



Predator-Friendly Beef Certification as an Economic Strategy to Promote Coexistence Between Ranchers and Wolves

Carol Bogezi^{1*}, Lily M. van Eeden², Aaron Wirsing¹ and John Marzluff¹

¹ School of Environmental and Forest Sciences, College of the Environment, University of Washington, Seattle, WA, United States, ² School of Life and Environmental Sciences, University of Sydney, Sydney, NSW, Australia

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*Correspondence:

Carol Bogezi
cbogezi@gmail.com

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Real and perceived economic losses are key factors driving negative attitudes and lack of tolerance toward carnivores. Alleviating economic losses through compensation and market-based strategies is one tool for addressing negative human-carnivore interactions. Despite general support among the public for market-based economic incentives to improve coexistence with predators, products marketed as “predator-friendly” are rare in mainstream markets. We explored stakeholders’ perspectives on certification of predator-friendly beef as a market-based economic incentive to enable ranchers to better coexist with gray wolves (*Canis lupus*) in Washington State, USA. We conducted semi-structured interviews ($N = 104$) and explored narratives using grounded theory to understand the perspectives of stakeholders involved in the cattle-wolf relationship, including ranchers, wildlife agency personnel, environmental non-government organization employees, beef industry workers, and politicians. Both economic and social factors motivated and constrained ranchers to participate in a program creating a predator-friendly beef label. Ranchers largely perceived marketing their products as predator-friendly to be more of a public outreach opportunity than a new source of income. Most stakeholders perceived an economic opportunity for predator-friendly beef facilitated by existing pro-environmental markets and existence of a private beef processing plant. Based on these results, we propose a design for effectively implementing a predator-friendly beef market. We recommend focusing on the type and objective of the rancher, ensuring local access to beef processing facilities to process small volumes of custom beef, developing a product brand that is favored by ranchers and beef processors, considering viable product pricing, and developing a regulatory process for a potential predator-friendly beef label on the mainstream market.

Keywords: *Canis lupus*, economic incentives, green marketing, human-wildlife conflict, wildlife-friendly certification, predator-friendly beef

INTRODUCTION

Large carnivores can provide ecological (Schmitz et al., 2000; Beschta and Ripple, 2010; Ripple et al., 2014), recreational (Naidoo and Adamowicz, 2005; Chan et al., 2012), intrinsic (Soulé, 1985; Vucetich et al., 2015), and health (Frumkin, 2001; Wilson, 2001; Bratman et al., 2015) benefits to human society. However, they can also depredate livestock resulting in economic loss

(Muhly and Musiani, 2009), emotional distress (Barua et al., 2013), and retaliatory killing that challenges their conservation (Naughton-Treves et al., 2003; Bradley and Pletscher, 2005). Wide-ranging large carnivores do not recognize protected area boundaries and are therefore prone to roam surrounding anthropogenic landscapes (e.g., private property; Muhly and Musiani, 2009; Athreya et al., 2013). Thus, these negative effects are often exacerbated in rural and exurban areas where protected areas or public wildlands are proximal to human livelihoods (Treves and Karanth, 2003; Treves, 2009; Athreya et al., 2014).

The asymmetrical impacts of many large carnivores often create tension between urban members of society, who disproportionately accrue benefits, and those who share landscapes with these species and suffer consequences (Mech, 2017). Gray wolves (*Canis lupus*), for example, predominantly roam wildlands where they can provide benefits to the public by improving riparian habitats and reducing overgrazing by their prey (Beschta and Ripple, 2010), yet their presence on the landscape (both private and public land) may be costly to rural dwellers. These costs include fear, owing to real and perceived threats to personal safety and pets, and foregone livestock production, whether by depredation (Muhly and Musiani, 2009) or weight loss through behavior-mediated responses of cattle to wolves (Laporte et al., 2010). Thus, rural communities, and especially ranchers, may not acknowledge the ecological benefits of wolves and other predators or consider these benefits to be outweighed by the real and perceived losses (Goldstein et al., 2011).

There are various ways in which society, either through government agencies or non-profit organizations, tries to encourage rural dwellers to coexist with and conserve large carnivores like wolves. These approaches include payments to encourage coexistence such as compensation, revenue sharing schemes, and performance payments (Nyhus et al., 2003; Dickman et al., 2011; Defenders of Wildlife, 2015). The effectiveness of payments to encourage coexistence is debated. Some studies suggest that paid compensation results in alleviating financial loss (Stone, 2009) and reducing retaliatory killing of carnivores (Hazzah et al., 2014), whereas others have documented that payments do little to increase coexistence or improve attitudes toward wildlife in general and particularly wolves (Naughton-Treves et al., 2003; Bulte and Rondeau, 2007). Besides failure to change attitudes, payments to encourage coexistence have other shortcomings including being prone to abuse, not being related to conservation outcomes, and being too dependent on external funding (Dickman et al., 2011).

General public attitudes toward environmental issues including wolf conservation have become more positive since the 1970s, a decade which saw development in the environmental movement resulting in changes to environmental policies and practices in the USA including banning the use of poison in wildlife management and listing wolves as protected under the Endangered Species Act (Jackman and Rutberg, 2015; George et al., 2016). Studies have identified that most of the public prefers non-lethal management tools for resolving carnivore conflicts (Jackman and Rutberg, 2015; Slagle et al., 2017; van Eeden et al., 2018). However, a very specific portion of the public who live in

proximity to wolves and have rural livelihoods such as ranching continue to engage in or promote lethal wolf control, even where compensation programs are implemented (Naughton-Treves et al., 2003; Agarwala et al., 2010; Bruskotter et al., 2010; Treves et al., 2013). As such, there is a need to investigate public-funded alternative economic incentives to improve coexistence between carnivore and rural dwellers.

Market-based economic incentives are one promising avenue for promoting coexistence with biodiversity, including carnivores (Badgley, 2003; Wong, 2009; Early, 2012; Davis et al., 2015; van Eeden et al., 2018). Market-based economic incentives may be achieved through consumer-driven certification, as has been documented for coffee (Schau et al., 2009; Mendez et al., 2010), fisheries (Teisl et al., 2002; Chaffee et al., 2003; Bush et al., 2013), and forestry (Overdevest and Rickenbach, 2006). Organic foods (Yiridoe et al., 2005; Hughner et al., 2007; Janssen and Hamm, 2012), free range chicken and eggs (Scrinis et al., 2017), and grass-finished beef (Melton et al., 1982; Enser et al., 1998; Umberger et al., 2009) are examples of successful food-specific certifications demonstrating that consumers are willing to pay for socially responsible, environmentally sound, and economically viable ranch products through certification. Beef and other meat products can be certified as “predator-friendly,” a designation implying production on ranches where predators are not lethally controlled (WFEN Wildlife Friendly Enterprise Network, 2013). A predator-friendly beef initiative might therefore entail providing certification to ranchers who do not use lethal predator control to protect their livestock, enabling them to sell their product at a premium price. Efforts to pursue such an initiative have been limited, however, as evidenced by lack of predator-friendly meats available in the mainstream market. Currently, some ranchers sell predator-friendly beef directly to consumers but face challenges such as an inability to meet consumer demand for the entire year, while others may have a suitable product but are hindered by limited access to willing consumers (Forero et al., 2014). Buying beef directly from a rancher presents challenges if buying small quantities is not profitable, but large quantities require the buyer to have appropriate, adequate storage. Other challenges include high shipping costs to individuals and transportation of frozen meats (Forero et al., 2014). Some ranchers have successfully sold certified meats at farmers’ markets, online, and schools (e.g., JBarL Ranch in Montana, USA; <https://www.jbarl.com/yellowstone-grassfed-beef>, PastureBird in California, and Ayrshire Farm in Virginia; <http://wildlifefriendly.org/buy-wild/>). However, many large-scale ranchers are “cattlemen” who raise and sell live cows not beef cuts, meaning that changing from cow-calf operations to niche beef markets would entail learning new skills such as marketing (Forero et al., 2014).

Although some studies have investigated certification of predator-friendly beef as a mechanism to increase ranchers’ coexistence with wolves, critical knowledge gaps remain. Most of these studies have focused on demand for rather than supply of predator-friendly beef. For example, Aquino and Falk (2001), Wong (2009), and Eadie (2018) each compared consumer preference for predator-friendly beef to non-certified beef, but these studies did not investigate other stakeholders

involved in the beef market lifecycle. Furthermore, those previous studies on niche beef markets were based on quantitative surveys (Aquino and Falk, 2001; Davis et al., 2015) and economic benefit-cost analyses (Wong, 2009; Lee et al., 2012) that did not incorporate the social context of predator-friendly beef as an economic incentive. Without understanding the social context, critical barriers may remain that restrict ranchers' (and other stakeholders') willingness to participate in a predator-friendly beef market. Finally, politicians often have a prominent voice in natural resource management decisions in rural areas, particularly where the issues are politically polarized, like wolf conservation and management (Nie, 2003). Yet, there are no previous studies comparing the perspectives of politicians and the people they represent (ranchers in this study) about predator-friendly beef as an economic market-based strategy to increase human-wolf coexistence.

Wolves have recently recolonized Washington (WA), a state where cattle ranching contributes between \$705 million and \$3.6 billion dollars to the economy annually (Neiberger et al., 2014; National Agricultural Statistics Services, 2017). The areas to which wolves have returned include those with the highest density beef cattle production in the state (Maletzke et al., 2016; Hanley et al., 2018). This scenario of beef cattle overlapping with a recently returned top predator in a state with a large, localized urban population that shows strong support for wolf conservation (Duda et al., 2008, 2014; Dietsch et al., 2016) provides an opportunity to investigate the feasibility of a local predator-friendly certified beef market.

In this study, we used semi-structured interviews to investigate how various stakeholders concerned with wolves perceived a market-based economic strategy along the entire market chain from the rural producer to the retailer to enable better coexistence with wolves. Quantitative survey methods with prepared questions tend to be limited in revealing the social context and nuanced responses of the participants because these questions can have a priming effect on the respondents (Krueger and Casey, 2000; Asah et al., 2012). Thus, we employed a qualitative approach using grounded theory (Charmaz, 2014). Grounded theory is based on narratives, patterns and themes from the data and moves beyond description to generate a theory of process, actions, or interactions imbedded in the views of the participants (Corbin and Strauss, 2014). We identified and analyzed themes that emerged from stakeholder interviews to explore: (i) the factors motivating or facilitating support for predator-friendly beef; (ii) the constraints for a predator-friendly beef market; and (iii) how different stakeholder groups compared with regard to their perceptions toward predator-friendly beef.

MATERIALS AND METHODS

The research design and protocol described below were reviewed and approved by an Internal Review Board (IRB) of the University of Washington's Human Subjects Division (HSD study #45684).

Data Collection

We used semi-structured stakeholder interviews based on an interview guide that we developed (see **Supplementary Material**) to facilitate exploration of economic incentives for coexistence between humans and carnivores such as wolves and, as part of these larger discussions, focused examination of the specific topic of predator-friendly beef labeling. For the purposes of these interviews, we defined predator-friendly as a certification that would be given to beef produced by ranchers who did not lethally remove wolves from their ranch, and used the terms "predator-friendly beef" and "wolf-friendly beef" interchangeably. We pre-tested the interview guide with three ranchers and one range rider in Montana to ensure that the wording of the questions was open-ended, neutral, and appropriate to the interviewees. All interviews were conducted by CB.

We used a purposeful sampling procedure (Bryant and Charmaz, 2010) to identify and recruit participants to conduct interviews. Unlike random sampling, which assumes that all potential subjects in the population will know or have an opinion about the research topic, purposeful sampling ensures that the sample meets the conceptual and informational needs of the study. The primary essential criterion for inclusion in the study was that all participants had to be concerned with, or affected by, wolf recovery in Washington state. In addition to direct experience, participants needed to be willing and available to participate, reflective, and able to articulate their experience (Bryant and Charmaz, 2010).

We employed snowball sampling once the interviews began by asking interviewees at the end of their interview to suggest other potential participants (Bryant and Charmaz, 2010). Snowball sampling strategies effectively provide a small but concentrated group of individuals with deep and intense knowledge of the relevant subject matter, in our case through their inclusion in the social processes of wolf recovery and conservation in Washington. Thus, the sample included ranchers, hunters, wildlife agency officials, wildlife agency commissioners, elected officials (state politicians and county commissioners), executives of environmental NGOs, beef processors, range riders (cowboys/girls with access to GPS location of wolves), and members of the Future Farmers of America (FFA) student club at Washington State University.

We conducted most of the interviews in person, though one interview with an environmental non-government organization (NGO) employee was conducted over Skype[®], and another was conducted over the telephone. Where participants preferred to be interviewed along with their colleagues or peers, we held focus group interviews. Like interviews, focus groups help one discuss particular topics with flexibility to explore often-unanticipated issues as they arise in the discussion (Bloomberg and Volpe, 2016). Participation in this study was voluntary. All interviews and focus groups were carried out from August 2013 to May 2015 and were audio-recorded with participants' permission.

Data Analysis

We transcribed the interview recordings verbatim (Poland, 1995; Charmaz, 2014) and then coded themes in NVivo v.11 (QSR International Pty Ltd., 2014). We used line-by-line

coding (Saldaña, 2015) to group transcribed responses into categories that closely corresponded to the research questions. We established validity and inter-coder reliability (96.8%) of the study design and data analysis (Miles and Huberman, 1994) by having two researchers code a sample of the same interviews. This initial coding process was conducted until “theoretical saturation” was reached (i.e., when no new data or themes appear; Charmaz, 2014; Saldaña, 2015).

In keeping with grounded theory inductive data analysis, we read and re-read the interview data and then grouped responses as positive or negative responses (or narratives) toward predator friendly beef labeling. We then interpreted the meaning of each narrative and merged narratives with similar meanings into new categories termed “constructs.” Patterns of constructs based on either similarity or differences among respondents are grouped together into themes. Themes can be broad or specific depending on the needs for the study (Ryan and Bernard, 2003). We formed themes that were broad to include the constructs that linked several narratives to a single meaning. We provide an example of how grounded theory was applied to this study in the **Supplementary Material**.

We repeated this process of identifying narratives, constructs, and themes for all the interview responses that were about predator-friendly beef labeling. In the second phase of analysis we queried and compared the themes to see if they were similar or different for the various stakeholders. The process of coding, querying, and comparing was iterative and eventually generated the thematic categories according to stakeholder groups that comprised the findings for this study.

Qualitative research’s primary limitation is concern about researcher bias, which may introduce subjectivity in the analysis of issues due to the researcher’s experience and involvement with the phenomenon under investigation (Bloomberg and Volpe, 2016). Accordingly, we sought to minimize such bias by recognizing research positionality. The lead researcher (CB) did not belong to any of the stakeholder groups interviewed for the study. She comes from an ecological background and asserts that wolves and other top predators, while sometimes destructive to rural livelihoods, belong in the natural landscape and that measures can be taken to protect rural communities from negative interactions that might arise. Furthermore, to prevent bias that might be caused by power dynamics within focus group discussions, including dominant personalities overshadowing others and “group think” (a tendency for participants to agree with each other), we specifically encouraged quieter group members to share their honest opinions.

RESULTS

We held a total of 78 meetings (67 individual interviews and 11 focus group interviews with 37 people) to interview 104 people. Stakeholder groups interviewed included ranchers ($n = 45$), NGO employees ($n = 11$), wildlife agency staff ($n = 19$), wildlife agency commissioners ($n = 2$), beef industry ($n = 4$), hunters ($n = 9$), FFA ($n = 5$), elected officials ($n = 4$), and range riders ($n = 2$). Ranchers interviewed had varying levels of dependence

on the income from their ranches. Large scale ranchers derived their entire livelihood from the ranches while some smaller scale ranchers had alternative jobs in addition to ranching. There were two ranchers who identified as hobby ranchers, and two for whom ranching was a second career after retiring from their first career.

We deduced five major findings (**Table 1**): (1) Both economic and social factors were mentioned as motivating or dissuading ranchers to participate in predator-friendly beef programs. (2) Most ranchers who responded positively toward predator-friendly beef labeling perceived marketing their products as predator-friendly to be more of an education and outreach opportunity than as a new source of income. (3) Some ranchers expressed that labeling their ranch products as predator-friendly would make them more socially accepted by the general public, but at the cost of being ostracized by their neighbors and fellow ranchers. (4) Predator-friendly labeling was considered inferior to grass-finished or organic beef labels, and many ranchers interviewed feared being burdened to prove their beef is legitimately predator-friendly, especially if their neighbors were not participating in the certification program. (5) All stakeholders except county commissioners and FFA perceived an economic opportunity for predator-friendly beef facilitated by existing pro-environmental markets and the existence of a private beef processing plant.

Factors Motivating and Facilitating Support for Predator Friendly Beef

Stakeholders mentioned several factors that they perceived made predator-friendly beef labeling a feasible program for ranchers with positive outcomes for their coexistence with wolves. These included using the predator-friendly label as the vehicle for communication, monetary benefits, and a potential new market.

Ranchers discussed predator-friendly marketing as an outreach opportunity to educate the public about their role as land managers and the reality of living with predators. They mentioned that by having a label showing that ranchers take the extra effort to coexist with predators, consumers will feel that ranchers make efforts to take care of the environment and wildlife more broadly. Ranchers further mentioned that the added price tag may remind consumers of the cost of producing beef in coexistence with predators and thereby communicate the ranchers’ struggles to the consumer.

“I kind of like it, I think that’s a good way of being able to communicate to the consumer that cattlemen are at risk for having predators and with that in mind, we’ve gone to the extent that it takes to make sure that ours are in a safe environment, and that we’ve had to do extra work in order to achieve that. I think it would communicate that there is a threat to people’s livestock and livelihood and that we have to do extra work too; I think that is a good idea, I do.”—Rancher

Ranchers, range riders, wildlife agency staff and commissioners, and NGO employees discussed economic incentive as a motivation based on two approaches: (1) to provide additional income to the participating rancher; and (2) to create a pool

TABLE 1 | Summary of the motivations and barriers that stakeholders had toward predator-friendly beef labeling as a way to enable ranchers to better coexist with wolves in Washington State.

Participant	Motivations and opportunities				Barriers and constraints						
	Communication and outreach	Processing facility	Potential new market	Conditional on existing natural/health beef labels	Limited market and competition	Accountability/verification	Vegetarian/vegan diets	Complex rigid beef industry	Political party affiliation	Historic perspectives	Emotional attachment
Ranchers (n = 45)	X	X	X	X	X	X	X	X	X	X	X
Beef industry (n = 4)					X	X		X		X	
Hunters (n = 9)					X	X		X	X		X
FFA (n = 5)					X	X				X	X
Range riders (n = 2)			X								
Elected officials: (n = 4)				X				X	X	X	
Wildlife agency staff (n = 19)			X	X	X	X				X	
Wildlife agency commissioner (n = 2)			X			X				X	
NGO employees (n = 11)			X		X		X			X	X

The gray-shaded checked [X] cells indicate the motivation or barrier (in the columns) that stakeholders (the rows) responded to.

of money that could be used for wolf-livestock management initiatives (e.g., insurance funds against wolf predation) and provide extra funds to the wildlife agency to manage wolves as well.

Ranchers mentioned the beef processing plant (Livestock Producers Cooperative Association) that had been recently opened in Odessa, WA, as a positive platform for developing a new predator-friendly beef program because it could be used to butcher and cure specialty-label beef to ensure that the labeled meats are not mixed with unlabeled meats. These ranchers mentioned increasing interest among consumers in the source of their meats as a driver for having local processing facilities enabling local ranchers to grow, process, and supply consumers with predator-friendly meats for which the chain of custody is certain.

Another aspect of economic motivation was that there was potential for new markets that would consume predator-friendly labeled products. Both ranchers and wildlife agency staff especially emphasized environmentally aware urban-centered markets (e.g., the greater Seattle area) that would buy these labeled products. Such markets are an opportunity for ranchers to take advantage of increasing “Green Pro-Environment Markets” (Goldstein et al., 2011), as expressed in the following quotation:

“I think that’s ripe for movement and evolution in that direction. I think we are still a long way away from being able to say, ‘wolf friendly beef’ and have that be a positive reaction within the livestock community. Some folks get it. And maybe we’ll need to work on the name [laughs] but, I mean it is no different than just the grass fed, I mean just the grain fed versus grass fed movement, organic, I can see where that will play an important role. Too early still too raw of an issue here in Washington but there are opportunities there.”—Wildlife agency staff

NGO employees placed the most emphasis on the potential of this market group. By implication, NGOs membership bases could be the initial market for this product.

Ranchers, wildlife agency staff, and state politicians mentioned that motivation to participate or purchase predator-friendly meats would be a positive if it were attached as a requirement to existing labels such as animal welfare, organic, or free-range. This way, in addition to the health benefits marketed by these labels, the predator-friendly label could add environmental value to these products. Wildlife agency staff mentioned that predator-friendly labeling is not as high-ranking for consumers as organic and other labels on the market, but they acknowledged that because organic and local products are increasing in popularity on the market, there may be some potential for predator-friendly labeling.

“The [predator-friendly] premium market is probably not as high [in demand] as some of the other markets, although organic stuff continues to do well and everybody likes buying and eating locally, and that’s another, another movement, if you will... I think it’ll be interesting to see how this plays out.” - Wildlife agency staff

The wildlife agency commissioners compared the predator-friendly label to the Forest Sustainability Certification (FSC)

label and suggested having agencies work together in partnership with the local commerce board and ranchers to see if such a certification would work.

“I think we could bring parties together but, since we don’t do anything remotely like that, I would think that we would not want to really get into the business of trying to promote that kind of economic development. I mean, maybe form some partnerships with, their community economic development councils. The advisory, the Department of Commerce had some innovation zone options, so there are departments within state government to try to promote economic development, so they would be the leads in doing something like that. We might try to bring people together but [department name] wouldn’t have much of a role in trying to create marketing networks [laughing] or anything like that.” - Wildlife agency commissioner

Constraints and Barriers to Predator Friendly Beef Certification

Stakeholders mentioned barriers and constraints that could hinder the ranchers from participating in raising or marketing their products as predator-friendly beef. Broadly these barriers are categorized into three: market barriers, administrative and logistical barriers and socio-cultural barriers. Market barriers include competition, limited interest in marketing beef by ranchers, and limited demand from consumers (perhaps due to low meat consumption by wolf conservation advocates). Administrative barriers include rigid beef market, accountability and verification of prospective participants, and inability for ranchers to change their ranching practices easily. Socio-cultural factors include underlying social factors, emotional attachment to livestock more than wolves, fear of being ostracized, anti-government sentiments and political party affiliation.

Some stakeholders perceived that predator-friendly beef would not be as popular as the organic and grass-fed labels and would suffer from competition on the market. Ranchers, beef processors, hunters, wildlife agency staff, hunters, FFA student members, and NGO employees all mentioned that predator-friendly beef would be constrained by competition on the market. They cited existing certifications such as organic and grass-fed beef as superior labels to predator-friendly (also documented by Wong, 2009). Ranchers mentioned that the market for selling beef directly to the consumer is a small niche market and is flooded with organic meats, leaving no room for predator-friendly items. Beef processors mentioned that such a market is limited to niche supermarkets (e.g., Whole Foods, Metropolitan Market), located mostly in western Washington (major urban centers) and rare in eastern Washington (where the livestock processing facilities are). Given the limited market, ranchers would have to sell large quantities of highly priced beef, thus limiting the individuals who can buy it to those with more money and adequate storage facilities. FFA members cautioned that if meat in Washington becomes very expensive because of their predator-friendly label, then individual consumers would purchase meat from nearby Idaho markets, and bulk buyers (e.g., beef processors) would buy from producers in Canada instead of Washington.

Some hunters mentioned that to be feasible, predator-friendly products should have continuous volume in the supply chain and not just a one-off marketing scheme. Some hunters mentioned that price of beef is the factor that most consumers consider when buying beef, and that having a high price on predator-friendly labeled beef would limit the people in the population who can purchase it. Some hunters mentioned that a predator-friendly label would only work when it is new because people will be curious about its novelty but once they get used to it, they will not buy it anymore. Finally, to emphasize the limitations of a market for predator-friendly beef, ranchers, NGOs and wildlife agency staff asserted that the people who are supportive of predator-friendly meat are vegetarians and vegans, so the market is all words and not reality as reflected in the following quotations:

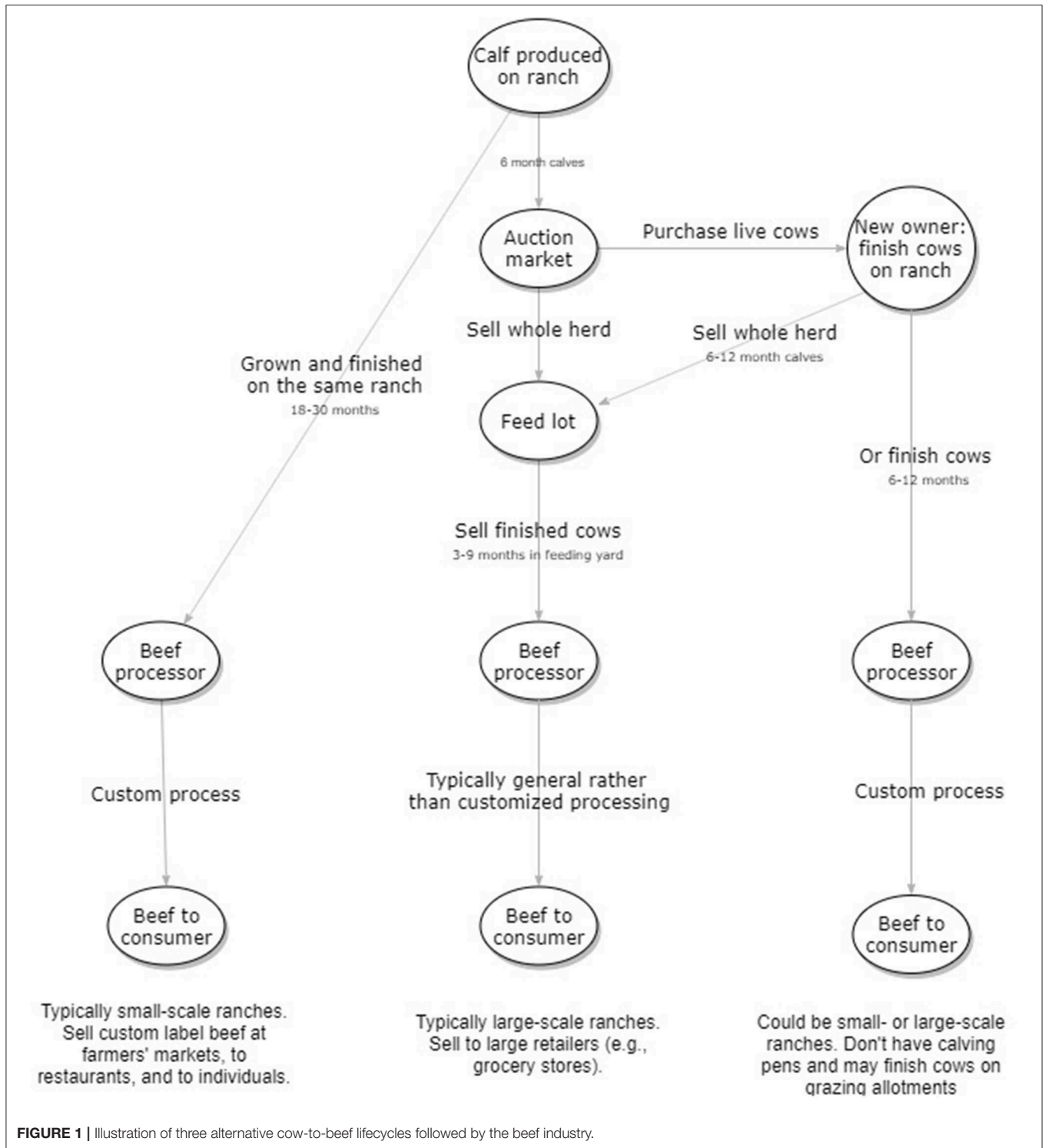
“You know there are people who really know the beef business, the niche for people who care about that [predator-friendly beef] is tiny. I mean there are people who care about it, but unfortunately a lot of people who really care about wolves are vegetarians. So they are not going to be buying beef.”—NGO employee

“I think most of the predator-friendly people probably live within the town limits and have never seen a predator, or know what a predator can do. They eat vegetables, they are probably vegetarians or something like that. But most importantly is that there are not enough to put their money where their mouth is, and actually pay more for that product.”—Rancher

Indeed, some respondents who supported the idea of a predator-friendly label (e.g., NGO employees) stated that they were vegetarian or vegan therefore unlikely to buy beef products for their personal consumption. They did note that they were also pet owners and so may buy the product as pet food.

Some ranchers, beef processors, hunters, FFA members, and wildlife agency employees mentioned that the market for predator-friendly beef will be limited because the beef industry values quality of beef and not the biodiversity conservation practices of the rancher. As cattlemen, ranchers mentioned that they are not interested in looking for markets for individual beef buyers. Ranchers, beef processors, and wildlife agency staff mentioned that of beef lifecycle is a tightly streamlined and rigid process whereby ranchers are constrained from diverting from their existing cow-to-beef cycle to investigate new beef markets (**Figure 1** shows an example of beef lifecycles). Beef processors mentioned that they cannot logistically purchase predator-friendly beef because their market chain is controlled by a corporation and not by individual buyers and sellers. Large scale ranchers who sold calves once a year to a finisher (such as a feedlot) perceived that diverting from their conventional mainstream market for cow-calf ranch operations was a high business risk that would cause financial losses. For example:

“If we sold three steers today at a price of \$400 apiece, I was going to offer the [Principal Investigator of this study] to pay me \$1200 and you take care of taking them to a special plant so they can be federally inspected so you can sell it. You take the cost and market it to Pike Place Market or somewhere in Seattle where there is predator friendly market, you do it and you can have all the profits.



I don't want to go to Pike's Place Market or go into all the work that it takes for [other rancher's name] to get his grass-fed beef. I'm not, I don't want to do that, so if they really do think that there is a predator-friendly market out there, if people think that, then just pay me my \$1200 and I get out right now and have you take it over, right guys.—Rancher

Beef processors and FFA members perceived that producing predator-friendly beef would be more complicated husbandry than what ranchers are currently using. They mentioned that to achieve perfect coexistence with wolves, ranchers would have to lock up their animals, for example in a feedlot setting, instead of having them free range. This necessity would then conflict

with the popular free range, organic, grass-fed markets. While this perception may be generally incorrect, because there are ranchers who are free range and predator-friendly, the ranchers were expressing that it would be lower cost to avoid free-ranging so as to better coexist with wolves. This claim is supported by proponents of intensive cattle management (Phalan et al., 2011).

Ranchers, hunters, beef processors, FFA members, and wildlife agency staff commissioners expressed concern about accountability and the verification processes to ensure that only qualified ranchers get the predator-friendly beef certification benefits. Ranchers expressed concern about which predators would be included in the certification of ranches to qualify as suppliers of predator-friendly beef. Many predators including wolves, cougars (*Puma concolor*), golden eagles (*Aquila chrysaetos*), coyotes (*Canis latrans*), and domestic dogs (*Canis lupus familiaris*) depredate livestock. Larger ranching operations mentioned that they would be at a disadvantage because of higher costs of verification relative to many smaller ranches owing to the area that they have to monitor to qualify to be predator-friendly. Smaller ranches could manage to sell all their products on the niche predator-friendly market but larger ranches would incur more costs and they probably would not sell well on the niche predator friendly market because of the scale of their production.

The certification process requires a third-party certifier, and this step can add cost to the product, making it harder to sell on the mainstream market. Wildlife agency staff mentioned that a predator-friendly label would be hard because there is not infrastructure in place to monitor compliance to the label. Wildlife agency staff mentioned that such a label would have to be initiated by the local ranchers themselves. When asked about whether the wildlife agency would be an appropriate entity to certify predator-friendly ranches, agency staff and commissioners were cautious about being a statutory body for certifying predator-friendly meats because they felt like ranchers who do not agree to get certified will refuse to work with the wildlife agency on other projects, too. Wildlife agency staff compared their certifying stand to the fact that the National Ocean and Atmospheric Administration (NOAA) does not certify sustainable fisheries, and so they do not expect to certify predator-friendly beef.

“First of all, I’d want to think about what our statutory authority is to do that [beef certification]. Whether we even have the authority to do it and then I would want to think about how that sets us up out in the livestock community. For example, ‘you certified my ranch, but you didn’t mine, so to heck with you, I’m not going to work with you’. Or is it an incentive? Well, you certified him and he’s getting more money for his so gee, I’d like to do that same thing. What kind of a response would you get? To, essentially, taking sides or being willing to do something that would result in a monetary gain for one person and not the other. I think that would be difficult position for the agency to be in. And I don’t know whether we have the authority to do it.”—Wildlife agency staff

The wildlife agency staff mentioned that it would be difficult to maintain the standards of predator-friendly certification label. For example, if a rancher who uses non-lethal measures and is

certified predator-friendly ever experiences an incident where wolves need to be removed lethally from their property, then the rancher would, by definition, no longer be predator-friendly; predator-friendly meat buyers would then be confused about whether the label is rigorous enough to completely protect wolves from lethal control. Similarly, agency commissioners mentioned that it would be hard to have a government agency in charge of the certification process and that they would prefer a non-profit or another third-party auditor of sorts, because both ranchers and environmental groups distrusted the wildlife agency. Wildlife agency commissioners also mentioned that by their agency getting into certification, they would be alienating a proportion of their constituents who do not want to be part of the certification program.

Underlying social factors such as attitudes toward predator-friendly beef could not be separated from stakeholders’ attitudes toward wolves and wolf management in general. Some ranchers perceived the name “predator-friendly” to convey the idea of stray and lost cattle whose meat is tough because they are being chased about by wolves, and those ranchers did not want their cattle to be associated with being friendly to wolves. Indeed, some ranchers sarcastically called it “wolf-scared” beef. Beef processors wondered about what would be an appropriate name that would not offend their ranchers or buyers (e.g., “predator-neutral” beef). Ranchers and hunters mentioned that the name “predator-friendly” was deceptive to buyers of certified beef by falsely insinuating that the wolf is friendly to cattle. Finally, some rural stakeholders posited that the term “predator-friendly” might be considered frightening by consumers, which might be mitigated by clever marketing in urban areas. One hunter, for example, thought that, *“the predator-friendly label would be scary except if it were placed besides a Starbucks label then urban markets will want to buy the product,”* suggesting that the label might need to be afforded legitimacy through affiliation with a familiar brand.

Historical, personal, and societal factors were found to limit support for predator-friendly beef, too. For example, ranchers and beef processors mentioned that wolves were removed in the first place to protect the interests of livestock producers, so some ranchers could not justify participating in any strategy to coexist with wolves. Some beef industry stakeholders who we interviewed perceived wolves as a threat to beef production and therefore that coexistence between livestock producers and wolves would be difficult to achieve. Ranchers, FFA, and NGO employees mentioned that ranchers invest in and care for their livestock as part of the rancher lifestyle and emotional attachment to their livestock, and do not just work for the money. They therefore do not want to see their animals eaten by wolves just because the remaining animals will receive a premium price as beef. Some hunters mentioned that cows are more valuable to ranchers than wolves and as such they would not support a predator-friendly label to increase coexistence.

Wildlife agency staff and commissioners and NGO employees mentioned that some ranchers would not participate in the predator-friendly label because ranchers do not want to be ostracized by their peers. Some ranchers mentioned that others had been ostracized by their communities for participating in NGO-led range-rider programs, and so were reluctant to

participate in any coexistence strategies for fear of being treated similarly. For example, one of the interviewed ranchers positively coexists with wolves on their ranch in eastern Washington, but when asked about labeling their meats predator-friendly to get a premium price from the Seattle market, that individual responded that he would not like to be ostracized by his neighbors and fellow ranchers. Wildlife agency commissioners mentioned that there may be a few ranchers who will be early adopters, but more ranchers would rather be late adopters because they do not want to get ostracized by their peers:

“[Interviewee name] brought it up to the guy who sells grass-fed beef at a [popular] market and other farmer’s markets on the west side and he is [the said rancher is marketing to a] real niche market. But [rancher] just looks at me when I brought it up because it is that ostracization that others have already felt just by having range riders or whatever or accepting money. The [rancher] said that it would be even worse, to say my beef is wolf-friendly. So that’s a huge hurdle.”—Wildlife agency staff

“The potential to be ostracized for being part of the predator-friendly thing. The situation I described here where, person is getting lots of attention and maybe getting a premium price, when in fact it’s because their neighbors are killing all the carnivores, that leads to a lot of resentment where the neighbor is going: ‘you’re benefitting because I’m killing carnivores, but you’re getting extra money, I really don’t like that and, you’re judging me at the same time’.—NGO employee

Some ranchers, hunters, and FFA members mentioned that ranchers tend to have anti-government sentiments and would prefer not to have government involvement in their businesses. Because ranchers perceived that the predator-friendly label would be too unpopular to make it on the market, they supposed that to have a predator-friendly label would require considerable government input and subsidies. The ranchers who do not want to be involved in government programs were therefore reluctant to participate in this mitigation strategy. As part of the anti-government theme, the ranchers mentioned that for a predator-friendly label to hold, there would have to be government money that would only come through taxes. Ranchers did not want to pay more taxes and hence were reluctant to support the predator-friendly labeled beef on the market.

Finally, as part of the societal constraints, the state politicians’ perception of predator-friendly beef label was dichotomously divided along political party ideology. The Democratic Party state politicians were generally supportive of a predator-friendly label for beef if it would increase ranchers’ coexistence with wolves, whereas Republican Party state politicians were unsupportive of the certification label as well as other incentives to increase ranchers’ coexistence with wolves.

DISCUSSION

We presented a hypothetical market-based scenario, predator-friendly beef, for discussion and evaluation by stakeholders as a possible solution to increase wolf-rancher coexistence and, ultimately, serve the objective of conserving wolves while

maintaining thriving rural livelihoods in Washington. Overall support for predator-friendly beef was high from wildlife agency staff, NGO employees, range-riders, Democratic state politicians, and some ranchers. Moderate support was expressed by FFA members and most ranchers, whereas the weakest support was expressed by hunters, county politicians, and Republican state politicians. Republican party affiliation and political ideology have been associated with expressing less environmental conservation concern in general and can therefore impede implementation of conservation efforts (Czech and Borkhataria, 2001; Cruz, 2017). The negative attitudes of hunters and politicians are important because, even though these groups do not work in beef production, they can be powerful voices in rural areas.

The most universal motivation across all stakeholders was the assumption that the population of the greater Seattle area, with its general environmentally-conscious behavior (Sheppard, 2011), could purchase predator-friendly given the success of other value-added food labels such as natural, free-range, and organic on the market. In dense metropolitan areas such as Seattle, consumers have become increasingly interested in knowing about the source and delivery process of their food (McKendree et al., 2014), in part because of a desire to know that their consumption behaviors in stores and restaurants are supporting wildlife conservation (or other environmental goals) and rural livelihoods at the same time (Scherr and McNeely, 2007). Our study suggests that this trend is widely appreciated by stakeholders in Washington, including in rural areas, and by inference could be leveraged in other regions to promote the feasibility of market-based coexistence incentives such as predator-friendly beef.

In addition, ranchers saw predator-friendly beef labeling as an outreach opportunity. Certifying ranch products to facilitate communication and outreach has been previously documented for wool and beef (Wong, 2009; Early, 2012). By sharing their story of the rancher lifestyle and good environmental stewardship through their beef, ranchers are in a way seeking social acceptability from the non-rancher (often urban) population. Because ranchers valued communicating about their environment stewardship to the public, using this predator-friendly beef product as a means of communication would be a better way to solicit ranchers’ participation than wolf conservation.

It is not surprising that several barriers to a predator-friendly certification program were also broached. These ranged from marketing to administrative and logistical, and socio-cultural barriers. Social factors cannot be ignored in investigating the feasibility of strategies for predator coexistence. For example, the culture of the various stakeholder groups, the underlying and historical assumptions of trying to coexist with wolves, emotional attachment to their livestock, negative affect toward wolves, and negative attitudes toward government are social factors that stakeholders mentioned as barriers to participating in predator-friendly labeling. Considerations to participate in predator-friendly beef would depend on the ranchers’ values and ideology about the role of wolves in the ecosystem and the ranchers’ relationship with nature (Garnette, 2013; van Eeden

et al., 2018) and not on the monetary benefits of predator-friendly beef. As part of the lifestyle, some ranchers do not want to be different from their peers and neighbors in order to avoid being ostracized. Fear of being ostracized was not limited to ranchers; some NGO employees mentioned that if they made choices that were not popular with their funders or fellow environmental NGOs, they would face anger and loss of income.

Culture was not just a barrier for ranchers as stakeholders; other stakeholders also indicated that their institutional cultures would be an impediment to the predator-friendly beef program. For example, some stakeholders pointed to the objective and culture of the wildlife agency to provide recreational hunting opportunities, suggesting that with hunting being an important source of funding for the wildlife agency as well as personal hunting culture of some wildlife agency staff, the staff would not be inspired to fully support initiatives that promote wolf conservation. This cultural consideration further suggests that some wolf coexistence programs could remain a low personal priority for wildlife agency staff even if they rate highly among the organization's objectives, potentially undermining the success of the coexistence program. This discrepancy between agency objectives and personnel culture has been documented by Mattson and Clark (2009) as a constraint on other carnivore conservation issues.

Ranchers' attitudes about wolf management, and the perceived value of wolves in nature, could not easily be separated from their attitudes about participating in a predator-friendly beef strategy (Garnette, 2013; van Eeden et al., 2018). Those attitudes seem to affect how ranchers feel about naming their ranch products. Naming of the product was a frequently mentioned constraint by ranchers as an ideological and social barrier (Hurley and Kliebenstein, 2000; Thilmany et al., 2006; Bennett et al., 2017). Many ranchers sell cattle and not beef and therefore do not have control of the finishing and branding of the beef from their product at the time of sale to the retailer. For ranchers who finish their cattle and control the processing of the beef, on the other hand, naming the product is part of the rancher's individual and social identity.

One unexpected concern raised related to whether the target market exists, as people who were willing to pay for wolf conservation were considered likely to be vegetarian or vegan. This sort of nuance is hard to assess from a quantitative analysis but was possible through the qualitative interview process as one can probe about responses further so that the respondents fully explain themselves. However, it is important to note that these are perceptions and not necessarily fact: public surveys in Washington have found that support for wolf conservation is generally high (Duda et al., 2008, 2014; Dietsch et al., 2016), so further investigation is needed to determine what market potential actually exists. Nevertheless, realizing that this potential barrier exists can help implementers decide what populations to target and how to frame branding. For example, pets' meat might be a more suitable product with which to target a predominantly vegetarian niche market.

Existing predator-friendly certified ranches in the USA are certified by Wildlife Friendly Enterprise Network and include Ervin's Natural beef in Arizona, which sells its beef to individual

clients, Prime Pastures in California, which sells to Wolfgang Puck restaurants, and Ayrshire Farm in Virginia, which sells online, at a farm store, and to Hunter's Head restaurant in Upperville, VA. International examples include predator-friendly beef in Namibia, which is managed through well-organized community-based natural resources programs and marketed for export (Ndhulukula and Du Plessis, 2009). The operations in the USA finish their livestock and seek out their own markets, selling directly to the consumer thereby skipping the complex rigid beef market, which includes cattle auctioneers, finishers, or feed lots. We explored the feasibility of a more localized mainstream market, in the state of Washington, where it may be difficult to replicate the direct ranch-to-consumer model that these existing certified ranches are using. Instead, through interviewing the different actors, we found that the existing beef processing plant in Odessa, WA, could enable larger scale production of certified meats, which may overcome the challenge of limited supply. However, the process of bringing predator-friendly certification to the mainstream market in Washington would still be encumbered by higher costs of beef per pound. Thus, if the certification process is not subsidized, consumers in Washington will need to be convinced of the values of purchasing predator-friendly beef e.g., environment conservation. For currently certified farms, the predator-friendly label serves as an economic incentive for better and long-term custodianship of predators living in close proximity with ranches, as well as providing premium prices for their meat products. This study reveals an additional advantage of certification; namely, as a means by which ranchers can communicate to their consumers about their practices and indirectly increase the social acceptability of ranching in populations where it would otherwise be perceived indifferently or negatively. The challenges faced by existing predator-friendly certified farms are similar to what we learn from this research and include administrative and logistical costs specifically about the verification process, lack of capacity for producers to supply a continuous demand, and combining more than one certifications can have the time and financial constraints.

Recommendations for Designing a Feasible Predator-Friendly Market

Based on the opportunities and barriers identified, we deduced possible design recommendations for a predator-friendly market. Here, we discuss five design elements that are linked with recurring themes in the results: (1) focus on the rancher; (2) beef processing facilities; (3) product branding and marketing; (4) retail pricing; and (5) the regulatory process.

Focus on the Rancher

Ranchers are not a uniform group. They range from hobby ranchers who do not depend on the income from the ranch for their livelihood, to cow-calf producers whose entire livelihood depends on their ranch (Goldstein et al., 2011). In this study, we found that small-scale ranchers who do not depend on their ranch for their entire livelihood might be more willing to try new marketing channels like predator-friendly beef than large-scale ranchers who depend on the ranch for their entire

livelihood. The nature of operation on ranches can also vary considerably: some ranchers sell off calves at auction yards while others finish their cattle and sell beef at various niche markets (Goldstein et al., 2011). Ranchers who finish their cows and sell beef can easily control the entire cattle production cycle and may have fewer constraints on adopting a predator-friendly approach than ranchers who do not finish their cows. Furthermore, ranchers have varying ideological and ethical reasons for using the ranching practices they have adopted (Ervin and Casey, 2001; Early, 2012). Some ranchers, for example, expressed anti-feedlot attitudes while many others sell their cattle to feedlots. Ranchers who do not like feedlots were more supportive of alternative new marketing avenues like predator-friendly beef than those who did. This variety in the nature of ranchers and purpose of ranching directly influences what particular ranchers feel about predator-friendly beef and should be considered in soliciting their participation in new strategies.

Focusing on the rancher would better be achieved through the niche market model than mass marketing. Niche markets have the advantages of directly connecting the consumer to the producer, thereby facilitating communication and helping narrow the rural (producers) and urban (consumers) divide (Goldstein et al., 2011). This attribute of niche markets would be appealing to some ranchers who were more motivated to market predator-friendly beef as an outreach vehicle about their environmental-friendly practices more than extra monetary benefits.

Meat Processing Facilities

Beef processing is an important step in the lifecycle of turning cattle into beef as all cattle have to go through an inspected beef processor before being sold to the public (Figure 1). By law, ranchers cannot slaughter their livestock on the ranch and sell to the public directly (Gwin et al., 2013). They instead must go through an authorized slaughter house and processing facility (Gwin et al., 2013; Lupo et al., 2013; USDA, 2016). Only ranchers noted the availability of the custom beef-processing plant (in Odessa, WA) as a factor that would enable a predator-friendly market. From this finding we deduced that ranchers must be pragmatic about the solutions in which they choose to participate. Therefore, thinking of the steps along the cattle-to-beef timeline (e.g., beef processing before the consumer receives the beef) is a necessary consideration for ranchers.

The presence of this meat processing plant would make it possible for ranchers to process their meats aimed for a specific certification label as part of a niche market rather than a mass market. The plant is small and in order to keep the certified meats separated from others, there must be scheduled days for exclusively processing predator-friendly meats. By contrast, mass marketing would require high volumes of meats processed daily, which the processing plant cannot currently handle.

Product Branding and Marketing

To many ranchers, the name of their beef product reflects the ranchers' identity and some ranchers did not want their identity to be associated with being "wolf-" or "predator-friendly." Some certification labels aimed at addressing consumer desires are not

generally prestigious to the beef industry, where the most prized certifications include Certified Angus Beef and Kobe beef. These valued beef certifications are rated based on how tender and fatty the meat is and not on how environmentally friendly the ranching practices are. The most prized attribute of beef to a beef producer is the amount of marbling (fat) in the cut (Nutrition Business Journal, 2004). Many ranchers we interviewed, however, perceived predator-friendly beefs as likely to produce leaner beef that may not sell for the price of higher marbling meats. Whereas, there are markets for lean meats, these markets are usually identified by distributors because ranchers are concerned with selling their cattle as fat as possible because the cost of a cow is based on how fat and heavy it is (Drouillard, 2018).

During data collection, we used the terms "predator-friendly beef" and "wolf-friendly beef" interchangeably, and many ranchers did not favor either name. The ranchers suggested that the names predator-friendly and wolf-friendly beef imply cattle that are chased by wolves, and consequently chased cattle are stressed and have tough, less fatty meat that is lower in quality on the beef market. Unfortunately, the ranchers who were opposed or even offended by the names we used for the product did not suggest alternatives. This step therefore remains an important element in the design: the ranchers and other directly involved stakeholders in beef industry, not the researcher or environmentalists, should choose a name that communicates their story, and value of the product.

Most stakeholders perceived that urban, environmentally conscious populations (e.g., Seattle) would be the primary market targeted for predator-friendly labeled beef. However, many acknowledged that stiff competition exists in the certified beef market. There are at least eight certified labels for beef on the market including grass-fed, grass-finished, organic, natural, Kosher/ Halal, "Whole Foods," humane handling, "wildlife-friendly," and fair trade. Therefore, some stakeholders perceived that adding another label may not compete well in the crowded marketplace. One solution to addressing this saturation of labels on the market would be to merge labels that meet consumer desires by having a comprehensive certification that addresses human health, animal welfare, and environmental values. A few merged labels exist on the market, for example the NOSH (Natural Organic Specialty Healthy) label in some grocery stores. There is potential for merging wildlife-friendly or grass-finished beef with predator-friendly certification if the operation meets all the standards of both schemes.

Besides creating or merging new marketing labels to get more buyers, there is a gap because many consumers do not directly connect their diet beef protein to predators or environment at large (Joyce et al., 2008). Efforts must be made to inform consumers of the connection between their beef and predators to increase the chances of consumers considering predator-friendly beef over other meats on the shelves in grocery stores (such as grass-fed or organic beef). Yet, at present consumers' preferences when purchasing beef are generally for taste, human health, animal welfare, and environmental concern against pollution and carbon footprint (Wandel and Bugge, 1997; Hughner et al., 2007), not specifically for predator conservation. Thus, consumer

demand should be assessed to explore the feasibility of certifying and marketing predator-friendly beef.

Retail Pricing

Value addition labels that are maintained by increasing prices of products carry the weakness of excluding low-income consumers from accessing these products (Oyewole, 2001). If value additions could receive appropriate structural and government support so that the end product is the same price as the conventional ones, all people could make a choice based on other attributes of the product instead of price alone. Involving a wide range of stakeholders including policy makers in the design process of environmentally-friendly markets (Oyewole, 2001; Amit and Jacobson, 2018) could help with price regulation, especially on the mainstream mass market. If by regulation, money assigned for wolf conservation is contributed toward the process of getting predator-friendly meat on the mainstream mass market, predator-friendly beef might be sold for prices as low as those for conventional beef.

Regulatory Process

The ranch certification process was suggested as a barrier that would limit adoption of the predator-friendly label. Predator-friendly beef labeling would be a form of voluntary certification whereby inspecting the ranch, auditing, and verification processes are done by a third-party (Eadie, 2018). Annual auditing and inspecting increase the time and financial cost to ranchers who would participate in this certification (Yenipazarli, 2015). Larger ranchers have large herds of cattle that are not easily converted into niche markets over a short time period because of the large production, whereas certification and verification costs and procedures can be limiting to small-scale ranchers who may find it difficult to make changes to their production due to economies of scale (Smithers and Furman, 2003). According to one predator-friendly certifying organization (WFEN Wildlife Friendly Enterprise Network, 2013), guidelines for verifying certified predator-friendly beef include that the ranch has native predators and, though predators do not have to be full-time residents on the ranch, space should be available for them to use it when they need to. The rancher must also have evidence of using non-lethal strategies to protect their livestock. Whereas, some guidelines are fairly easy to meet, limitations on hunting, even for non-predator wildlife, could disqualify many ranchers from being predator-friendly (WFEN staff personal communication, November 1, 2017). Furthermore, if one rancher has several farms that are not contiguous with each other, all of the ranches must meet all the standards for them to qualify their brand as predator-friendly (WFEN staff personal communication, November 1, 2017). Many ranchers do not want to follow any more regulations than those to which they are already subject.

The challenge of verification of predator-friendly products on the market could be addressed by using private and government institutional protocols to accurately verify what ranchers qualify to be predator-friendly certified. Scarlett (2011) recommended that the Farm Bill develop technical guidelines for quantifying, reporting, registering, and verifying environmental benefits of

land management to facilitate development of environmental markets. If this recommendation could be applied to predator-friendly beef, then the Farm Bill, in conjunction with the United States Department of Agriculture (USDA), the relevant regulatory wildlife agency, and a third-party could undertake a pilot to register, verify, and create an experimental predator-friendly market. A private-public verification process (Cashore et al., 2004) would help address the concerns ranchers had about the traceability of the beef to ensure that it truly came from areas with wolves.

CONCLUSION

Based on the design elements discussed for this study, predator-friendly beef would fare better if initiated as a niche market and then spread to mass markets with pricing that is low enough to allow access by a wide audience. Niche meat markets are the fastest growing segment of the overall meat market (Nutrition Business Journal, 2004; Goldstein et al., 2011), and this trend was acknowledged by most of the stakeholders as they mentioned the availability of new and merging environmentally-friendly markets that can be harnessed in western Washington. Because most buyers from niche markets voluntarily choose to offset their environmental impacts or fund conservation efforts for personal reasons, there could be an opportunity for niche products to sell for a much higher price than mass marketed meats for as long as the consumers are willing to pay. The disadvantages of niche markets are that they are still relatively small, location dependent, and can be difficult for ranches to transition into (Goldstein et al., 2011). This challenge was expressed by ranchers who preferred not to interact with consumers directly nor go out of their way to find new markets for their products. Mainstream mass marketing of predator-friendly beef remains an alternative model that ranchers who prefer not to sell directly to the consumer could utilize. However, the mainstream market would have to be slightly modified to what USDA refers to as a regional-aggregated chain supply model (Gwin et al., 2013) whereby several ranchers sell their predator-friendly finished animals to a central entity (e.g., a distributor brand, or co-op) that arranges for processing and distribution and handles marketing in compliance with predator-friendly guidelines, thus reducing the tasks for the ranchers. This distributor would be similar to the way organic beef producers sell to organic meat distributors such as Mountain Beef and Rocky Mountain Organic Meats, thereby saving the rancher the step of having to look for individual consumers to sell to.

Overall, there was interest among the affected stakeholders in developing a predator-friendly beef market in Washington. Our findings suggest that to design a predator-friendly beef program for ranchers in Washington, multiple-stakeholders including the beef industry should be consulted to have a product that can get into and persist on the mainstream beef market. The program managers should consult ranchers primarily so that the program can be an avenue for ranchers to reach out and educate the public about the ranching lifestyle, as education was the unique opportunity that ranchers mentioned as a

motivation for this incentive. Ranchers and beef processors should also be consulted for a name with which they would be proud to associate their beef product. Finally, political representatives' perspectives aligned with political ideology of the people they represented but did not align with practical solutions that ranchers held about coexisting with wolves through the economic incentive of predator-friendly beef. Misalignment between politicians and those they represented emphasizes the complexity of the wolf issues even when people appear to be on the same side (e.g., ranchers and their political representatives). Our findings demonstrate that predator-friendly certification presents an opportunity to promote coexistence between farming and predators in Washington, and the design elements we describe could be similarly implemented to suit local markets and cultures elsewhere.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Internal Review Board (IRB) of the University of Washington's Human Subjects Division (HSD study #45684).

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The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

CB designed the study, collected and analyzed the data, and wrote the manuscript. All other authors contributed to interpreting the data and editing the manuscript.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fevo.2019.00476/full#supplementary-material>

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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