Julliard *et al.* 2011). Key functions of SIA in the implementation stage are to ensure
330 that interventions remain adaptive and responsive to emerging issues, and to
331 maintain active engagement between managers, affected communities and
332 interested publics. The creation of diverse, inclusive project management and
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
336 media presence.

337

338 **5. Appraisal**

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

350

351 **Challenges to adoption**

352 Perhaps the greatest challenge to incorporating SIA into invasive species
353 management is that this is not a method for gaining social acceptance of pre-
354 determined projects. Consequently, should this process be adopted there will be
355 occasions where initiatives, at least in their original form, will be rejected because
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
358 also worth reiterating that SIA directly allows for the *positive* social impacts and
359 opportunities of management to be explored and maximised.

360

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
364 the impacts ‘that count’ (Vanclay 2012). This is particularly true of cultural or
365 personal, often emotional, attachments to places, species, and individual organisms,
366 the strength and significance of which should not be underestimated. However,
367 methods to assess and express cultural, personal and ethical values are being
368 developed (Chan *et al.* 2012) and applied to management planning (Lynn 2012;
369 Context 2015). Second, whilst frameworks can be devised and adapted, there is no
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
372 novel or unexpected issues. We have emphasized the importance of appraisal and
373 sharing experiences, but adaptation and adjustment of the process will need to be
374 continuous. Third, for SIA to be effective, managers need to develop trusting
375 relationships with stakeholders and affected communities, which includes
376 recognising and working to address power imbalances. Previous failures, or existing
377 animosity, can increase the perceived risks of management and decrease
378 confidence in its potential for success (Evans, Wilkie & Burkhardt 2008). Early,
379 meaningful public engagement may therefore be vital in achieving sustainable
380 outcomes for invasive species management (Ford-Thompson *et al.* 2012; Moon,
381 Blackman & Brewer 2015), and SIA provides a practical mechanism for delivering
382 this.

383

384 In conclusion, many invasive species management projects receive widespread
385 societal support and achieve successes that protect economies, public health,
386 biodiversity and ecosystems. However, like any environmental intervention, invasive
387 species management can create negative social, economic and environmental

388 impacts that need to be evaluated against alternatives. Social impact assessment is
389 constructive, pragmatic, flexible, and well placed to contribute to democratic
390 decision-making. As the 'deliberative turn' (Parkins & Mitchell 2005) in environmental
391 management picks up pace, we propose that social impact assessments could very
392 usefully be incorporated into invasive species management.

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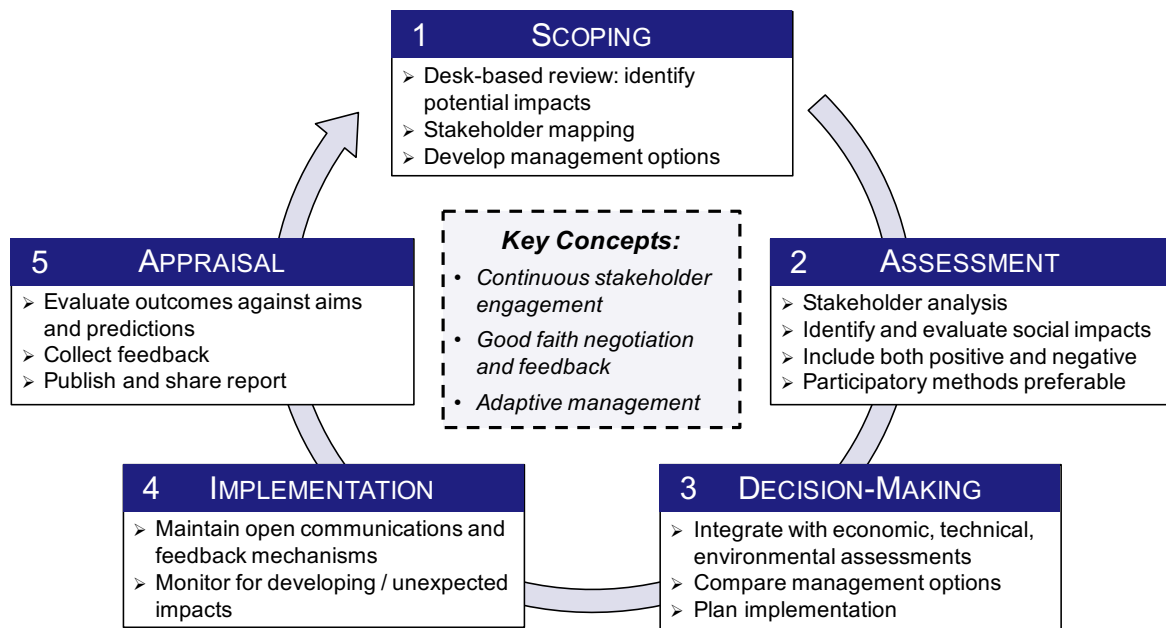
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572 *Figure 1. Social Impact Assessment framework, adapted for application to invasive*
 573 *species management.*