MINI REVIEW

Determining Where the Wild Things will be: Using Psychological Theory to Find Tolerance for Large Carnivores

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Abstract

We review recent empirical efforts to understand human tolerance for large, terrestrial carnivores, and highlight how psychological theory on hazard acceptance can help conservation scientists explain, and ultimately increase, human tolerance for these species. For hazards in general, and for carnivores in particular, the majority of variation in acceptability judgments can be explained by the perceptions of risks and benefits associated with the hazard. Factors such as affective (emotional) reaction to a species, personal control over the risks, and trust in managing agencies are important, but secondary factors. Experimental research highlights the importance of communicating the benefits of a species to increase tolerance. In combination, these findings point to a need to rethink communications about carnivores that focus solely on lowering perceived risk by increasing individual control over the hazard. Such efforts may inadvertently decrease tolerance by overlooking the distinct and important role that the positive outcomes (i.e., benefits) associated with carnivores can play when evaluating the acceptability of a particular population or management action.

Introduction

Large, terrestrial carnivores are making a comeback in the United States and Europe. Cougars (*Puma concolor*) are moving back into the Midwest (LaRue *et al.* 2012), gray wolves (*Canis lupus*) are expanding their range in the American West and Midwest (74 Fed. Reg. 15123, 76 Fed. Reg. 81666), and the grizzly bear (*Ursus arctos horribilis*) population in the Greater Yellowstone region is on the rise (Eberhardt & Briewick 2010). Likewise, wolves and brown bear are expanding their range and numbers throughout much of Europe (Enserink & Vogel 2006). Despite such successes, large carnivores remain prone to high extinction risk due to their relatively small populations, large habitat requirements, and slower growth rates (Purvis *et al.* 2000). Carnivores appear to be particularly sensitive to human persecution, especially when institutionalized by governments (Kellert *et al.* 1996; Dalerum *et al.* 2009). Government-sponsored efforts to exterminate large carnivores in the United States during the late 19th and early 20th Centuries were so successful that, by 1930, cougar, grizzly bear, and wolves had been mostly eradicated east of the Rocky Mountains (Mattson & Merrill 2002; Feldman 2007; McCollough 2011).

Our ability to effectively reduce and even eliminate carnivores through concerted action suggests that human tolerance for these animals will define their distributions and densities, highlighting the need for understanding the psychological mechanisms that promote or inhibit tolerance for these species. The need is made more acute by recent research indicating large, terrestrial carnivores change the composition of ecological communities via their impact on sympatric ungulates and mesopredator populations (Ripple & Beschta 2004a,b; Prugh *et al.* 2009). For example, research suggests large carnivores limit ungulate densities, which decreases ungulate herbivory, and impacts the recruitment of a variety of plant species (Ripple & Beschta 2012). Thus, the reintroduction and recovery of wolves in Yellowstone National Park (USA) corresponded with a decrease in elk (*Cervus*

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elaphus) populations, an increase in woody browse, and the recovery of riparian plant communities (Beschta & Ripple 2010). Yet, the realization of such ecological benefits may not be possible in systems where human-caused mortality is relatively high (see Mech 2012). Our ability to conserve large carnivores and obtain the ecological benefits associated with these species will ultimately depend upon human tolerance for their existence. However, if tolerance for carnivores is to be maintained and promoted, we must understand the factors that lead people to become intolerant. To that end, we briefly review recent empirical efforts to understand the psychology of tolerance for large carnivores, and highlight how psychological research on hazards can help explain and potentially increase tolerance for carnivores.

What is "tolerance" for wildlife?

In a 2009 analysis of the threats faced by wolves in the northern Rocky mountains, the U.S. Fish and Wildlife Service (USFWS) argued that the primary cause of wolves' extirpation was human intolerance for the species:

> *"…attitudes toward wolves is the main reason the wolf was listed under the [Endangered Species Act of 1973]…[p]ublic hostility toward wolves led to the excessive human-caused mortality that extirpated the species from the [northern Rocky Mountains]…in the 1930s… Because of the impact that public attitudes can have on wolf recovery, we are requiring adequate regulatory mechanisms to be in place that will balance negative attitudes toward wolves in the places necessary for recovery" (74 FR 15175).*

Thus, the USFWS acknowledged that the success of wolf conservation depends upon public policy (i.e., "regulatory mechanisms"), human behavior (i.e., "human-caused mortality"), and human cognition (i.e., "attitudes"). That anthropogenic factors contribute to the success of carnivore populations is well-established (Woodroffe 2000; Linnell *et al.* 2001); what is less well understood is how such factors relate to one another, conceptually. Indeed, although studies assessing attitudes or opinions about large carnivores abound, there appears to be little agreement upon how these psychological constructs are best conceptualized or measured. Researchers have assessed attitudes toward species (Bath *et al.* 2008; Treves *et al.* 2013), judgments concerning the acceptability of management actions (e.g., lethal control) (Bruskotter *et al.* 2009; Vaske *et al.* 2013) and carnivore populations (Riley & Decker 2000), as well as intentions to engage in supportive (e.g., sign a ballot measure) or oppositional actions (e.g., shoot/kill the animal) (Bright & Manfredo 1996; Treves & Martin 2011).

A useful analogue for understanding the relationships among these concepts is provided by research on prejudice. Linn (1965) defined prejudice as an *attitude*, reserving the term "discrimination" for overt *behavior*—that is behavior undertaken with the intent of impacting persons or groups of people that are the target of prejudicial attitudes (see Schneider 2004 for review). We take a similar view of tolerance for wildlife; that is, tolerance may take both attitudinal (e.g., attitudes toward a species, judgments concerning the acceptability of a species) and behavioral forms (e.g., overt illegal killing, political protests). Yet, although attitudes are important predictors of behavior (Ajzen & Fishbein 2005), one may hold negative attitudes toward a species and still not engage in any behavior that threatens or otherwise impacts its conservation. Even if motivated, few people are likely to have the opportunity and skill to locate and kill elusive carnivores. Therefore, Bruskotter and Fulton (2012) argued that behaviors, or alternatively, behavioral intentions (one's intention to engage in a behavior) are the best indicators of tolerance for a species—that is, the most likely to actually impact carnivore populations.

In general, *tolerance* can be defined as passive acceptance of a wildlife population (Bruskotter & Fulton 2012). In contrast, *intolerance* occurs when an animal or population becomes unacceptable (a judgment or attitude), or in a more extreme form, when that attitude leads an individual to take action with the intent to kill an individual animal or reduce or eliminate that population (a behavior). This inclusive definition of tolerance allows for a broad integration of past research that examines general attitudes toward species, judgments regarding the acceptability of species, management actions, or policies, as well as intentions to engage in supportive or oppositional behavior. Specifically, following a half century of psychological research on attitudes and behavior (Fishbein 1967; Ajzen & Fisbbein 1974; Ajzen & Fishbein 2005), we view the types of judgments or attitudes studied in prior research on large carnivores as the antecedents of overt, intentional behaviors aimed at these species. Psychological theory also provides a useful starting place for understanding how people formulate such judgments, and ultimately, why they choose to act in ways that promote or inhibit carnivore conservation.

Toward a psychological approach: carnivores as hazards

Research has illuminated a variety of perceptual factors that could impact judgments about carnivore management and the acceptability of carnivore populations. For example, research indicates that beliefs about the general outcomes (or impacts) one associates with a species

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or a proposed management action can strongly influence judgments concerning the acceptability of the species or management action (Bright & Manfredo 1996; Decker *et al.* 2006; Lischka *et al.* 2008; Bruskotter *et al.* 2009). This proposition is consistent with attitudinal research in psychology, which suggests that one's attitude toward a particular object is a function of one's salient beliefs about the object (Fishbein 1967). So intuitively, if one believes that the recovery of a large carnivore population will result in substantial negative outcomes for people or ecosystems (e.g., livestock depredations, reduction in valued game populations), then that individual should be more supportive of efforts to reduce or eliminate that population.

Research from the risk-based judgment and decision-making literature provides similar insight into how individuals may formulate judgments about the acceptability of carnivore populations, namely that an individual's willingness to accept a hazard is largely a function of the *perceived risks* and *benefits* associated with that hazard (Siegrist 2000; Siegrist *et al.* 2000). By focusing on these risk-benefit beliefs, the hazard-acceptance model implies that the acceptability of a hazard is, first and foremost, the result of a kind of rational weighing of the costs and benefits associated with that hazard. However, decades of research on risk perception demonstrate that there is a significant mismatch between rational, technical assessments of the risk associated with a hazard and public perceptions or lay judgments (Slovic & Peters 2006). Specifically, technical assessments assume that the likelihood of an event occurring is just as critical to an evaluation of overall risk as the consequences should it occur. Further, hazards that are high risk can simultaneously be high benefit, and therefore acceptable (e.g., chemotherapy treatments for cancer). However, lay judgments or "intuitive risk" tends to be driven largely by the outrage that is felt over the potential consequences (Sandman 2004), essentially downplaying the role of the likelihood of exposure to a risk. Further, lay judgments of risk tend to be inversely related to perceived benefits, meaning a hazard that is risky cannot simultaneously be beneficial (Finucane *et al.* 2000). The relevance of this mismatch for understanding public attitudes and perceptions toward carnivores, is demonstrated by past research where the dread invoked by thinking about a potential (albeit low likelihood) negative carnivore encounter drives up risk perception and related fear, despite the fact that the calculated or measurable risk may be low (Johansson & Karlsson 2011; Roskaft *et al.* 2003).

As a result of this mismatch between objective or measurable risk and perceived risk, communication efforts focused largely on the low probability of negative consequences when it comes to particular species of wildlife are not likely to be effective at building more informed lay risk judgments or encouraging the adoption of appropriate risk mitigation behavior (Fischhoff 1995). Hazard-acceptance theory explicitly addresses this dilemma by positing that the risks and benefits one associates with a hazard are not necessarily a result of a logical cost-benefit analysis, rather they are a function of the *social trust* one perceives in a management authority; that is, the agency charged with managing a hazard (Siegrist 2000; Siegrist *et al.* 2000). Specifically, trust serves as a heuristic, or decision-making shortcut, where if one trusts the managing agency he or she will both believe the information being provided and act in accordance with relevant recommendations (Griffin *et al.* 1999). In the context of carnivore conservation, hazard-acceptance theory would predict that greater trust in wildlife management agencies leads to lower perceived risks and higher perceived benefits associated with the species, which in turn leads to greater acceptance of the hazard (i.e., species or population).

The judgment and decision-making literature provides additional insight into how perceptions of risk and benefit are formed, further contrasting technical risk assessments with public intuitions about risk. Importantly, classic risk management involves hazards that cannot be controlled by the general public (e.g., nuclear power or nanotechnology), making trust a particularly important component of risk-benefit perception. However, large carnivores are different from typical hazards explored in the dominant risk literature because control over the risks is not only attributable to external management agencies, but also to the actions of the individual. For example, a livestock producer might avoid depredations by adopting better animal husbandry practices (Musiani *et al.* 2005), and a homeowner living in bear habitat may avoid conflicts by removing food attractants. Consequently, another important variable for understanding perceived risk-benefit and acceptance is *perceived control*—that is, beliefs about one's ability to avoid negative outcomes through one's own actions. High perceived control is often demonstrated through an internal locus of control (e.g., people can get good outcomes and avoid bad outcomes through their own actions), high self-efficacy (e.g., I have the ability to engage in these actions), and high response efficacy (e.g., my actions will result in the desired outcome) (Floyd *et al.* 2000). It follows that as perceived control increases, risk perceptions should decrease, benefit perceptions should increase, and individuals should demonstrate greater acceptability or tolerance. This hypothesis is well supported in the risk literature (Slovic 1987; Kahan *et al.* 2007), as well as in a recent study that examined tolerance for black bears. Specifically, Zajac et al. (2012) found a strong negative association ($\beta = -0.53$) between perceived control and perceived risks from bears. In other recent

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carnivore-specific studies these two dimensions of control and risk are actually treated as one related construct (i.e., danger) (Johansson & Karlsson 2011).

Perceived control over wildlife-hazards might also moderate the influence of trust on risk perceptions. Specifically, when people are knowledgeable about a hazard, the influence of trust on acceptance of the hazard decreases (Siegrist & Cvetkovich 2000). One possible explanation is that people are empowered by knowledge; that is, they have a greater sense of perceived control over the hazard and believe that they can take action to protect themselves from the hazard. In the case of carnivores, if one believes he or she can reduce the risks associated with a species through their own actions, or that there is no "real" risk, the actions of the management authority and one's trust in that authority become less important as a predictor of perceived risk-benefit.

Finally, *affect*—one's instinctual and emotive response to a species—is also an important predictor of risk-benefit perceptions. Affect is commonly defined as the psychosomatic response one has to a stimulus that is based on past direct and indirect experience with the stimulus (Damasio 1996). Although valenced as positive or negative when measured, affect is believed to operate at a subconscious level, often informing our thoughts and choices without any conscious recognition (Bechara *et al.* 1997; Zajonc 2000). These affective reactions are believed to both directly influence behavior (e.g., causing us to freeze upon encountering a bear in the woods), as well as influence future information processing and higher order beliefs (see Wilson 2008 for a detailed discussion of dual processing and affect in the context of wildlife conservation). For example, research on the affect heuristic indicates that affective responses to a stimulus (in this case, a species) are what drive the previously mentioned inverse relationship between perceived risk and perceived benefit (Finucane *et al.* 2000). Specifically, positive affective responses drive up perceived benefit and drive down perceived risk, and vice versa, negative affective responses (which precede emotional responses like fear) lead to high perceived risk and low perceived benefit. Slagle et al. (2012) found support for these relationships in the context of wolf conservation in the United States, where, in particular, positive affect for the species led to a stronger belief ($\beta = 0.86$) in positive outcomes (i.e., perceived benefits) and greater intentions to support wolf recovery ($\beta = 0.16$). Similarly, Johansson and Karlsson recently found that fear of bears and wolves (which is driven by negative affective tags associated with predatory wildlife) was positively associated with the perceived danger and uncontrollability of wildlife encounters (Johansson & Karlsson 2011).

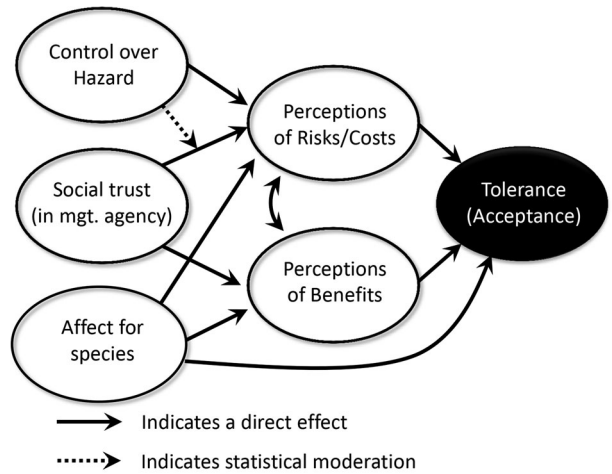

Figure 1 Proposed hazard-acceptance model modified for use with large carnivores.

In summary, a review of the relevant literature predicts that acceptance of wildlife-hazards is directly affected by perceptions of risk and benefit associated with that species, and those perceptions of risk and benefit are, in turn, a function of perceived control over the hazard, trust in the management agency, and affect for the species. Affect, in and of itself can also have a separate and direct effect on acceptance above that which is mediated by perceived risk-benefit (Figure 1). Recent research lends strong support to the use of hazard-acceptance models for understanding tolerance for large carnivores (Slagle *et al.* 2012; Zajac *et al.* 2012). Zajac et al. (2012) found that risk and benefit perceptions explained nearly 70% of the variability in the preferred population size of black bears in Ohio (i.e., wildlife acceptance capacity). Likewise, Slagle *et al.* (2012) found that the same two hazard-acceptance model components, along with a measure of affect for wolves, explained more than 80% of intended intolerant political behaviors (e.g., writing or phoning one's congressperson). Conceptually similar research undertaken to explain acceptance of tigers (*Panthera tigris*) around a national park in Nepal found that perceived benefits and perceived vulnerability (i.e., risks) together explained 51% of the variance in people's acceptance (as gauged by preferred population size) (Carter *et al.* 2012). To date, these studies offer the most parsimonious explanation of tolerance for large carnivores.

Communicating about carnivores: why benefits are important

Using psychological theory to understand human tolerance for large carnivores allows researchers to gain

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insights from empirical work on other hazards. Interestingly, recent research indicates that the perceived benefits (as opposed to risks) tend to be stronger predictors of acceptance for a wide variety of hazards (Bronfman & Vazquez 2011; Ascher *et al.* 2012). Replicating this finding, Carter et al. (2012) found that the strongest predictor of acceptance of tigers in Nepal were the perceived benefits associated with this species ($\beta = 0.49$). Similarly, Slagle et al. (2012) found that benefit perceptions were a better predictor (than risk perceptions) of respondents' intentions to support wolf recovery in the United States ($\beta = 0.67$ [benefits]; -0.13 [risk]). Lending further support to this finding, a recent experimental study that tested the effect of different types of messaging on tolerance for black bears found that tolerance for bear populations increased when subjects viewed messages that contained information about the benefits of bears (Slagle *et al.* 2013). Presenting information about how to avoid or reduce the risks associated with bears (without information about benefits) actually lowered tolerance, while tolerance was increased the most when participants were given information about both the benefits and ways to control the risks.

Despite evidence that the perceived benefits are critical for communication for a variety of environmental hazards, risk communication traditionally focuses on manipulating perceived risk or using fear appeals paired with information about how best to protect oneself to motivate action. Specifically, decades of research in the health domain suggests that protective behavior results from (1) a high threat appraisal (i.e., a belief that negative consequences are likely and outweigh the benefits of not taking action), followed by (2) a high coping appraisal (i.e., high perceived control, or a belief that one is both able to take action to protect themselves and that taking such action will successfully lower the risk) (Witte & Allen 2000). Alternately, individuals who have a high threat but low coping appraisal often engage in fear protection. In the context of carnivores, our previous research suggests that fear protection resulting from too much focus on the risks and necessary action, and not the benefits, could lead to an immediate reduction in tolerance for that species (Slagle *et al.* 2013). In order to counteract this tendency, and promote greater acceptance while encouraging individuals to take appropriate action when necessary (e.g., keeping trash contained in bear country), risk communication must include the benefits of the species while still ensuring that individuals feel able to cope with any potential risk.

By separating the risks from the benefits, hazard-acceptance theory better explains tolerance for carnivores *and* provides useful insight into how best to frame messages so as to increase tolerance. It also help explain why exposure to news media coverage about carnivores—messages that do not typically discuss their ecological benefits (Houston *et al.* 2010)—tends to be negatively associated with tolerance for these species (Gore *et al.* 2006). This is an important lesson for agencies and nongovernmental organizations that communicate with the public about large carnivores: people's tolerance for these species will depend (in part) upon their perceptions of benefits. Thus, communications and public outreach that focus solely on how to avoid or reduce risk may actually decrease tolerance for these species (Slagle *et al.* 2013) (Figure 2). Likewise, when conservation scientists or news media outlets focus exclusively on the risks associated with a species without discussion of their benefits, these communications may reduce tolerance by inflating perceived risk—even if the communication is directed at helping people understand, and then avoid or reduce those risks.

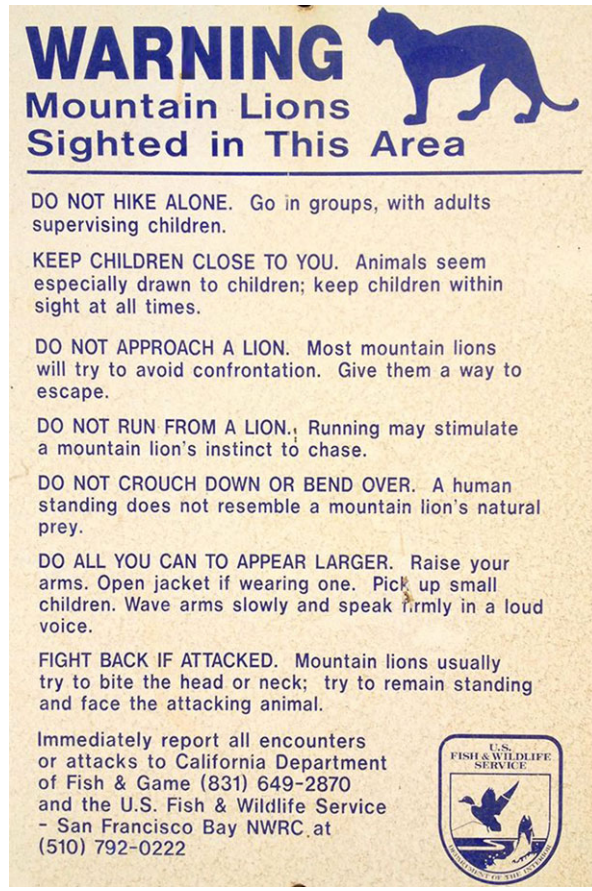

Figure 2 Our research suggests that communications—like this sign—that provide information on how to avoid or survive carnivore attacks without any information about the ecological benefits of carnivores, may heighten risk perceptions, ultimately leading to lower tolerance for these species (Image courtesy of Jim Doty, Jr.).

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Mech (2012) recently chastised scientists and the news-media alike for "sanctifying the wolf" by overstating research purporting to show ecological benefits associated with wolves. We do not advocate the promotion of tolerance through such distortions. Indeed, conservation professionals who purposefully distort research to prevent a more favorable view of these species risk losing credibility, and ultimately undermine their own efforts. Rather, it is our view that communications that (1) assist people in formulating accurate perceptions of the risks *and* benefits associated with carnivores, and (2) provide specific actions individuals can take to reduce their own risk will be most effective for promoting tolerance. Hazard models also suggest an explicit role for wildlife management agencies beyond simply providing information; specifically, any actions taken by agencies that result in increased trust in that agency have the potential to impact perceptions about the risk and benefits associated with carnivores—indirectly impacting tolerance. Conversely, when agency personnel use divisive rhetoric or engage in actions that otherwise lower trust, they risk inadvertently reducing tolerance for these species. For example, in a recent newspaper article the Utah Director of Natural Resources compared the reintroduction of wolves to a "resurrection of the T. rex" asserting that wolves are a "biological weapon" (Bruskotter *et al.* 2011). Trust is believed to be multidimensional, involving both relational trust (e.g., an assessment of shared values and goals) as well as calculative trust (e.g., an assessment of past performance that is likened to confidence in one's ability to carry out a task) (Earle 2010). In order to build trust broadly, agencies should highlight the fundamental values and goals that they share with stakeholders (e.g., the protection of human safety and property), as well as document and publicize past and ongoing management success when it comes to achieving those shared goals (Eiser *et al.* 2009). Highlighting values that favor some stakeholders over others (as in the quote above) is likely to exacerbate conflict over carnivores.

Our review has focused on the use of psychological theory to help promote carnivore conservation; however, we recognize that there are instances in which the broad goals of conservation may be better served by reducing a population. In such cases, the same models and recommendations apply—though the focus may be more on the costs or impacts associated with the species. We also recognize that the acceptability of the methods used to conserve and manage carnivore populations is likely to vary considerably, and this variability may cause considerable consternation for management agencies. Though our review highlights empirical support for the use of hazard-acceptance models across a variety of contexts, there will be instances in which individuals do not view carnivores as hazards, but rather, a potential source of revenue. Such instances are more likely in resource-dependent communities, where the benefit accrued to the individual from killing the animal, may far outweigh the perceived ecological benefits associated with its presence. Such scenarios challenge the applicability of hazard-acceptance models, and necessitate further research to demonstrate their generalizability. Finally, although the use of psychological theory can help us understand why people take actions in opposition to or support of carnivores, it cannot tell us which actions are *right* from an ethical standpoint. Such questions are best handled by environmental ethicists.

Finding tolerance for large carnivores will be an ongoing challenge in the face of increasing human populations, changing land uses, and global climate change. This challenge will undoubtedly require concerted efforts from conservation professionals with a variety of disciplinary expertise. Psychological theory can help us understand how individuals formulate judgments about the acceptability of these animals, and knowledge of risk communications can help us ensure our messages about these species are framed such that they have the desired effect. Our research suggests that efforts to promote tolerance of carnivores can be enhanced by a focus on the benefits—ecological and otherwise—that people derive from these species. Ultimately, the benefits we perceive—not the risks—may determine where 'the wild things' will be.

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