ECOSYSTEM SERVICES PROVIDED BY WILDLIFE MEAT: A CROSS CULTURAL COMPARISON BETWEEN THE UNITED STATES AND SWEDEN

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ABSTRACT

Wildlife meat, the meat procured from free-ranging animals, is harvested and consumed throughout the world for economic, cultural, ecological, and nutritional reasons. Although culture is recognized as a major factor influencing the harvest and consumption of wildlife meat, research on the relationship between culture and consumption of wildlife is lacking. Additionally, institutions govern how wildlife meat is obtained, used, and distributed determining who benefits from wildlife meat and in what manner. Thus, institutions can mediate the relationship between culture and wildlife consumption. Markets in wildlife meat and the policies that govern them are a contentious institution in wildlife conservation and public health.

I use the ecosystem services framework to identify how wildlife meat contributes to culture. Chapter 2 explores previous research to construct a comprehensive assessment of ecosystem services and disservices provided by wildlife meat, establishing the theoretical underpinnings for this dissertation. Wildlife meat provides a unique example of a synergistic relationship between two ecosystem services: wildlife meat is a provisional ecosystem service (in the form of food; ornamental resources; or biochemicals, natural medicines, and pharmaceuticals) that simultaneously provides cultural ecosystem services (in the form of social relations, cultural identity, cultural heritage, spiritual and religious, knowledge systems, sense of place, and recreation and tourism). Chapters 3 and 4 uses interviews with hunters in Michigan and Sweden to explore how wildlife meat provides cultural ecosystem services under differing governance systems. Sixty interviews with Michigan deer hunters and 32 interviews with Swedish large ungulate hunters were analyzed using provisional, attribute, in vivo, and descriptive coding. Wildlife meat provided hunters cultural ecosystem services in the form of social relations, identity, cultural heritage, education, knowledge systems, spiritual and religious,

and recreation and tourism. This finding emphasizes the cultural importance of wildlife meat, and more broadly wildlife, to society.

Chapter 5 uses the Institutional Analysis and Development (IAD) framework to compare the complex systems of wildlife meat use and distribution in Michigan, USA and Sweden in order to explore the influence of governance on the creation and distribution of benefits from wildlife meat. In Michigan and Sweden formal and informal institutions determine who has access to wildlife meat. Informal institutions, however, had greater influence on how wildlife meat was actually distributed. The provisional and cultural ecosystem services hunters derive from wildlife meat appear ubiquitous regardless of the presence or absence of markets for wildlife meat. In Sweden, the presence of formal markets in wildlife meat appears to increases access to wildlife meat for non-hunters and provides additional cultural ecosystem services in the form of recreation and tourism.

Findings from this dissertation provide insights for wildlife conservation and public health. My study is novel in its application of the cultural ecosystem services framework to wildlife meat and the demonstration that the cultural ecosystem services framework is an effective tool for recognizing and articulating the many and complex cultural components of wildlife meat. Additionally, this is the first study to identify cultural ecosystem services provided by wildlife meat to license purchasing hunters in the United States and Sweden. Using the cultural ecosystem services framework allows for systematic interpretation of the relationship between culture and consumption advancing understanding of the benefits wildlife meat, and more broadly wildlife, provide society. Identifying the influences of governance (i.e., the presence or absence of markets) on the creation and distribution of benefits from wildlife meat contributes to current debates and is needed to inform science-based policy.

This dissertation is dedicated to the loving memory of Jon Goguen,
my father and the person who introduced me to the world of science.

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CHAPTER 1: INTRODUCTION AND ORGANIZATION

People throughout the world harvest wildlife for food (Hoffman & Cawthorn, 2012) and have been doing so for an estimated five million years (Larsen, 2003). Wildlife meat recently has been gaining interest in popular literature (Cerulli, 2012) and academic research (Corradini et al., 2022). Markets used for the distribution of wildlife meat are a topic of continuous, contentious debate (Geist, 1988; Thogmartin, 2006). Markets in wildlife meat pose potential risks for wildlife populations (VanVliet & Mbazza, 2011; Wilkie & Carpenter, 1999) and public health (Paulsen et al., 2014; Volpato et al., 2020). Furthermore, policies around wildlife meat are still hindered by a lack of knowledge, particularly relating to sociocultural effects (Chausson et al, 2019; Nasi et al., 2011; Morsello et al., 2015). Exploring the benefits provided by wildlife meat enables an understanding of what drives consumption and the role of wildlife meat, and more broadly, wildlife, in society. Identifying the influence of governance (in particular, the presence or absence of markets) on the creation and distribution of benefits from wildlife meat can contribute to current policy debates.

Wildlife meat is derived from free-ranging mammals, birds, reptiles and amphibians that are not cultivated, domesticated, or tamed (Food Law, 2000; Nasi et al., 2008). The term meat refers to the parts of an animal that are used for human consumption, which vary from culture to culture, but are broadly identified as the muscle, viscera, skeleton, and associated body tissues (Stanford & Bunn, 2001). Other common terms for wildlife meat are game meat, bushmeat, wild-harvested meat, or wild meat.

Wildlife meat is generally considered a healthy source of lean protein, high in energy and essential macronutrients (Bureš et al., 2015; Cordain et al., 2002; Hoffman & Wiklund, 2006; Marchello et al., 1985). However, potential adverse health risks can arise from the handling and

consumption of wildlife meat (Paulsen et al., 2014), such as illness caused from bacteria, protozoa, and parasites (Gill, 2007; Nelson et al., 2003; Ramanzin et al., 2010; Ross et al., 2001); zoonotic diseases (Alexander et al., 2015; Bell et al., 2004; Volpato et al., 2020); and ingestion of bio-accumulated chemical contaminants and heavy metals (Danieli et al., 2012; Iqbal et al., 2009, Warenik-Bany et al., 2016).

Food practices are key elements of many cultures and serve economic, political, recreational, social, aesthetic, religious, ceremonial, magical, legal and medical functions (Bryant et al., 2003). Wildlife meat can also serve these functions, thus playing an important cultural role. Although culture is recognized as a factor influencing wildlife meat consumption (Chausson et al, 2019; Mainka & Trivedi, 2002; Nasi et al., 2011; Bennet & Robinson, 2000; Schenck et al., 2006; Van Vliet & Mbazza, 2011), research on the relationship between culture and wildlife consumption is lacking (Chausson et al, 2019; Nasi et al., 2011; Morsello et al., 2015). However, there is growing interest in understanding the cultural importance of wildlife meat (Goguen & Riley, 2020; Van Vliet & Mbazza, 2011; Watkin Lui et al., 2016).

Markets in wildlife meat are a contentious issue in wildlife conservation and public health. In some areas of the world, unregulated markets in wildlife meat have been identified as causing declines in wildlife populations (VanVliet & Mbazza, 2011; Wilkie & Carpenter, 1999). Consumption of wildlife meat also poses public health risks. For example, wildlife meat consumption in China is thought to have been the vehicle for transmission of SARS-CoV2 to humans, which has had devastating effects worldwide (Paulsen et al., 2014; Volpato et al., 2020). Debates about allowing economic benefits from the sale of wildlife meat exist even in highly regulated wildlife management systems. In the United States, fundamental changes to wildlife management are being proposed that would legalize the sale of wildlife meat. For instance,

lawmakers in New Jersey put forth a bill to allow the commercial harvest and sale of venison from wild deer (New Jersey Assembly Bill No. 3039, 2014). A better understanding of the function and influence of wildlife meat is needed to inform science-based policy changes pertaining to markets in wildlife meat as risks to food safety and security emerge and social transformations alter the way humans interact with nature.

The conceptual framework underpinning my dissertation is the Ecosystem Services Framework. Ecosystem services are ecological characteristics, functions, or processes that benefit humans (Costanza et al., 2017), or simply, the benefits that people derive from nature (MEA, 2005). Ecosystem services is a holistic and transferable framework useful for identifying the diverse linkages between people and nature (Gee & Burkhard, 2010; Kaltenborn et al., 2017; MEA, 2005). The ecosystem services framework is discussed in detail in Chapter 2. My previous research (Goguen et al., 2018; Goguen & Riley, 2020) identified provisional ecosystem services provided by venison in Michigan. However, through this research, I recognized that many of the benefits provided by venison did not fall under the category of provisional services. Adding to this realization is the recent interest in understanding how the cultural importance of wildlife meat drives consumption (Van Vliet & Mbazza, 2011; Watkin Lui et al., 2016).

I propose that wildlife meat provides a unique example of a synergist relationship between two ecosystem services: wildlife meat is a provisional ecosystem service, that also provides cultural ecosystem services. This synergistic relationship has received little attention in literature and has not been systematically studied. I use the cultural ecosystem services concept to identify and describe the cultural significance of wildlife meat. My dissertation aims to advance knowledge about wildlife meat to better inform wildlife conservation and policy, and food safety and security through new knowledge and insights about the roles wildlife meat plays

in society, while also enhancing the theoretical underpinnings of cultural ecosystem services with empirical evidence.

The research objectives guiding my dissertation were to: 1) establish and test the theoretical underpinning that wildlife meat provides provisional and cultural ecosystem services; 2) evaluate the cultural ecosystem services created by wildlife meat under different systems of governance; 3) determine whether or how governance structures influence benefits derived from wildlife meat.

I chose to accomplish these objectives via a cross-case comparison between the United States and Sweden of how wildlife meat connects people and nature through the ecosystem services it provides. This cross-case comparison enables examination of how governance structure influences the benefits provided to society by wildlife meat. Comparing these two systems enables careful consideration of how the presence or absence of markets in wildlife meat influence the benefits provided to society by wildlife meat. In general, the sale of wildlife meat in the United States is illegal, whereas in Sweden, wildlife meat can be sold by hunters in a variety of ways to other individuals and food businesses for public consumption. Furthermore, most research pertaining to wildlife meat consumption focuses on subsistence communities; little research has been conducted on the benefits provided to society by wildlife meat harvested by license purchasing hunters in Europe, the United States, and Canada.

My dissertation is structured with this introductory chapter, three analytical chapters, and a final synthesis chapter. Chapter 2, titled “Wildlife Meat Provides Ecosystem Services,” is an extensive literature review that reveals gaps in knowledge and proposes theory to be tested. Chapter 3, titled “Cultural ecosystem services provided by venison in Michigan, USA” analyzes 60 in-depth interviews conducted with Michigan deer hunters to identify the cultural ecosystem

services provided by venison in Michigan, USA. Chapter 4, titled “Cultural ecosystem services provided by wildlife meat in Sweden” analyzes 32 interviews conducted with Swedish hunters to identify the cultural ecosystem services provided by wildlife meat in Northern and Southern Sweden. Chapter 5, titled “A cross-case comparison of ecosystem services provided by wildlife meat under different governance systems” compares and synthesizes the interview data from Michigan, USA and Sweden, along with data from my previous research (Goguen et al., 2018; Goguen & Riley, 2020) and studies conducted in collaboration with Swedish colleagues to identify similarities and differences in the ecosystem services provided by wildlife meat under different governance structures (i.e. with and without formal markets for wildlife meat).

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CHAPTER 2: WILDLIFE MEAT PROVIDES ECOSYSTEM SERVICES

Abstract

Ecosystem services are ecological characteristics, functions, or processes that benefit humans directly or indirectly, consciously or un-consciously; or simply, the benefits that people derive from nature. In this chapter, I explore previous research to construct a comprehensive assessment of the ecosystem services and disservices provided by wildlife meat. I examine how wildlife meat provides a unique example of a synergistic relationship between two ecosystem services: Wildlife meat is a provisional ecosystem service that also provides cultural ecosystem services. In this way, wildlife meat is polysemic; it can carry multiple meanings simultaneously. Wildlife meat refers to the meat from free-ranging mammals, birds, reptiles, and amphibians that are not cultivated, domesticated, or tamed. Meat and other parts from harvested wildlife provide provisional ecosystem services in the form of food; ornamental resources; or biochemicals, natural medicines, and pharmaceuticals. Wildlife meat is a source of lean protein, high in energy content and essential macronutrients, and contributes substantially to food and economic security around the world. Although much of the research on wildlife meat emphasizes its nutritional and economic importance, there has been recent interest in understanding how the cultural importance of wildlife meat influences its use. Food is more than just something we eat; food also has non-nutritional functions. Food practices serve economic, political, recreational, social, aesthetic, religious, ceremonial, magical, legal, and medicinal functions. These properties can be applied to wildlife meat. I determined that wildlife meat provides cultural ecosystem services in the form of social relations, cultural identity, cultural heritage, spiritual and religious, knowledge systems, sense of place, and recreation and tourism. However, wildlife meat may also provide disservices in the form of biological, chemical, and physical risks. Recognizing how wildlife

meat simultaneously generates services and disservices enables a more complete assessment of the use and value of wildlife meat to society, which is important for public health, cultural preservation, and managing wildlife populations.

Ecosystems Services Framework

Ecosystem services are ecological characteristics, functions, or processes that benefit humans directly or indirectly, consciously or un-consciously (Costanza et al., 2017), or simply the benefits that people derive from nature (Millennium Ecosystem Assessment [MEA], 2005). The MEA classifies ecosystem services into four categories: supporting services are necessary to produce other services (ex. nutrient cycling); regulating services are the benefits obtained from the regulation of ecosystem processes (ex. water purification); provisioning services are the tangible products obtained from ecosystems (ex. food); and cultural services are the non-material benefits obtained from ecosystems (ex. recreation) (MEA, 2005) (Figure 2.1). Although alternative classifications are emerging (Díaz et al., 2019), in this paper I use the original MEA classifications because of their widespread use and understanding.

Tradeoffs and synergies are interactions between and within ecosystem services categories (Mouchet et al., 2014). Tradeoffs occur when there is a negative relationship between two ecosystem services (Cord et al, 2017; Lee & Lautenbach, 2016; Mouchet et al., 2014). For instance, when one ecosystem service increases and another decreases (Bennet et al., 2009; Howe et al., 2014). Synergies occur when there is a positive association between two ecosystem services (Cord et al, 2017; Lee & Lautenbach, 2016; Mouchet et al., 2014). For example, when increases in one ecosystem service increases another (Bennet et al., 2009; Howe et al., 2014).

The ecosystem services framework is a holistic and transferable conceptual construct useful for identifying the diverse linkages between people and nature by recognizing nature's

contributions to human well-being (Costanza et al., 2017; Gee & Burkhard, 2010; Kaltenborn et al., 2017; MEA, 2005). The ecosystem services framework was designed to improve assessment and decision making related to natural resources conservation (Chan et al., 2012; Kaltenborn et al., 2017; Satz et al., 2013). Although popular and widely accepted (Costanza et al., 2017; Daniel et al., 2012), the ecosystems services framework has many critics. Rooted in ecological economics, it has been criticized for its economic valuation and commodification of nature (M. J. Peterson et al., 2010; Plieninger et al., 2015; Pröpper & Haupts, 2014). A focus on purely economic valuation classifies some ecosystem services above others because they are easier to measure in economic terms (Scholte et al., 2015). The ecosystem services framework also has been criticized for being anthropocentric (Kaltenborn et al., 2017), rooted in Western ideology (Pröpper & Haupts, 2014), and based in a natural science paradigm (ecocentic), which may exclude social science perspectives (Binder et al., 2013; Tengberg et al., 2012). Despite these limitations, the ecosystem services framework still provides a comprehensive way to capture the many complex ways people use and benefit from wildlife meat.

In this chapter, I explore previous research to construct a comprehensive assessment of the ecosystem services and disservices provided by wildlife meat. I explore how wildlife meat provides a unique example of a synergist relationship between two ecosystem services: Wildlife meat is a provisional ecosystem service that provides cultural ecosystem services. Recognizing this co-generation of services and disservices provided by wildlife meat enables more complete assessment of the use and value of wildlife meat to society, which is important for public health, cultural preservation, and managing wildlife populations.

Wildlife Meat

For purposes of this dissertation wildlife meat refers to the meat of free-ranging

mammals, birds, reptiles and amphibians that are not cultivated, domesticated, or tamed (Food Law, 2000; Nasi et al., 2008). The term "meat" refers to the parts of the animal used for human consumption, which vary from culture to culture, but are broadly identified as the muscle, viscera, skeleton, and associated body tissues (Stanford & Bunn, 2001). Other common terms for wildlife meat are game meat, bushmeat, wild-harvested meat, or wild meat. I use the term wildlife meat because it clearly identifies the source (wildlife) and animal parts (meat), while remaining a relatively broad term. Defining what constitutes wildlife (and thus wildlife meat) is difficult, as the difference between domestic and wild is blurred by wildlife farming, high fence hunting operations, supplemental feeding, and wildlife herding (Geist, 1988). Although insects, fish, and shellfish are a valuable protein source (Hoffman & Cawthorn, 2012), whether they are considered wildlife meat is debated (Chardonnet et al., 2002; Nasi et al., 2008). Insects, fish, and shellfish are not considered in this dissertation. Wildlife meat may be procured legally or illegally. The illegal harvest of wildlife is a known threat to wildlife populations globally (Nasi et al., 2008; Van Vliet & Mbazza, 2011), and issues of governance are considered in Chapter 5 of this dissertation. However, in this chapter, I am not concerned with the legality of the harvest, but the ecosystem services it provides, as wildlife meat provides benefits regardless of the legality of its harvest.

Wildlife Meat as a Provisional Ecosystem Service

Provisional ecosystem services are tangible services people receive from ecosystems (MEA, 2005). They are categorized as: food or fiber; fuel; genetic resources; biochemicals, natural medicines, and pharmaceuticals; ornamental resources; and fresh water (MEA, 2005). Harvests of wildlife yield meat and other animal parts (e.g. hides) that can be used for consumption (food), décor and handicrafts (ornamental resources), or zootherapeutic remedies

(biochemicals, natural medicines, and pharmaceuticals) (Table 2.1) (Hoffman & Cawthorn, 2012; Klemens & Thorbjarnarson, 1995; Souto et al., 2018). I focus most of the discussion below on wildlife meat as food; however, the other provisional ecosystem services wildlife meat provides are tied to wildlife harvest and consumption patterns. These links are important to consider when taking a systems approach as they are interconnected with the cultural ecosystem services wildlife meat provides.

Food

Wildlife meat is a provisional ecosystem service because people throughout the world consume wildlife as food (Hoffman & Cawthorn, 2012). Humans have been using animals for food for an estimated five million years (Larsen, 2003). I review how wildlife meat is used as food by describing its nutritional value, as well as harvest and consumption patterns. Wildlife meat contributes to people's livelihoods through the provision of meat for consumption or sale (illegal or legal) (Hoffman & Cawthorn, 2012; Van Vliet et al., 2016). Food security in many countries is linked to the consumption of wildlife meat, creating confounding conservation issues balancing local livelihoods and wildlife populations (Richardson, 2010). Although a majority of examples are from wildlife meat being used for subsistence, wildlife meat does not need to be consumed at a subsistence level to provide benefits to humans (Goguen et al., 2018; Goguen & Riley, 2020). Regardless of the frequency of consumption, wildlife meat provides nutritional benefits, not to mention its potential cultural importance (discussed later in this chapter).

Nutritional Value of Wildlife Meat

Wildlife meat is a source of lean protein, high in energy content and essential macronutrients (Bureš et al., 2015; Cordain et al., 2002; Hoffman & Wiklund, 2006; Marchello et al., 1985). For example, venison (deer meat) has a lower fat content and higher protein,

Omega-3 Fatty Acid, Vitamin B-12, and iron content than domestic beef (Bureš et al., 2015; Marchello et al., 1985; Polak et al., 2008; Ramanzin et al., 2010; Strazdiņa et al., 2013; United States Department of Agriculture [USDA], 2015; Zomborszky et al., 1996) (Note: Data from Bureš et al., 2015 is farm-raised deer, source of USDA venison (farm-raised or wild) cannot be determined, all other references are from wild sources). The meat of African ungulates, Camillidae, rodents, ratites, and reptiles has low levels of lipids and cholesterol, and low ratios of saturated fatty acids to high polyunsaturated fatty acids (Hoffman, 2008). A review of the composition of meat from capybara (*Hydrochoerus hydrochaeris*), rhea (*Rhea spp*.), guanaco (*Lama guanicoe*), llama (*Lama glama*), nutria (*Myocastor coypus*), and the tegu lizard (*Tupinambis s*.) in South America report similar results (Saadoun & Cabrera, 2008). Additionally, wildlife meat is thought to be free of antibiotics, hormone supplements, and other additives, and is not subject to engineered genetic modifications (GMO), although wildlife may still consume GMO crops (Radder & Le Roux, 2005). Depending on the harvest location, wildlife meat can also be considered a local food product (Cerulli, 2012; M. N. Peterson et al., 2010; Tidball et al., 2014). Despite the research discussed above, considerable knowledge gaps still exist regarding the nutritional values of wildlife meat (Tidball et al., 2014).

Wildlife Meat Harvest and Consumption Patterns

The magnitude and extent of wildlife meat consumption varies based on availability, hunting regulations, consumers' socio-economic status, and culture (Ntiamoa-Baidu, 1997). Incomplete data for wildlife harvest and consumption patterns make global estimates of these parameters difficult (Ntiamoa-Baidu, 1997). Here, I highlight some examples of wildlife harvest and consumption rates as evidence of wildlife meat being used as food (a provisional ecosystem service).

In Africa, wildlife meat (often referred to as bushmeat) is one of the most valued and preferred protein sources in the diets of both urban and rural inhabitants (Ntiamoa-Baidu, 1997). Hundreds of species belonging to at least 236 genera are consumed (Hoffman & Cawthorn, 2012). Wildlife meat is estimated to be 20% - 90% of all animal protein consumed in Africa (Hoffman & Cawthorn, 2012; Ntiamoa-Baidu, 1997). At the turn of the 21st century, it was estimated that 3.4 million tons of wildlife meat were produced annually in Central Africa (Hoffman & Cawthorn, 2012). Other estimates suggest greater than 4.9 million tons of wildlife meat are harvested in Afrotropical forests annually, which supply food to millions of people (Fa et al., 2002).

Although harvest rates are estimated to be less in South America (0.15 million tons) than Africa (4.9 million tons) (Fa et al., 2002), wildlife meat is consumed regularly in many regions of South America. Non-indigenous inhabitants of the Argentine Chaco consume an estimated 59,700 kg per year of wildlife meat, which averages out to consuming wildlife meat 7.7 days per month per household (Altrichter, 2006). Rural and indigenous communities living in the Amazon are estimated to extract at least 67,000 tons of wildlife meat annually (Valencia-Aguilar et al., 2013). Wildlife meat comprises an estimated 30% - 50% of the overall animal protein consumption in rural communities of Central and South America (León & Montiel, 2008).

In Europe, wildlife meat is sold legally in restaurants and grocery stores. In Hungary, an estimated 14,000 tons of wildlife meat from Red deer (*Cervus elaphus*), fallow deer (*Dama dama*), roe deer (*Capreolus capreolus*), mouflon (*Ovis orientalis orientalis*), and wild boar (*Sus scrofa*) were produced in 2012, and the amount is increasing each year (Bleier et al., 2013). During the 2010-2011 hunting season in Sweden, an estimated 17,000 tons of wildlife meat were harvested; Moose (*Alces alces*) comprised 67% (Wiklund & Malmfors, 2014). Nearly 65% of

non-hunters report consuming wildlife meat at least once per year in Sweden (Ljung et al., 2012). In Germany, an estimated 0.9 kg per person per year of wildlife meat is consumed from a 40,000 metric tons annual harvest (Atanassova et al., 2008). Consumption rates in Austria and Switzerland range from 0.6–1kg per person per year (Atanassova et al., 2008).

Wildlife meat is regularly consumed in the United States by subsistence and non-subsistence communities, mainly distributed through hunters' social networks (Goguen & Riley, 2020; Goguen et al., 2018; Smith et al., 2018). An estimated 42% of the U.S. population consume wildlife meat annually (National Shooting Sports Foundation, 2011). Many Alaskans rely on wildlife meat for a significant part of their diet (Titus et al., 2009). The annual harvest of wildlife meat in Alaska provides 170 kg of wildlife meat per person per year in rural areas and 10 kg per person per year in urban areas (Titus et al., 2009). In rural areas of Alaska, 60% of households harvest wildlife meat, and 86% of rural residents report consuming wildlife meat (Titus et al., 2009). An estimated 11,402–14,473 metric tons of venison from white-tailed deer (*Odocoileus virginianus*) is harvested by Michigan hunters annually (Goguen et al., 2018). An estimated 75% of the Michigan population has consumed wildlife meat at some point in their life; 49% consume venison annually; and 14% consume venison more than 10 times a year (Goguen & Riley, 2020). There is speculation that wildlife meat may play an important and often overlooked role in the diets of U.S. license purchasing hunters and their families (Burger, 2000 & 2002; Tidball et al., 2013).

One overlooked source of wildlife meat is marine mammals, reptiles, and amphibians. Since the 1970s, 92 marine mammal species have been consumed in over 125 countries, and at least 27 countries were found to use 100s of marine mammals for food each year (Robards & Reeves, 2011). Many species of amphibians and reptiles are an important protein source to

communities around the world (Hoffman, 2008; Klemens & Thorbjarnarson, 1995; Valencia-Aguilar et al., 2013). Turtles are the most heavily exploited reptile used for human consumption (Hoffman, 2008; Klemens & Thorbjarnarson, 1995). Much attention has been paid to the large-scale harvest of South American river turtles (*Podocnemis s.)* for eggs and meat (Klemens & Thorbjarnarson, 1995). Alligator snapping turtles (*Macrochelys temminckii*) and common snapping turtles (*Chelydra serpentine)* are consumed in North America (Goguen & Riley, 2020; Klemens & Thorbjarnarson, 1995). There is extensive documentation of the harvesting of sea turtles for meat, eggs, oil, and shells (Klemens & Thorbjarnarson, 1995). Snake meat is regularly consumed in southeast Asia (Klemens & Thorbjarnarson, 1995; Zhang et al., 2008). Worldwide, crocodilians are harvested for meat and skin (Hoffman 2008; Joanen et al., 1997; Klemens & Thorbjarnarson, 1995). Amphibians from the families Hylidae, Bufanidae, and Leprodactylidae yield provisioning ecosystem services to human societies in neotropical ecosystems (Valencia-Aguilar et al., 2013).

Ornamental Resources

Ornamental resources are raw materials from ecosystems that are used as decoration or in the creation of other goods and handicrafts (MEA, 2005). In some cases, wildlife meat (muscle, viscera, skeleton, and associated body tissues) is used as an ornamental resource; however, other animal parts, not intended for consumption, are more commonly used for décor and handicrafts (MEA, 2005). Although some items discussed in this section may not be derived from wildlife meat, it is still important to explore their use, as harvest for consumption and ornamental use can be interlinked. Below are a few examples of the myriad ways harvested wildlife are used as ornamental resources. Seal skins, narwhal (*Monodon monoceros)* ivory, and muskox (*Ovibos moschatus*) wool are all used as ornamental resources in the Canadian Artic (Condon et al.,

1995). The non-indigenous inhabitants of the Argentine Chaco often have animal parts as decorations in their homes, such as cat or anteater skins and armadillo shells (Altrichter, 2006). The skins of lizards, crocodilians, and snakes are popular worldwide for leather goods (Chardonnet et al., 2002). Iguana skin is used in Costa Rica and Nicaragua for crafts such as purses, wallets, and shoes (Valencia-Aguilar et al., 2013). The leather produced from capybara hides is used to make gloves, belts, jackets, and handbags in South America (Saadoun & Cabrera, 2008). In the Greater Yellow Stone Ecosystem in the United States, antlers are used or sold for use in art and ornamentation (Maher et al., 2023). Although cooked meat is typically not an ornamental resource, masterfully cooked and decoratively plated pieces of meat might be considered art in the visual sense.

Biochemicals, Natural Medicines, and Pharmaceuticals

Biochemicals, natural medicines, and pharmaceuticals are products such as medicines, biocides, food additives, and other biological materials that are derived from ecosystems (MEA, 2005). Wildlife meat and other animal parts are believed to contain medicinal or healing properties (Suoto et al., 2018). People use these zootherapeutics for socioeconomic or cultural reasons. A well-known example of wildlife used for medicinal purposes is traditional Chinese medicine, thought to be a contributor to the illegal harvest of wildlife (Manika & Mills, 1995; Mills & Servheen, 1994; Still, 2003). For example, bear paws are used to make bear paw soup, a delicacy with alleged medicinal properties such as vitality (Ellis, 2013; Mills & Servheen, 1994). The Koya and Guthikoya tribes of the Warangal district of Andhra Pradesh, India use the meat of Russell's viper (*Vipera russelli*), Bengal monitor lizard (*Varanus bengalensis*), tawny owl (*Strix aluco nivicola*), ass (*Equus s.*), leopard (*Panthera pardus*), buffalo (*Bubalus s.*) and barking deer (*Muntiacus muntjac*) to promote strength and virility (Benarjee et al., 2010). Meat from the

Indian jackal (*Canis aureus indicus)* and Rhesus macaque (*Macaca mulatta*) are thought to cure asthma and other ailments (Benarjee et al., 2010). In their study of Mexican traditional medicine, Alonso-Castro (2014) reported 163 animal species were used for medical purposes in Mexico (48 birds, 3 fish, 22 insects, 49 mammals, and 41 reptiles). For example the meat of doves (*Columbina s.)* was thought to cure fever, the meat of white-tailed deer in soup was used to help fertility, or the meat of american hog-nosed skunk (*Conepatus leuconotus*) cooked in a soup was used for stomach ache (Alonso-Castro, 2014). Meat was identified as the most important medicinal animal part harvested by hunters in the semi-arid state of Paraiba in northeastern Brazil (Souto et al., 2018). Specifically, the meat of 57 species were used for medicinal purposes (Souto et al., 2018).

Reptile meat is considered to have many medicinal benefits (Hoffman & Cawthorn, 2012; Klemens & Thorbjarnarson, 1995). In communities across Latin and South America, more than 60 amphibian and reptile species are used for medicinal purposes (Valencia-Aguilar et al., 2013). The non-indigenous inhabitants of the Argentine Chaco use fat from the tegu lizard for ailments such as cuts, snakebites, and colds, and fat from pumas (*Puma concolor*) and boas for contusions and muscular pain (Altrichter, 2006). Non-indigenous rural inhabitants of east Paraguay believe that tegu lizard meat can fortify blood and its tongue can be used for snake bites (Norman, 1987). The granular glands of amphibian skin produce a wide range of chemical compounds that are used medicinally (Valencia-Aguilar et al., 2013).

Cultural Ecosystem Services Provided by Wildlife Meat

Cultural ecosystem services are difficult to quantify and measure; these services are often referred to as the non-tangible benefits people derive from natural systems (MEA, 2005). Cultural ecosystem services can be categorized as: recreation and tourism, aesthetic, bequest,

intrinsic and existence, spiritual and religious, educational, knowledge systems, social relations, cultural identity, cultural heritage, cultural diversity, inspiration, and sense of place (Hernández-Morcillo et al., 2013; MEA, 2005; Milcu et al., 2013). However, categorizing cultural ecosystem services is challenging because categories overlap and sometimes cannot be treated independently (Gee & Burkhard, 2010; MEA, 2005; Plieninger et al., 2013). Below, I identify that wildlife meat provides cultural ecosystem services in the form of social relations, cultural identity, cultural heritage, spiritual and religious, knowledge systems, sense of place, and recreation and tourism. In the literature, I did not find evidence for wildlife meat providing educational, inspiration, aesthetic, or bequest, intrinsic, and existence cultural ecosystem services. However, this does not mean wildlife meat cannot provide these services, just that current evidence is lacking.

In this chapter, many examples of cultural services are derived from indigenous or subsistence communities' use of wildlife meat. Few examples exist in the literature outside this context. This is not to imply wildlife meat provides cultural ecosystem services only when used by indigenous or subsistence communities; more research is needed on the use of wildlife meat in other contexts. My application of the ecosystem services framework to indigenous and subsistence communities' use of wildlife meat can be critiqued for imposing western conceptions of natural resource use on non-western communities (Pröpper & Haupts, 2014; Stålhammar & Pedersen, 2017). Furthermore, the ecosystem services framework, and cultural ecosystem services specifically, does not always recognize the unique and varied connections with nature represented in some indigenous ontologies (Stålhammar & Pedersen, 2017). Cultures perceive, experience, and value cultural ecosystem services differently (MEA, 2005).

Despite these critiques, I believe the ecosystem services framework provides a useful

heuristic for identifying the cultural importance of wildlife meat. Much of the research on wildlife meat emphasizes its nutritional and economic importance (Brashares et al., 2011; Nasi et al., 2008; Van Vliet & Mbazza, 2011). Nonetheless, there is value in understanding how the cultural importance of wildlife meat influences and is influenced by consumption (Ljung et al, 2012; Van Vliet & Mbazza, 2011; Watkin Lui et al., 2016). Food is more than just something that is eaten – it has non-nutritional functions (Bryant et al., 2003). Food practices are key elements of many cultures and serve economic, political, recreational, social, aesthetic, religious, ceremonial, magical, legal and medical functions (Bryant et al., 2003). These properties are true of wildlife meat. Many of the cultural ecosystem services derived from wildlife meat stem from its role as food.

Social Relations

Social relations produced or influenced by ecosystems are a cultural ecosystem service (MEA, 2005). Ecosystems provide opportunities for creating or enhancing relationships and strengthening communities (Calvet-Mir et al., 2012). Food is used to create and maintain social relations, as a mechanism of socialization, and as a symbol of prestige and social status (Bryant et al., 2003; Quandt et al., 2001). Wildlife meat has long played an important social role in human societies (Smil, 2002). It is theorized that the origins of human intelligence and sociality are linked to wildlife meat due to the cognitive abilities needed for acquiring and sharing meat (Smil, 2002).

Subsistence activities, including the sharing of wildlife meat, are important for social relations in indigenous communities of the Alaskan and Canadian Artic (Condon et al., 1995; Dombrowski, 2007; Omura, 2013). Among Holman Inuit of Canada, the sharing of subsistence foods (including wildlife meat) is important for community integration, kinship and friendship

ties, and denoting respect between hunting households (Condon et al., 1995). The harvesting and processing of wildlife meat also fosters relationships in indigenous subsistence communities in southeast Alaska (Dombrowski, 2007). In these communities, subsistence foods, including wildlife meat, are used by high-ranking community members to forge economic and political relationships inside and outside of the community (Dombrowski, 2007). Inuit from the village of Kagaaruk in the Canadian central Artic have five types of systems to distribute meat, based on the social relations the sharing produces or maintains, which suggests that sharing wildlife meat is central to the construction of social relationships in those communities (Omura, 2013). Wildlife meat is an essential element of community for Inuit in northwest Greenland where it is shared to express hospitality, provide mutual aid, and as a gift (Nuttall, 1991). The Torres Straight Islanders of Australia share wildlife meat—turtle and dugong meat in particular—to maintain relationships and honor elders (Watkin Lui et al., 2016). When visiting family that live outside the Torres Straight area, sharing wildlife meat is a way of demonstrating the importance of that relationship because wildlife meat is considered special (Watkin Lui et al., 2016). In the subsistence community of Conambo in the Ecuadorian Amazon, wildlife meat is strategically shared to recruit and secure political allies (Patton, 2005).

Wildlife meat can also be important for social relations in non-subsistence communities. In the mid-1990s, Orion – the Hunters Institute began hosting Windsor Dinners that utilized the sharing of wildlife meat to bring together people with diverse perspectives on hunting (hunters, non-hunters, and anti-hunters) and create shared experiences and connections (Fergus, 1996). The sharing of wildlife meat is sometimes used to provide for those in need; supporting the community is a type of social relation. Hunters for the Hungry is a program in the US that provides donated wildlife meat to those in need (Heffelfinger, 2014). In 2012-2013, the program

donated 2.2 million pounds of venison nationwide, providing 8.8 million meals (Heffelfinger, 2014). Much of the previously discussed sharing that occurs in subsistence communities also serves to support those in need within the community.

One social function of being a hunter, particularly a successful hunter, is the development of social capital, respect, prestige, and status through the possession of wildlife meat (Fischer et al., 2013; Van Vliet et al., 2016). The sharing of country foods (including wildlife meat) by Inuit of the Canadian Artic generates social capital within the community (Gombay, 2005). Historically, in medieval Europe, venison was only available to the rich and influential, and thus a symbol of the ruling elite (Heffelfinger, 2014). Venison was the ultimate high-status food; having venison on the table was a demonstration or advertisement of status (Fletcher, 2011). Wildlife meat still maintains its high status in some cultures. In China, eating wildlife meat is a status symbol and used as part of a "fashionable lifestyle" (Zhang et al., 2008).

Cultural Identity

The formation or thickening of cultural identity can be tied to an ecosystem or its components (Chan et al., 2012). Food and food consumption can be a powerful symbol or marker of cultural identity (Bryant et al., 2003; Fischler, 1988). These meanings are not inherent, but socially constructed, and dependent on context (Murcott, 1982). Wildlife meat can be a culturally significant food tied to identity (Ngade et al., 2017), thus providing cultural ecosystem services. Among Inuit in the Canadian Arctic, subsistence foods such as wildlife meat play an important role in the construction and performance of cultural identity (Dombrowski, 2007; Searles, 2002). Meat from wildlife hunted through subsistence activities is considered an indispensable "real food" that maintains Inuit identity (Omura, 2013). Subsistence foods can be a cultural object, a tangible and tasty marker of identity, that when consumed can function as a

statement of identity (Searles, 2016). Food sharing is part of Inuit ideology; Holman Inuit who did not participate in substance food sharing reported feeling more separated from their cultural identity (Condon et al., 1995).

For the Torres Straight Islanders of Australia, dugong and turtle meat strongly relate to their cultural identity (Watkin Lui et al., 2016). Sharing wildlife meat is an important cultural act and a means for maintaining culture and identity, while simultaneously slowing cultural erosion (Watkin Lui et al., 2016). Cultural attachment to bushmeat is an important driver of consumption and trade in Central Africa (Van Vliet & Mbazza, 2011). Consuming wildlife meat is a cultural preference and connects urban consumers to rural village life (Van Vliet & Mbazza, 2011). A study of factors affecting wildlife meat consumption in Bata, Equatorial Guinea found that nationality and ethnicity predicted meat consumption, quantifying the connection between identity and wildlife meat consumption (East et al., 2005). First and second-generation African expatriates living in New York and Atlanta reported that eating wildlife meat was a way to share their culture with friends and family (Bair-Brake et al., 2014). Sharing and consuming wildlife meat can be a way to preform or share culture, or connect people with a cultural identity.

Cultural Heritage

Under the ecosystem services framework, cultural heritage is defined as the "legacy of biophysical features, physical artifacts, and intangible attributes (related to the natural world) of a group or society that are inherited from past generations, maintained in the present, and bestowed for the benefit of future generations" (Daniel et al., 2012, p.8814). Services that create cultural heritage connect people to their collective and individual roots or histories (Tengberg et al., 2012). Cultural heritage and identity are linked (Tengberg et al., 2012). Wildlife meat is a physical part of the natural world that serves as a totem for stories and memories, is involved in

traditions, and the creation of knowledge. These stories, traditions, and knowledge are passed down through generations, as part of a hunter's cultural heritage.

Subsistence hunting and the consumption of wildlife meat are traditions in the Canadian Arctic; the continuation of these traditional activities maintains continuity with the past (Condon et al., 1995). For Torres Straight Islanders in Australia, sharing wildlife meat is a way to explain and transmit culture to younger generations, connecting youth to their cultural heritage (Watkin Lui et al., 2016). Consumers of wildlife meat in Port Elizabeth South Africa value wildlife meat for its tradition and considered wildlife meat an old-fashioned food associated with "the way back" (Radder & Grunert, 2009).

Spiritual and Religious

Spiritual and religious values can be attached to ecosystems and their components (MEA, 2005). Ecosystems can also be a source of inspiration for religious or spiritual thought and experience (Chan et al., 2012). Food can be sacred and connect people to their faith (Mintz & DuBois, 2002). Food is used in ceremonies and rituals, holds symbolic values, and can be embedded in belief systems (Mintz & DuBois, 2002). Wildlife meat is used during ceremonies and rituals due to its cultural, religious, or spiritual significance (Van Vliet et al., 2016). Cultures and religions use wildlife meat in different ways, and the species used vary based on their symbolic value (Valencia-Aguilar et al., 2013). Sharing of moose, caribou, and deer meat are important for Inuit ceremonies in the Alaskan and Canadian Artic (Dombrowski, 2007; Titus et al., 2009). Inuit believe that wildlife possess a spirit that is immortal; in order for the spirit to be reborn, it must be consumed by people with the correct intentions and attitudes (Omura, 2013). Sharing and consuming wildlife meat helps the spirit separate from the animal body and take a new form, continuing the cycle of life (Omura, 2013). Inuit of northwest Greenland find sharing

wildlife meat to be a spiritual act: they believe the seal gives its life to the hunter, thus the hunter must share its life with other people by sharing the gift of its meat (Nuttall, 1991).

Torres Straight Islanders of Australia refer to dugong meat as "soul food", emphasizing its spiritual significance in ceremonies such as tombstone openings, weddings, Mabo day (celebrates indigenous land rights), the "Coming of the Light" ceremony (commemorates the adoption of Christianity), and birthdays (Watkin Lui et al., 2016). Members of the Mishmi tribe in the state of Arunachal Pradesh in northeast India give fresh dried wildlife meat to village priests and guests as a traditional practice during weddings (Aiyadurai et al., 2010). The Yakama of the Pacific Northwest use wildlife as a ceremonial meat during tribal funerals, memorials, name-giving ceremonies, weddings, and other celebrations (McCorquodale, 1997). Wildlife meat and other animal parts are used in cultural and religious ceremonies in rural Nigeria, such as masquerades, death ceremonies, and the installation of traditional rulers (Adeola, 1992). Bay duiker (*Cephalophus dorsalis*) is consumed during burials by the Anyanh people in southwest Cameron (Van Vliet & Mbazza, 2011). Rates of wildlife harvest in the village of Ntsieté, Gabon increase during the dry season because wildlife meat plays a role in the circumcision ceremonies that occur during this time (Van Vliet & Nasi, 2008). The Afro-Brazilian religion of Candomlé ritually sacrifice wildlife to gain or maintain connections with deities (Neto et al., 2009; Valencia-Aguilar et al., 2013). Special parts of the animal (such as the heart, liver, or lungs) are offered to the deities, while the remaining meat is eaten during communal feasts, signifying the link between people and deities (Neto et al., 2009; Valencia-Aguilar et al., 2013).

Knowledge Systems

Ecosystems influence formal and informal knowledge systems developed by communities (MEA, 2005). For example, the ability to identify and harvest food from nature,

and then process, prepare, and consume that food in culturally acceptable ways are important aspects of traditional food knowledge (Kuhnlein & Receveur, 1996). The retention of traditional food knowledge helps maintain traditional food systems (Kuhnlein & Receveur, 1996). Among the Lac du Flambeau Band of Lake Superior Chippewa in Wisconsin, techniques for respectfully butchering and handling deer meat are passed down inter-generationally within families (Reo & Whyte, 2012). The ethnozoological knowledge tied to wildlife meat is a component of traditional medical knowledge in some cultures, and another example of how wildlife meat contributes to knowledge systems (Alonso-Castro, 2014). Dietary taboos around wildlife meat consumption are also important components of indigenous beliefs and traditional knowledge systems (Luzar et al., 2012).

Wildlife meat not only contributes to knowledge systems, but also facilitates the transmission of traditional knowledge. The Torres Straight Islanders of Australia use the sharing of wildlife meat to transmit traditional knowledge to islanders raised away from the homeland (Watkin Lui et al., 2016). As communities undergo social, economic, and political change, and interact with wildlife less (including hunting), some fear that knowledge of traditional food will be lost (Alonso-Castro, 2014; Condon et al., 1995). For example, due to protections aimed at restricting the harvest of seabirds, the inhabitants of Røst in the Lofoten Islands of northern Norway are concerned about losing the traditional knowledge of how to make delicacies out of local species (Kaltenborn et al., 2017).

Sense of Place

Sense of place is an individual or collective socially constructed attachment to a particular environmental setting and is often linked to identity (Urquhart & Acott, 2014). Wildlife meat can represent a location or environment, connecting the individuals who consume

it to where the meat was harvested. Torres Straight Islanders share wildlife meat with community members living on mainland Australia because it provides a connection to where they are from (Watkin Lui et al., 2016). In their study of Inuit life in Northern Quebec, Goombay (2005) states that "there is no way of separating the food that I eat from an awareness of the place that it comes from" (p. 418). The harvesting of country foods, like wildlife meat, builds an understanding of the land, a knowledge of one's place in the world, and contributes to people's construction of place (Gombay, 2005).

Recreation and Tourism

Ecosystem services are also derived from the physical use of ecosystems for recreational purposes (Kulczyk et al., 2018). This includes recreation conducted through tourism (MEA, 2005). Cultural ecosystem services are created through the pursuit and harvest of wildlife meat. Hunting is associated with providing physical, psychological, social, and economic benefits (Hendee, 1974). Assessing the cultural ecosystem services provided by hunting, however, is beyond the scope of this dissertation, as the focus is on wildlife meat and the ecosystem services provided once an animal has been killed. Nonetheless, wildlife meat is inextricably linked to its acquisition. Wildlife meat is purported to serve as a re-embrace, or totem, of the hunt (M. N. Peterson et al., 2010).

Wildlife meat provides cultural ecosystem services through tourism. For example, in South Africa, tourists often consume wildlife meat because it is considered exotic and local (Hoffman et al., 2003). Wildlife meat is a favorite type of meat for German, Belgian, and American tourists to order at restaurants in Western Cape, South Africa (Hoffman et al., 2003). Nearly 92% of tourists who responded to the survey had eaten wildlife meat at a restaurant or hotel (Hoffman et al., 2003). In China, tourists seek local gastronomic experiences through the

consumption of local cuisines made with wildlife meat (Ying et al., 2021). In Lin'an, Zhejiang province an estimated 16,150 kg of wildlife meat are consumed though tourism (Ying et al., 2021).

Disservices Provided by Wildlife Meat

Disservices are negative effects of the environment on people that can counteract or reduce the benefits provided by ecosystems (Power, 2010). Wildlife meat can be a vessel for disservices. Food safety hazards such as allergens, bacteria, chemicals, foreign bodies, fungi, heavy metals, hormones, protozoa, parasites, pesticides, prions, radioactive isotopes, toxins, and viruses can cause a wide range of negative impacts on humans (Randles et al., 2014). Handling and consuming wildlife meat can pose adverse biological, chemical, and physical risks (Randles et al., 2014). Biological risks created from bacteria, protozoa, parasites, and viruses can cause illness in humans (Vagsholm, 2014). Three quarters of recent zoonoses are thought to have originated from wildlife; consuming wildlife as food puts people and wildlife in direct contact, increasing the likelihood of disease transmission (Kamins et al., 2014). For example, STEC *Escherichia coli* (Coburn et al., 2005; Ramanzin et al., 2010), *Salmonella spp*. (Atanassova et al. 2008; Gill, 2007), and Mycobacterium tuberculosis (Randles et al., 2014) are all bacteria found in wildlife meat that can cause illness in humans. *Toxoplasma gongii* (Ross et al., 2001; Vikøren et al., 2004) and *Trichinella spiralis* (CDC, 2013; Nelson et al., 2003) are parasites found in wildlife meat that are known to cause illness in humans. Viruses that cause diseases such as severe acute respiratory syndrome (SARS) (Bell et al., 2004), Ebola (Alexander et al., 2015), and coronavirus disease 2019 (COVID-19) (Volpato et al., 2020) are all believed to have been transmitted to humans by handling or consuming wildlife meat.

Chemical risks can either be present in the environment or introduced by human

activities, like the deposition of pesticides, dioxins, polychlorinated biphenyls (PCB's), and heavy metals into the environment (Burger, 2000; Gremse et al., 2014; Randles et al., 2014). PCB's and dioxins (Kuhnlein & Chan 2000, Warenik-Bany et al., 2016) and lead (Arnemo et al., 2016; Danieli et al., 2012; Iqbal et al., 2009; Mateo et al., 2007) are found in wildlife meat. Bio-accumulated chemicals in wildlife meat can be present at levels unsafe for human consumption, especially by women who are pregnant or may become pregnant, and by children less than 6 years old (Danieli et al., 2012; Iqbal et al., 2009; Mateo et al., 2007).

Physical risks can be as simple as eating a piece of bone or as complex as radioactive isotopes in wildlife meat (Randles et al., 2014). Radionuclides from Chernobyl present in the environment were identified as potential public health risks accrued from the consumption of wildlife in Northern Sweden (Palo et al., 1991).

Synergies and Tradeoffs

Wildlife meat can carry many simultaneous meanings (Bryant et al., 2003). For example, wildlife meat can simultaneously provide provisional ecosystem services, cultural ecosystem services, and disservices (Figure 2.2). A family sitting down for dinner with friends may be consuming wildlife meat as food (a provisional ecosystem service); while sharing it with friends strengthens social relations (a cultural ecosystem service); however, that wildlife meat may also be contaminated with lead (a disservice). When services occur simultaneously, there can be interactions between ecosystem services categories known as synergies, bundles, and tradeoffs (Mouchet et al., 2014). Wildlife meat is a unique example of a synergistic relationship: it is a provisional ecosystem service that provides cultural ecosystem services. The Torres Straight Islanders of Australia consume turtle and dugong meat (wildlife meat as a provisional ecosystem service in the form of food) and share this meat to maintain relationships and honor elders

(wildlife meat provides cultural ecosystem services in the form of social relations) (Watkin Lui et al., 2016). Potential disservices created by handling and consuming wildlife meat force tradeoffs with consuming and sharing wildlife meat. Consuming wildlife meat may be an important expression of cultural identity, yet if that wildlife meat is contaminated, consumption may lead to health issues. This contradiction—that wildlife meat can provide both positive and negative benefits simultaneously—complicates management decisions and requires holistic systems-based solutions.

Conclusions

It is well accepted and documented that wildlife meat is a provisional ecosystem service used as food, ornamental resources, and for biochemicals, natural medicines, and pharmaceuticals. In this chapter I establish that wildlife meat also provides cultural ecosystem services in the form of social relations, cultural identity, cultural heritage, spiritual and religious, knowledge systems, sense of place, and recreation and tourism. Handling and consuming wildlife meat also creates potential disservices in the form of biological, chemical, and physical risks. That wildlife meat can provide multiple ecosystem services simultaneously in the form of synergies and tradeoffs increases its significance to societies throughout the world.

Assessments relying solely on the provisional ecosystem services of wildlife meat underestimate the total value of wildlife meat to society. Recognizing the co-generation of benefits and disservices provided by wildlife meat, as well as the interactions and feedback loops between ecosystem services, enables a more complete assessment of the value of wildlife meat to society, and the complexities of managing such an interrelated system. Placing ecosystem services within a framework of metacoupled human and natural systems (human-nature interactions within, as well as between, adjacent and distant places) (Liu 2017) may enable a

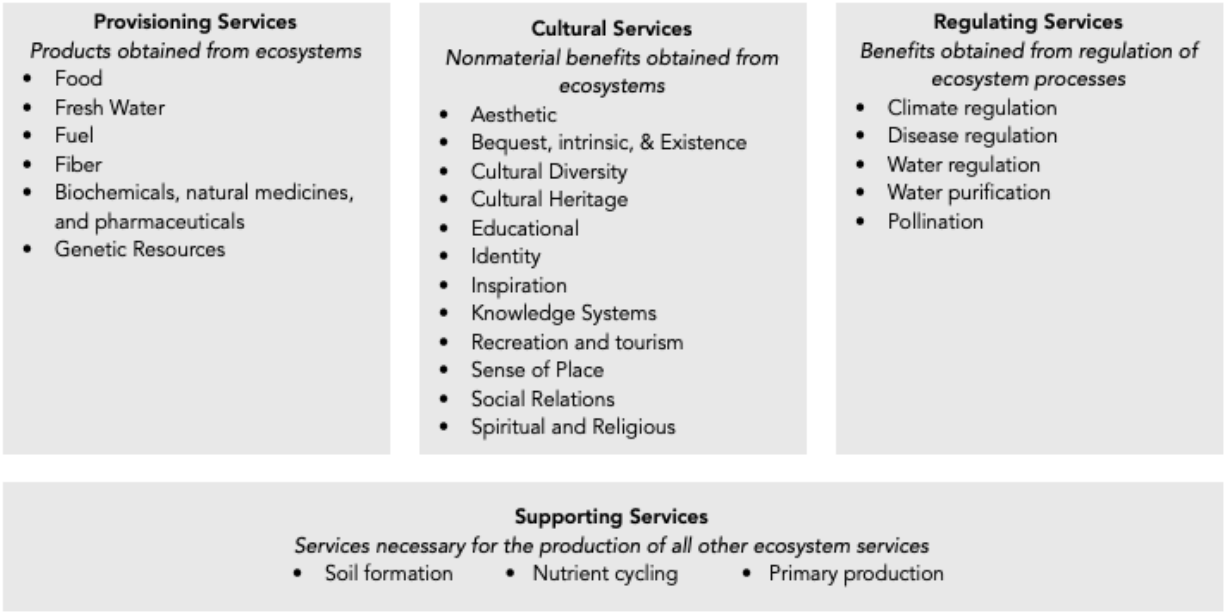
deeper understanding of how ecosystem services and disservices from one location can have a far-reaching effect. For example, wildlife meat consumption in China, driven by nutritional and cultural motivations, was a potential vehicle for transmission of SARS-CoV2 to humans, which has had devastating effects worldwide.

Wildlife meat provides cultural ecosystem services that can add substantial additional value, as well as disservices that may reduce its value. Identifying the cultural ecosystem services provided by wildlife meat contributes to knowledge about the cultural drivers of consumption. When setting forth to mitigate the unsustainable harvest of wildlife, recognizing the multiple benefits provided by wildlife meat, and their interconnectedness, increases the probability of a more complete assessment. For example, regulations that severely limit the amount of wildlife meat harvested may lead to a loss of cultural ecosystem services. Replacing wildlife meat with other substitutions may fulfill dietary needs, but not cultural needs. Alternatively, systems attempting to increase the consumption of wildlife meat may inadvertently promote the spread of disservices. Using the ecosystems services framework enables a more comprehensive assessment of the provisional and cultural services provided by wildlife meat, as well as the disservices, and a way to assess their synergies and tradeoffs to make more holistic and informed decisions about consumptive uses of wildlife.

FIGURES

Figure 2.1:

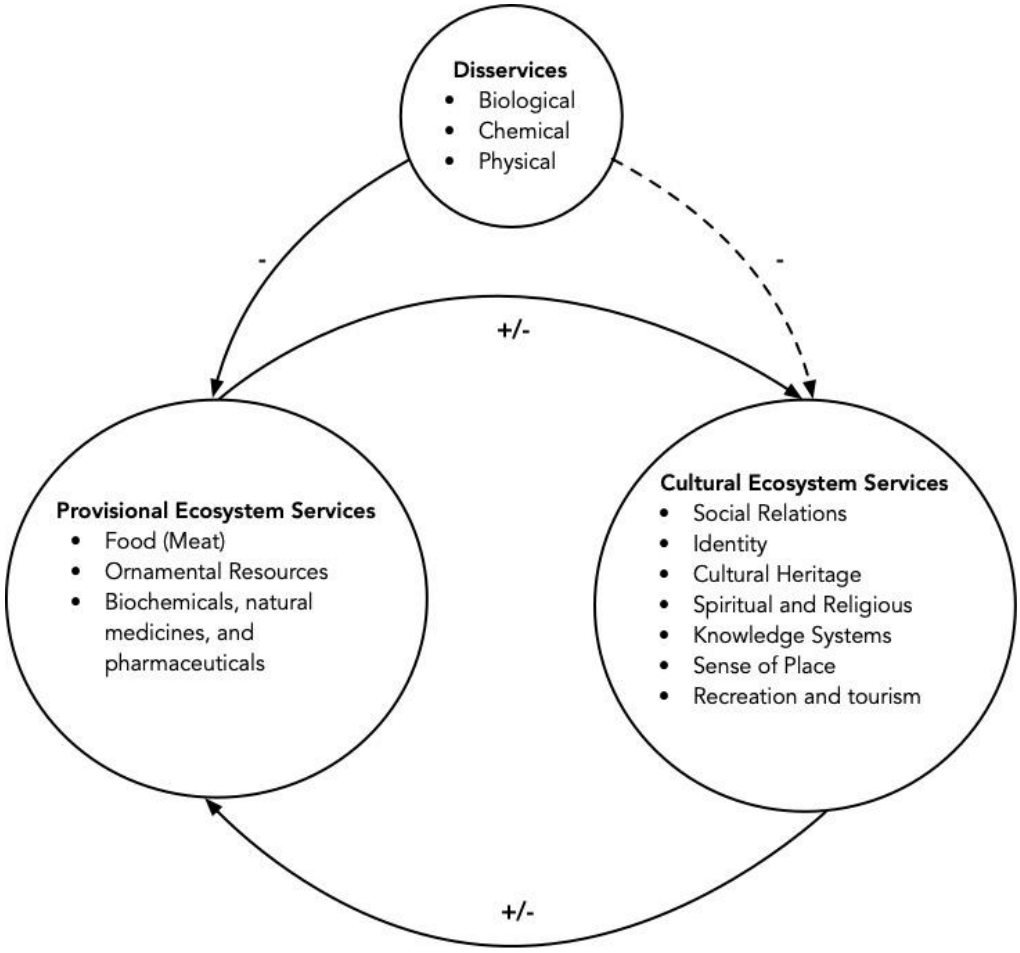
The ecosystem services framework.



Note. Adapted from MEA, 2005.

Figure 2.2:

Identification of and relationships between provisional ecosystem services, cultural ecosystem services, and disservices from wildlife meat.



Note. Wildlife meat is a provisional ecosystem service in the form of food, ornamental resources, or biochemicals, natural medicines, and pharmaceuticals. Wildlife meat provides cultural ecosystem services in the form of social relations, cultural identity, cultural heritage, spiritual and religious, knowledge systems, sense of place, and recreation and tourism. Wildlife meat can distribute disservices in the form of biological, chemical, and physical risks. As a provisional ecosystem service, wildlife meat provides cultural ecosystem services. The quantity and quality of wildlife meat can have positive (increased cultural ecosystem services) or negative (decreased cultural ecosystem services) effects. Cultural ecosystem services provided by wildlife meat can affect how wildlife meat is used as a provisional ecosystem service in positive ways (increased harvest and consumption) or negative ways (decreased harvest and consumption). Disservices from wildlife meat can have direct negative effects on wildlife meats use as a provisional ecosystem service and thus indirect negative effects on the cultural ecosystem services it provides.

TABLES

Table 2.1:

Ecosystem services and disservices provided by wildlife meat.

Service/Disservice	Category	Definition	Evidence of wildlife meat providing this service/disservice
Provisional Ecosystem Services: tangible products obtained from ecosystems (MEA, 2005).	**Food**	Products harvested from ecosystems used for human consumption (MEA, 2005).	4.9 million tons of wildlife meat are harvested in Afrotropical forests annually, which supply food to millions of people (Fa et al., 2002).
			Rural and indigenous communities living in the Amazon are estimated to extract at least 67,000 tons of wildlife meat annually (Valencia-Aguilar et al., 2013).
			In Germany, 0.9 kg per person per year of wildlife meat is estimated to be consumed from an estimated 40,000 metric ton annual harvest (Atanassova et al., 2008).
	Ornamental resources	Products harvested from ecosystems used for decoration or handicrafts (MEA, 2005).	Seal skins, narwhal ivory, and muskox wool are all animal parts used as ornamental resources in the Canadian Artic (Condon et al., 1995).
			Skins of lizards, crocodilians, and snakes are popular worldwide for leather goods (Chardonnet et al., 2002).
	Biochemicals, natural medicines, and pharmaceuticals	Products such as medicines, biocides, food additives, and other biological materials that are derived from ecosystems (MEA, 2005).	The Koya and Guthikoya tribes of the Warangal district of Andhra Pradesh, India believe the meat of the Indian jackal and Rhesus macaque cure asthma and other ailments (Benarjee et al., 2010).
			The non-indigenous inhabitants of the Argentine Chaco use fat from tegu lizards for ailments such as cuts, snakebites, and colds, and fat from pumas and boas for contusions and muscular pain (Altrichter, 2006).
Cultural Ecosystem Services: non-material benefits	**Social Relations**	Ecosystems provide opportunities for creating and enhancing	Among Holman Inuit of Canada, the sharing of subsistence foods, including wildlife meat, is important for community integration, kinship and friendship ties, and denoting respect between hunting households (Condon et al., 1995).

Table 2.1 (cont'd)

obtained from ecosystems (MEA, 2005).		relationships and strengthen communities (Calvet-Mir et al., 2012).	The Torres Straight Islanders of Australia share wildlife meat, turtle and dugong meat in particular, to maintain relationships and honor elders (Watkin Lui et al., 2016).
			The sharing of country foods (including wildlife meat) by Inuit of the Canadian Artic generates social capital within the community (Gombay, 2005).
	Cultural identity	The formation or thickening of cultural identity can be tied to an ecosystem or its components (Chan et al., 2012).	Food sharing is part of Inuit ideology; Holman Inuit who did not participate in substance food sharing reported feeling more separated from their cultural identity (Condon et al., 1995).
			A study of factors affecting wildlife meat consumption in Bata, Equatorial Guinea found that nationality and ethnicity predicted meat consumption, quantifying the connection between identity and wildlife meat consumption (East et al., 2005).
			First and second-generation African expatriates living in New York and Atlanta reported that eating wildlife meat was a way to share their culture with friends and family (Bair-Brake et al., 2014).
	Cultural heritage	Legacy of biophysical features, physical artifacts, and intangible attributes (related to the natural world) of a group or society that are inherited from past generations, maintained in the present, and bestowed for the benefit of future generations (Daniel et al., 2012.)	Subsistence hunting and consumption of wildlife meat are a tradition in the Canadian Arctic; these traditional activities maintain continuity with the past (Condon et al., 1995).
			For Torres Straight Islanders in Australia, sharing wildlife meat provides a way to explain and transmit culture to younger generations, connecting youth to their cultural heritage (Watkin Lui et al., 2016).

Table 2.1 (cont'd)

	Spiritual and religious	Attach spiritual and religious values to ecosystems and their components (MEA, 2005) and ecosystems are a source of inspiration for religious or spiritual thought and experience (Chan et al., 2012).	Inuit believe that wildlife possess an immortal spirit and that sharing and consuming wildlife meat helps the spirit separate from the animal body and take a new form, continuing the cycle of life (Omura, 2013)
			The Yakama of the Pacific Northwest use wildlife as a ceremonial meat during tribal funerals, memorials, name-giving ceremonies, weddings, and other celebrations (McCorquodale, 1997).
			Wildlife meat and other animal parts are used in rural Nigeria for cultural and religious ceremonies, such as masquerades, death ceremonies, and the installation of traditional rulers (Adeola, 1992).
	Knowledge systems	Ecosystems influence the types of knowledge systems developed (traditional and formal) (MEA, 2005).	Among the Lac du Flambeau Band of Lake Superior Chippewa in Wisconsin, techniques for respectfully butchering and handling deer meat are passed down inter-generationally within families (Reo & Whyte, 2012)
			Due to protections aimed at restricting the harvest of seabirds, inhabitants of Røst in the Lofoten Islands of northern Norway are concerned about losing the traditional knowledge of how to make delicacies out of local species (Kaltenborn et al., 2017).
	Sense of place	An individual or collective socially constructed attachment to a particular environmental setting and often linked to identity (Urquhart & Acott, 2014).	Torres Straight Islanders share wildlife meat with community members living on mainland Australia because it provides a link to the homeland and a connection to where they are from (Watkin Lui et al., 2016).
			For Inuit of Northern Quebec the harvesting of country foods, including wildlife meat, builds an understanding of the land, a knowledge of one's place in the world, and contributes to people's construction of place (Gombay, 2005)
	Recreation and tourism	Ecosystem services are derived from the physical use of	Wildlife meat was reported as a favorite type of meat among German, Belgian, and American tourists to order at restaurants in Western Cape South Africa, nearly 92% of whom reported

Table 2.1 (cont'd)

		ecosystems for recreational purposes (Kulczyk et al., 2018), this also includes recreation conducted thought tourism (MEA, 2005).	consuming wildlife meat (Hoffman et al., 2003).
Disservices: negative effects of the environment on people that can counteract or reduce the benefits provided by ecosystems (Power, 2010).	**Biological**	Biological risks created from bacteria, protozoa, parasites, and viruses can cause illness in humans (Vagsholm, 2014).	STEC *Escherichia coli* (Coburn et al., 2005; Ramanzin et al., 2010), *Salmonella spp*. (Atanassova et al. 2008; Gill, 2007), and Mycobacterium tuberculosis (Randles et al., 2014) are all bacteria found in wildlife meat that can cause illness in humans.
			Viruses that cause diseases such as severe acute respiratory syndrome (SARS) (Bell et al., 2004), Ebola (Alexander et al., 2015), and coronavirus disease 2019 (COVID-19) (Volpato et al., 2020) are all believed to have been transmitted to humans by handling or consuming wildlife meat.
	Chemical	Chemical risks can be present either in the environment or introduced by human activities, such as the depositing of pesticides, dioxins, polychlorinated biphenyls (PCB's), and heavy metals into the environment (Burger, 2000; Gremse et al., 2014; Randles et al., 2014).	PCB's and dioxins (Kuhnlein & Chan 2000, Warenik-Bany et al., 2016) and lead (Arnemo et al., 2016; Danieli et al., 2012; Iqbal et al., 2009; Mateo et al., 2007) are found in wildlife meat.
	Physical	Physical risks can be	Radionuclides present in the environment from Chernobyl were

Table 2.1 (cont'd)

		as simple as eating a piece of bone, but also more complex such as radioactive isotopes in wildlife meat (Randles et al., 2014).	identified as potential public health risks accrued from the consumption of wildlife in Northern Sweden (Palo et al., 1991).

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CHAPTER 3: CULTURAL ECOSYSTEM SERVICES PROVIDED BY VENISON IN MICHIGAN, USA

Abstract

By identifying the cultural ecosystem services provided by wildlife meat, this chapter assesses our knowledge, reveals gaps in that knowledge, and deepens our understanding of how culture and wildlife are linked through wildlife meat. Wildlife meat is the meat (muscle, viscera, bones, and associated body tissues used for human consumption) of free-ranging mammals, birds, reptiles, and amphibians that are not cultivated, domesticated, or tamed. Although culture is recognized as a major factor influencing the harvest and consumption of wildlife meat, research on the relationship between culture and the consumption of wildlife is lacking, particularly for license purchasing hunters in the United States. Additionally, research on synergies between provisional and cultural ecosystem services, and the co-occurrence of cultural ecosystem services is limited. To improve our understanding of these complex topics, I conducted 60 in-depth, in-person interviews with hunters who purchased a state hunting license for deer in southcentral Michigan. Hunters where asked about their venison associated behaviors. Provisional, attribute, in vivo, and descriptive coding of these interview transcripts revealed that wildlife meat provides hunters with cultural ecosystem services in the form of social relations, identity, cultural heritage, education, knowledge systems, and spiritual and religious. Results from my study can inform policy and management decisions through additional insights into how culture and wildlife meat consumption are linked and how changes in consumption can influence the benefits derived from wildlife meat and hunting.

Wildlife Meat

People throughout the world harvest wildlife for economic, cultural, ecological, and

nutritional reasons (Hoffman & Cawthorn, 2012; Mainka & Trivedi, 2002). Wildlife meat, also called game meat, bushmeat, wild-harvested meat, or wild meat, refers to the meat (muscle, viscera, skeleton, and associated body tissues that are used for human consumption) of free-ranging mammals, birds, reptiles and amphibians that are not cultivated, domesticated, or tamed (Food Law, 2000; Nasi et al., 2008; Stanford & Bunn, 2001). I use the term wildlife meat because it clearly identifies the source (wildlife) while remaining a relatively broad and inclusive term. Defining what constitutes wildlife meat, however, is increasingly difficult as the definitional line between domestic and wild is blurred with the advent of wildlife farming, creation of sanctuaries for hunting, feeding of wildlife for viewing or as a management practice, and nomadic herding of wildlife (Geist, 1988; Needham et al, 2023).

Wildlife meat is gaining popularity with consumers because it is perceived as healthy, ethical, and environmentally friendly (Corradini et al., 2022; Needham et al., 2023). Wildlife meat is a culturally important and healthy source of lean protein, high in energy content and essential macronutrients (Hoffman & Wiklund, 2006). The harvest of wildlife meat is perceived as more ethical than factory farming (Kempen et al., 2023) and wildlife meat has lower emissions than industrialized meat (Fiala et al., 2020; Johnson et al., 2021). However, in some areas of the world, harvesting wildlife for consumption is blamed for declines in wildlife populations (VanVliet & Mbazza, 2011; Wilkie & Carpenter, 1999). Handling and consuming wildlife meat also poses potential public health risks (Paulsen et al., 2014; van Vilet et al., 2022; Wegner et al., 2022). For example, the transmission of SARS-CoV2 to humans, which has had devastating effects worldwide, is hypothesized to have occurred through wildlife meat consumption in China (Volpato et al., 2020).

In some regions of the world, wildlife meat is understudied and undervalued, creating

gaps in knowledge about its use and value to society. Although research on wildlife meat has recently been increasing (Corradini et al., 2022), current research on wildlife meat emphasizes its nutritional and economic importance (Brashares et al., 2011; Gomez et al., 2022; Nasi et al., 2008; Van Vliet & Mbazza, 2011). Culture influences the consumption of wildlife meat (Chausson et al, 2019; Mainka & Trivedi, 2002; Nasi et al., 2011; Bennet & Robinson, 2000; Schenck et al., 2006; Van Vliet & Mbazza, 2011), yet research on the relationship between culture and wildlife consumption is lacking (Chausson et al, 2019; Nasi et al., 2011; Morsello et al., 2015). However, there is a growing interest in understanding the cultural importance of wildlife meat (Ahmed et al., 2022; Goguen & Riley, 2020; Gomez et al., 2022; Van Vliet & Mbazza, 2011; Watkin Lui et al., 2016). Furthermore, most research on wildlife meat is from subsistence or indigenous communities, or relates to bushmeat from the tropics (Alvard et al., 1997; Davies & Brown, 2007; Gurven, 2004). There is little research on wildlife meat, particularly its cultural importance, in other contexts. Understanding the cultural importance of wildlife meat has implications for public health policy and wildlife management decisions, as culture affects both the consumption of and benefits derived from wildlife meat.

An estimated 263 million kg of wildlife meat are harvested annually by hunters in the United States (Johnson et al., 2021), yet wildlife meat remains an overlooked component of US food systems (Hall et al., 2020; Tidball et al., 2014). Research on hunting in the United States tends to focus on the economic value of hunting or managing wildlife populations, rather than the wildlife meat that hunting provides, creating gaps in our knowledge about a significant aspect of hunting (Maher et al., 2023; Marchello et al, 1985). Although research on the use and distribution of hunter-harvested wildlife meat in the United States is limited, even less is known about its cultural importance. Research in the United States on socio-cultural values created by

hunting has largely focused on the act of hunting itself providing physical, psychological, social, and economic benefits (Decker & Connelly, 1989; Hendee, 1974).

In general, the sale of wildlife meat is illegal throughout the United States, although regulations vary from state to state and markets exist for some species (Abhat & Unger, 2010; Geist, 1988). As wildlife meat is generally not available in stores or restaurants in the United States, most wildlife meat is accessed through hunting or receiving it directly from a hunter without monetary exchange. Thus, the social networks of hunters play a major role in wildlife meat distribution and wildlife meat sharing is an integral part of hunting culture (Goguen & Riley, 2020; Goguen et al., 2018; Stedman & Decker, 1996). Identifying how wildlife contributes to US hunting culture will fill knowledge gaps and provide valuable insights for policy.

Cultural Ecosystem Services

In this dissertation, I use cultural ecosystem services as a framework to identify the cultural significance of wildlife meat. Cultural ecosystem services are the non-tangible benefits people derive from natural systems (MEA, 2005). More specifically, "cultural ecosystem services are the contributions ecosystems make to human wellbeing in terms of the identities they help frame, experiences they help enable, and the capabilities they help equip" (Fish et al., 2016, p. 212). Although defined as non-tangible, cultural ecosystem services can have material aspects or be tied to a material object (Fish et al., 2016; Plieninger et al., 2015; Satterfield et al., 2013). In this study, they are tied to wildlife meat, which is also a provisional ecosystem service.

Cultural ecosystem services have been critiqued for: a separationists perspective of humans and nature (Plieninger et al., 2015), a reductionist view of culture as a service (Plieninger et al., 2015; Setten et al., 2012), and being rooted in Western ideology and difficult to

transfer to indigenous ontologies (Pröpper & Haupts, 2014; Satterfield et al., 2013; Stalhammar & Pedersen, 2017). Additionally, cultural ecosystem services are difficult to define and quantify and thus often lack empirical evidence (Fish et al., 2016; Hernández-Morcillo et al., 2013; Satz et al., 2013). For these reasons, cultural ecosystem services are often not adequately considered or represented in assessments, and their importance is not recognized in decision making (Daniel et al., 2012; Plieninger et al., 2013). However, cultural ecosystem services are directly experienced and intuitively appreciated, which makes them valued by the public (Milcu et al., 2013; Plieninger et al., 2013). Cultural ecosystem services play an important role in motivating public support for conservation because the loss of cultural ecosystem services creates effects realized by society (Chan et al., 2011; Daniel et al., 2012). Furthermore, cultural ecosystem services enable decision makers to address the increased demand for cultural considerations in management (Satterfield et al., 2013) and enable more holistic assessments of management issues (MEA, 2005).

Categorization of Cultural Ecosystem Services

To assist in this assessment, I chose the following categorization of cultural ecosystem services: recreational and tourism, aesthetic, bequest, intrinsic and existence, spiritual and religious, educational, knowledge systems, social relations, cultural identity, cultural heritage, cultural diversity, inspiration, and sense of place (Hernández-Morcillo, Plieninger et al., 2013; MEA, 2005; Milcu et al., 2013). Cultural ecosystem services categories are overlapping, interdependent, and evolve over time (Gee & Burkhard, 2010; Pröpper & Haupts, 2014; Hernández-Morcillo et al., 2013). The categorization of cultural ecosystem services is multifaceted and often oversimplified (Tengberg et al., 2012). Individuals perceive, experience, and value cultural ecosystem services according to their unique perspectives and experiences

(Plieninger et al 2015). Although division into categories may be subjective and nuanced, categorization can assist in assessment (Tengberg et al., 2012).

Synergies between Provisional and Cultural Ecosystem Services

In this chapter, I focus on connections, coined synergies, between provisional and cultural ecosystem services. Synergies occur when there is a positive association between two ecosystem services within or between categories (Cord et al, 2017; Lee & Lautenbach, 2016; Mouchet et al., 2014). Harvesting activities, such as fishing and gardening, provide both cultural and provisional ecosystem services (Calvet-Mir et al., 2012; Chan et al., 2012;). In the Lofoten Islands of Northern Norway, fishing provides not only provisional ecosystem services in the form of food, but also recreation and tourism, aesthetic, knowledge systems, social relations, cultural heritage, and sense of place cultural ecosystem services (Kaltenborn et al., 2017). Consuming and sharing wildlife meat is another example of a synergistic relationship: wildlife meat is a provisional ecosystem service that also provides cultural ecosystem services (Chapter 2). Another form of synergy is the co-occurrence of multiple types of the same ecosystem service. As described above, fishing provides multiple cultural ecosystem services simultaneously. Wildlife meat is also another example of the co-occurrence of multiple cultural ecosystem services simultaneously (Chapter 2).

Cultural Ecosystem Services Provided by Wildlife Meat

Chapter 2 reviewed literature to explore how wildlife meat provides cultural ecosystem services. Sharing and consuming wildlife meat with others can be an important way hunters create and maintain social relations (Condon et al., 1995; Dombrowski, 2007; Fergus, 1996; Gombay, 2005; Heffelfinger, 2014; Omura, 2013; Patton, 2005; Watkin Lui et al., 2016). Sharing and consuming wildlife meat is also tied to the construction, performance, and

maintenance of identity (Bair-Brake et al., 2014; Condon et al., 1995; Dombrowski, 2007; East et al., 2005; Maher et al., 2023; Ngade et al., 2017; Omura, 2013; Searles, 2002; Watkin Lui et al., 2016). Wildlife meat connects people to their collective and individual cultural heritage through its use in traditional activities that maintain continuity with the past (Condon et al., 1995) and can function as a vehicle to explain and transmit culture to younger generations (Watkin Lui et al., 2016). Wildlife meat can be used for religious, spiritual, and cultural reasons due to its symbolic values (Adeola, 1992; Ahmed et al., 2022; Aiyadurai et al., 2010; Neto et al., 2009; Omura, 2013; Titus et al., 2009; VanVliet et al., 2016; Watkin Lui et al., 2016). The knowledge and skills necessary for identifying, harvesting, processing, preparing, and consuming wildlife meat are a food knowledge system that is maintained and built by engaging in these activities and sharing this knowledge with others (Kaltenborn et al., 2017; Kuhnlein & Receveur, 1996). Wildlife meat contributes to sense of place by providing connections to the homeland (Watkin Lui et al., 2016), aids in building an understanding of the land, and supporting people's construction of place (Gombay, 2005). Consuming wildlife meat is popular with tourists because it is considered exotic and local, providing tourism cultural ecosystem services (Hoffman et al., 2003). Many sources for this assessment came from literature about subsistence or indigenous communities, or relating to bushmeat from the tropics. This study will test whether or not this evidence is transferable to wildlife meat harvested under other circumstances.

The Current Study

My study seeks to better understand the value of wildlife by identifying the cultural ecosystem services that wildlife meat provides. Furthermore, I seek to do this in a context other than subsistence or indigenous communities, to expand understanding of the cultural importance of wildlife meat to other contexts. Findings from this study can also contribute to cultural

ecosystem services literature, providing further evidence for synergies between and within ecosystem service categories. This study takes place in the United States with a focus on venison, or the meat of true deer (family Cervidae), in particular, the meat of white-tailed deer (*Odocoileus virginianus*). In the United States, white-tailed deer are the most abundant and popular big game species (Aiken & Harris, 2011; VerCauteren et al., 2011). A majority (estimated 93%) of wildlife meat harvested in the United States is from ruminants, most of which are white-tailed deer (Johnson et al., 2021). Deer hunting has a long history and heritage in many communities where deer are found (Stransky, 1984). In my study, I conducted in-depth, in-person interviews with Michigan deer hunters about their venison-associated behaviors. The results of this study expand our understanding of the value of wildlife and can be used to inform policy and management decisions.

Methods

Study Site, People, and Wildlife

The state of Michigan, located in the northcentral United States, had a population of 9,883,640 people in 2010 (U.S. Census, 2010). Michigan's licensed deer-hunting population ranked second in the US, and ranked fifth in the number of resident deer hunters 16 years and older (Fuller, 2016). About 90% of all annually-licensed hunters in Michigan obtain a license to hunt white-tailed deer, the most abundant deer species present in the state (Frawley, 2006). Besides contributing substantially to the Michigan Department of Natural Resources (MDNR) budget, hunting contributes an estimated $2.3 billion to the state's economy and is considered an important cultural heritage among the state's residents (Langenau, 1994; MDNR, 2010; Rudolph, 2005; Arnett & Southwick, 2015).

In 2013, 712,404 people purchased at least one deer hunting license in Michigan, and an

estimated 661,788 people participated in the 2013 deer hunting season (Frawley, 2014). An estimated 11.4–14.5 million kg of venison from white-tailed deer is harvested annually in Michigan (Goguen et al., 2018). An estimated 75% of the Michigan population has consumed wildlife meat at some point in their life, while 49% consume venison annually, and ≥14% consume venison more than 10 times a year (Goguen & Riley, 2020). The mean age of Michigan license-purchasing deer hunters in 2013 was estimated to be 42 years, 89% of whom identify as male (Frawley, 2014).

Participant Selection

I used a qualitative approach of in-depth semi-structured interviews with a sample of state license purchasing deer hunters in Michigan. Hunters who received and responded to a mail-back 2013 Michigan Deer Harvest Study, had purchased a 2013 Michigan deer-hunting license, harvested at least one deer during the 2013 Michigan deer hunting season, and were residents of either Ingham, Eaton, Clinton, or Shiawassee county (Figure 3.1) comprised the sample population. In compliance with regulations governed by the Michigan State University Human Research Protection Program, individuals under the age of 18 were not considered for interviews. Tribal members and others who hunted under circumstances that did not require a license from the State of Michigan, were not part of the sample selected for this study. A maximum variation approach was used to select the interview sample (Patton, 1990). The sample was stratified by county (Ingham, Eaton, Clinton, or Shiawassee), community type (urban or not-urban), and number of people a hunter reported sharing venison with on a previous questionnaire (Goguen et al. 2018). Sharing behaviors were divided into four categories based on the distribution of people with whom hunters reported sharing: none, 1-3 people, 4-10 people, and more than 10 people. Additional sample variation was sought in gender (male and female),

amount of deer harvested in 2013, and age. Community type was determined using the methods described in Goguen et al. 2018.

Data Collection

A total of 60 interviews were conducted between May-August 2014. Postcards describing the purpose of the study and providing researcher contact information (cell phone and email) were sent out in small waves (Appendix 3.1). Potential interviewees were offered a $25 gift card for their participation (which ended up being a $30 gift card due to bank regulations). If a hunter did not respond within two weeks, a second card was sent with an additional handwritten note discussing the importance of their participation. It was assumed that requiring individuals to call and schedule an interview would yield rich informants and allowed review of qualifications for inclusion in the study (Patton, 1990).

If a hunter contacted the researcher, met the qualifications for inclusion in the study, and wished to participate in an in-person interview, a time was arranged to meet and conduct the interview in a location of their choice. All interviewees were given an informed consent document to read and sign prior to beginning the interview. Audio recordings of all interviews were taken with the permission of participants to improve the accuracy of data collection. These audio recordings were later transcribed by a professional transcription agency to minimize error through the application of training and quality assurance control (Babbie, 1990). By the completion of interviews no novel concepts and themes emerged. Researching this point of saturation indicates that the interviews conducted captured the diversity, depth and nuances of wildlife meat use and distribution in Michigan (Hennink & Kaiser, 2022).

Interview Instrument

Interview questions were developed with the input of expert advice and were piloted with

several different populations of hunters to ensure the validity and reliability of responses (Vaske, 2008). Interviews were divided into two parts: 1) a combination of structured and semi-structured open-ended questions (Appendix 3.2), and 2) a short survey consisting of closed and open-ended questions to ascertain demographic information not collected by the MDNR about the interviewee (Appendix 3.3). Hunters were asked questions about their 2013 deer harvest, deer processing, other sources of venison in the household, household venison consumption patterns, venison preparation, venison sharing external to the household, venison receiving and trading, the sociocultural value of venison and venison sharing, and any concerns or limitations they experience when sharing or consuming venison. After the interview was completed, a short background questionnaire was administered about the interviewee's race, profession, current residence type, residence type when they were growing up, number of years lived in Michigan, highest level of education achieved, annual household income, and membership in hunting clubs. This questionnaire also provided an option for additional comments.

Analyses

Interview transcripts were analyzed using provisional, descriptive, in vivo, and attribute coding (Saldaña, 2016). Provisional coding started with a list of predetermined codes established by a priori knowledge or theory to ensure that the analysis aligned with research questions (Saldaña, 2016). Initial provisional codes were created from cultural ecosystem service categories: recreational and tourism, aesthetic, bequest, intrinsic and existence, spiritual and religious, educational, knowledge systems, social relations, cultural identity, cultural heritage, cultural diversity, inspiration, and sense of place.

Ten information-rich interviews that represented the diversity of participants and their experiences with venison were used for initial analysis. These ten interviews were used to

develop a more complex codebook with sub codes for each initial cultural ecosystem services code category. Descriptive, in vivo, and attribute coding were used to identify sub codes (Saldaña, 2016). To provide more control over the initial analysis, hard copies of interview transcripts were used (Saldaña, 2016). Once a complete codebook was developed, it was entered into MAXQDA, and all interviews were analyzed using this computer-assisted qualitative analysis software. Coding was an iterative and multistep cyclical process where sub codes were revised, modified, expanded, or deleted throughout analysis.

Results

Description of Hunters Interviewed

Almost all (96.7%) of the hunters interviewed identified their race and ethnicity as white, non-Hispanic. Two hunters identified as Hispanic or Latinx. The majority interviewed (86.7%) were male. The mean age of interviewees was 49 (range 19–78 years). The hunters lived in rural (n = 22), suburban (n = 20), and urban (n = 18) community types. Hunters reported the following levels of education: high school diploma/GED (n = 8); associate degree (n = 6); technical or vocational degree (n = 3); some college (n = 15); bachelor's degree (n = 19); graduate or professional degree (n = 9). Of the hunters who reported their household income (n = 57), 22.8% earned $0.00- $49,999, 47.4% earned $50,000-$99,999, and 29.8% earned greater than $100,000. Hunters reported a wide array of behaviors related to venison consumption and sharing, although all hunters ate at least some of their venison and shared it with at least one other person.

Cultural Ecosystem Services

I found evidence of venison providing cultural ecosystem services in the form of social relations, identity, cultural heritage, education, knowledge systems, and spiritual and religious

(Table 3.1). There was no evidence that venison provided cultural ecosystem services in the form of aesthetic, cultural diversity, bequest, intrinsic, and existence, inspiration, sense of place, or recreation and tourism.

Social Relations

Processing, cooking, sharing, and eating venison provided hunters with opportunities to create, maintain, and strengthen relationships. This was the most ubiquitous cultural ecosystem service provided by venison, present in every interview. Hunters perceived venison as important, thus sharing it emphasized or signaled the significance of relationships. Furthermore, venison processing provided opportunities for social engagement, sharing venison was used to demonstrate reciprocity, and providing venison to those in need was a way to support family, friends, or community.

Hunters referred to venison as "something special" or a "prized possession". The amount of time and effort that was put into acquiring venison was what made it more special. As Hunter 12 described:

> "The venison as a food product is something that I've created with my hands. If I were a carpenter, I don't know, maybe I'd build them a bookcase as a gift. But the hunting experience is special to me. I take a great deal of care in hunting morally and properly taking care of the meat. So, I guess it's probably the equivalent of your next-door neighbor that has this wonderful garden bringing over really great tomatoes. It's the same thing. I don't grow a garden. I harvest deer, but it's the same kind of deal. This is a venison garden that I— when I scouted, that's putting in the seeds, and when I go out and spend time and make sure I'm in the right spot, well that's the weeding, and then eventually I'll get an opportunity to pick one. But it's the same kind of thing, so it's the

same sort of social interaction as if I had an apple tree and I went out and picked apples and make them available to my neighbors because I have it for those that like it, it's something that I've made, if you will, and I give away. I have that feeling of giving them something that's special to me and perhaps justify my existence."

Sharing something special, like venison, emphasized the importance of the relationships with whom venison was shared. Most hunters thought carefully about who they would choose to share their venison with. As Hunter 41 described, "Deer is my favorite red meat and I share it, but I only share it to very special people. I really do. I don't share it with people that are not special." For many hunters, including Hunter 1, special people were identified as family and close friends. "I think that the people like my family, immediate family, that's important. My close friends, that's important. So that's how I choose [who to share my venison with] ." Venison was also reserved for special occasions, such as Hunter 60 describing a 4th of July celebration (U.S. Independence Day); "…then you might dig out the tenderloin and some chops and make it something a little bit more than just hamburger, just to make it a little bit more special." Sharing something valuable was a way to signal the importance of a relationship, and thus maintain and strengthen it.

For some hunters, processing a deer was a social activity and an opportunity to build and maintain relationships. For Hunter 4 and their family, processing the deer they harvested was a big family event and tradition: "We get together the Friday after Thanksgiving, that's what we do. We process deer. We have a vacuum packager and sausage maker, sausage stuffer. We get most of it done that weekend." Hunter 21 expressed a similar occurrence: "Now the grandsons are helping to cut and the sons or son-in-law's will come over and we all kind of pitch in." Some hunters described processing a deer as a time to bond or a fun time spent with family and friends.

Not all hunters, however, processed their own deer. Some brought it to a commercial processor and did not describe these experiences.

Venison was reported as being used to say thank you or demonstrate reciprocity. In this example, Hunter 7 used venison to maintain an important relationship with the landowner and to thank the landowner for allowing them to hunt their property:

> "To me though, my landowner is really, really important—that relationship. I don't own property and I enjoy hunting on private land magnitudes better than state land and so, to me, it's critical that I maintain a good relationship with the landowner and [sharing venison is] something I can do that gives back to them and maintains that relationship. They look forward to it, so I know that's important to them and that is a good way to keep that relationship."

Providing venison to those in need was a way of supporting others. Venison was frequently given to family members, friends, or community members who needed assistance. As Hunter 4 explains:

> "Yeah, we don't have to look real far in our community to find people who maybe don't have a lot of resources or extra resources to go buy meat. Yeah, you know, you give them a couple grocery bags full [of venison], which is usually about 30 pounds or so."

Hunters talked about having an open freezer or family foodbank to provide venison to a family member who did not live within their household. Venison from this communal freezer was available without having to ask. As Hunter 23 described:

> "It's just stockpiled, and it's my stockpile, and if the daughter needs some, it's just in my freezer. Like I said earlier, it's a communal freezer, it's big and it gets full. But if anybody ever needs anything like [my children] or family members, it's there. I have a [family]

> food bank and I keep my [family] from going to a church or a food bank on their own, do you know what I mean? I subsidize my end of the world."

Venison was also provided to hunters who did not harvest a deer or families who used to have a source of venison and no longer do, due to a hunter aging or dying. Hunter 34 illustrates this scenario:

> "Well, if you are not able to get one this past year, you have friends, you have brothers, you have nephews that did. So yes, they will share. Sometimes you don't even have to ask. They'll say, "I shot a deer, you want something?" There you go. So literally every year, regardless if I shoot one or not, I will have venison in my freezer."

Identity

Processing, sharing, and eating venison was tied to the formation or thickening of personal identity (individual goals, values, and beliefs) and social identity (definition of self in relation to others, including cultural identity) (Schwartz et al., 2006). For some hunters, sharing and consuming venison was considered a part of hunting culture and engaging in these activities was tied to their identity as a hunter. Hunters described sharing venison as "what you do" and "a rule". Hunter 30 identified the sharing of venison as part of the culture of their church, which was located in a rural community: "And for sure, there's a venison dish here every time just because of the culture. [It] is a country church so they're all about bringing something that's wild." For Hunter 1, sharing venison was not so closely tied to hunting culture, as it was with a more universal cultural practice of food sharing.

> "I think that at a fundamental level sharing food or cooking a good meal and enjoying it with family and friends, that's an important part of culture. It's just what we do so, and I think venison helps us provide or fill that role."

Respect for nature was an important cultural norm for many hunters. Hunters discussed how they treated the carcass and meat as a way of respecting the animal they killed. How respect was conveyed varied, however, engaging in these individually sanctioned acts was central to some individuals' identities as hunters. Hunters described how the animal was handled in the field, how killing was talked about, how meat was processed and used, and how using as many parts of the deer as possible as ways to express respect for the harvested deer. For Hunter 14, properly cleaning and consuming the deer they shot was respecting the animal's life they had taken: "You shoot it, you kill it, you eat it. You kill it, you clean it, and you eat it. You want it dead; you take responsibility for it." Similarly, for Hunter 17, preparing a good meal was the best way to express their respect: "I bring it home and I give that animal as much respect in the kitchen as I possibly can..." Waste was also a concern for some hunters. For example, Hunter 8: "I do that [mount my deer] out of respect for the deer. They gave up their life and you should honor them no matter how big or small they are. [I] use every part of them." Connecting the consumption of harvested deer to showing respect for the life taken deepens the meaning behind sharing and consuming venison to more than mere sustenance.

Another way venison contributed to identity was through self-fulfillment. Hunters could fulfill their ambitions, capabilities, and desires through efforts relating to the harvest, sharing, and consumption of venison, thus enabling them to enact and fulfill their personal identity. Hunters talked about how providing venison made them feel good, self-worth, satisfaction, pleasure, pride, gratification, a sense of accomplishment, fulfillment, and rewarded. These sentiments were often linked to self-sufficiency or self-reliance. For example, Hunter 25 stated:

> "But it's that satisfaction of I hunted it, I harvested it, I field dressed it and I took it in, I got that and now I'm going to eat it. It's sort of a circle, do you know what I mean? Just

a—I don't what you'd call that. A certain amount of fulfillment of knowing I'm eating what I harvested."

Hunters expressed feeling fulfilled by their ability to take a deer from the field to the table and provide sustenance for themselves, their family, and their friends. Multiple hunters used the metaphor of woodworking or gardening to describe their connection to the venison they harvested. Using this metaphor, they expressed how the time and effort they put into harvesting venison made it special and sharing that was giving others "a piece of themselves". Venison was the end product of their efforts, and thus symbolic of their identity as a hunter. As Hunter 23 described:

> "Well, it's just knowing that somebody's getting something from you. Something that is given has to be acquired somehow, whether it's from the heart or pint of blood or store or trinket or birthday gift, but when you give something to somebody, something that you provided ... that's something that you hunted, prepared for, that's what you got up early for, that's what you went out there in the rain for, and then you enjoyed taking it and then you're giving that to somebody. That's giving something of yourself. That's giving a piece of your effort."

Cultural Heritage

Venison is a physical part of the natural world that serves as a totem for stories, memories, knowledge, and traditions, which are passed down through generations and serve to perpetuate hunting culture. Cultural heritage was identified when venison served as a totem for connecting to past events and experiences. For one hunter, venison was tied to childhood memories and brought feelings of nostalgia. For another, simply removing a package of meat from the freezer triggered memories of the day that meat was harvested and who was present.

Sharing venison provided an opportunity to share stories and memories about hunting. For example, Hunter 37 talked about sharing venison during the holidays, “At Thanksgiving time everyone is telling their stories—their hunting stories and stuff, so [sharing our venison] brings them out."

Another way cultural heritage was identified was through knowledge related to venison procurement, processing, and preparation being passed on to others and down through generations. Hunter 9 described engaging his children when processing his deer: “I have my daughter helping me cut. Sometimes, I’ve had my one son that hunts deer quite a bit too help me out … And they’re learning, they’re learning from me what I’ve learned and I’m passing it down." Furthermore, hunters expressed the idea that showing people how to properly process a deer is “passing on the heritage.” Overall, the concept of passing on venison-related knowledge was important for perpetuating hunting culture.

The final way that cultural heritage was identified in these interviews was in traditions created and passed on through the sharing and consumption of venison. For Hunter 51, venison is considered a traditional dish. “[Venison] is something that I grew up with and it is kind of a traditional thing.” Some hunters discussed the ritual of consuming the organs of freshly harvested deer. For example, Hunter 15 described, "At deer camp, it’s usually tradition the first deer, the liver and heart get consumed." Other hunters discussed that it has become a tradition to bring venison to certain events or to give venison as yearly gifts. Some hunters described developing new traditions related to venison. For example, Hunter 26 discussed developing a tradition of cooking venison tenderloins wrapped in bacon for Christmas Eve: “We just decided to do it one time and we've done it, I think, five years in a row now. So, it's starting to be a tradition as long as I can get [a deer].”

Education

Processing, sharing, and eating venison provided hunters with an opportunity for formal and informal education about ethics, biology, and hunting. For Hunter 7, having extra venison provided the opportunity to teach their son about giving back to the community.

> "I like to teach my son that, just that ethical part of it, the giving back, so we like to [donate a deer] every year actually… it's important for us to recognize that there is a need out there and if we're fortunate enough to harvest multiple deer, we can certainly give back."

For Hunter 37, processing their deer became an opportunity to teach their daughter about deer anatomy.

> "My daughter was very interested in just how everything looks... But she's interested in seeing everything from start to finish on it, so she looks through and sees the—how we gut the deer and all that stuff, so we show her all the different parts, the intestines and all that stuff. One year, she actually wanted to see what the brain looked like and all that kind of fun stuff—eyeballs and things like that."

Sharing venison also provided hunters with the opportunity to teach others about hunting. As mentioned before, venison can serve as a totem for memories and experiences of the hunt. When shared with non-hunters, venison can be used as a vehicle not only for sharing these stories, but for teaching non-hunters about hunting. For example, Hunter 39 talked about venison being "a conduit to talk with people about hunting." Some hunters described telling non-hunters about the role venison plays in their diet and how hunting manages the deer herd, while sharing venison. Hunter 34 described this process:

> "Like I mentioned before, you are going to eat something that you shot and that is going

to be shared with a nonhunter, so not only are you telling a story, but you are also telling them how you got it, what day it was, how you brought it home, and then here you go, and then you are going to share the recipe, how to cook it. So it means so much."

Knowledge Systems

The knowledge required for processing, cooking, sharing, and eating venison comprises a knowledge system. By engaging in these activities, hunters were constantly building knowledge themselves and sharing this built knowledge with others. As discussed in this chapter's introduction, categories of cultural ecosystem services overlap and intertwine. Some of the ways that venison contributes to knowledge systems have already been described in examples of passing on knowledge to others when discussing cultural heritage and education. Processing a deer was often a point where hunters described building and passing knowledge on to others. For example, as Hunter 13 described:

> "I process my own animal and stuff like that, I think there are some aspects to when you process the animal correctly it tastes better. It depends on how you process it, how fast you cut it up, you know, how fast you get the hide off it, and stuff like that. It's how long you let it hang. A deer should hang for at least three to four days and age a little bit, not when it's 90 degrees out."

Hunter 7 described building knowledge around how to properly cook venison: "Now over the years of doing it, you develop recipes and a way of cooking and you just get good at and then that's the way it works out."

Spiritual and Religious

Venison can be a vehicle for religious or spiritual thoughts and experiences. As mentioned previously, venison can be considered something special, and thus used to celebrate

special occasions. Some hunters used venison to help celebrate religious holidays, such as Christmas and Easter, either by cooking special dishes or by giving away venison as gifts. Multiple hunters described saving special cuts of the deer, such as the tenderloins, specifically for religious holiday celebrations.

Some hunters expressed a spiritual or religious connection with taking the life of a deer and felt spiritually or religiously connected to, or responsible for, the animal they harvested. As Hunter 9 expressed:

> "Well, it's odd because there's a peculiar bond that I have with wildlife. I think my dad was quite a spiritual person and he instilled in me and my brother, that if you take something from the wild, you utilize it. You don't allow it to spoil. My dad instilled that in my brother and I, that if you take something, you use it. It's a spiritual kind of thing, I think really, a spiritual connection that we have with all the animals on the face of this earth ... when you take the life of an animal there's a certain sadness, there's also a certain reverence for that animal taken."

For Hunter 9, this spiritual connection with wildlife was derived from taking an animal's life and enacted by utilizing that animal's meat and other parts. For Hunter 21, the connection was more religious: "So, it's what I call honoring what God gives you out in the field, and taking care of it, and doing the right thing with it. Making sure that every part of that deer is used." For Hunter 21, their respect for the animal was tied to their religious beliefs. Their religious connection to an animal was also expressed through properly taking care of the carcass, and ensuing that nothing was wasted.

Discussion

These results contribute to theory by providing direct and detailed evidence that wildlife

meat provides cultural ecosystem services. Assessments of the ecosystem services provided by wildlife often completely disregard cultural ecosystem services (Bredin et al., 2015; Gorosábel et al., 2020), or are incomplete (Chardonnet et al., 2002; Maher et al, 2023; Valencia-Aguilar et al., 2012). My study is novel in its application of the cultural ecosystem services framework to wildlife meat and the demonstration that the cultural ecosystem services framework is an effective tool for recognizing and articulating the cultural components of wildlife meat. Recognizing all of the ways that wildlife meat contributes to culture is important for holistic assessments. Identifying the cultural value of wildlife meat, and more broadly, wildlife, informs the consideration of these services in decision making.

Studies that do assess the cultural value of wildlife meat (such as Chausson et al., 2019) lack a framework for easy comparison. Applying the ecosystem services framework to wildlife meat can provide a common language and consistent articulation of values from wildlife meat across cultures, thus enhancing decision making (Lyver et al., 2017). The methods used in my study provide a way to identify cultural ecosystem services from wildlife meat through semi-structured interviews and coding, similar to methods used by Gould et al. (2014). Although simple, these methods are effective at elucidating the myriad ways that wildlife meat provides cultural ecosystem services and are easily repeatable in other locations and populations. Using the ecosystem services framework for analysis enables a consistent approach across cases, while still providing the flexibility to encompass the broad array of cultural connections to wildlife meat.

Additionally, this is the first study to identify cultural ecosystem services provided by wildlife meat in the United States. Although some recent studies in the US have also discussed the cultural value of wildlife meat (Ahmed et al., 2022; Maher et al., 2023), no studies have

focused exclusively on the cultural ecosystem services provided by wildlife meat, or in as much detail as the current study. The results of my study help fill a gap in our knowledge about wildlife meat and its cultural importance to hunters who do not identify as members of a subsistence or indigenous community, like the majority of hunters in Europe, the United States, and Canada. The hunters in my study, licensed deer hunters in Michigan, did not identify as members of an indigenous or subsistence community, yet wildlife meat provided them with cultural ecosystem services. Although cultural ecosystem services may vary based on an individual and their culture, it appears ubiquitous across cultures that wildlife meat provides cultural ecosystem services.

My study contributes to the theoretical development of cultural ecosystem services by providing direct evidence for the co-generation of benefits through a synergistic relationship between provisional and cultural ecosystem services (Cord et al, 2017; Lee & Lautenbach, 2016; Mouchet et al., 2014). For example, if a hunter made a wildlife meat dinner for their friends (wildlife meat as a provisional ecosystem service), that dinner also signified the importance of that relationship (sharing wildlife meat with someone who is special – cultural ecosystem services in the form of social relations). Evidence for this type of relationship is limited (Plieninger et al., 2015). Recognizing this synergy is particularly important for harvesting activities, such as hunting, where provisional ecosystem services support cultural ecosystem services (Lyver et al., 2017). Cultural ecosystem services provided by provisional ecosystem services can be an integral part of culture. Increases in provisional ecosystem services may enhance culture; however, the loss of provisional ecosystem services may lead to the loss of culture. This emphasizes the importance of considering cultural ecosystem services when investigating provisional ecosystem services or when making policy decisions that affect

provisional ecosystem services.

Because the cultural ecosystem services provided by wildlife meat are directly tied to a provisional ecosystem service, the presence of wildlife meat could be used as a proxy measurement for cultural ecosystem services as a whole. Cultural ecosystem services are difficult to identify, particularly in large populations using quantitative methods (Satz et al., 2013). The synergistic relationship between cultural and provisional ecosystem services enables additional ways to measure the more difficult-to-assess cultural ecosystem services.

In my study, I identified the co-occurrence of multiple cultural ecosystem services from one provisional ecosystem service. For example, a hunter processing a deer with their child expressed using the deer processing as an anatomy lesson (cultural ecosystem services in the form of education); the same hunter also donated venison to those in need (cultural ecosystem services in the form of social relations). This co-occurrence is important because the cultural ecosystem services provided by wildlife meat likely cannot be considered independently of one another (MEA, 2005). The polysemic nature of wildlife meat may add complexity for policy makers, as multiple, completing cultural ecosystem services may be present simultaneously.

The results from my study present evidence that wildlife meat is deeply woven into the fabric of hunting culture in the US. Identifying that wildlife meat provides cultural ecosystem services is evidence that the harvest, consumption, and sharing of wildlife meat are motivated by more than provisional ecosystem services. Interviews with hunters provide rich descriptions of the myriad ways wildlife is imbedded in the lives of hunters and those around them. Food and culture are often tightly linked (Bryant et al., 2003). Wildlife meat serves as a representation of hunting culture and a way to share hunting culture with others. Most hunting seasons in the US are short, but wildlife meat can extend engagement with hunting throughout the entire year.

The predominant way that wildlife meat provides cultural ecosystem services was by creating or enhancing relationships and strengthening communities. Hunters share their wildlife meat with others, especially non-hunters (Goguen & Riley, 2020; Goguen et al., 2018; Stedman & Decker, 1996). In the Greater Yellowstone Ecosystem, sharing wildlife meat contributes to the maintenance of rural communities (Maher et al., 2023). My study supports this finding, while also identifying more ways that wildlife meat contributes culturally to hunters and their communities. Wildlife meat is shared to strengthen social relationships and support those in need in subsistence and indigenous communities around the world (Chausson et al., 2019; Condon et al., 1995; Dombrowski, 2007; Morsello et al., 2015; Omura, 2013; Watkin Lui et al., 2016). Michigan deer hunters used venison in a similar manner, sharing mainly with family and close friends, but also with those in need directly or indirectly, such as by donating venison to food banks (Goguen & Riley 2020). It appears that wildlife meat plays an important role in the social relations of hunters around the world.

Another key way that venison provided cultural ecosystem services was through the formation or thickening of hunters' personal and social identity. A study of wild food environments in Montana found similar results, where researchers concluded that wild foods contributed to the cultural identity of rural residents (Ahmed et al., 2022). Similarly, a study involving hunters in the Greater Yellowstone Ecosystem suggested that self-reliance was tied to hunters' identities and that self-sufficiency and food security was a cultural benefit of hunting (Maher et al., 2023). In interviews with hunters, Dizard (2003) found that harvesting wildlife meat provided hunters with a sense of security and self-assurance. Self-reliance and self-sufficiency were key themes in my study, further supporting the claim that wildlife meat provides identity cultural ecosystem services to hunters in the United States.

My study did not find evidence for venison providing cultural ecosystem services in the form of aesthetic, cultural diversity, bequest, intrinsic, and existence, inspiration, sense of place, or recreation and tourism. A prior review of literature, mostly focused on indigenous or subsistence cultures (see Chapter 2), also did not identify that wildlife meat provides aesthetic, cultural diversity, bequest, intrinsic, and existence, or inspiration cultural ecosystem services. In contrast to the review presented in Chapter 2, my study did find evidence for educational cultural ecosystem services created by wildlife meat, which demonstrates that identifying cultural ecosystem services can be challenging and nuanced. Further research is needed before firm conclusions can be made about what services wildlife meat does not provide.

Although evidence exists for wildlife meat providing cultural ecosystem services in the form of a sense of place (Gombay, 2005; Watkin Lui et al., 2016), I did not find evidence that venison provided Michigan deer hunters with this service. I propose that this is likely because no direct questions were asked about sense of place in connection to venison, rather than the absence of this service. Wildlife meat is often considered a local food (Tidball et al., 2013), which supports the idea that wildlife meat connects US hunters to their local environments or the landscapes where the meat was acquired. Future studies involving more directed conversations about wildlife meat and its ties to the land may yield different insights.

Recreation and tourism cultural ecosystem services were also not identified in my study, but present in the Chapter 2 analysis. Although hunting provides cultural ecosystem services in the form of recreation, the focus of this dissertation is on wildlife meat and the ecosystem services provided once an animal has been killed. In Chapter 2, wildlife meat was identified as providing tourism cultural ecosystem services. For example, tourists in South Africa consuming wildlife meat at restaurants (Hoffman et al., 2003). My study focused only on resident hunters,

which resulted in a limited estimate of the total ecosystem services provided by wildlife meat. Asking non-hunters and non-resident hunters about their experiences with wildlife meat is necessary to gain a more complete picture of the cultural ecosystem services provided by wildlife meat. It is important to note that in most contexts, venison cannot be sold in the United States; thus, tourists in the United States are not able to legally purchase hunter-harvested venison at restaurants (Freese, 1997; Organ et al., 2012).

Limitations

The co-occurrence of cultural ecosystem services can make them difficult to categorize, especially as categories overlap and cannot always be treated independently (Gee & Burkhard, 2010; MEA, 2005; Plieninger et al., 2013). This was true in my analyses, particularly with the categories of cultural heritage and identity, and knowledge systems and education. During coding, sections of text were allowed to have multiple codes at the same time to allow to account for this overlapping. When it came to the reporting of results, however, quotes were used to represent only one category at a time, and were not repeated.

Study findings only provide a cross section in time, yet ecosystem services change from system to system, site to site, and time to time. For example, all interviews were conducted prior to wild white-tailed deer testing positive for Chronic Wasting Disease (CWD) in Michigan near my study site (MDNR, 2020). Additional interviews are needed to assess if the emergence of CWD has affected the cultural ecosystem services that wildlife meat provides Michigan deer hunters.

Hunters were identified using responses to a survey, which could lend bias to hunters for whom the topic of wildlife meat is especially salient given their willingness to respond to the survey. Additionally, only hunters who harvested a deer were interviewed; hunters who had not

recently harvested wildlife meat may have different experiences. However, having information on hunter's harvest and sharing enabled selection of a wide variation of sharing behaviors, and hunter's willingness to discuss their harvest provided rich descriptions for analysis.

Interviews were conducted in a small geographic area with a relatively homogenous group. The way cultural ecosystem services are defined or described depends on individuals and their culture. Similar studies in different areas are needed to triangulate results. Although findings from my study cannot be extrapolated to other systems directly, the results provide systemic insights about how wildlife meat provides cultural ecosystem services. That wildlife meat provides cultural ecosystem services appears universal in communities where wildlife meat is harvested and consumed (Chapter 2); however, what specific services are provided and how those are created likely varies with individual and cultural differences. The cultural ecosystem services framework in my study was used in a western culture by a western researcher. There may be issues of transferability of study methods if this study were repeated in a non-western cultural context.

Conclusion

Wildlife meat can only provide cultural ecosystem services if it is used and valued (MEA, 2005). Changes in access to wildlife meat could also change what cultural ecosystem services, if any, are provided. Issues of disease and contamination, a reduction in or loss of wildlife available for hunting, or changes to hunting regulations can all negatively impact a hunter's willingness or ability to harvest wildlife meat, resulting in a potential loss of cultural ecosystem services (Kaltenborn et al., 2017). When making policy decisions that affect wildlife meat, it is important to consider that wildlife meat is not just a provisional ecosystem service, but also provides cultural ecosystem services, and can provide multiple cultural ecosystem services

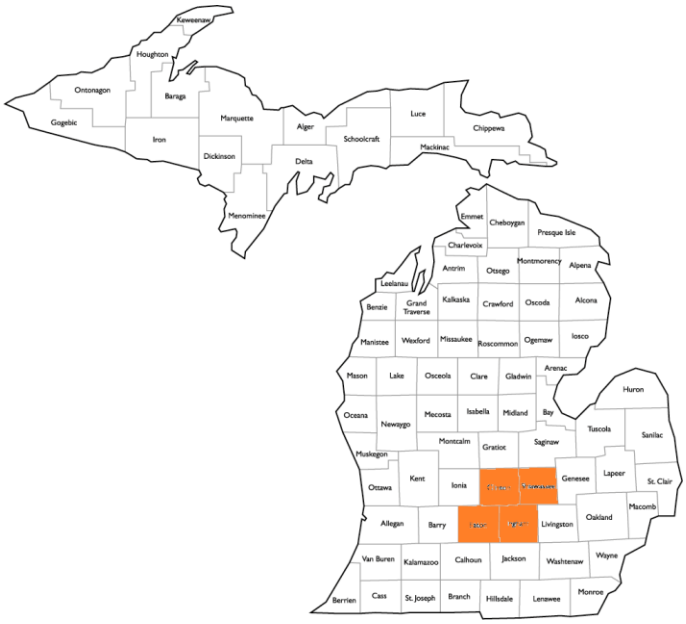
simultaneously.

Results from my study advance our understanding of the societal value derived from wildlife and elucidate more fully the multiple ecosystem services provided by wildlife. The provisional and cultural ecosystem services provided by wildlife meat have been absent from reported valuations of hunting, and thus, unavailable to aid in decision making. Recognizing the myriad benefits wildlife meat provides to society enables a more complete assessment of the use and value of wildlife. Additionally, recognition of the cultural importance of wildlife meat may help support the perpetuation of hunting as a cultural activity, despite changing wildlife value orientations toward mutualism and protectionism (Manfredo et al., 2003; Manfredo et al., 2009). Framing hunting around food or community bolsters public support for hunting (Blascovich & Metcalf, 2019; Decker et al., 2015). Considering the cultural ecosystem services provided by wildlife meat when addressing public health policy, wildlife population management, or changes to hunting regulations provides a more complete assessment of the effects of these policies.

FIGURES

Figure 3.1:

Map of counties in Michigan (either Ingham, Eaton, Clinton, or Shiawassee) where interviews took place.



TABLES

Table 3.1:

The cultural ecosystem service categories used in this study, their definitions, and how they were interpreted in the context of wildlife meat.

CES Category	Definition	Application to wildlife meat
Cultural Heritage	Legacy of biophysical features, physical artifacts, and intangible attributes (related to the natural world) of a group or society that are inherited from past generations, maintained in the present, and bestowed for the benefit of future generations (Daniel et al., 2012).	Wildlife meat is a physical part of the natural world that serves as a totem for stories and memories, involved in traditions, and source of knowledge that are part of hunters' cultural heritage and passed down through generations.
Identity	Formation or thickening of cultural identity tied to an ecosystem and/or it's components (Chan et al., 2012).	Formation or thickening of identity tied to the processing, sharing, and eating of wildlife meat.
Education	Ecosystems, their components and processes provide a basis for formal and informal education (MEA, 2005).	Processing, sharing, and eating wildlife meat provides a basis for formal and informal education.
Knowledge Systems	Ecosystems influence the types of knowledge systems developed (traditional and formal) (MEA, 2005).	Processing, cooking, sharing, and eating wildlife meat helps build knowledge systems related to wildlife meat.
Social Relations	Ecosystems provide opportunities for creating and enhancing relationships and strengthen communities (Calbet-Mir et al., 2012).	Processing, cooking, sharing, and eating wildlife meat provides opportunities to create, maintain, and strengthen relationships.
Spiritual & Religious	Attach spiritual and religious values to ecosystems and their components (MEA, 2005) and ecosystems are a source of inspiration for religious or spiritual thought and experience (Chan et al., 2012).	Wildlife meat is a source for religious or spiritual thoughts and experiences.

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APPENDIX 3.1: MICHIGAN POSTCARD

Figure 3.2:

Michigan Postcard.

I am a graduate student at Michigan State University studying ways in which Michigan deer hunters consume and share the venison they harvest. Understanding how people use and value natural resources will lead to better conservation and provide additional support for hunting in Michigan. To capture the unique and varied experiences of Michigan deer hunters I am conducting in-person interviews with hunters who harvested at least one deer during the 2013 season. If you are willing and able to be interviewed at your convenience please contact me via phone, text, or email for more details. All hunters who complete an interview will receive a $20 VISA gift card as a token of appreciation for your time and sharing your experiences.

I look forward to hearing from you soon!

Amber Goguen

TO:

Contact Information
Amber Goguen
Dept. of Fisheries and Wildlife
Michigan State University
Phone: 517-515-2755
Email: goguenam@msu.edu

Note. The back and front of the postcard sent to Michigan hunters inviting them to participate in the study.

APPENDIX 3.2: MICHIGAN INTERVIEW TRANSCRIPT

General Introductory Questions

1. How did you learn to hunt?
2. Who taught you?
3. At what age did you start hunting?
4. What species do you mostly hunt or do you hunt a variety of species?
5. When did you start deer hunting? (If first hunting experience was not related to deer)
6. How frequently do you deer hunt?
7. Do you go deer hunting with anyone else or do you hunt alone?
8. What are you main reasons or motivations for deer hunting?

Although you may participate in other hunting seasons, and may consume and share wild game meat from numerous species, this research focuses on venison. If you are interested in sharing more information about the other species you harvest, consume and share we can talk about this at the end of the interview or set up another time to talk. We focus on deer because of the large quantity of meat that comes from a harvested deer and the popularity of deer hunting. Also, as we are asking for detailed information we felt it may be too much to ask the interviewee to recall information on all of the species they harvest. The remainder of this interview will focus on white tailed deer harvest and the consumption and sharing of venison.

Deer Harvest

1. How many deer did you harvest in this past 2013 deer hunting season? What were they? Buck? Doe? Fawn? (If they say yearling or button buck ask for more information to try and figure out age)
2. How does this compare with what you would consider a normal year?

Deer Processing

1. What did you do with this/these deer after you harvested it/them? For example did you take them to a processor, process it/them yourself, donate it/them to an organization, charity, or another person, or keep for a trophy mount?
2. Is this what you normally do?
3. Commercial Processor
    a. Why did you choose to use a commercial processor?
    b. What did you have your meat processed into?
    c. Are there any special parts you keep? For what reason?
4. Self -Process
    a. Why did you choose to process your deer yourself?
    b. Does anyone help you?
    c. What parts do you keep?
    d. Are there any special parts you keep? For what reason?
5. Donated
    a. Who did you donate/give away deer to?
    b. What are the primary reasons you choose to donate/give away deer?
    c. If given to another person (not organization) what did this person do with it/them?

d. What were the costs involved? (If donated or charity or organization)

6. Taxidermy/Trophy
    a. What part did you have preserved? Why did you choose to preserve it?
    b. What did you have your meat processed into?
    c. Are there any special parts you keep? For what reason?

Other Household Harvesting and Processing

1. Does anyone else in your household hunt deer?
2. If yes, did they harvest a deer in the 2013 season?
    a. How many?
    b. What Kind? Buck? Doe? Fawn?
3. How was this/these deer processed?
4. Is this venison combined with the venison you harvested or are they kept separate?

Venison Consumption

1. Do you eat the venison that you harvest?
2. If no, is there any particular reason why not?
3. Are there any members of your household who eat the venison you harvest?
    a. If yes, Who? Why?
    b. If no, Why not?
4. Is there a time of the year that you (and your household) eat more venison or do you consume the same amount year round?
    a. If consumption varies
        i. When do you eat venison most often?
        ii. How often do you consume venison during this time period?
        iii. How often do you consume venison during the rest of the year?
    b. If consumption is the same
        i. How often do you consume venison throughout the year?
5. How important is venison to your diet? (Large source of overall protein intake or just something you eat every once and a while or for a special occasion?)

Venison Preparation

1. Who normally cooks in your household?
2. Who normally cooks red meat in your household?
3. Who cook the venison you (and your household) eat?

Venison Sharing External to Household

1. Do you share the venison you harvest with anyone outside of your household such as relatives, friends, coworkers?
    a. If Yes, use chart.
    b. If no, is there any particular reason why you don't share the venison you harvest?
2. How do you choose whom to share your venison with?
3. How do you determine how much meat to keep versus share?
4. What parts do you keep versus share? How do you determine what to keep and what to share?
5. Is there a time of the year you share more venison or do you share the same amount

throughout the year?

a. If yes, what time of year do you share the most?
b. If all year, How often do you think you share throughout the year?

Venison Receiving

1. Do you (or your household) ever receive venison from anyone else?
   a. If yes, Chart
   b. If no, Continue
2. During or after this past 2013 season did you receive venison from anyone else? (Use the chart to answer this question)

Venison Trading

1. Do you ever exchange venison for something else? For example I have a friend who trades his venison for fresh salmon.

Sociocultural Value

1. In general, what would you say is your main motivation for sharing the venison you harvest?
2. Is sharing your venison an important activity to you? Why or Why not?
3. Would you say sharing your venison has any sort of effect on the people you share it with? What kind of effect?

Concerns and Limitations

1. Do you have any concerns about sharing venison with others?
2. Have the people you shared with expressed any concerns about eating the venison you give them?
3. Do you feel there are any limitations in your ability to share venison with others?

Wrap up

1. Do you have any other questions, concerns, or comments relating to what we talked about today?

APPENDIX 3.3: MICHIGAN BACKGROUND QUESTIONNAIRE

1. With what race do you most strongly identify?

- ☐ White, non-Hispanic
- ☐ African American
- ☐ Asian_____
- ☐ Hispanic or Latino
- ☐ Native American
- ☐ Other _____

2. What is/are your profession(s)?

_____

_____

3. Would you consider your current residence as Urban, Suburban, or Rural?

- ☐ Urban: means like a city, with houses close together and more concrete than grass and trees.
- ☐ Suburban: means in-between a city and rural environment. House lots are single tract and spread out, and there is more grass and trees than concrete.
- ☐ Rural: means in a relatively undeveloped area where there are large areas of land separating houses and few roads.

4. How would you describe the area where you lived during most or all of your childhood?

- ☐ Urban: means like a city, with houses close together and more concrete than grass and trees.
- ☐ Suburban: means in-between a city and rural environment. House lots are single tract and spread out, and there is more grass and trees than concrete.
- ☐ Rural: means in a relatively undeveloped area where there are large areas of land separating houses and few roads.

5. How many years have you lived in Michigan? _____ year(s)

6. **What is the highest level of education you have completed to date?**
    - ☐ Less than High School Diploma
    - ☐ High School Diploma or GED
    - ☐ Trade or Vocational School
    - ☐ Some College
    - ☐ Associates Degree (2-year)
    - ☐ Bachelors Degree (4-year)
    - ☐ Graduate or Professional Degree

7. **What is your annual household income?**
    - ☐ $0 - $24,999
    - ☐ $25,000 – $49,999
    - ☐ $50,000 - $75,000
    - ☐ $75,000 – $99,999
    - ☐ $100,000 - $124,999
    - ☐ $125,000-$149,999
    - ☐ $150,000 or more

8. **Are you a member of any hunting clubs or organizations?**

    _____

    _____

    _____

    _____

9. **Any other comments you would like to share?**

    _____

    _____

    _____

    _____

CHAPTER 4: CULTURAL ECOSYSTEM SERVICES PROVIDED BY WILDLIFE MEAT IN SWEDEN

Abstract

In Sweden, an estimated 16.7 million kilograms of wildlife meat are harvested annually, yet research on the use, distribution, and cultural value of this meat is limited. Hunters can sell the wildlife meat they harvest to private persons, food businesses (restaurants and stores), or game handling facilities (specialized processors for wildlife meat). Markets for wildlife meat add complexity to how wildlife meat is distributed and used in Sweden, while also providing the opportunity to examine how these markets affect its cultural importance. Thirty-two in-person interviews were conducted with Swedish hunters about their use of wildlife meat and how they distribute that meat within society. The hunters interviewed lived in urban and rural environments in northern (Vasterbötten county) and southern (Östergötlands and Södermanland counties) Sweden. Additionally, ethnographic field notes were taken while participating in hunting and hunting related activities, as well as exploring Swedish wildlife meat markets. Provisional, attribute, in vivo, and descriptive coding of interview transcripts and ethnographic field notes revealed that wildlife meat provides hunters with cultural ecosystem services in the form of social relations, identity, cultural heritage, education, knowledge systems, spiritual and religious, and recreation and tourism. Formal markets in wildlife meat appeared to have little effect on the ecosystem services that hunters received from wildlife meat, but spread the benefits from wildlife meat more broadly across society. The results of this study are intended to inform policy and management decisions by providing insight into how culture and markets affect the benefits derived from wildlife meat.

Wildlife Meat

Wildlife meat (also called game meat or bushmeat) refers to the muscle, viscera, skeleton,

and associated body tissues that are used for human consumption of free-ranging animals that are not cultivated, domesticated, or tamed (Food Law, 2000; Nasi et al., 2008; Stanford & Bunn, 2001). Wildlife meat plays important economic, cultural, ecological, and nutritional roles in communities around the world (Hoffman & Cawthorn, 2012; Mainka & Trivedi, 2002). Comprised of lean protein and essential macronutrients, wildlife meat is a healthy food source that is also viewed as ethical and environmentally friendly (Corradini et la., 2022; Hoffman & Wiklund, 2006). However, the handling and consumption of wildlife meat can pose health risks from disease and contamination (Paulsen et al., 2014). Despite the large quantities of wildlife meat harvested around the world, research on the relationship between culture and wildlife consumption is lacking (Chausson et al, 2019; Nasi et al., 2011; Morsello et al., 2015). There is growing interest, however, in understanding the cultural importance of wildlife meat in diverse contexts (Goguen & Riley, 2020; Van Vliet & Mbazza, 2011; Watkin Lui et al., 2016). Much of the current research on wildlife meat relates to its nutritional and economic importance in subsistence and indigenous communities; less is known about its use and cultural importance in other contexts (Alvard et al., 1997; Brashares et al., 2011; Davies & Brown, 2007; Gurven, 2004; Nasi et al., 2008; Van Vliet & Mbazza, 2011).

During the 2010–2011 hunting season, an estimated 16.7 million kilograms (carcass weight) of wildlife meat was harvested by Swedish hunters (Wiklund & Malmfors, 2014). An estimated 20% of this harvest was sold on the market through game handling facilities (vilthanteringsanläggning), while the remaining 80% was used and distributed by hunters (Wiklund & Malmfors, 2014). In a study of Swedish residents, Ljung et al. (2012) reported that 65% of non-hunters consumed wildlife meat at least once per year. It was estimated in a follow-up study that 62% of non-hunters from urban Stockholm consumed wildlife meat at least once

per year, whereas 81% of non-hunters in rural Northern Sweden consumed wildlife meat at least once per year (Ljung et al., 2015). These studies not only provide evidence that the distribution of wildlife meat extends beyond hunter households in Sweden, but also evidence of its cultural importance in the lives of hunters and those with whom they share. However, the authors of these studies also highlight that there is much more to learn about how Swedish hunters use and distribute the wildlife meat they harvest (Ljung et al., 2012; Ljung et al., 2015).

Markets in Wildlife Meat

A unique aspect of Swedish wildlife meat distribution is that it is not only legal to sell wildlife meat, but selling wildlife meat is encouraged by some organizations (Krantz, 2015). Hunters can sell small amounts of wildlife meat to private persons and food businesses, and unlimited quantities to game handling facilities (specialized processors for wildlife meat) (SNFA, 2007). Under Swedish regulations, wildlife meat is quantified in units: one big game unit is equal to one moose, three red or fallow deer, or 10 roe deer, while one small game unit is equal to one small game animal (SNFA, 2007). A small amount is defined as 25 big game units or 10,000 small game units with the skin on; or 1 big game unit or 1,000 small game units butchered (without the skin on) (SNFA, 2007).

What hunters consume in their own homes and share with other household members is not regulated (SNFA, 2007). In general, there is no inspection requirement for small quantities of wildlife meat sold to private persons; however, it is recommended (SNFA, 2007). Wildlife meat sold by a hunter directly to a local food business should be inspected (SNFA, 2007). Food businesses that sell wildlife meat directly from hunters need to be registered with their municipal government and must follow food safety standards for handling wildlife meat (SNFA, 2007). Currently, animals that commonly carry the disease Trichinella (e.g., bear, boar, beaver, etc.)

must go to a game handling facility, and should not be shared or sold beyond the household (SNFA, 2007). However, to increase the distribution of wild boar meat, these regulations are changing (SNFA, n.d.). Hunters are also responsible for ensuring they do not exceed the selling limits (SNFA, 2007).

Wildlife meat markets are a controversial issue for conservationists and public health officials around the world (Bennet & Robinson, 2000, Geist, 1988; VerCauteren et al., 2011, Wegner et al., 2022). Unregulated markets in wildlife meat have been identified as a threat to wildlife populations, as economic incentives can drive excessive harvest (Alvard et al, 1997, Bennet & Robinson, 2000, Freese, 1997). Wildlife meat markets can also pose public health risks; for example, wildlife meat markets in China are thought to have been a potential vehicle for the transmission of SARS-CoV2 to humans, which has had devastating effects worldwide (Volpato et al., 2020). Swedish markets have measures in place to protect public health, as well as sale and harvest quotas to prevent the overharvesting of wildlife. Understanding the cultural importance of wildlife meat, and the effects of markets on its cultural value, can lead to informed public health policy and wildlife management decisions.

Cultural Ecosystem Services

Cultural ecosystem services are the non-tangible benefits people derive from natural systems (Millennium Ecosystem Assessment [MEA], 2005). More specifically, "cultural ecosystem services are the contributions ecosystems make to human wellbeing in terms of the identities they help frame, experiences they help enable, and the capabilities they help equip" (Fish et al., 2016, p. 212). Cultural ecosystem services can be further categorized as: recreation and tourism, aesthetic, bequest, intrinsic and existence, spiritual and religious, educational, knowledge systems, social relations, cultural identity, cultural heritage, cultural diversity,

inspiration, and sense of place (Hernández-Morcillo et al., 2013; MEA, 2005; Milcu et al., 2013). In this chapter, I use the cultural ecosystem services framework to identify how wildlife meat contributes to culture.

Chapter 2 and Chapter 3 provided evidence that wildlife meat provides various cultural ecosystem services in the form of social relations, cultural identity, cultural heritage, spiritual and religious, knowledge systems, education, sense of place, and recreation and tourism. Processing, sharing, and eating wildlife meat contributes to the creation and strengthening of social relations (Chausson et al, 2019; Omura, 2013; Watkin Lui et al., 2016). Consuming wildlife meat is tied to the construction, performance, and maintenance of identity (Dizard, 2003; Dombrowski, 2007; East et al., 2005; Ngade et al., 2017; Omura, 2013; Searles, 2002). Activities related to the consumption and sharing of wildlife meat connect people to their cultural heritage (Condon et al., 1995; Watkin Lui et al., 2016). Wildlife meat provides spiritual and religious cultural ecosystem services when used for religious, spiritual, or cultural ceremonies and rituals (Adeola, 1992; Aiyadurai et al., 2010; Neto et al., 2009; Omura, 2013; Titus et al., 2009; VanVliet et al., 2016). The knowledge and skills necessary for the identification, harvest, processing, preparation, and consumption of wildlife comprise a knowledge system that is built and maintained by engaging with others through wildlife meat (Kaltenborn et al., 2017; Kuhnlein & Receveur, 1996). Wildlife meat contributes to sense of place by providing connections to landscapes and contributes to people's construction of place (Gombay, 2005; Watkin Lui et al., 2016). Consuming wildlife meat is popular with tourists because it is considered both exotic and local, providing tourism cultural ecosystem services (Hoffman et al., 2003). Chapter 3 provided evidence that wildlife meat produces educational ecosystem services by creating opportunities to learn about ethics, hunting, and biology.

The ecosystem services framework enables a holistic assessment of the costs and benefits humans derive from ecosystems (Gee & Burkhard, 2010). Furthermore, it is a widely accepted formal framework to describe and categorize the complex connections between ecosystems and society (Daniel et al., 2012). Prior research (Chapters 2 and 3) has demonstrated the utility of the cultural ecosystem services to identify the cultural value of wildlife meat. European Union governments, including Sweden, use the ecosystem services framework for policy development and assessment, as the integration of ecosystem services into governance is essential to maintaining benefits for current and future generations (Grima et al, 2019; Hansen & Malmaeus, 2016). Knowing the cultural ecosystems services an ecosystem is providing enables decision makers to address the increased demand for cultural considerations in management (Satterfield et al., 2013). Recognition of cultural ecosystem services during decision-making can lead to increased sustainability (Plieninger et al., 2015).

The Current Study

My aim is to characterize how wildlife meat contributes to culture by identifying the cultural ecosystem services it provides, and to explore if placing an economic value on wildlife meat through regulated markets affects these cultural ecosystem services. To that end, I conducted ethnographic field research and in-depth in-person interviews with large ungulate hunters in northern and southern Sweden, regarding their behaviors around wildlife meat. Sweden is an ideal location for exploring the intersection of regulated markets for wildlife meat and the cultural importance of wildlife meat. These results are intended to inform policy and management decisions by providing insight into how culture effects consumption and if markets impact the benefits derived from wildlife meat.

Methods

Location, People, and Wildlife

Sweden, located in northern Europe, is home to 10.6 million people who reside in a myriad of ecological, social, economic, and residential environments that provide a diversity of settings for inquiry (Statistics Sweden, 2023). There are approximately 300,000 hunters in Sweden—3% of the total population (Boman & Mattson, 2012). Additionally, hunters make up a greater proportion of the population in northern and rural parts of the country, compared to the southern and urban parts (Boman & Mattson, 2012). Hunting plays a key role in wildlife management, specifically limiting economic losses to forestry and agriculture, and wildlife vehicle collisions (Lavsund et al, 2003; Lindqvist et al., 2014; Mattson et al., 2014).

Sweden has five large ungulate species: moose (*Alces alces*), the most widespread and popular game species; red deer (*Cervus elaphus)*, also known as the European elk; fallow deer (*Dama dama)*, introduced from Asia; roe deer (*Capreolus capreolus*), the smallest and most common native deer species in southern Sweden; and wild boar (*Sus scrofa*), which was reintroduced after extirpation (Bergström et al., 1992; Lindqvist et al., 2014; SJ, n.d.). During the 2010–2011 hunting season, an estimated 16.1 million kilograms (carcass weight) of wildlife meat from these five ungulate species were harvested by Swedish hunters (Table 4.1). Wildlife meat harvested from Swedish ecosystems provides opportunities for hunters to share and sell wildlife meat, creating a vibrant environment in which to conduct this study.

Approach

To assess the cultural ecosystem services provided by wildlife meat in Sweden, I used a qualitative approach. Qualitative methods are the best way to identify cultural ecosystem services, as these systematic inquiries enable in-depth insights about unknown and complex

social phenomena (Satterfield et al, 2013; Sullivan & Sargeant, 2011; Teherani et al., 2015). This chapter uses an almost identical approaches and analysis methods to Chapter 3. The one addition is the use of ethnographic field notes in conjunction with interviews. Nevertheless, interviews remain the main source of data for analyses. Interviews encourage participants to freely talk in their own words, enabling the capture of difficult-to-express concepts (Scholte et al., 2015). Ethnographic field notes were used to fill gaps in interview data.

Interviews

Participant Selection

Interviews were conducted in both northern and southern Sweden due to potentially different sharing environments based on quantity of meat harvested, species hunted, hunting methods, land use, and access to markets. In northern Sweden, there is one main ungulate species to hunt (moose), whereas in southern Sweden, all five ungulate species are present (moose, red deer, fallow deer, roe deer, and wild boar). Interviews were conducted in both urban and non-urban areas. Sweden has 21 counties (län) that are divided up into 290 municipalities (kommun). In the northern study site (Vasterbötten county), interviews were conducted with hunters living in Umeå (urban) and Bjurholm, Vindeln, and Robertsfors (non-urban) municipalities (Figure 4.1). Interviews in the southern study site were conducted with hunters from Norrköping (urban; Östergötlands county), Katrineholm, Gnesta, and Flen municipalities (non-urban; Södermanland county). The urban municipalities of Umeå and Norrköping have a similar population size.

All hunters in Sweden must register and pay an annual fee for a hunting license (SEPA, n.d.). The names and contact information of participants were accessed from the Swedish hunting license register. A random sample of hunters over the age of 18 was selected from this register using zip codes associated with the eight chosen municipalities. Only those who hunted

moose, red deer, fallow deer, wild boar, or roe deer in Sweden during the 2015–2016 hunting season and who harvested, or were part of a team that harvested, at least one of these species during the 2015–2016 hunting season were considered. A maximum variation approach was used to select participants based on the available information from the hunting license register: age and location (urban/non-urban) (Patton, 1990). To appropriately stage interviews and seek maximum variation, potential interviewees were divided into 4 different groups: North Urban (Umeå), North Non-urban (Bjurholm, Vindeln, Robertsfors), South Urban (Norrköping), and South Non-urban (Katrineholm, Gnesta, and Flen). Maximum variation within each group was sought based on age (50:50 split of ages greater than and less than the average age of Swedish hunters) and gender (one female greater than and one less than the average age).

Data Collection

Interviews were conducted in April and May of 2016. Postcards describing the purpose of the study and providing contact information were sent out to solicit interviewees (Appendix 4.1). The contact method was later switched to postcards in an envelope, and then formal letters with a SLU (Sveriges lantbruksuniversitet) letterhead enclosed in an envelope (Appendix 4.2). Mailings were staggered in order to keep inquiries manageable and interviews within reasonable geographic distance. If a hunter did not respond to the postcard/letter via phone (call or text) or email within two weeks, a second postcard/letter was sent with an additional hand-written note discussing the importance of their participation. It was assumed that requiring individuals to call and schedule an interview provided rich informants and it enabled the researcher to double check their qualifications for inclusion in the study (Patton, 1990). By the completion of interviews no novel concepts and themes emerged. Researching this point of saturation indicates that the interviews conducted captured the diversity, depth and nuances of wildlife meat use and

distribution in Sweden (Hennink & Kaiser, 2022).

If a hunter contacted the researcher, met the qualifications for inclusion in the study, and wished to participate in an in-person interview, a time was arranged to meet and conduct the interview in a location of their choice. When possible, interviews were conducted in public locations; however physical limitations, schedules, childcare needs, and the location of some residences required some interviews be conducted at the hunter's home. Audio recordings of all interviews were made with the permission of participants to improve the accuracy of data collection. Many Swedes can speak English; however, to ensure the accuracy of information and participant comfort, all interviews were conducted in Swedish by a native Swedish speaker. The interviewer also translated and transcribed interviews from Swedish to English. All English transcripts were then reviewed by a native English speaker to ensure the accuracy of translations and minimize any error in analysis.

Interview Instrument

The interview questions from Chapter 3 were modified to fit a Swedish context. These modified questions were further developed and translated with the input of experts and native Swedish speakers. To ensure correct translations, interview questions were back translated between English and Swedish several times and piloted with Swedish hunters to ensure the validity and reliability of responses (Brislin, 1970; Vaske, 2008).

Interviews were divided into two parts: 1) semi-structured open-ended questions (Appendix 4.3 & Appendix 4.4); and 2) a short survey consisting of closed and open-ended questions to ascertain demographic information not collected by the Swedish hunting license register (Appendix 4.5 & Appendix 4.6). The interview began with general questions about the interviewee's participation in hunting to help build rapport and to ease into more difficult lines of

inquiry. Questions were then asked about the hunter's participation in hunting team(s), including information about the number of teams they are a member of, general information about each team (number of people, location of hunting lease, type of lease, how long they have been a team), the species the team hunts for, the 2015/2016 team harvest, and how the team processes and distributes the wildlife meat they harvest. Hunters were then asked about their own hunting behavior, including any additional independent harvests, their motivations for hunting, other sources of wildlife meat for the household, household wildlife meat consumption patterns, the role of wildlife meat in their diet, wildlife meat distribution behaviors and reasons for these decisions, other sources of wildlife meat, the importance of sharing/selling wildlife meat, and any concerns about distributing or consuming wildlife meat. After the interview was completed, a short background questionnaire was administered to provide demographic information about the hunter not provided by the Swedish hunting license register.

Ethnographic Field Notes

Taking ethnographic field notes requires entering a setting and engaging in firsthand participation while observing (Emerson et al., 2011). I participated in ungulate hunts in the north and south of Sweden to gain more context about how Swedes hunt and use wildlife meat. During hunts, I sat with shooters waiting for game to pass or went walking with dog handlers who were driving the game. I went hunting with teams, individuals, and on large estates. I was present when an animal was shot and participated in field dressing, removing wildlife from the forest, and processing the meat. I also went to grocery stores, slaughterhouses, butchers, markets, game meat handling establishments, and farm shops to explore how wildlife meat was sold and distributed. I had conversations with county officials, employees of Svenska Jägareförbundet, and other researchers about wildlife meat in Sweden. I took contemporaneous notes (jottings)

during these interactions and later recorded more detailed systematic notes about observations, what I learned while participating in these events, and through discussions (Emerson et al., 2011). These detailed field notes were descriptive, context sensitive, and locally informed, while being mindful of lens and researcher bias (Emerson et al., 2011).

Analyses

Both interview transcripts and ethnographic field notes were analyzed using the same methods from Chapter 3. The codebook from Chapter 3, which was developed using provisional, descriptive, in vivo, and attribute coding, was used as a starting point for coding Swedish interviews (Saldaña, 2016). All interviews were analyzed using MAXQDA, a computer-assisted qualitative analysis software. Coding was an iterative and multistep cyclical process, where sub codes were revised, modified, deleted, or expanded throughout analysis to adjust the initial codebook to differences between Michigan and Swedish hunters (Saldaña, 2016). I let the hunters speak for themselves whenever possible. If a theme was present in both field notes and interviews, I prioritized using interview transcripts, only relying on field notes to fill in themes not present or well-articulated in interviews.

Results

Description of Hunters Interviewed

Thirty-two hunters were interviewed, 16 from the northern study site and 16 from the southern study site. An equal number of interviewees resided in urban (10,000–199,000 inhabitants) and non-urban communities (the countryside, fewer than 200 inhabitants) across both study sites. A majority (n = 25) of the hunters interviewed were male. The mean age of interviewees was 54 years old (range 20–81 years). Hunters reported the following highest levels of education: Obligatorisk skola, or obligatory school, approximately 0–9 years of schooling (n =

2); Yrkesutbildning, or vocational training (*n* = 2); Gymnasieutbildning, or upper secondary school/high school, approximately 10–12 years of schooling (*n* = 10); and Universitet eller högskoleutbildning, or university/college education, approximately 13+ years of schooling (*n* = 18). Reported annual household income after taxes was categorized as $11,000–$33,000 USD (*n* = 11), $33,000–$55,000 USD (*n* = 13), and $55,000+ USD (*n* = 8). Hunters reported harvesting a wide array of wildlife species and engaging in a variety of consumption and sharing behaviors, although all hunters ate at least some wildlife meat and shared it with at least one other person.

Cultural Ecosystem Services

I found evidence of wildlife meat providing cultural ecosystem services in the form of social relations, identity, cultural heritage, education, knowledge systems, spiritual and religious, and recreation and tourism (Table 4.2). There was no evidence of wildlife meat providing cultural ecosystem services in the form of aesthetic, cultural diversity, bequest, intrinsic, and existence, sense of place, or inspiration.

Social Relations

Processing, cooking, sharing, and eating wildlife meat provided opportunities to create, maintain, and strengthen relationships. This was the most ubiquitous cultural ecosystem service provided by wildlife meat. The value that hunters placed on wildlife meat plays an important role in how wildlife meat provides cultural ecosystem services in the form of social relations. Hunters identified wildlife meat as something special, and because of this designation, sharing it with others emphasized the importance of these relationships. Hunter 88 described what made wildlife meat special:

> "I feel like it is something special to eat and share, like, this is from the hunting team. It's fun that it is, not just the food but everything that comes along with it …

> [I am] sharing the joy that comes from hunting. I'm not thinking that you give away a piece of meat, but you give away a piece of hunting."

For Hunter 88, wildlife meat was special because it symbolized the process involved in obtaining it, which was important to them. Hunter 90 described how the process of obtaining wildlife meat embedded it with meaning:

> "It is part of the whole hunting experience, from clearing stands and getting up in the tower and waiting for the animals, or helping the drive and waiting for the animals, and when you have cooked it and are sitting down to eat it, it's the whole experience. It's for the sake of hunting to eat this meat, for it to have meaning and purpose."

Wildlife meat became a symbol of all the actions and experiences that were part of procuring it. Consuming meat was the culmination of these experiences and was what gave hunting meaning for Hunter 90. Hunter 70 had a slightly different take on why wildlife meat was special. Hunter 70 identified that the experience of obtaining the meat was what made it special, because it developed respect for what you were eating.

> "I also believe that when you are the one hunting and handling the meat, is the one who stands there a very long night, and will cut it up into fine pieces, then you get a different kind of respect for what you eat. And you understand that it's an animal, I killed an animal, I then eat, it brings a respect for what you actually eat."

Hunters also mentioned that the limited access to wildlife meat made it special. The people they shared meat with found it special because they could not easily access it themselves. Those they shared wildlife meat with described it as "rare" and "exotic". Hunter 70 described their perspective on why access to wildlife meat was limited:

> "The others do not have access to it. You must really take that into account. Those who

> hunt have land, it is not something you acquire in a jiff … [and] it costs a lot to buy a hunting lease ... Or pay into a hunting party, or to be invited. So it is pretty tight premises, one can have access to meat, and therefore it is fair and nice to share it."

To access wildlife meat through hunting, a person must be able to afford to do so, able to find a place to hunt, and able to find a team to hunt with, especially for moose. Although wildlife meat could be purchased at a store, it was easier to obtain if you knew a hunter who would share or sell it, because most wildlife meat remained with hunters. As Hunter 80 described, it was not always easy to find meat in the store, nor was it affordable.

> "It's good. It is fantastic. There are many who never at all would get to eat it, if you are not invited to it. In the stores you hardly find it. It's some large estate that sells. But often it is so expensive that people hesitate to buy it. So of course I want to share, that's what I can share."

Sharing wildlife meat was repeatedly identified as an important aspect of hunting. As Hunter 70 described, "But one thinks of the social aspect, to barbecue together and eat something you have cooked together, then it's really important, to cook together and then eat it, which is delicious." For Hunter 70, cooking and eating wildlife meat was integral to the process of hunting and brought them closer to others. But to Hunter 67, sharing wildlife meat was a more fundamental part of being human: "I think that's something one is bred with, to give, to share, for it has always been and so much good comes from it. You get so much back."

For Hunter 67, not only was sharing fundamental, but they felt they got a lot in return from others for sharing their wildlife meat. For Hunter 89, sharing wildlife meat was a way to show others that they cared for them and appreciated them: "I want to show an appreciation from my side to whoever I give to. That's the main purpose, for me at least." Sharing wildlife meat

played an important role in how hunters built and maintained social relationships.

Wildlife meat was shared judiciously by hunters. Hunters discussed carefully considering who would receive their wildlife meat, using terms like “closest circle”, “very tight relationships”, or “those who are closest to me” to describe who received their meat. As Hunter 89 explained: “First and foremost, it is the loved ones you have in your immediate perimeter.” Hunter 77 provided more detail:

> “It is important, in fact, for it is not like anything else. For me, it is mine, my efforts, both in time and money, which is quite close to my heart. I guess I'm pretty selective with who I give it away to. There are people that you, this sounds really corny, but people you feel something more special for, with whom you want to share with, and who are known to appreciate it.”

Hunters most often shared their wildlife meat with family or close friends. When Hunter 80’s kids came by once a week, “it [was] always game on the menu”. Hunter 81 gave their grandchildren wildlife meat as a Christmas present, which prompted further conversations on how to properly cook the meat, and then later, stories from the grandchildren of how they prepared and shared it. Hunter 80 described sharing wildlife meat with their parents: “We are so tight in our family, Mom and Dad have had game meat their whole life, and if they run out, I want to share with them, so it is within the family.” Hunter 76 similarly shared wildlife meat with their in-laws: “My mother-in-law. She is 86 years old. She is delighted to receive all bones and other meat as well, of course. Her moose-meat-soup with dumplings (klimp) is not a joke! It is a culinary delicacy!” Hunters considered wildlife meat special and gave it to those they considered special as well; this distinction emphasized the importance of that relationship, thus maintaining and strengthening it.

Wildlife meat was also used to assist others, particularly helping family members lower food costs. When discussing providing wildlife meat to family members who did not live in their household, Hunter 73 stated, “It is nice to contribute to their lower household costs.”. Hunter 87 felt similarly:

> “I feel some responsibility to provide for Mom now. And my sister is, she does not hunt, but she has family and then I think she may have a better use of it than what I need. I am on dry land so to speak. I don't need it, I have a surplus.”

Since Hunter 87 had a surplus, they believed they should provide meat to those in their family that could benefit. This view was shared by Hunter 82, who also had a surplus:

> “Yes, I get more than I need and the ones I give to in this situation, they need it really. I have a better economy than them. So I could never imagine not doing it. But it should be to those who really need and not to, and I could not think of selling to anyone private, then I rather give to someone who needs it.”

Hunters also described providing wildlife meat to hunters who were no longer able to harvest their own meat. Hunter 91 described giving wildlife meat to a neighbor who was no longer able to hunt: “He was a hunter but for various reasons had to stop, so he is happy when they get a piece of meat. They are so grateful.”

Some hunters offered wildlife meat to say thank you or demonstrate reciprocity. For example, Hunter 69 used wildlife meat to pay or thank others for work done around their home: “I occasionally give a piece of meat to someone as thanks, if you've had help with something.” Hunter 69 even used wildlife meat to get electrical work done: “One person who was here on a hunt, he wondered if he could take a boar, in exchange, he did electrical work. He is an electrician so I said absolutely, it was a good deal for me.” On another occasion, they used

wildlife meat to thank the workers who renovated their floors: “I had a few people that helped me with the floors so they received a smoked roe deer shoulder. More of a thanks than payment, I paid too, but they were nice and showed up on short notice.” Hunter 91 similarly used wildlife meat to thank a neighbor for watching their home while they were away: “The neighbor straight across the road, we help each other. When we go away, he looks out for the house. So then he usually gets some as a thank you, a nice piece of meat.” Likewise, Hunter 76 described using wildlife meat to thank their parents for favors: “With my mother and father we do each other favors, back and forth. I have a good supply of meat and they help us with the kids and things like this … And it works quite well that they get meat.”

In Sweden, it is customary to bring a gift for the host when you are invited to someone’s home. Some hunters fulfilled this important social custom using wildlife meat. Instead of the traditional flowers or bottle of wine, hunters discussed gifting a good quality piece of meat. Because wildlife meat is considered special, Hunter 81 described that it made a great host gift.

> “I’m a little proud that I have a really nice product that I can share with others … We are often invited to peoples homes, and every time to go and buy a bunch of flowers or some damn thing, then we see that it is much more appreciated to bring a steak or ground meat.”

Wildlife meat was used to celebrate non-religious holidays or special events such as birthdays or weddings, emphasizing its heightened importance and special nature. For example, Hunter 65 celebrated the New Year by smoking moose meat with a friend to make a traditional Swedish dish: “This New Year’s we did moose souvas. My friend built a place to smoke meat in at his house. So we made moose souvas and it was really good.” Hunter 75 described using wildlife meat to make all the meat dishes for their daughter’s wedding, while Hunter 81 provided a whole

wild boar for a wedding that served barbeque. One hunting team donated meat to their local village's annual community dinner. Hunter 70 described saving the best pieces of meat to celebrate someone's birthday:

> "Yes, they [the fillets] are the most tender pieces. We eat them, so far, at the finest occasions when it's someone's birthday, and then we did as good as we could, with fallow deer fillet and home-made red wine sauce, you know, really made an effort."

While all interviewees hunted as part of a hunting team, some also hunted individually for certain species. Most of the meat, however, was harvested in a team setting. Transporting the harvested meat out of the forest, then processing and dividing it up to be taken home was a team effort that provided many opportunities to build and strengthen the social relations between team members. As Hunter 68 expressed: "I think that there has always been an interest, based on solidarity, to help. What you do in the forest are one part, but then the work continues, until we have divided the meat." Hunter 63 elaborated on the team effort following an animal's retrieval from the forest:

> "And so, off to the slaughterhouse, and then skin it there, hanging it up there. We do the job together! I would not be able to take care of an entire moose myself. Not a chance … We help each other to cut up, everyone helps and you do the thing you can do best."

The processing facilities used by hunters varied widely. Some used a shed or a team member's garage, while others had state of the art slaughterhouses kept to the perfect temperature with running water and sanitary stainless-steel tables. Regardless of the facilities, processing an animal often provided an opportunity to engage with other members of the team. One hunter showed the interviewer their slaughterhouse equipped with a barbeque outside so they could cook up some of the fresh meat from the hunt while they were still processing the

harvest. Multiple other hunters discussed adding a fika room to their slaughterhouses so their teams could partake in fika (a Swedish coffee break for socializing) while processing animals.

Hunters described how the hunting team would get together over a meal made from the wildlife meat they harvested. One team had a tradition of getting together for kidney pie every year, while others hosted potluck dinners made from wildlife meat. Hunter 87 described how they started a tradition of making soup from wildlife bones for their team: “Two or three years ago I started to invite the whole team for meat soup. I said, "Save bones and I'll cook soup". So now it has become a thing. I invite the whole team for meat soup”. Sharing wildlife meat even occurred during the hunt. I witnessed a boiled moose nose being passed around amongst team members during a coffee break on a moose hunt in northern Sweden. People took a slice off with a knife and passed the nose along; everyone who wanted some took a piece. Sausages and other portable snacks made from wildlife meat often accompanied hunts.

In Sweden, hunting for ungulates frequently involved the use of dogs to drive game. Dogs and their handlers were therefore pivotal to the hunt, and often benefited from increased social standing within a hunting team. Dog handlers were often provided with special parts of the harvested animal to emphasize their importance and thank them for their efforts. They frequently received wildlife meat or pieces of the animal to feed the dogs or use for training purposes. Hunter 82 described the special treatment received by dog handlers on their team: “And here we have a system that the first calf that is shot, or calves, depending on how many dog handlers there are, go to the dog handlers”. Some hunting teams presented the heart (a very special piece) to the dog handler, rather than the shooter, as is traditional. Hunter 79’s team even included dogs in their processing: “And everything that we cut off that we deem is suitable for dog food, we gather in a special pile and mince it for the dog.” Hunter 81 usually got enough meat from the

team's harvest to make and store an entire year's worth of dog food: "All the other viscera … I take care of and cut and then we cook dog food once a year so that there is enough for a year. There will be about 150-170 kg per year."

Identity

Processing, sharing, and eating wildlife meat played a role in the formation or thickening of personal identity (individual goals, values, or beliefs) and social identity (definition of self in relation to others, including cultural identity) (Schwartz et al., 2006). One way wildlife meat contributed to hunters' identities was through self-fulfillment. Wildlife meat enabled hunters to enact and fulfill their personal identity by achieving their ambitions, capabilities, and desires through their efforts related to the harvest, sharing, and consumption of wildlife meat. Hunters talked about how providing wildlife meat made them feel good, great, right, satisfied, cozy (mysig), and proud. For example, Hunter 61 said, "It feels good to be able to give a little bit of something that is so good and so useful to those who cannot get it." Hunter 62 expressed a similar sentiment: "It feels great to be able to bring home fine meat that you know where it comes from."

Often, these sentiments were tied to expressions of self-sufficiency or self-reliance. Hunter 78 expressed self-fulfillment because they harvested and processed the wildlife meat they shared: "I think it's satisfying to give it to someone else, because I shot it myself and took care of it myself. I like to give away stuff like that". Hunter 62 made a similar connection: "It is precisely that it is wild game meat that you yourself have hunted, it is satisfying retrieving your own food." Hunter 65 described feeling fulfilled by being self-reliant and not needing to depend on the supermarket.

"I like to hunt it. It is connected. It feels good to actually eat the meat you hunt. That is

why I hunt. I don't just want to go out and shoot, you want to bring something home as well. It feels good to not be dependent on ICA (Supermarket chain) and to buy."

For Hunter 77, a woman, their feeling of fulfillment from harvesting their own food from forest to table intersected with gender and defying gender stereotypes.

"It's a pride in that, once again, to know where it comes from, and that you have harvested it yourself. There are often discussions about the hunt and so on around the dinner table as well, it is impressive that it is I who have done it and not my husband... I feel a pride in the hunt, in being a member."

For some hunters, consuming wildlife meat was tied to national identity. Hunters described wildlife meat as Swedish and connected consuming wildlife meat to being Swedish. Hunters expressed a preference for wildlife meat because it was a "Swedish meat". Hunter 86 liked eating wildlife meat because it helped them "take advantage of our Swedish meats." For Hunter 88, who hailed from northern Sweden (Norrland), moose meat was tied to their regional identity. Here, they described giving meat to their Swedish friends to share with their non-Swedish girlfriends:

"I have friends in my class who are from Stockholm and they can't even spell moose. So a couple of them have gotten it straight into their hands, especially when their girlfriends come, they have to represent Norrland in some way."

To this hunter, moose meat represented Norrland and provided a connection to their identity as a resident of both Norrland and Sweden.

Cultural Heritage

Wildlife meat was a physical part of the natural world that served as a totem for traditions and ways of life passed down through generations. Hunters identified several traditions that were

built and passed on through the sharing and consumption of wildlife meat. Many hunters referenced the tradition of giving the heart of an animal to the person who shot it. Hunters described the heart as “something special”, “a delicacy”, or “a reward” for the shooter, and giving the heart to the shooter was an “old custom”, “tradition”, or “how it has always been”. Hunter 85 described it like so: “It's something historic. It's something that, I've been hunting there for quite a few years, I started at other places, but it has probably always been so.” Hunters also mentioned preparing traditional Swedish dishes made with wildlife meat. A particularly popular dish was haggis. In Sweden, haggis was traditionally made from wildlife meat by grinding the marrow in bones and the meat that was attached to those bones. Hunter 85 enjoyed making haggis for their grandchildren:

> “We do have some small grandchildren in [location name removed]. They love that haggis. There's a lot to do, but I have time to do it, before you have cleaned everything, it's much boiling and then, but you have the most delicious taste.”

In addition to honoring old culinary traditions, some hunters started new traditions involving wildlife meat. Like Hunter 79: “It has almost become a tradition, it is the third year we live here now. The two last autumns, we have made sausages with all the neighbors”.

Hunters discussed sharing and consuming wildlife meat as part of their way of life. For some, sharing wildlife meat wasn’t something they often thought about because it was “routine”. As Hunter 66 expressed: “It is quite natural in these old communities to share a steak if one has it.” Many hunters considered wildlife meat a staple food, or something that had always been a part of their diet, like Hunter 74: “It [Wildlife meat] is the staple food and so it has been since I was very small”. Hunter 87 expressed a similar sentiment:

> “But it is precisely this, it is my upbringing, it's tradition, it's what I know, it's food for

> the winter … I think it's very much of it this way I was brought up. Moose meat was food on the table for the winter."

Wildlife meat was not only something hunters had grown up on, but something they were raising their children on too. Hunter 73 said it best: "my children … are born and bred on wild game meat, I've always hunted". For Hunter 68, harvesting and consuming wildlife meat was not only tied to their upbringing, but part of connecting to humanity's distant past: "I think it is important to take part of the cultural heritage, that is what we have done the most time on this earth, hunted and fished."

Education

Processing, sharing, and eating wildlife meat provided a basis for formal and informal education about biology, hunting, and wildlife management. Hunters mentioned using wildlife meat to educate others about hunting and wildlife management. Hunter 63 viewed sharing as a way of introducing others to the benefits of wildlife meat: "I would like to do a bit of advertising for the moose meat." To Hunter 68, sharing wildlife meat was a way to start discussions about the benefits of wildlife meat and the role of hunting in wildlife management: "Above all you have a dialogue about the meat when you eat it. Talk about where it comes from and what a resource game really is, so there will be a greater awareness." For Hunter 88, wildlife meat was not only a symbol of the hunt, but a way to educate others about where our food comes from.

> "Sharing the joy that comes from hunting. I'm not thinking that you give away a piece of meat, but you give away a piece of hunting. For people from the south who don't know anything about this, it actually becomes a piece of meat and to highlight that what you buy at ICA [Supermarket chain] does not grow on trees, it is an actual animal lying there."

While participating in a moose hunt in northern Sweden, I observed children learning about the anatomy of moose when a carcass was brought to the local barn for processing. When the hunting team arrived with the moose, their family members were waiting to see the day's harvest and help with processing. The moose was raised using a tractor and the adults began to break down the carcass into smaller, more manageable pieces. A group of children gathered to inspect the moose's head and teeth. This became an opportunity to discuss how moose and human teeth were shaped differently and how this related to what moose eat.

Knowledge Systems

The knowledge required to process and prepare wildlife meat for consumption encompasses a knowledge system. By engaging in these activities, hunters are constantly building knowledge themselves and sharing this knowledge with others. Categories of cultural ecosystem services overlap and intertwine (Gee & Burkhard, 2010; Pröpper & Haupts, 2014; Hernández-Morcillo et al., 2013). Some of the ways in which wildlife meat contributes to knowledge systems were already described in the sections on cultural heritage and education. Processing and preparing wildlife meat for consumption were where Swedish hunters most often described building knowledge around wildlife meat.

Some of the knowledge systems surrounding wildlife meat were created in more formal educational settings. Swedish hunters must take a course to receive a hunting license, part of which covers the processing of wildlife meat. Additional courses with more detailed training on processing were available, as well as courses to become a game investigator (viltundersökare), individuals trained to inspect wildlife meat for disease and contamination before it is sold to a game handling facility (SNFA, 2007). If hunters had not taken a course themselves, there were often other team members who had. Trained hunters generally managed the processing, while

teaching other team members the proper hygiene for handling meat.

> "There are so many talented guys around here, if you end up with any of them you'll learn quickly. There are many good people here to learn from… You learn pretty fast how to take care of the bodies. I personally would like to take a butchering course, for example, and learn from a pro." (Hunter 78)

A key component of the knowledge system for processing wildlife meat was the concept of 40-degree days (dygnsgrader), a process used to age meat. For example, if the average temperature every day in a given week was 8C, the meat should hang for 5 days, totaling 40C. Temperatures in a cooling room or meat locker can be regulated, but some teams did not have access to such facilities, which meant letting their harvest hang in a barn or shed, exposed to daily temperature fluctuations. Some hunters preferred to let their meat hang a little longer, for 60-degree days. Dygnsgrader was also about flavor. It was not only important to hunters that meat was hygienic, but also that it tasted good. In recent years, Hunter 68's team has started to focus on the quality of the meat:

> "It's often the case that there is one or a few that have a little more knowledge, but then I think probably most people want to be involved and learn. There is a craft in itself, we've gotten more knowledgeable in recent years, the importance of the different phases, what significance it has for meat tenderness and durability and so on. There is quite a lot to take part in."

Although courses and training were available, hunters often discussed learning about processing wildlife meat from other knowledgeable members of their family or team. Hunter 85 described it like this: "Those who have hunted there for forty years, they have learned. You stand there and look, that is the way you learn." Hunter 88 detailed the experience of a team member

who was interested in learning how to process wildlife meat and sought out more experienced hunters from whom they could learn:

> "We have one [a team member] who is, he is 45 maybe, and he does not work as a chef or anything, and he has lived there [near hunting ground] his whole life and he learned by his own interest, followed other hunting teams, especially when he was younger."

Learning to prepare wildlife meat was another way knowledge systems were built from wildlife meat. Hunter 80 recounted the process of slowly learning how to properly prepare wildlife meat: "So it has been for many years with trial and error to find a way to cook to suit me and learn how to do different things." Not only did Hunter 64 learn how to cook wildlife meat, but having wildlife meat in the house taught them how to cook in general: "It has meant, concerning the meat, that I have had to learn how to cook. I couldn't before." Hunter 62 described how knowledge about preparing wildlife meat was unique and different from preparing grocery-bought meat.

> "Before I ate wild game meat once every two years and could not say much about it either. And now I have learned a lot more, and you can discover new dishes. Since the meat is a little different than the meat that can be bought in the store, other recipes are required, some other recipes or cooking methods because it is pretty low fat. Then also when you get all the different parts of an animal, you are encouraged to cook different kinds of dishes. What is suitable for a steak or a fillet, it is quite different. And at ICA [Supermarket chain] there are not so many varieties to choose from."

Learning to prepare wildlife meat gave hunters the opportunity to learn from others and create their own recipes. Hunter 92 learned how to prepare wild boar, a meat newer to Sweden but prominent in Germany, from other members of their hunting team: "Then I have received

information from the German housewives [wives of hunting team members] how to cook it, and then I made it my way too. A mix of recipes." For Hunter 88, learning to prepare wildlife meat was an opportunity to learn family recipes that had been passed down by older generations. (This could also be considered cultural heritage cultural ecosystem services).

> "The relatives that came from [where they hunt], this is what they ate, it is the same recipes. Stews and soup, and how to cook the less fine parts I've become interested in. It is popular with filets and the nicer parts, but if you get a fransyska what do you do with it? Then you have to ask grandma right away. My uncle might know since he is a chef, but grandma knows a lot about this stuff."

Spiritual and Religious

Wildlife meat was used to celebrate religious holidays like Christmas and Easter, usually in the form of traditional holiday meals. Hunter 88 used wildlife meat to make a traditional Christmas dish called tjälknöl (frozen moose slowly roasted for a long time at a low temperature and then set in a brine), while Hunter 64 made meatballs from minced meat (ground wildlife meat mixed with spices and fruit) every year with their daughter to celebrate Christmas and Easter.

Wildlife meat was also given as a present to celebrate religious holidays. Hunter 67 gave wildlife meat as Christmas gifts because "I would much rather give a nice steak for Christmas than anything else you've bought in the store, which they will of course not be grateful for." Hunter 77 expressed a similar sentiment: It can be fun to bring a piece of meat as a Christmas present or something like that, to someone who appreciates it." Hunter 69 indicated that they enjoyed smoking wildlife meat and gave away some of their smoked meat during the holiday season: "We smoke a lot from roe deer. Shoulders and such. Some of which we give away,

around Christmas". Some hunters even saved special cuts specifically for religious holiday celebrations. For example, Hunter 87 explained that moose tongue is a tradition for Christmas dinner: "I always take the tongue and heart if my hunting companions do not take it, for my mom very much wants to have the tongue, it belongs to the Christmas dinner, so I always take that out for her."

Recreation and Tourism

The wildlife meat harvested from Swedish forests was perceived as uniquely Swedish, a direct connection to Swedish culture and place. Cultural ecosystem services like cultural heritage and identity were tied to wildlife meat and part of how wildlife meat provided tourism cultural ecosystem services. Wildlife meat was advertised as being local and Swedish. For example, on a trip to Östermalms Saluhall in Stockholm (a historic indoor market with food stalls and restaurants), I found numerous stalls selling all types of wildlife meat from different locations in Sweden advertised as local meat. Restaurants throughout Sweden had wildlife meat dishes (viltkött) on their menu; some restaurants marketed themselves specifically as wildlife meat restaurants. There were even tourist guides highlighting the best restaurants for wildlife meat consumption in Sweden.

During interviews, hunters did not directly identify receiving cultural ecosystem services in the form of recreation and tourism. This was not surprising, as hunters already have wildlife meat and, as such, do not participate in wildlife meat tourism in Sweden. Some hunters, however, profited from selling wildlife meat to food businesses or game handling facilities, that in turn sold meat to restaurants and markets. The market for wildlife meat in Sweden allows wildlife to provide cultural ecosystem services in the form of tourism. Some hunters may have profited from the sale of wildlife meat, but generally, hunters were slightly removed from this

commercial system.

Discussion

By identifying direct links between wildlife meat and culture, the results from my study help fill in the gaps in our existing knowledge about the relationship between wildlife meat and culture (Chausson et al, 2019; Nasi et al., 2011; Morsello et al., 2015). I identify that wildlife meat provides multiple cultural ecosystem services, evidence that wildlife meat is culturally important to Swedish hunters, and more broadly the cultural importance of wildlife. Previous research established the cultural importance of wildlife meat (Chapter 2), but very little literature exists that uses the cultural ecosystem services framework to describe this relationship (Valencia-Aguilar et al., 2013). My study broadens the diversity of contexts in which wildlife meat and its cultural importance are studied (Goguen & Riley, 2020; Van Vliet & Mbazza, 2011; Watkin Lui et al., 2016). To my knowledge, no studies have focused exclusively on the cultural ecosystem services provided by wildlife meat in Sweden or in as much detail. My research findings provide additional evidence that wildlife meat is culturally important to hunters who do not identify as members of a subsistence or indigenous community. This supports the concept that the cultural ecosystem services provided by wildlife meat may be ubiquitous across multiple groups.

Governance can affect the benefits provided by wildlife for current and future generations (Grima et al., 2019). Cultural ecosystem services are often not adequately considered or represented in assessments, and their importance is not recognized in decision making (Daniel et al., 2012; Plieninger et al., 2013). European Union governments are currently adopting the ecosystem services framework for policy development and assessment (Hansen & Malmaeus, 2016). These study findings provide evidence of wildlife meat's cultural importance, and could

aid in the inclusion of cultural ecosystem services addressing public health and wildlife policy. Issues of disease and contamination, a reduction in or loss of wildlife available for hunting, or changes to hunting regulations can all negatively affect hunters' ability to harvest wildlife meat, resulting in loss of cultural ecosystem services (Kaltenborn et al., 2017).

Changes in demand or other market structures can also affect how hunters use or benefit from wildlife meat. Because wildlife meat is so imbedded in many facets of hunters' lives, changes to the accessibility of wildlife meat might be deeply felt. Changes in access to wildlife meat would likely affect an integral component of many hunters' lives, potentially altering how they view themselves and interact with others in their social network. The way that wildlife meat is imbedded in a hunter's life is a characteristic of cultural ecosystem services, which are often highly valued by the public and thus can play a role in public support for uses of natural systems that provide these services (Chan et al., 2011; Daniel et al., 2012; Milcu et al., 2013; Plieninger et al., 2013). Consuming wildlife meat was found to have a positive effect on Swedish non-hunters' attitudes toward hunting (Ljung et al., 2012; Ljung et al., 2015). The cultural ecosystem services provided by wildlife meat that were identified in my study may be a key component of that relationship.

Wildlife meat is more than food for many Swedish hunters. Wildlife meat is woven into a hunter's way of life and perpetuates the hunting season throughout the entire year. Wildlife meat is valued more than other domestically available meats because it is imbued with additional culturally important meaning. Wildlife meat is polysemic; it carries many different meanings simultaneously for hunters. Wildlife meat is an important component of Swedish hunters' social lives and interactions, especially when used as gifts or to celebrate special people or events like religious holidays; this is consistent with other findings about the importance of wildlife meat in

hunters' social relations (Adeola, 1992; Aiyadurai et al., 2010; Chausson et al, 2019; Omura, 2013; VanVliet et al., 2016; Watkin Lui et al., 2016). Sharing meat was part of how Swedish hunters defined themselves in relationship to others, making wildlife meat integral to a hunter's sense of self. This observation is consistent with other research, which reports that wildlife meat links directly to identity (Dizard, 2003; Dombrowski, 2007; East et al., 2005; Ngade et al., 2017; Omura, 2013; Searles, 2002). Wildlife meat consumption and sharing was a key way for hunters to participate in their cultural heritage around hunting, similar to findings from Condon et al (1995) and Watkin Lui et al. (2016). Like the Michigan hunters from Chapter 3, Swedish hunters used wildlife meat for educational purposes. Additionally, the knowledge needed to process and prepare wildlife meat for consumption created a knowledge system among Swedish hunters, akin to the knowledge systems around wildlife meat found in other cultures (Kaltenborn et al., 2017; Kuhnlein & Receveur, 1996).

Furthermore, my study provides preliminary evidence that wildlife meat purchased through markets provides cultural ecosystem services in the form of tourism and recreation (Hoffman et al., 2003). Hunters were able to benefit economically from selling wildlife meat to private persons, food businesses, and game handing facilities. Meanwhile, tourists could consume wildlife meat harvested from Swedish forests by Swedish hunters at restaurants or purchase wildlife meat in stores without first having to know a hunter. Without the existence of a market, these cultural ecosystem services would not be present or would be limited to those who personally know hunters. However, interviews with non-hunters who consume wildlife meat from market sources are needed to identify if wildlife meat provides additional cultural ecosystem services when available for purchase.

The provisional and cultural ecosystem services provided to Swedish hunters by wildlife

meat often outweighed the economic incentives selling wildlife meat. Sharing wildlife meat provided hunters with multiple cultural ecosystem services, which hunters described valuing over potential profit. Profits from selling wildlife meat were often used to offset the costs of hunting, rather than as a main form of income (with the exception of wildlife meat harvested at estates). Generally, hunters prioritized their household's nutritional needs, and if surplus wildlife meat was available, they shared or sold it via their social network. Even hunters with a surplus often opted to share rather than sell, or sold to friends and family at a reduced rate. While a detailed analysis of how hunters decide whether to sell or share meat is beyond the scope of this chapter, it appeared that hunters' desire to consume and share wildlife meat often exceeded their desire to profit from its sale.

The ecosystem services framework is rooted in economics and often measures value in monetary terms (Plieninger et al., 2015; Pröpper & Haupts, 2014). Past valuations of the ecosystem services provided by Swedish forests have used the market value of wildlife meat as one measure of value (Hansen & Malmaeus, 2016). That wildlife meat has a market value makes economic assessments of ecosystem services easier in Sweden compared to countries like the United States, where hunter-harvested wildlife meat has no legal or established economic value. However, my study found that wildlife meat provides many cultural ecosystem services that are difficult to put in economic terms, which begs the question: does the market value of Swedish wildlife meat represent an accurate estimate of its total value? Some hunters argued that the high price of wildlife meat in stores makes it inaccessible to other people. Other hunters called wildlife meat priceless. Further consideration of the cultural ecosystem services provided by wildlife meat is needed when making economic assessments of the value of wildlife meat to society.

My study did not find evidence that wildlife meat provides cultural ecosystem services in the form of aesthetic, cultural diversity, bequest, intrinsic, and existence, inspiration, or sense of place. However, these cultural ecosystem services are particularly difficult to identify in the context of wildlife meat. A lack of evidence in my study only warrants further investigation into these potential services, particularly sense of place. Wildlife meat has reportedly provided sense of place cultural ecosystem services in other contexts (Gombay, 2005; Watkin Lui et al., 2016). Many Swedish hunters identified that they enjoyed consuming wildlife meat because they knew where their food came from. This was discussed in health contexts such as meat quality, environmentally friendly food, and industrialized meat. Although these concepts linked meat to the local landscape, the connections made by hunters related more to health than to a strong sense of place, therefore sense of place was not identified as a cultural ecosystem service. Additionally, wildlife meat providing ties to regional or national identities may have been coded as sense of place by another researcher, however, I defined sense of place as wildlife meat providing direct ties to a specific place or landscape. Further questioning along this line of inquiry may have yielded more evidence for wildlife meat providing sense of place cultural ecosystem services. Swedish culture has strong ties to harvesting food from the forest (Hansen & Malmaeus, 2016); these connections between wildlife meat and place could be further explored. Part of wildlife meat's value to tourists is that wildlife meat from Swedish forests provides local gastronomic experiences and connects people to the places they visit through consumption. This connection is likely present in Swedish society but was not adequality explored during data collection.

Like the results reported in Chapter 3, the data in this chapter provides additional evidence for the co-generation of benefits though a synergistic relationship (a provisional

ecosystem service simultaneously provides cultural ecosystem services) and the co-occurrence of multiple cultural ecosystem services from a single provisional ecosystem service. My findings advance the theoretical underpinnings of the ecosystem services framework, especially in regard to the co-generation of cultural ecosystem services, for which evidence is limited (Plieninger et al., 2015; Satz et al., 2013). These findings also provide evidence that the presence of a provisional ecosystem service, like wildlife meat, could be used as a proxy measurement for the cultural ecosystem services derived from that provisional ecosystem service.

Limitations

These study findings provide a snapshot in time of a relatively homogenous group of hunters within a small geographic area. As cultural ecosystem services are unique to individuals and their culture, similar studies in different areas are needed to triangulate the results. Furthermore, using the methods from Chapter 3, with modifications to fit the Swedish context, makes evident the efficacy and transferability of applying the cultural ecosystems framework to wildlife meat. Using the ecosystem services framework allowed for consistency across cases, while still providing the flexibility to encompass the broad array of cultural connections to wildlife meat.

Additionally, these study findings are difficult to generalize to all types of markets for wildlife meat in other locations. Markets for wildlife meat in Sweden are relatively small, elite, and highly regulated. Markets for wildlife meat in other regions of the world are less regulated and the profits from selling wildlife meat play a much greater role in hunters' livelihoods (Cawthorn and Hoffman, 2015). Additional studies in different market conditions are needed to determine the full extent of the effect of markets on the cultural ecosystem services provided by wildlife meat.

Swedish hunters had difficulty expressing the cultural ecosystem services directly provided by wildlife meat. While hunters easily discussed all the ways that they used wildlife meat, when asked why wildlife meat was important to them, some struggled to articulate its value. This issue was exacerbated by some Swedes' reserved natures and the translation of findings from Swedish to English. Swedish hunters were more likely to respond to questions with a simple yes or no, and provided less detailed responses when asked to elaborate on a situation. Additionally, some detail in responses was likely lost in translation, although efforts were made to limit this through intensive discussions between the translator and researcher for every transcript. Despite these challenges, the interviews still provided rich data for analysis, and ethnographic field notes helped fill in the gaps.

Our analysis of study findings met with challenges due to overlapping cultural ecosystem services categories (i.e. co-occurrence) (Gee & Burkhard, 2010; MEA, 2005; Plieninger et al., 2013). As reported in Chapter 3, the categories of cultural heritage and identity, and knowledge systems and education were often interlinked. Although coded segments were allowed multiple overlapping codes, quotes were not repeated in multiple categories when presented as results.

Conclusion

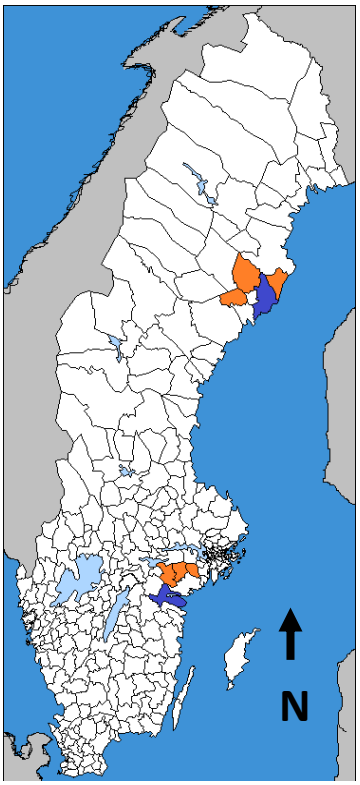
Wildlife meat provides cultural ecosystem services, emphasizing the cultural importance of wildlife meat—and more broadly, wildlife—to society. Formal markets in wildlife meat appeared to have little effect on the ecosystem services that hunters received from wildlife meat, but appeared to spread the benefits from wildlife meat more broadly. Currently, the deep-rooted nature of wildlife meat in hunters' lives seem to be greater than a desire for economic gain from the sale of wildlife meat. These findings contribute to our knowledge about ecosystem services by revealing the synergistic relationships between provisional and cultural ecosystem services

and the co-generation of cultural ecosystem services. European Union governments are currently adopting the ecosystem services framework for policy development and assessment, to aid in maintaining benefits for current and future generations. Results from my study could aid lawmakers with considering the cultural ecosystem services provided by wildlife meat when addressing public health and wildlife policy.

FIGURES

Figure 4.1:

Swedish municipalities used for selection of interview participants.



Note. Blue municipalities are urban and orange municipalities are not urban. The northern urban (blue) municipality is Umeå, and from left to right the northern not urban (orange) municipalities are Bjurholm, Vindeln, and Robertsfors. The southern urban (blue) municipality is Norrköping, and from left to right the southern not urban (orange) municipalities are Katrineholm, Flen, and Gnesta.

TABLES

Table 4.1:

Total number of harvested animals and estimated carcass meat from the five large ungulate species hunted in Sweden during the 2010/2011 hunting season.

Species	Total number of harvested animals	Estimated carcass meat weight (kg)
Moose (*Alces alces)*	92,132	11,311,522
Red Deer (*Cervus elaphus)*	5,822	333,699
Fallow Deer (*Dama dama)*	21,359	545,728
Wild Boar (*Sus scrofa)*	58,527	2,952,681
Roe Deer (*Capreolus capreolus)*	80,398	972,819
Total	**258,238**	**16,116,449**

Note. Carcass meat estimates use total carcass weight, although the actual amount of edible wildlife meat produced is less. This table is modified from Wiklund & Malmfors (2014).

Table 4.2:

The cultural ecosystem service categories used in this study, their definitions, and how they were interpreted in the context of wildlife meat.

CES Category	Definition	Application to wildlife meat
Cultural Heritage	Legacy of biophysical features, physical artifacts, and intangible attributes (related to the natural world) of a group or society that are inherited from past generations, maintained in the present, and bestowed for the benefit of future generations (Daniel et al., 2012).	Wildlife meat is a physical part of the natural world that serves as a totem for stories and memories, is involved in traditions, and is a source of knowledge that is part of hunters' cultural heritage and passed down through generations.
Identity	Formation or thickening of cultural identity tied to an ecosystem and/or its components (Chan et al., 2012).	Formation or thickening of identity tied to the processing, sharing, and eating of wildlife meat.
Education	Ecosystems, their components, and processes provide a basis for formal and informal education (MEA, 2005).	Processing, sharing, and eating wildlife meat provides a basis for formal and informal education.
Knowledge Systems	Ecosystems influence the types of knowledge systems developed (traditional and formal) (MEA, 2005).	Processing, cooking, sharing, and eating wildlife meat helps build knowledge systems related to wildlife meat.
Social Relations	Ecosystems provide opportunities for creating and enhancing relationships and strengthen communities (Calbet-Mir et al., 2012).	Processing, cooking, sharing, and eating wildlife meat provides opportunities to create, maintain, and strengthen relationships.
Spiritual & Religious	Attach spiritual and religious values to ecosystems and their components (MEA, 2005) and ecosystems are a source of inspiration for religious or spiritual thought and experience (Chan et al., 2012).	Wildlife meat is a source for religious or spiritual thoughts and experiences.
Recreation & Tourism	Ecosystem services are derived from the physical use of ecosystems for recreational purposes (Kulczyk et al., 2018), this also includes recreation conducted thought tourism (MEA, 2005).	Wildlife meat is appreciated by tourists who identify it as a local food and view consuming it as a unique experience.

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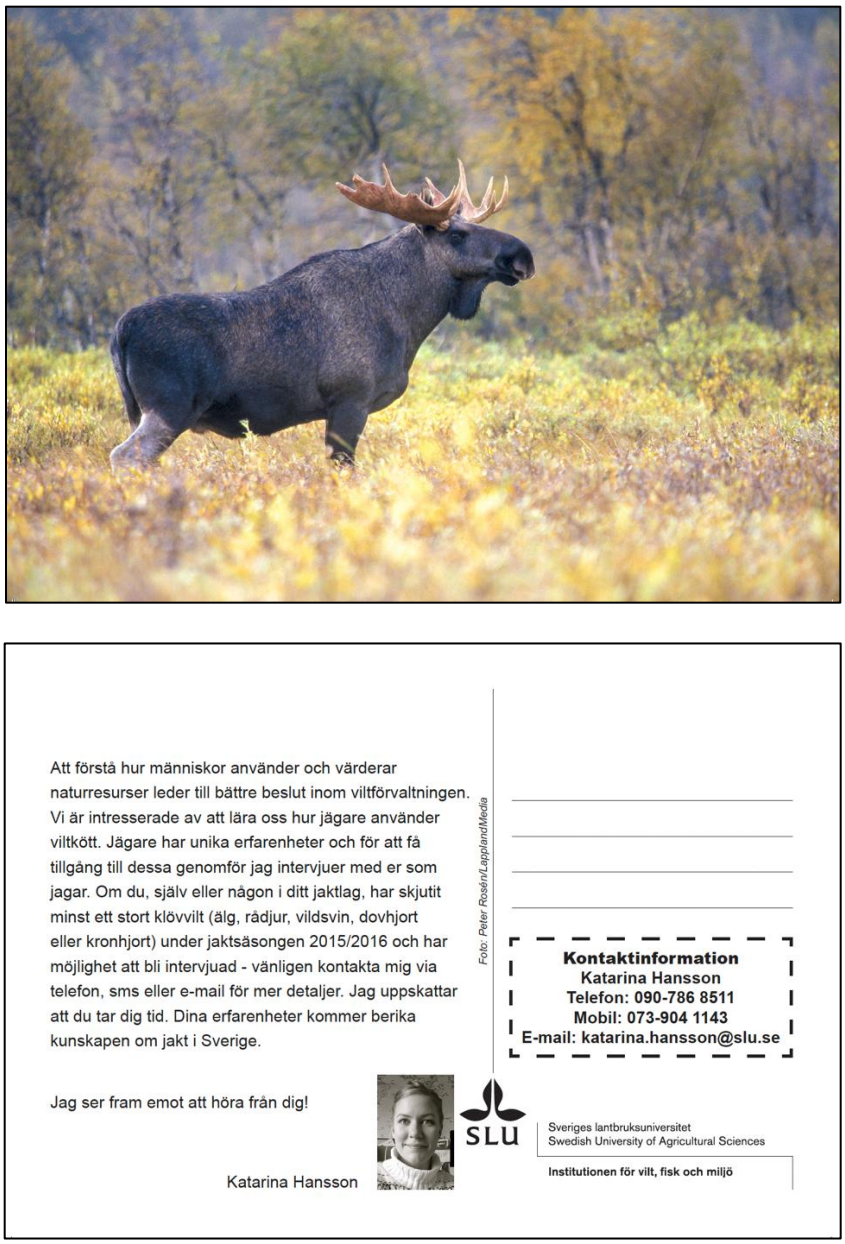
APPENDIX 4.1: SWEDISH POSTCARD

Figure 4.2:

Swedish Postcard.



Note. The front (top) and back (bottom) of the postcard sent to Swedish hunters inviting them to participate in the study.

APPENDIX 4.2: SWEDISH LETTER

Figure 4.3:

Swedish Letter.

Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences
Institutionen för vilt, fisk och miljö

2016-05-06

Hej Jager,

Att förstå hur människor använder och värderar naturresurser leder till bättre beslut inom viltförvaltningen. Vi är intresserade av att lära oss hur jägare använder viltkött. Jägare har unika erfarenheter och för att få tillgång till dessa genomför jag intervjuer med er som jagar. Intervjuer är genomförda i norra Sverige och nu är det dags för södra Sverige, närmare bestämt Norrköping med omnejd.

Om du, själv eller någon i ditt jaktlag, har skjutit minst ett stort klövvilt (älg, rådjur, vildsvin, dovhjort eller kronhjort) under jaktsäsongen 2015/2016 skulle jag vilja träffa dig för en intervju. Jag uppskattar om du tar dig tid att träffa mig. Dina erfarenheter kommer berika kunskapen om jakt i Sverige. Vänligen kontakta mig via telefon, sms eller e-mail för mer detaljer.

Jag ser fram emot att höra från dig!

Katarina Hansson

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Note. The letter on SLU (Sveriges lantbruksuniversitet) letterhead sent to Swedish hunters inviting them to participate in the study.

APPENDIX 4.3: SWEDISH INTERVIEW QUESTIONS IN SWEDISH

Intervjuguide

Inledande frågor

Vid vilken ålder började du jaga? Vad jagade du?

Hur lärde du dig jaga? Vem lärde dig?

Vilka arter jagar du nu?

Vad jagar du helst?

Även om du jagar andra arter eller äter annat kött så fokuserar den här studien på klövviltet. Detta för att mest kött kommer från klövviltet, så härifrån kommer intervjun fokusera på klövviltet.

Hur ofta jagar du (älg, rådjur, kronhjort, dovhjort, vildsvin) ?

Vad motiverar dig att jaga? *(Om naturupplevelse; På vilket sätt? Kan du beskriva upplevelsen?)*

Är du medlem i något jaktlag? Hur många?

Du är medlem i _____ lag. Jag kommer fråga om ett lag i taget.

LAG 1

Var jagar laget? Samhälle, kommun?

Vilken typ av mark jagar ni på? Privat, arrende?

Hur många är med i laget?

Är du jaktledare?

Hur bereder ni i jaktlaget fällda djur? Från skog till frys: Var hanterar ni köttet? Hur fick de tillgång till stället?

Sparar ni några särskilda delar? Av vilket skäl?

LAG 2

Var jagar laget? Samhälle, kommun?

Vilken typ av mark jagar ni på? Privat, arrende?

Hur många är med i laget?

Är du jaktledare?

Hur bereder ni i jaktlaget fällda djur? Från skog till frys: Var hanterar ni köttet? Hur fick de tillgång till stället?

Sparar ni några särskilda delar? Av vilket skäl?

Individuell jakt och kött

Har du skjutit och tagit hem kött från något klövvilt utan att ha varit med i ett jaktlag, dvs själv?

Med andra? Vilka, var? Hur mycket?

Hur bereder du köttet du tagit hem? Från skog till frys: Var hanterar du köttet?

Sparar du någon särskild del? Finns det något särskilt skäl?

Hushållet

Jagar någon annan i ditt hushåll? (De som lever i ditt hus)

Bidrar denna/dessa till mängden viltkött i hushållet?

Om ja, vilka typer av viltkött tar de med hem och hur mycket?

Förvaras detta viltkött tillsammans med din mängd eller förvaras de separat?

Viltköttskonsumtion

Tidigare sa vi att du hade tagit hem _____ viltkött. Om du jämför denna jaktsäsongs totala mängd kött du tagit hem med ett normalt år, är det normalt, mer eller mindre?

Äter du viltköttet du tar med hem?

Om inte, finns det någon särskild anledning till det?

Äter andra i hushållet det viltkött du tar med hem?

Om ja, vem?

Om inte, varför inte?

Vad gör du med viltköttet hemma? Hur används det? *(Rått, korv, hamburgare)*

Är det någon särskild tid på året du och ditt hushåll äter mer viltkött? Eller är det jämt utspritt över året?

a) Om konsumtionen varierar; När äter du mest viltkött?

Hur ofta äter du viltkött under denna tidsperiod?

Hur ofta äter du viltkött under resten av året?

b) Om konsumtionen är jämn: Hur ofta äter du viltkött under året?

Hur viktig är viltkött i din kost? *(Protein, speciella tillfällen) (På vilket sätt är det viktigt? På vilket sätt är det ekologiskt?)*

Varför väljer du att äta viltkött? Varför tycker du om att äta viltkött?

Uppskattningsvis, hur många procent av det röda köttet du äter din kost kommer från viltkött?

Dela viltkött

Ger du viltkött till någon utanför ditt hushåll?

Om inte, finns det något särskilt skäl varför du inte delar viltkött?

Om du tänker tillbaka på den senaste jaktsäsongen (2015/2016) och det viltkött du tagit hem, vem har du gett viltkött till?

Har du delat med någon annan?

Har du tagit med kött till en större middag, ex jobb-evenemang eller fest?

Om ja, beskriv evenemanget. *(Hur många personer, hur ofta, flera evenemang?)*

Brukar du bjuda hem folk att äta viltkött? *(Hur ofta? Hur många personer? Vilka? Samma eller olika personer? Hur ofta är ofta: veckovis, månadsvis eller årligen?)*

Är det någon du har planerar att ge viltkött till som du ännu inte gett till? T.ex i sommar.

Är det någon du vanligtvis ger kött till som du inte har gett till senaste jaktsäsongen?

Hur väljer du vem du ger kött till?

Hur väljer du hur mycket du ska ge bort?

Vilka delar väljer du att spara? Är det något du sparar till dig själv och ditt hushåll? Särskilt skäl? Vilka delar väljer du att ge bort? Särskilt skäl?

Hur gör du med det som inte är kött, typ ben, hud?

Är det någon tid under året du ger bort mer kött eller ger du samma mängd hela året?

Om ja, när ger du bort som mest?

Om hela året, hur ofta ger du bort kött under året?

Byta / Få viltkött

Händer det att du byter viltkött mot något annat?

Vem? Relation? Hur mycket? Särskilt skäl? Hur ofta? Vad motiverar dig att byta?

Får du eller någon annan i ditt hushåll viltkött som gåva av någon?

Vem? Relation? Hur mycket? Särskilt skäl? Hur ofta?

Sälja viltkött

Säljer du ditt viltkött till någon, t.ex. privatpersoner, vänner, släkt, gårdsbutik, restaurang?

Om inte, finns det något särskilt skäl till att du inte gör det?

Om du tänker tillbaka på viltköttet du tagit med hem senaste jaktsäsongen (2015/2016), till vem har du sålt?

Hur väljer du vem du ska sälja kött till?

Hur avgör du hur mycket kött du ska sälja?

Finns det någon särskild del av djuret du säljer? Särskilt skäl? Säljer du delar som inte är kött, t.ex hud, ben?

Är det någon särskild tid på året du säljer mer viltkött eller är det samma mängd under hela året?

Om ja, vilken tid på året säljer du mest?

Om hela året, hur ofta säljer du kött under året?

Vad gör du med pengarna du får genom försäljning?

Har jaktlaget sålt kött? Till vem, i vilken form?

Vad gör lagen med pengarna de får in via försäljning?

Sociokulturellt värde

För att sammanfatta det vi har pratat om idag, generellt, vad motiverar dig att ge bort viltkött?
Att ge bort kött, är det en viktigt aktivitet för dig? Varför/Varför inte?

Att sälja viltkött, är det en viktig aktivitet för dig? Varför/ Varför inte?

Alt. Hur känner du inför försäljning av viltkött?

En del av den här forskningen studerar effekter hos icke-jägare som äter viltkött. Skulle du säga att det finns någon effekt på de som inte jagar själva att du ger till dem? Vilken typ av effekt?
(Kan du beskriva hur icke-jägare har upplevt det när de har fått viltkött?)

Funderingar / Oro

Känner du någon oro kring att ge bort eller sälja ditt viltkött?

Känner du någon oro för att äta viltkött?

Om ja, vad/varför? *(Var fick de information ifrån? Har laget talat om det?)*

Har de du gett till eller delat med uttryckt oro kring att äta köttet du gett till dem?

Avslutning

Har du några frågor eller kommentarer rörande det vi talat om idag?

Om jag har följdfrågor, kan jag kontakta dig då?
Om ja, hur? Kontaktuppgifter?

Jag har ett kort formulär med bakgrundsinformation för att samla demografisk data. Det tar max 5 minuter att fylla i. Syftet är att kunna jämföra.

APPENDIX 4.4: SWEDISH INTERVIEW QUESTIONS IN ENGLISH

Interview guide

Introductory questions

At what age did you start hunting? What did you hunt?

How did you learn to hunt? Who taught you?

What species are you hunting now?

What do you prefer to hunt?

Even if you hunt other species or eat other meat, this study focuses on ungulates. This is because most meat comes from ungulates, so from here the interview will focus on ungulates.

How often do you hunt (moose, roe deer, red deer, fallow deer, wild boar)?

What motivates you to hunt? (About nature experience; In what way? Can you describe the experience?)

Are you a member of a hunting team? How many?

You are a member of _____ teams. I will ask one team at a time.

TEAM 1

Where does the team hunt? Community, municipality?

What type of ground do you hunt on? Private, lease?

How many are on the team?

Are you the team leader?

How do you prepare downed animals in the hunting team? From forest to freezer: Where do you handle the meat? How did the team gain access to the place?

Do you save any particular parts? For what reason?

TEAM 2

Where does the team hunt? Community, municipality?

What type of ground do you hunt on? Private, lease?

How many are on the team?

Are you the team leader?

How do you prepare downed animals in the hunting team? From forest to freezer: Where do you handle the meat? How did the team gain access to the place?

Do you save any particular parts? For what reason?

Individual hunting and meat

Did you harvest any large ungulate species not as a member a member of a team, i.e. yourself?

Which species? Where? How much?

How do you prepare the meat you brought home? From forest to freezer: Where do you handle the meat?

Do you save any particular part? Is there a particular reason?

The Household

Does anyone else in your household hunt? (Those who live in your house)

Does this contribute to the amount of game meat in the household?

If so, what types of game meat do they bring home and how much?

Is this game meat stored with your lot or are they stored separately?

Game meat consumption

Earlier we said that you had brought home _____ game meat. If you compare this hunting season's total amount of meat you brought home with a normal year, is it normal, more, or less?

Do you eat the game meat you bring home?

If not, is there any particular reason for that?

Do others in the household eat the game meat you bring home?

If yes, who?

If not, why not?

What do you do with the game meat at home? How is it used? (Raw, sausage, hamburger)

Is there a particular time of year that you and your household eat more game meat? Or is it evenly spread over the year?

a) If consumption varies; When do you eat the most game meat?

How often do you eat game meat during this time period?

How often do you eat game meat during the rest of the year?

b) If consumption is even: How often do you eat game meat during the year?

How important is game meat in your diet? (Protein, special occasions) (How is it important? How is it organic?)

Why do you choose to eat game meat? Why do you enjoy eating game meat?

Approximately, what percentage of the red meat you eat in your diet comes from game meat?

Sharing Game Meat

Do you share game meat with people outside your household?

If not, is there a particular reason why you don't share game meat?

If you think back to the last hunting season (2015/2016) and the game meat you brought home, who did you give game meat to?

Have you shared with someone else?

Have you brought meat to a larger dinner, e.g. work event or party?

If yes, describe the event. (How many people, how often, several events?)

Do you usually invite people over to eat game meat? (How often? How many people? Who? The same or different people? How often is often: weekly, monthly or yearly?)

Is there someone you plan to give game meat to that you haven't yet? For example, this summer.

Is there someone you usually give game meat to that you haven't given to this past hunting season?

How do you choose who you give meat to?

How do you choose how much to give away?

Which parts do you choose to save? Is it something you save for yourself and your household? Special reason?

Which parts do you choose to give away? Special reason?

What do you do with other parts, like bones, skin?

Is there any time during the year that you give away more meat or do you give the same amount all year?

If yes, when do you give away the most?

About the whole year, how often do you give away meat during the year?

Barter / Trade Game Meat

Do you happen to trade game meat for something else?

Who? Relationship? How much? Special reason? How often? What motivates you to switch?

Do you or someone else in your household receive game meat as a gift from someone?

Who? Relationship? How much? Special reason? How often?

Selling Game Meat

Do you sell your game meat to someone, e.g. private individuals, friends, family, farm shop, restaurant?

If not, is there any particular reason why you don't?

If you think back to the game meat you brought home last hunting season (2015/2016), who did you sell to?

How do you choose who to sell meat to?

How do you decide how much meat to sell?

Is there a particular part of the animal you sell? Special reason? Do you sell parts that are not meat, eg skin, bones?

Is there a particular time of year you sell more game meat or is it the same amount throughout the year?

If so, what time of year do you sell the most?

About the whole year, how often do you sell meat during the year?

What do you do with the money you get from sales?

Has the hunting team sold meat? To whom, in what form?

What do the teams do with the money they get through sales?

Sociocultural value

To summarize what we've talked about today, in general, what motivates you to share game meat?

Is sharing game meat an important activity for you? Why/Why not?

Is selling game meat an important activity for you? Why/ Why not?

How do you feel about selling game meat?

Part of this research studies effects in non-hunters who eat game meat. Would you say that there is any effect on those who don't hunt themselves that you give game meat to? What kind of effect? (Can you describe how non-hunters have experienced it when they have had venison?)

Thoughts / Worries

Do you feel any anxiety about giving away or selling your game meat?

Do you have any concerns about eating game meat?

If yes, what/why? (Where did they get the information? Has the team talked about it?)

Have those you have given to or shared with expressed concern about eating the meat you have given them?

Termination

Do you have any questions or comments about what we talked about today?

If I have follow-up questions, can I contact you then?
If yes, how? Contact details?

I have a short form with background information to collect demographic data. It takes a maximum of 5 minutes to fill in. The purpose i

APPENDIX 4.5: SWEDISH BACKGROUND QUESTIONNAIRE IN SWEDISH

Bakgrundsinformation

Är du man eller kvinna?

- ☐ Man
- ☐ Kvinna

2. Vilket år är du född?

Jag är född 19_____ (Ange år)

3. Är du född i Sverige?

- ☐ Ja
- ☐ Nej

4. Hur många år har du bott i Sverige? _____ år

5. Vad är ditt yrke?

_____

6. Hur skulle du beskriva ditt nuvarande bostadsområde?

- ☐ På landsbygden, eller ort med färre än 200 invånare
- ☐ Ort med färre än 2 000 invånare
- ☐ Ort med 2 000 - 9 999 invånare
- ☐ Ort med 10 000 - 199 999 invånare
- ☐ 200 000 eller mer (t. ex. Stockholm, Göteborg eller Malmö)

7. Hur skulle du beskriva området du bodde i under största delen av din barndom?
Barndomen är ditt liv före 18 års ålder.

- ☐ På landsbygden, eller ort med färre än 200 invånare
- ☐ Ort med färre än 2 000 invånare

- ☐ Ort med 2 000 - 9 999 invånare
- ☐ Ort med 10 000 - 199 999 invånare
- ☐ 200 000 eller mer (t. ex. Stockholm, Göteborg eller Malmö)

8. Vilken utbildning har du? *Sätt ett kryss i rutan framför det alternativ du anser stämma bäst in på dig.*

- ☐ Obligatorisk skola (t.ex. grundskola, folkskola)
- ☐ Yrkesutbildning (yrkesskola, fackskola, institut av olika slag)
- ☐ Gymnasieutbildning (även realexamen, folkhögskola)
- ☐ Universitet eller högskoleutbildning

9. Ungefär hur stor är ditt hushålls sammanlagda inkomst efter skatt per månad?

- ☐ 0 – 9.999 kr
- ☐ 10.000 – 19.999 kr
- ☐ 20.000 – 29.999 kr
- ☐ 30.000 – 39.999 kr
- ☐ 40.000 – 49.999 kr
- ☐ 50.000 – 59.999 kr
- ☐ 60.000 kr eller mer

10. Är du medlem i någon jägarorganisation?

_____

_____

_____

11. Övriga kommentarer som du vill dela med dig av?

_____

_____

_____

APPENDIX 4.6: SWEDISH BACKGROUND QUESTIONNAIRE IN ENGLISH

Background Information

10. What is your gender?

- ☐ Male
- ☐ Female

11. In what year were you born?

I was born in 19_____ (Enter year)

12. Were you born in Sweden?

- ☐ Yes
- ☐ No

13. How many years have you lived in Sweden? _____ year(s)

14. What is/are your profession(s)?

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15. How would you describe where your current residence?

2) A rural area, or place with fewer than 200 inhabitants
- ☐ Place with fewer than 2,000 inhabitants
- ☐ Place with 2,000 - 9,999 inhabitants
- ☐ Place with 10,000 - 199,999 inhabitants
- ☐ 200,000 or more (e.g. Stockholm, Gothenburg or Malmö)

16. **How would you describe the area you lived in for most of your childhood?**
17. *Childhood is your life before the age of 18.*

3) A rural area, or place with fewer than 200 inhabitants
- ☐ Place with fewer than 2,000 inhabitants
- ☐ Place with 2,000 - 9,999 inhabitants

- ☐ Place with 10,000 - 199,999 inhabitants
- ☐ 200,000 or more (e.g. Stockholm, Gothenburg or Malmö)

18. **What education do you have?** *Put a cross in the box in front of the option you think suits you best.*

4) Compulsory schooling (e.g. elementary school, folk school)
5) Vocational training (vocational school, trade school, institutes of various kinds)
6) Secondary School (also real exam, high folk school)
7) University or higher education

19. What is your total household income after tax each month?

- ☐ 0 – 9.999 kr
- ☐ 10.000 – 19.999 kr
- ☐ 20.000 – 29.999 kr
- ☐ 30.000 – 39.999 kr
- ☐ 40.000 – 49.999 kr
- ☐ 50.000 – 59.999 kr
- ☐ 60.000 kr or more

20. Are you a member of a hunting organization?

_____

_____

_____

21. Any other comments you would like to share?

_____

_____

_____

CHAPTER 5: A CROSS-CASE COMPARISON OF ECOSYSTEM SERVICES PROVIDED BY WILDLIFE MEAT UNDER DIFFERENT GOVERNANCE SYSTEMS

Abstract

Institutions are essential for effective natural resource management and the allocation of benefits and costs from natural systems across society. Wildlife meat, meat procured from free-ranging animals, provides ecosystem services and disservices to those who harvest or consume it. Institutions regulate how wildlife meat is obtained, used, and distributed throughout society. Markets in wildlife meat and the policies that govern them are an example of an institution that affects the harvest, use, and distribution of wildlife meat. In this chapter, I use the Institutional Analysis and Development (IAD) framework to explore the influence of governance (in particular, the presence or absence of regulated markets) on the creation and distribution of benefits from wildlife meat in Sweden and Michigan, USA. Based on this comparison, the provisional and cultural ecosystem services that hunters derive from wildlife meat appear ubiquitous, regardless of the presence or absence of markets for wildlife meat. Overall, the provisional and cultural ecosystem services provided by wildlife meat in Sweden and Michigan are remarkably similar, despite differences in physical environment, community attributes, and rules or regulations governing wildlife, hunting, and wildlife meat distribution. It appears, however, that wildlife meat is more accessible in Sweden, where consumption rates are greater and wildlife meat provides tourism cultural ecosystem services. These differences may be attributed to existing regulated markets for wildlife meat in Sweden, which increase access to wildlife meat for non-hunter consumers who can purchase wildlife meat in stores and at restaurants. My results provide insights into the influence of governance on the benefits derived from wildlife meat.

Wildlife meat, the meat of free-ranging animals, is consumed throughout the world, and has been part of the human diet for an estimated 5 million years (Hoffman & Cawthorn, 2012; Larsen, 2003; Nasi et al., 2008; Stanford & Bunn, 2001). Wildlife meat is a provisional ecosystem service that is a healthy source of lean protein, high in energy and essential macronutrients (Bureš et al., 2015; Cordain et al., 2002; Hoffman & Wiklund, 2006; Marchello et al., 1985). Wildlife meat provides cultural ecosystem services to hunters and those with whom they share their wildlife meat (Chapters 3 & 4). The handling and consumption of wildlife meat can also provide disservices from disease and contaminants (Alexander et al., 2015; Bell et al., 2004; Danieli et al., 2012; Gill, 2007; Iqbal et al., 2009; Nelson et al., 2003; Paulsen et al., 2014; Ramanzin et al., 2010; Ross et al., 2001; Warenik-Bany et al., 2016). Recently, wildlife meat is gaining popularity with consumers because it is seen as healthy, ethical, and environmentally friendly (Cerulli, 2012; Corradini et al., 2022). Although research on wildlife meat is growing, there are still many gaps in our knowledge about the benefits derived from wildlife meat and how they are distributed throughout society (Corradini et al., 2022).

Governance is the set of processes used to collectively steer society towards particular objectives (Peters & Savoie, 2000; Rudolph et al., 2012). Institutions — defined as the formal or informal rules, norms, or customs that place constraints on behavior and create incentives for action or inaction — are a tool of governance used to help meet those objectives (Crawford and Ostrom, 1995). External factors, such as physical and cultural conditions, interact with institutions to further influence behavioral outcomes (Polski & Ostrom, 2017). Natural resource management utilizes institutions to allocate the benefits and costs from natural systems across society (Cumming et al., 2020). Institutions can also define or mediate the relationship between society and nature (de Vasconcellos Pegas et al., 2015). Ultimately, institutions influence how

wildlife can be harvested and how wildlife meat can be used and distributed in society.

The management of wildlife and wildlife meat poses complex challenges, particularly due to its important economic, cultural, ecological, and nutritional roles in communities around the world (Hoffman & Cawthorn, 2012; Mainka & Trivedi, 2002). Harvesting wildlife affects wildlife populations, and the consumption and distribution of wildlife meat can pose public health risks (Ingram et al., 2021; Paulsen et al., 2014). Although the governance of wildlife meat is important for wildlife conservation and public health, governance can also alter human-nature relationships in negative or positive ways (de Vasconcellos Pegas et al., 2015). Changes in governance can transform how wildlife meat is used and distributed, which can have nutritional, ecological, economic, and social implications (LaRocco, 2020). Policies that affect hunters or consumers' access to wildlife meat can result in changes to the provisional and cultural ecosystem services that wildlife meat provides (Kaltenborn et al., 2017). For example, the policies that prevented the Sans people of Botswana from harvesting wildlife meat directly impacted their identity and way of life, because wildlife meat sharing was integral to their culture and how social relations were built and maintained (LaRocco, 2020). Understanding how governance affects the benefits people receive from wildlife meat is important both for conservation and human well-being.

A market is simply a space of exchange, or more specifically, the institutional arrangements that set conditions for the transfer of goods and services (Ménard, 1995). Institutions provide the environment in which markets function by outlining the conditions for the production and exchange of goods and services (Ménard, 1995). Markets in wildlife meat and the policies that govern them comprise an institution that affects the harvest, use, and distribution of wildlife meat. Commercializing wildlife meat, or making wildlife meat available through a

market or for financial gain, is a contentious issue; markets in wildlife meat are seen as a double-edged sword (Freese & Trauger, 2000).

In some areas of the world, unregulated markets in wildlife meat have been identified as a critical factor driving the over-exploitation and unsustainable use of wildlife (Bennet & Robinson, 2000; VanVliet & Mbazza, 2011; Wilkie & Carpenter, 1999). Bushmeat from the tropics and the markets that sell it have been a major focus of research on wildlife meat (Ingram et al., 2021). Markets work on a shorter time frame than ecosystems, meaning that market demand can be greater than species' reproductive rates; this mismatch can lead to negative outcomes for wildlife conservation (Freese & Trauger, 2000). Wildlife meat can also pose public health risks (Paulsen et al., 2014). For example, the consumption of wildlife meat at markets in China is thought to have been a potential vehicle for the transmission of SARS-CoV2 to humans, which has had devastating effects worldwide (Volpato et al., 2020). The introduction of markets in wildlife meat can also have cultural consequences (LaRocco, 2020). Commercializing wildlife can cause breakdowns in traditional hunting practices (Bennett & Robinson, 2000). The introduction of a market for whale meat in an Inuit community located in northwest Greenland had negative consequences because it affected social relations; sharing whale meat benefited the community, while selling it benefited only the buyer and seller (Nuttall, 1991). Additionally, allowing the commercialization of dead wildlife is seen as a precursor to wildlife privatization, which contradicts many countries' beliefs that wildlife belongs either to no one or everyone (Geist, 1988; Vercauteren et al., 2011).

Despite the potential drawbacks, the economic value of the commercial trade in wildlife meat contributes to local and national economies around the world (Rao & McGowan, 2002). Wildlife meat markets allow non-hunters to connect to hunting, and wildlife more broadly,

though consuming wildlife meat (Corradini et al., 2022; Ljung et al., 2012). Research from Sweden found that the consumption of wildlife meat by non-hunters was associated with more positive attitudes towards hunting, which poses the question: would increased access to wildlife meat lead to more positive attitudes towards hunting? (Ljung et al., 2012). Recently, there has been discussions about increasing the availability of wildlife meat though markets in wildlife meat (Adams, 2015; Corradini et al., 2022; Krantz, 2015; Wiklund & Malmfors, 2014). In the United States, some have proposed that allowing the commercial harvest and sale of deer meat could help manage abundant deer populations (Thogmartin, 2006; Vercauteren et al., 2011).

Identifying how governance influences the creation and distribution of the benefits provided by wildlife meat—particularly through the presence or absence of markets—contributes to current policy deliberations. A better understanding of how wildlife meat markets function is needed to inform science-based policy changes, as risks to food safety and security emerge, and social transformations alter the way that humans interact with nature (Freese & Trauger, 2000).

Institutional Analysis and Development Framework

The Institutional Analysis and Development (IAD) framework, first developed by Ostrom et al. (1994), is a comprehensive method for organizing policy analysis using concepts, variables, and diagnostic tools to systematically explore and evaluate policy and build theory (Figure 5.1) (Polski & Ostrom, 2017). The IAD provides flexibility, while simplifying the complexity of policy analysis under a diverse range of situations and allows researchers to focus on areas of interest within larger systems (Namujju et al., 2023; Polski & Ostrom, 2017). The first step of the IAD is to define a policy question or problem, which directs the focus of analysis and defines the action arena (Polski & Ostrom, 2017). The action arena is the conceptual space where actors gather information, consider alternatives, make decisions, take action, and

experience consequences (Polski & Ostrom, 2017). Next, the factors that influence the action arena (physical and material conditions, community attributes, and rules-in-use) are identified and analyzed, followed by the evaluation of patterns of interaction and outcomes. (Polski & Ostrom, 2017). Following the IAD framework enables assessment of the performance of a policy system and identification of factors that influence outcomes of interest (Polski & Ostrom, 2017).

The Current Study

To examine how differences in governance affect the provisional and cultural ecosystem services provided by wildlife meat, I compare the use and distribution of wildlife meat in Sweden and Michigan, USA. Comparing these two systems enables us to consider how the presence or absence of formal, regulated markets in wildlife meat influences the benefits provided to society by wildlife. In general, selling wildlife meat harvested from large ungulates is illegal in the United States, whereas in Sweden, wildlife meat can be sold by hunters for public consumption.

Most research pertaining to wildlife meat consumption and markets focuses on bushmeat from the tropics. Little research has been conducted on these topics in the highly regulated management systems of Europe, the United States, and Canada. Guided by the IAD framework, I explore the physical and material conditions, community attributes, rules-in-use (including interactions), and outcomes for each location. Then I assess how governance, and the external factors that influence governance, affect the ecosystem services provided by wildlife meat. This chapter does not seek to advocate for or against commercializing wildlife meat, but rather explores how commercialization affects the societal distribution of costs and benefits derived from wildlife meat.

Biophysical/Material Conditions

Michigan

Michigan (146,570 km²) is a state comprised of two peninsulas, situated in the Great Lakes region of the north-central Midwestern United States (Figure 5.2). Most of Michigan is either forested (56%) or agricultural land (27%), but also contains wetlands, grasslands, lakes, streams, and urban developments (Derosier et al., 2015; NDA, 2023). Most urban development and agricultural land are located in the southern part of the state, while the north is dominated by coniferous forest (Derosier et al., 2015). The majority of land in Michigan is privately owned (79%) and public land access increases the further north you go in the state (MDNR, 2016).

White-tailed deer (*Odocoileus virginianus*) are the most widely distributed and abundant ungulate species in Michigan, and provide the vast majority of the available wildlife meat (Goguen & Riley, 2020; MDNR, 2016). While moose (*Alces alces*), elk (*Cervus canadensis*), and feral swine (wild boar) (*Sus scrofa Linnaeus)* are present in Michigan, they do not provide significant quantities of wildlife meat in Michigan due to small population sizes or hunting restrictions (Frawley, 2023; Goguen and Riley, 2020; Harlow, 2022; Largent et al., 2015).

Sweden

Sweden, a country located in northwestern Europe along the Baltic Sea, has a land area of 447,425km^2 (Statistics Sweden, n.d.). One-fifth of Sweden's land area is located above the Arctic Circle (Bergström et al, 1992). Overall, 69% of Sweden is covered in forests, while the remainder of the landscape is composed of 8% agriculture, 8% grasslands, 7% mires, 5% mountains, and 3% urban development (Statistics Sweden, 2019). The coniferous forests of northern Sweden are of great economic importance, with 80% used for commercial forestry (Hansen & Malmaeus, 2016; Hörnberg, 2001). Despite 78% of the land in Sweden being privately owned (Statistics Sweden, 2019), most of Sweden is accessible to the public for

recreational activities such as hiking, camping, and mushroom and berry picking through The Right to Public Access (Allemansrätten; Hellstadius, 2011; Stryamets et al., 2012). However, Allemansrätten does not include hunting *(*Stryamets et al., 2012).

Moose (Älg; *Alces alces*), red deer (Kronhjort; *Cervus elaphus*), fallow deer (Dovhjort; *Dama dama*), roe deer (Rådjur; *Capreolus capreolus*), wild boar (Vildsvin; *Sus scrofa Linnaeus*), and European mouflon (Mufflon; *Ovis orientalis*) are the large ungulate species hunted in Sweden (Davis et al., 2016; Elofsson & Häggmark, 2021; Höglund et al., 2013; Hörnberg, 2001; Kjellander et al., 2012; Lavsund et al., 2003; Thulin et al., 2015). Moose are distributed throughout most of the country, whereas red deer, fallow deer, roe deer, wild boar, and mouflon are isolated in regional and local populations, generally located in the southern half of the country (Bergström et al, 1992). Mouflon is not native to Sweden and the population remains so small that it does not provide significant amounts of wildlife meat (Thulin et al., 2015).

Community Attributes

Michigan

Michigan's population was estimated to be 10.1 million people in 2023, with a density of 69 people per km^2 (U.S. Census Bureau, n.d.). The vast majority (92%) of Michigan's population lives in the southern half of the lower peninsula (MDNR, 2016). In 2022, the total number of hunting licenses purchased in Michigan was 660,933, or 7% of the Michigan population (USFWS, n.d.). Around 90% of Michigan hunters obtain a license to hunt white-tailed deer (Frawley, 2006). In 2021, 593,177 people purchased a deer hunting license in Michigan (6% of the population), and an estimated 537,014 went deer hunting (Frawley, 2022). Hunters in the United States are generally white, older males, often from rural areas with medium to high levels of income (USFWS, 2023); those trends persist in Michigan. Hunting is important to cultural

heritage in Michigan and contributes an estimated $2.3 billion to the state's economy (Arnett & Southwick, 2015; Langenau 1994). Nationally, 80% of Americans approve of legal hunting. Regionally, the highest level of support for hunting can be found in the Midwest (86%), where Michigan is located (RM & NSSF, 2019). American support for hunting varies dependent on hunters' motivations: human protection (85%), food (84%), population management (82%), sport (50%), or trophy (29%; RM & NSSF, 2019).

Sweden

Sweden's population was 10.5 million people in 2023, with a population density of 26 people per km^2 (Statistics Sweden, n.d.). Most of the Swedish population is concentrated along the coast in urban areas; 85% of the population lives on less than 1.5% of the land area (Statistics Sweden, 2019). Approximately 300,000 people hunt annually in Sweden, about 3% of the total population (Boman et al., 2011; Mattson et al., 2014; Sandström et al., 2013). Swedish hunters are generally older males of Swedish nationality, often from rural areas, with a high level of education (Lindberg, 2010). Hunting provides an estimated 3 billion SEK (approximately 290 million USD) per year to the Swedish economy and is important for maintaining cultural and social values, particularly in rural areas (Mattson, Boman, & Ericsson, 2008; Willebrand, 2009). Swedes are generally supportive of hunting, although, support varies by motivation: 81% are supportive when hunting is done for recreation and food, but only 33% when the motivation is recreation and sport (Heberlein & Willebrand,1998). Additionally, Swedish attitudes toward hunting follow a rural-urban gradient, where attitudes are more positive in rural areas (Heberlein & Ericsson, 2005; Ljung et al., 2015).

Rules in Use

Regulations that determine how wildlife meat is procured (like wildlife conservation,

hunting, and weapon regulations) and rules about wildlife meat influence wildlife meat use and distribution. These rules are embedded in the larger governance structure of each location. In the following section, I discuss the larger governance structure of Michigan and Sweden, explore wildlife ownership, assess rules that pertain to hunting, and conclude with how wildlife meat can be distributed in each location.

Governance Structure

Michigan. The United States is a constitutional federal republic, where states are the sovereign government entity, and the federal government is a limited, delegated government (Favre, 2003). At the international level, the United States has entered into international treaties and agreements (i.e., the Convention on Biological Diversity [CBD] and the Convention on International Trade in Endangered Species [CITES]) that were created to influence how wildlife is managed (Figure 5.3). What falls under federal control versus state control is determined by the U.S. Constitution: in general, the federal government is responsible for what is outlined in the constitution, while everything else falls within the state government's purview (Favre, 2003). The federal government is responsible for migratory and endangered species, wildlife on federal lands, and commerce as it relates to wildlife (Favre, 2003). The executive departments of Commerce (DOC), Agriculture (USDA), and the Interior (DOI) and their respective bureaus (such as the U.S. Forest Service and Animal and Plant Health Inspection Service [part of the USDA]; and the Fish and Wildlife Service, Bureau of Land Management, and National Park Service [part of the DOI]) along with independent and semi-independent government agencies, such as the Environmental Protection Agency (EPA), are the main parties responsible for wildlife management at the federal level (Organ et al., 2012). The Food and Drug Administration (FDA) is also responsible for regulating wildlife meat food safety (considered a "non-amenable

meat") at the federal level (USFDA, 2022). The Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF) is part of the Department of Justice (DOJ) and is responsible for federal firearms regulation and enforcement.

Wildlife in the United States is primarily managed at the state level, meaning there are 50 similar but distinct systems for wildlife management (Favre, 2003). I focus on Michigan, which has a similar government structure to the federal government, consisting of three branches (judicial, legislative, and executive). The Natural Resources and Environmental Protection Act identifies game species, establishes a framework for licensing, and conveys authority of wildlife management and hunting to the Michigan Department of Natural Resources (MDNR) and the Natural Resource Commission (NRC; Rudolph, 2005). The Wildlife Division, under the MDNR, is the main government organization responsible for wildlife management in Michigan. To insulate management decisions from politics, many states have vested regulatory authority in a board or commission comprised of citizens (Organ et al., 2014). Michigan has an NRC comprised of seven members of the public appointed by the governor and approved by the legislature (Rudolph, 2005). With MDNR and public input, the NRC establishes regulations such as hunting seasons, which are found in the Wildlife Conservation Order (WCO; Rudolph, 2005). Michigan also has conservation officers (also known as game wardens) who are fully commissioned state police officers with the additional authority to enforce MDNR laws and regulations (Heffelfinger et al., 2013). The Michigan Department of Agriculture and Rural Development (MDARD) is responsible for food safety at the state level. Local police departments are responsible for issuing firearms permits when applicable. Landowners, hunters, and consumers are also responsible for decisions that affect the amount of meat harvested, how it is distributed, and how it is consumed in Michigan.

Sweden. Sweden's government is a constitutional monarchy. At the international level, Sweden has entered into international treaties and agreements (i.e., the Convention on Biological Diversity [CBD] and the Convention on International Trade in Endangered Species [CITES]) that influence how wildlife is managed (Figure 5.4). At the supernational level, Sweden is a member of the European Union (EU), which means that Sweden has delegated some decision-making powers to the EU (Hansson-Forman et al., 2018). Some EU regulations influence wildlife management and food safety standards. At the national level, Sweden has three branches of government: the judicial branch; the legislative branch (parliament or Riksdag); and the executive branch made of the monarch (a symbolic figure), the prime minister, and government ministries (SEPA, 2014). The Swedish Environmental Protection Agency (Naturvårdsverket) is the main supervisory authority responsible for hunting and game management, although other organizations such as the Swedish Board of Agriculture (Jordbruksverket), the Swedish Forest Agency (Skogsstyrelsen), and the Swedish National Veterinary Institute (Statens veterinärmedicinska anstalt) also play a role in wildlife management (Hansson-Forman et al., 2021; SEPA, 2014). The Swedish National Food Agency (Livsmedelsverket) is responsible for the regulation of food in Sweden, and this includes wildlife meat. The Swedish Association of Hunting and Wildlife Management (*Svenska* Jägareförbundet) is a non-profit organization that has been delegated by the Swedish Environmental Protection Agency to be responsible for the practical management of hunting and wildlife conservation (SEPA, 2014).

At the regional level, Sweden is divided into 21 counties (län) and 290 municipalities (kommuner). County Administration Boards (länsstyrelserna) make decisions about regional wildlife management and plan or collaborate with Wildlife Management Delegations, which are a collaborative body that decides on wildlife management guidelines and objectives at the county

level (Hansson-Forman et al., 202; SEPA, 2014).

Some wildlife species are managed at an even more local level. For example, moose are managed at the level of Moose Management Areas that are led by Moose Management Groups (Dressel, 2020). Moose Management Groups are comprised of hunters, landowners, and, when applicable, Indigenous Sami people (who have the exclusive rights to herd reindeer, hunt, and fish on 50 % of the land surface), who set 3-year adaptive management plans (Dressel, 2020; Trop, 2013). Red deer can also be managed in Red Deer Management Areas established by hunters in collaboration with the County Administrative Board (SJ, n.d.). Sweden has hunting supervisors/game wardens (Jakttillsynsmän) who monitor compliance with hunting laws and regulations (Jaktlag 1987:259). Regulations, training, and equipment for hunting supervisors are issued by the Police Authority (Sjöström, 2000).

At the local level, police issue firearms permits and municipalities regulate the food businesses that sell wildlife meat. Landowners, hunters, hunting teams, and consumers are also responsible for any decisions that affect the harvest, distribution, and consumption of wildlife meat in Sweden.

Wildlife Ownership

Michigan. Wildlife in the United States is held in trust by the federal or state government for the benefit of current and future generations: This principle, known as The Public Trust Doctrine, derives from common law (Organ et al., 2014). Common law forms from the rulings of court cases and evolves though additional court decisions (Organ. & Mahoney, 2007). The seminal 1842 U.S. Supreme Court case of *Martin v. Waddell* traced the basis of U.S. law back to the Magna Carta (1215) and Roman Law, which defined wildlife as common property (*res communis*), which could not be owned (*res nullius*) (Batcheller et al., 2010; Geist, & Organ,

2004; Organ. & Mahoney, 2007). In 1855, the U.S. Supreme Court case *Smith v. Maryland* ceded the power to regulate the natural resources within a state's boundaries to that particular state, emphasizing the state's role as trustee (Organ et al., 2014).

Common law can change based on court rulings; however, the Public Trust Doctrine has been codified into statutory law in some states (Organ et al., 2014; Organ & Mahoney, 2007). In Michigan, the Natural Resource and Environmental Protection Act (Section 40105) states, "All animals found in this state, whether resident or migratory and whether native or introduced, are the property of the people of the state, and the taking of all animals shall be regulated by the department as provided by law" (Natural Resources and Environmental Protection Act, 1994). To further this point, the Wildlife Conservation Order states, "Live game taken from the wild shall not be possessed" (WCO, 1989).

Although all living wildlife in Michigan belongs to everyone in the state, dead wildlife can be possessed by the person who kills them, if that person holds a legal permit or license to do so (Farve, 2003). The Wildlife Conservation Order states that "Game lawfully taken, acquired, and transported may be possessed by any person" (WCO, 1989). Individuals can harvest wildlife through hunting and transfer it into their possession. Dead wildlife, which was not harvested though hunting, is also regulated by the state. For example, non-game animals that are not protected or endangered species that are killed by a non-intentional vehicle crash may be possessed without a permit (WCO, 1989). Some game animals, including deer, that are killed by a non-intentional vehicle crash may be possessed, but this requires a free salvage permit from the MDNR or a police officer (WCO, 1989).

Sweden. For thousands of years Swedish wildlife were considered common property, with no formal regulation of hunting (Bergström et al, 1992). Today, this customary historical

practice prevails; no one owns living wildlife (Brainerd & Kaltenborn, 2010; Hawley et al., 1983; von Essen et al., 2017). However, dead wildlife may be possessed (Brainerd & Kaltenborn, 2010). In 1789, King Gustaf III ruled that all commoners who owned taxable land held the right to conduct hunting on their own property (Bergström et al, 1992). Under current Swedish laws (Jaktlag 1987:259), landowners possess the hunting rights to their property, which includes the right to any wildlife found dead or killed in contexts other than hunting (Brainerd & Kaltenborn, 2010; Hawley et al., 1983). However, there are exceptions for certain protected animal species (also called game belonging to the state or vilt som tillfaller staten) which belong to the government for science and teaching purposes when they are found dead, need care due to injury, or are killed not within hunting regulations (Jaktförordning 1987:905).

Hunting

Michigan. To harvest wildlife in Michigan, individuals must take a hunter's safety course, obtain a hunting weapon, pay a license fee, and find land on which to hunt. Individuals born after January 1st, 1960 must complete a hunter's safety course and present this certification to purchase a license (MDNR, 2023). This course consists of a background section with information about hunting and wildlife conservation, and an in-person field day training that includes a classroom session, outdoor shooting, blood trailing, demonstrations of tree stand safety, and survival skills (MDNR, n.d.a).

In Michigan, hunters can harvest deer using rifles, shotguns, handguns, muzzleloaders, crossbows, or bows (compound, recurve, or long), depending on their location in the state (MDNR, 2023). In the United States, laws constraining firearm ownership are limited, with restrictions existing for those convicted of a crime or those deemed unsafe to be in possession of a firearm (Gun Control Act, 1968). Currently, in Michigan, background checks are required to

own handguns, but not to own long guns like rifles, shotguns, or muzzleloaders. However, recent legislation requires a background check for all firearms sales in the state (Public Act 19 of 2023, 2023). There are no limitations on owning archery equipment.

In Michigan, hunters must purchase a sport card and a base license that are priced based on age: $6 USD for a Junior, $11 USD for an Adult, and $5 USD for a Senior (MDNR, 2023). This base license is valid for small game only; additional licenses are required for other species, including deer (MDNR, 2023). Base license species have seasons, or daily or seasonal harvest limits (MDNR, 2023). Deer harvesting is further restricted by tag allotment, which requires a $20 USD tag per animal harvested (MDNR, 2023). Kill tags must be affixed to harvested deer and hunters cannot harvest deer without a physical kill tag in their possession (MDNR, 2023). Deer harvesting is therefore limited by the number of tags an individual can purchase, as well as other rules regarding location and antler status. (More detailed information on deer hunting regulations and seasons can be found in the 2023 Michigan Hunting Regulations Summary: MDNR, 2023).

Hunters can hunt on private land either as the landowner or with the written or verbal permission of the landowner. Landowners retain no right to the wildlife harvested on their property (WCO, 1989). Despite access to public lands, 89% of deer are harvested on private land while only 11% harvested on public land (Frawley, 2022).

Michigan's deer hunting season lasts from September to January, although the majority of the harvest occurs during the two-week regular firearm season from November 15th – 30th (Frawley, 2022). Hunting is generally done individually, either by stalking, where an individual is on the move and tries to sneak up on a deer, or stand hunting, where an individual waits in a blind for a deer to pass by. Dogs cannot be used to hunt, but can be used to find wounded

animals if kept on leash. The person with a dog cannot carry a weapon, unless accompanied by a licensed dog tracker (MDNR, 2023).

Sweden. To hunt in Sweden, individuals must pass a hunting proficiency test, obtain a firearm permit and a firearm, pay a hunting fee, and find land to hunt on (either their own or leased). This proficiency test includes a theoretical test on wildlife and hunting knowledge and a technical exam that tests an individual's shooting accuracy and precision, as well as their firearm safety (SJ, n.d.). In order to obtain a firearm for hunting, individuals need a permit issued by the local police, which is only granted to those who can establish a genuine need (hunting is considered a genuine need) and have passed a hunter's proficiency test (Bergström et al, 1992). The Swedish Environmental Protection Agency also collects an annual license fee of 400 SEK ($35 USD) which is required for hunting (SEPA, n.d.). Hunters must carry their hunting license with them while hunting and show their hunting license upon request to supervisory authorities or the person who holds the hunting rights (Jaktförordning 1987:905). Moose hunters must pay a fee to the County Administration Board for each moose killed, which goes into a county-wide moose conservation fund (Jaktförordning 1987:905).

In Sweden, hunting rights belong to the landowner, but can be transferred to another individual (Bergström et al, 1992; Sandström et al., 2013). However, the Sami (indigenous reindeer herders) have the right to hunt on traditional lands, so some areas have parallel rights (Sandström, 2012). Thus, to hunt in Sweden, you must either own land to hunt on or have an agreement with a landowner to hunt on their property and be transferred the hunting rights.

Animals in Sweden can only be hunted if there is a specific hunting season for that animal (Sandström, 2012). The primary legislations that regulate hunting in Sweden are Jaktlag (1987:259) and Jaktförordning (1987:905) (Bergström et al, 1992). In general, the government

decides which species can be hunted and sets hunting seasons, although stakeholders are involved at multiple levels in this process (Bergström et al, 1992). Some species have open seasons, while others are more tightly regulated at a county level (Bergström et al, 1992). Most hunting occurs in the autumn and winter, from August to February (SJ, n.d.).

Hunting for large ungulates takes multiple forms in Sweden. Individuals can partake in stalking/stealth hunting, where they walk and try to sneak up on an animal, or vigil/guard hunting, where an individual waits, often in a stand, for animals to pass by. Hunters can also hunt in teams. Moose, for example, are typically hunted in organized teams with many hunters (Hawley et al, 1983). Hunting in a team allows landowners to pool their land together to make a larger hunting ground or enables hunters to afford leasing a hunting ground. Hunting teams provide hunters with the capital necessary to harvest and process large animals, such as vehicles to transport moose from the field or slaughtering facilities. Hunting teams often place individuals in stands and attempt to drive the animal past a waiting hunter (Hawley et al., 1983). Hunting large ungulates, moose in particular, often utilizes a dog to sniff out the location of the prey and move it slowly and calmly (SJ, n.d.).

Team hunting in Sweden is an organized and collective activity that emphasizes reciprocal social interactions and helps to maintain a sense of community (Gunnarsdotter, 2008; Mattson, Boman, Ericsson, & Paulrud, 2008). Only rifles or shotguns are allowed for hunting and there are specific rules for what type of weapon and ammunition can be used for which species and where (Bergström et al, 1992). While hunting in Sweden follows formal rules and regulations, there are also ethical guidelines and customary traditions rooted in rural Swedish culture, which ensure safety, cooperation, and the wellbeing of animals (Bergström et al, 1992). Because Swedish landowners own the hunting rights to their land, they can sell those hunting

rights for profit; this is referred to as commercial or tourist hunting (Sillanpaa, 2008). For example, large farms/estates (Större gårdar) allow hunters from within Sweden or abroad to pay to hunt there (Krantz, 2015).

Distribution Rules

Michigan. Wildlife populations in the United States declined during the 1800s, due to human demographic changes (e.g., urbanization, population growth, etc.), advances in technology (e.g., railways, refrigeration, etc.), habitat degradation, and harvest pressure with limited regulations governing harvests (Jacobson et al., 2010, Organ et al, 2012). During this time of plentiful harvest, markets for wildlife meat and other animal parts thrived (Organ et al, 2012). These markets and the hunters who participated in them are often blamed for later declines in wildlife populations; thus, their elimination is seen as an essential step in U.S. wildlife conservation (Organ et al., 2012). In 1900, the Lacey Act was passed, which made it unlawful to import, export, transport, sell, buy, or possess fish, wildlife, and plants taken possessed, or transported in violation of any laws (Nasi et al., 2008). Essentially, this act enabled wealthy elites to restrict the commercial trade in wildlife in favor of recreational hunting, by regulating wildlife markets into extinction (Heberlein, 1991; Vercauteren et al., 2011). Hunting shifted from an activity for food or economic gain to a leisure or recreational activity done for sport (Heberlein, 1991). Eliminating markets in wildlife meat and other animal parts in order to deny dead wildlife economic value remains a key principle of current day wildlife conservation in the United States (Geist, 1988). Markets are also seen as a way of privatizing wildlife, which contradicts the concept of wildlife as a public resource under the Public Trust Doctrine (Geist, 1988).

However, not all markets for wildlife meat and other parts were eliminated. Mainly,

markets for wildlife that are considered game species or are desirable for sport hunting, such as deer, were limited. For example, there is a highly regulated and active market for pelts from furbearers (Organ et al., 2012). The United States also has a highly regulated commercial fishing industry, yet individual recreational anglers cannot sell the fish they catch (Freese & Trauger, 2000). Markets for reptiles and amphibians are not always regulated closely (Organ et al., 2012). For example, the Western diamondback rattlesnake (*Crotalus atrox*) has undergone extensive commercialization, with a highly structured network of dealers and hunters (Adams et al., 1994; Fitzgerald & Painter, 2000). While there have been recent attempts to introduce commercial deer harvesting in some states in the United States, none have been successful (Adams, 2015).

Since interstate commerce is regulated at the federal level, the Lacey Act restricts wildlife markets at a national level. However, since most wildlife is managed at the state level, each state can also have its own regulations for the sale of wildlife meat. In Michigan, the Wildlife Conservation Order (Section 4.3 Buying and Selling) states the rules pertaining to the sale of wildlife meat and other animal parts in the state of Michigan (WCO, 1989). Fur-bearing animals and their parts, if lawfully harvested (in Michigan or elsewhere), may be bought or sold (WCO, 1989). The teeth, claws, flesh, bones, or internal organs of wildlife other than furbearers cannot be bought or sold (WCO, 1989). The fur, hide, pelt, plumage, or skin of wildlife that was lawfully harvested by a hunter or from a permitted captive wildlife facility, may be sold by the hunter who harvested it or by the facility permit holder (WCO, 1989). A dealer in meats, restaurateur, private club manager, shooting preserve licensee, or sponsor of a field dog trial may sell for food the carcasses of fur-bearing animals, wildlife meat from a permitted captive wildlife facility, or wildlife meat that was lawfully imported (WCO, 1989). In short, this means that venison harvested by a hunter cannot be bought or sold; the only way for deer hunters to

distribute their meat is by gifting it or sharing it with others in their social network (Goguen et al., 2018; Goguen & Riley, 2020) (Figure 5.5).

Because wildlife meat is not generally available for sale in the United States, there are few, if any, safety standards for the handing and consumption of free ranging wildlife meat harvested and processed by hunters (Hedman et al., 2020). At the federal level, the FDA Food Code 2022 outlines food safety standards for wildlife meat from both commercial and wild harvested sources (Byrd et al., 2015; FDA, 2022). To be sold commercially in the United States, deer meat must be farm-raised, meaning venison available in stores or restaurants in the United States is either imported or from the cervid farming industry (Byrd et al., 2015). In Michigan, the Food Law Act 92 of 2000 states the rules and regulations for the food supply chain. It regulates wildlife meat under just two circumstances: wildlife meat processors and wild game dinners (Food Law, 2000). In Michigan, there are meat processors that are regulated by the state; some will process a hunter's deer for a fee during the hunting season. During the 2021–2022 season, 43% of hunters used a commercial processor for their deer (Frawley, 2022). The Food Law Act 92 of 2000 sets the rules for safety and hygiene when processing a wild deer, and also states that any sausage made from wild game cannot be sold and must be labeled "not for sale" (Food Law, 2000).

Deer donation programs exist throughout the United States to provide venison to those in need (Hildreth et al., 2011). In Michigan, the Natural Resources and Environmental Protection Act (Section 324.43540a, 1994) states that the MDNR must implement a program to distribute wildlife meat to people in need, called the Sportsmen Against Hunger Program. The Sportsmen Against Hunger Program uses commercial processors to handle donated venison, which is then distributed to organizations that provide meals or food to people free of charge. Over the 2022

hunting season, they collected 51,479 kg of venison (MSAH, n.d.). Donated venison that was harvested from areas where chronic wasting disease and bovine tuberculosis are present in the deer herd must be tested prior to distribution (MDNR, n.d.b). All donated venison is additionally scanned for metal fragments (J. Presgrove, personal communication, December, 20, 2023).

Wild game dinners are a popular event during the hunting season, particularly in rural Michigan (Chapter 3). The Food Law Act 92 of 2000 states that wildlife meat provided by a hunter can be used at wild game dinners hosted by a charitable, religious, fraternal, or other nonprofit organization, as long as that wildlife meat is served to its members, as part of a fund-raising event, or to those in need, free of charge (Food Law, 2000). However, if wildlife meat harvested by a hunter is being served, the following notice must be posted at the entrance to the dinner: "The wild game served at this facility has not been subject to state or federal inspection" (Food Law, 2000).

Sweden. In Sweden, hunters may keep their wildlife meat for household consumption, share or sell their wildlife meat to their social network, or sell it to a game handling faculty or food business (Figure 5.6). However, it must be noted that wildlife meat belongs to the hunting rights holder (Brainerd & Kaltenborn, 2010). Generally, the transfer of wildlife meat is agreed upon when hunting rights are transferred; however, every situation is unique and examples of how this occurs are diverse (Brainerd & Kaltenborn, 2010). The landowner may retain some wildlife meat harvested from their property or be gifted it by a hunting team or hunter. Wildlife meat harvested by a hunting team is distributed among team members. Often teams have established, sometimes elaborate, rules for how this distribution occurs, which are frequently related to participation in hunting team activities and roles during the hunt (Chapter 4).

Once an individual hunter is in possession of wildlife meat, it is up to them to determine

what to do with it. Some restrictions exist, however, for animals commonly infected with trichinella. An estimated 20% of wildlife meat harvested in Sweden enters the market through game handling facilities, while 80% of the meat harvested stays with hunters (Wiklund & Malmfors, 2014). What hunters consume in their household or share with other household members is not regulated (SNFA, 2007). Hunters can also share, gift, or sell their meat to members of their social network, such as friends, family, neighbors, or coworkers (Chapter 4). Most of the wildlife meat harvested in Sweden is distributed within hunters' social networks, making its use and distribution difficult to track (Wiklund & Malmfors, 2014).

Under certain conditions, hunters can sell the wildlife meat they harvest to private persons, local food businesses (e.g., restaurants, stores, etc.), or game handling facilities (i.e., specialized processors for wildlife meat; SNFA, 2007). The market for wildlife meat in Sweden must follow EU Regulation (EC) No 852/2004 and Regulation (EC) No 853/2004, which are general rules for food hygiene of animal origin for food business operators. EU law states that hunters can sell small quantities of the wildlife meat they harvest, and each member state of the EU is responsible for establishing national rules for hunters selling small quantities of wildlife meat (Wiklund & Malmfors, 2014). In the Food Ordinance 2005:20, the Swedish Food Agency defines small quantities and other regulations for those who wish to sell their wildlife meat (LIVSFS 2005:20). The Swedish Food Agency quantifies wildlife meat in units: 1 big game unit equals 1 moose, 3 red deer or fallow deer, or 10 roe deer, while one small game unit equals one small game animal. A small quantity is defined as 25 big game units or 10,000 small game units with the skin on; or 1 big game unit or 1,000 small game units butchered (without the skin on) (SNFA, 2007). Hunters' sale of small quantities are excluded from EU Regulation (EC) No 852/2004 and Regulation (EC) No 853/2004. Hunters can sell small quantities of wildlife meat to

private persons and local food businesses, and unlimited quantities to game handling facilities (SNFA, 2007). Hunters are also responsible for ensuring they do not exceed these limits (SNFA, 2007).

In general, Sweden does not have inspection requirements for small quantities of wildlife meat sold to private persons; however, inspections are recommended (SNFA, 2007). Wildlife meat sold by hunters directly to local food businesses should be inspected by someone trained to inspect wildlife meat, either at the food business or a trained food inspector (SNFA, 2007). Food businesses that sell wildlife meat obtained directly from hunters need to be registered with their municipal government and must follow the food safety standards for handling wildlife meat (SNFA, 2007). Hunters are responsible for the safety of the wildlife meat they share and sell, according to EU Regulation (EC) No. 178/2002 (SNFA, 2007; Hedman et al., 2020). Hunters can only sell small quantities within Sweden; wildlife meat sold outside of Sweden must meet EU regulations, which means it must be processed at a game handling facility (SNFA, 2007). Hunters that sell more than small quantities of wildlife meat are considered food businesses and must be registered and follow food business regulations from both the Swedish Food Agency and the EU (SNFA, 2007).

Game handling facilities are slaughterhouses for wildlife meat that have been approved by the Swedish Food Agency and meet the requirements of Regulation (EC) No 852/2004 and Regulation (EC) No 853/2004, as well as other Swedish Food Agency requirements (Clarin & Karlsson, 2013). Wildlife meat processed by a game handling faculty can be sold within Sweden or exported to other countries (Wiklund and Malmfors, 2014). There are currently 186 game handling facilities approved for wildlife meat in Sweden (SNFA, n.d.). Wildlife carcasses must be sold to game handling facilities with the skin on (SNFA, 2007). Additionally, if a hunter's

carcasses were not initially inspected by a game investigator (viltundersökare), their harvest must be delivered to the game handing facility with the head and internal organs (SNFA, 2007).

Some game handling facilities have their own stores (in-person or online) and their own restaurants, where they sell the wildlife meat they process. Some large farms/estates (Större gårdar) that harvest wildlife from their property may also have their own game handing facilities, stores (gårdsbutik), and restaurants. Game handling facilities also sell the wildlife meat they process to other food businesses, such as restaurants, grocery stores, catering businesses, or wholesalers (Clarin & Karlsson, 2013). Wholesalers buy wildlife meat from game handling facilities and sell it to food businesses or individuals. Sometimes, wildlife meat from game handling facilities is purchased for public food (offentlig mat) for use in nursing homes or schools (Krantz, 2015). Some game handling facilities also process wildlife meat for individual hunters (Clarin & Karlsson, 2013).

One exception to these rules is wildlife meat that has been harvested from species known to be commonly infected with Trichinella, like bear, boar, and beaver. Currently, the meat from these animals must go to a game handling facility and should not be shared or sold beyond the household (SNFA, 2007). It is recommended that hunters test any wildlife meat harvested from these species for Trichinella, even if it is only intended for household consumption (Clarin & Karlsson, 2013). However, in 2024, new regulations for wild boar will take effect, making it possible for hunters who have undergone training on handling wild boar to sell wild boar meat directly to private individuals (SNFA, n.d.).

During interviews, Swedish hunters were asked about selling wildlife meat (Chapter 4). Some hunters had strong opinions on not selling their meat, while others simply preferred to use it themselves or didn't find selling it "worth the hassle." Generally, hunters preferred to "fill the

freezer" before considering selling wildlife meat. Multiple hunters mentioned only selling when a surplus was present or in an emergency to prevent waste. Both team and individual hunters discussed using the money from selling wildlife meat to offset hunting costs; some teams even charged their members for wildlife meat for this reason. Some hunters saw selling their wildlife meat as a way of allowing more people to enjoy it.

While the Swedish market for wildlife meat is relatively small overall, there are movements to increase the amount of wildlife meat available for sale (Krantz, 2015; Wiklund & Malmfors, 2014). An (often intentionally) short supply chain means that wildlife meat passes through the hands of only a few intermediaries in route to the final consumer (Clarin & Karlsson, 2013). Some people hypothesize that the market may be small because of a lack of consumer knowledge about wildlife meat or because hunters lack knowledge about regulations (Clarin & Karlsson, 2013; Wiklund & Malmfors, 2014). In my research, I found that some hunters were unsure or unwilling to discuss the details of selling wildlife meat because they didn't want to unknowingly state that they had broken a law. Southern Sweden has more opportunities for wildlife meat to enter the market, because there are more game handling facilities and estates that specialize in harvesting wildlife for profit (Wiklund & Malmfors, 2014).

Swedish markets in wildlife meat face issues with logistics, capacity, storage, and costs (Krantz, 2015). There are also concerns about food hygiene and quality from hunters who sell small quantities because there is very little oversight (Wiklund & Malmfors, 2014). Some believe that hunters' knowledge of meat quality is not sufficient and slaughtering capabilities are not optimal, compared to game handling facilities (Wiklund & Malmfors, 2014). Game handling facilities complain about poor shots and incorrectly handled carcasses that cause wasted meat (Krantz, 2015). Some game handling facilities are downsizing due to profitability issues (Krantz,

2015). Hunters have expressed concern about the overall cost, as well as transportation and the accessibility of market access points (Krantz, 2015). In its study of wildlife meat products on the market in Sweden, the Swedish Food Agency found that, of the 44 products they tested, 43% contained animal species different than the packaging indicated (Fäger et al., 2018). The Swedish Food Agency suspects that most of these issues relate to importer handling or cross contamination (Fäger et al., 2018). The Swedish Food Agency also tested wildlife meat from game handling facilities for lead. Of the 100 samples taken from 47 different facilities, 36% contained lead from ammunition and 15% exceeded the EU limits for lead levels in domestic animal meats (Kautto & Bjerselius, 2020). Currently, the EU does not have a limit for lead levels in wildlife meat, but the Swedish Food Agency recommends that the limit for domestic meats be applied to wildlife meat as well (Kautto & Bjerselius, 2020).

Outcomes

Provisional Ecosystem Services

Wildlife Meat Production.

Michigan. An average of 380,666 white-tailed deer were harvested annually over a 10-year period (2011–2021) in Michigan, providing an estimated 13.1 million kg of venison per year (Table 5.1). This results in a per capita venison production of 1.2 kg per person per year or 24.4 kg per deer hunter per year. The Michigan landscape yielded an average of 89.3 kg venison per km^2 annually. The venison production of Michigan hunters appears to have been relatively stable for the past 10 years.

Sweden. An average of 355,461 animals from the top five meat-producing ungulate species (moose, red deer, fallow deer, roe deer, and wild boar) were harvested annually over a 10-year period (2011–2021) in Sweden, providing an estimated 13.2 million kg of wildlife meat

per year. This results in a per capita wildlife meat production of 1.3 kg per person per year or 43.9 kg per hunter per year. The Swedish landscape yielded an average of 29.3 kg of wildlife meat per km^2 annually. Moose provided 57% of the wildlife meat produced in Sweden, followed in volume by wild boar (25%), roe deer (9%), fallow deer (7%), and red deer (3%; Table 5.2). Total wildlife meat production in Sweden fluctuated, but remained relatively stable during the 10-year period despite large variations in individual species' harvest. Moose was the only species whose overall harvest rates declined from 2011–2021; all other species experienced an increase in harvest. Most notable were fallow deer and wild boar harvests, which more than doubled over the 10-year period. The wildlife meat production of Swedish hunters appears to be relatively stable, but changing wildlife populations suggests the type of wildlife meat provided may be shifting.

Distribution and Consumption Patterns.

Michigan. An estimated 75% of the total Michigan population and 59% of the Michigan non-hunter population have consumed wildlife meat at least once in their life (Goguen & Riley, 2020). Venison from white-tailed deer is the most popular type of wildlife meat consumed in Michigan (Goguen & Riley, 2020). Of the general population, 28% reported never having consumed venison; 23% reported consuming venison, but not in the past 12 months; 20% reported consuming it once or twice in the past 12 months; 15% reported consuming it 3–10 times in the past 12 months; and 14% reported consuming it less than10 times in the past 12 months (Goguen & Riley, 2020). Of the non-hunters in Michigan, an estimated 43% had never consumed venison; 23% reported consuming venison, but not in the past 12 months; 19% reported consuming it once or twice in the past 12 months; 11% reported consuming it 3–10 times in the past 12 months; and 4% reported consuming it less than10 times in the past 12

months (Goguen & Riley, 2020). Of the 49% of the general population who consumed venison in the 12 months prior to the survey, 56% received it from family members who did not live within their household; 54% from friends, neighbors, or coworkers; 26% from members of their household; and 7% received it from a community event or game dinner (Goguen & Riley, 2020). Of the 34% of non-hunters who consumed venison annually, 61% received it from friends, neighbors, or coworkers; 59% received it from family members who did not live within their household; 20% received it from members of their immediate household; and 5% received it from a community event or game dinner (Goguen & Riley, 2020). A study of Michigan hunters found that of hunters who harvested deer, 85% reported sharing their venison with an average of 5.6 people (Goguen et al., 2018). Hunters primarily shared their venison within tight social networks: 69% reported sharing with members of their households; 52% with relatives; and 50% with friends, neighbors, or coworkers (Goguen et al., 2018).

Sweden. Wildlife meat is consumed across Swedish society and consumption rates have remained relatively constant since the 1980s (Ljung et al., 2015). Seventy percent of the Swedish population reports consuming wildlife meat at least once a year (Ericsson & Heberlein, 2002). Another study found similar consumption patterns, reporting that 68% of Swedes consume wildlife meat at least once per year (Hellstadius, 2011). Monthly consumption frequencies are less, reported at 22% (Ljung et al, 2014). Non-hunters also have relatively high annual consumption rates: 65% of non-hunters consume wildlife meat at least once per year (49% 1-2 times per year, 12% greater than 1 per month, 4% greater than 1 per week; Ljung et al., 2012).

Wildlife meat consumption in Sweden follows a north-south gradient, where more wildlife meat is consumed in the north than the south (Ljung et al, 2014). The four northernmost counties in Sweden had the greatest consumption rates per month—57% in Norrbotten, 48% in

Vasterbotten, 62% in Jamtland, and 39% in Västernorrland—compared to the 16% reported in Stockholm, located further south in the country (Ljung et al., 2014). Non-hunter consumption frequency also follows a north-south gradient in Sweden, where non-hunters in the north eat wildlife meat more frequently than non-hunters in Stockholm (Non-hunters in Stockholm: 50% yearly, 12% monthly, 38% never; Non-hunters in northern Sweden: 40% yearly, 41% monthly, 19% never; Ljung et al., 2015). Moose meat is the most popular wildlife meat—59% of Swedes reported consuming moose meat at least once a year, followed by roe deer (40%), wild boar (33%), fallow deer (13%), and red deer (12%; Ljung et al., 2014). Swedes obtain moose meat in a variety of ways: 36% reported receiving it from friends, 31% from family, 29% from a store, and 21% from a restaurant (Ljung et al., 2014). In northern Sweden, the most common source of moose meat was friends or family; in Stockholm, people were more likely to obtain it from a store or restaurant than a hunter (Ljung et al, 2014).

I conservatively estimate that 2.6 million kg of wildlife meat harvested in Sweden ends up on the market, while other estimates edge closer to 4.0 million kg of wildlife meat (Wiklund & Malmfors, 2014). Approximately 35% of the wildlife meat on the market is moose meat (Wiklund & Malmfors, 2014). Wild boar makes up an estimated 31% of the market and deer (unspecified species) another 20% (Wiklund & Malmfors, 2014). Sweden exports an estimated 1.5 million kg of wildlife meat (Wiklund & Malmfors, 2014). Sweden imports an estimated 1.8 million kg of wildlife meat (excluding rabbits, hares, and pigs) and 2.6 million kg of wild boar meat (Wiklund & Malmfors, 2014). Companies that sell wildlife meat in Sweden also import venison from New Zealand (Wiklund and Malmfors, 2014). Vitally, not all wildlife meat on the market in Sweden is harvested from Swedish forests, and it is unknown how savvy consumers are to the differences in source (Wiklund and Malmfors, 2014).

Cultural Ecosystem Services

Michigan. In Michigan, venison provides hunters with cultural ecosystem services in the form of social relations, identity, cultural heritage, education, knowledge systems, and spiritual and religious (Chapter 3).

Sweden. In Sweden wildlife meat provides hunters cultural ecosystem services in the form of social relations, identity, cultural heritage, education, knowledge systems, spiritual and religious, and recreation and tourism (Chapter 4).

Synthesis

Biophysical/Material Conditions

Sweden's land area is three times larger than Michigan and located farther north (Table 5.3). Despite the differences in latitude, both have a similar distribution of habitats: coniferous forest dominates the north, grasslands and deciduous forests the south, with wetlands, rivers, and lakes spread throughout (Bergström et al, 1992; Derosier et al., 2015). While the southern part of Michigan has significantly more agricultural land than Sweden, the northern forests of Sweden are far more heavily cultivated for timber production (Derosier et al., 2015; Hansen & Malmaeus, 2016). Private land ownership is nearly identical in both Sweden and Michigan. However, where Swedish private land is open to all for recreational activities (excluding hunting), private land in Michigan is not open to others without permission from the landowner (MDNR, 2016; Statistics Sweden, 2019; Stryamets et al., 2012). The accessibility of land for hunting is discussed in detail later in this chapter. Similar large ungulate species reside in both systems: moose, elk, deer, and wild boar. In Swedish, moose are called Älg, which sounds like, and often gets translated to, elk; however, the Swedish red deer (*Cervus elaphus*) is more closely related to the north American elk (wapiti; *Cervus canadensis),* as they are separate species within

the genus *Cervus* (Hu et al., 2019). One large ungulate species makes up a vast majority of Michigan's large ungulate biomass, whereas Sweden is a multi-species system.

Community Attributes

Although the human population of Michigan and Sweden are similar in size, the population density in Sweden is much lower than in Michigan (Statistics Sweden, n.d.; U.S. Census Bureau, n.d.). Both populations are heavily focused in one area—for example, the south of Michigan or the coast and south of Sweden—leaving large swathes of sparsely-populated land (MDNR, 2016; Statistics Sweden, 2019). Michigan has twice as many hunters as Sweden, but overall, the total proportion of the population that hunts is low in both locations (Boman et al., 2011; USFWS, n.d.). Hunting likely contributes more to Michigan's overall economy than to Sweden's (Arnett & Southwick, 2015; Langenau, 1994; Willebrand, 2009). Hunting is culturally important in both locations, particularly in rural areas (Arnett & Southwick, 2015; Langenau, 1994; Willebrand, 2009). General population attitudes toward hunting are similar in both locations and depend on the perceived motivations of hunters (Heberlein & Willebrand, 1998; RM & NSSF, 2019).

Rules in Use

Governance Structure

Although both governments function democratically, there are some notable differences, and a few similarities, when comparing their overall structure. Both locations are subject to international treaties and agreements. While Sweden technically remains a monarchy, the monarch is largely symbolic and the government is run democratically with a parliament. Both locations have a delegated government—in Sweden, the EU and in Michigan, the U.S. federal government—and then their own government with three branches (Favre, 2003; Hanssen-

Forman et al, 2018). However, of the two delegated governments, the EU appears to play a larger role in wildlife meat regulation than the U.S. federal government. The two main difference in governance structure relating to wildlife and hunting are who functions as the main authority for wildlife management and how involved stakeholders are in management decisions.

In Sweden, the practical management of hunting and wildlife conservation falls to a non-profit, whereas in Michigan, it falls to a government agency with a civilian committee that has been granted decision-making powers (Rudolph, 2005; SEPA, 2014). Much of the decision-making in Sweden is further decentralized to the county level, where stakeholders can be more involved through organizations such as Wildlife Management Delegations or Moose Management Groups (Dressel, 2020; Hansson-Forman et al., 2021). Swedish landowners have more control over the wildlife on their properties and are often more involved in or responsible for management (Brainerd & Kaltenborn, 2010). Although the Michigan NRC does provide opportunities for public input on decision-making, these are more passive than those afforded to stakeholders in Sweden. In the United States, there have been calls for more participatory approaches to wildlife conservation (Jacobson et al. 2010; Organ et al., 2014). Both locations have game wardens who enforce hunting rules; however, U.S. game wardens are more militarized than their Swedish equivalents, with the same capabilities as police officers (Heffelfinger et al., 2013; Jaktlag 1987:259).

Wildlife Ownership

In both Sweden and the United States, wildlife is considered a public resource (Organ et al., 2014; von Essen et al., 2017). The ownership of dead wildlife, however, highlights key differences between the two locations. Dead wildlife in Michigan (a proxy for the United States) that has been legally obtained through hunting belongs to the person who killed it (the hunter),

once they apply their unique carcass tag (Farve, 2003; MDNR, 2023; WCO, 1989). In contrast, dead wildlife in Sweden belongs to whoever holds the hunting rights, whether that is the landowner or someone to whom the hunting right has been transferred (Jaktlag 1987:259).

In Sweden, dead wildlife not killed by hunting also belongs to whoever holds the hunting rights, unless it is a protected species, in which case, the Swedish government can take possession for scientific or educational purposes (Jaktlag 1987:259). In Michigan, dead wildlife not obtained through hunting belongs to the state, unless otherwise specified (WCO, 1989). For example, in a wildlife-vehicle collision, the owner of the vehicle generally has first rights of possession (WCO, 1989). These differences emphasize that wildlife ownership in Sweden may be considered more privatized than in Michigan, as owning dead wildlife is directly tied to owning land.

Hunting

While the basic steps necessary to hunt are similar in both locations, Sweden has more rules and regulations than Michigan in most cases. The hunters' test in Sweden is much more involved, requiring hunters to pass multiple tests for firearm safety and accuracy (MDNR, 2023; SJ, n.d.). Michigan allows more weapon types to be used for hunting than Sweden does and obtaining a weapon in Michigan has few, if any, additional requirements and minimal stipulations (Bergström et al, 1992; MDNR, 2023). Firearm ownership in Sweden is much more restricted, but there remain clear pathways to firearm ownership for hunters (Bergström et al, 1992). Hunting licenses are easy to purchase in both locations, and generally do not cost that much. In both locations, a majority of the land hunted on is privately owned, and the landowner must grant permission to access. However, in Sweden, this permission is formalized with the transfer of hunting rights (MDNR, 2023; Sandström, 2012). In Sweden, hunters or landowners

pool together property in order to hunt large game, such as moose. Hunting is more individualistic in Michigan, although it still provides social benefits to hunters. Hunting large ungulates in Sweden is almost always a social affair, occurring in teams often with the aid of dogs; whereas using dogs to hunt deer is illegal in Michigan (Hawley et al., 1983; MDNR, 2023; SJ, n.d.).

Distribution Rules

When it comes to the distribution of wildlife meat, the greatest difference between the United States and Sweden is the existence of markets for the sale of wildlife meat from large ungulates in Sweden—something that Americans generally consider antithetical to wildlife conservation (Organ et al., 2012; SNFA, 2007). However, despite the existence of a Swedish market for wildlife meat, most of the wildlife meat harvested in Sweden still relies on the social networks of hunters for distribution, just as it does in Michigan (Goguen & Riley, 2020; Ljung et al, 2012; Wiklund & Malmfors, 2014) While there are no restrictions on American hunters sharing their wildlife meat, Swedish hunters face restrictions on sharing the meat from species that carry Trichinella (SNFA, 2007). In both locations, a majority of the responsibility for wildlife meat food hygiene and safety falls to the hunter (Hedman et al., 2020, SNFA, 2007). Hunters in Michigan can donate their entire deer to civic organizations like Sportsmen Against Hunger, a practice that generally does not occur in Sweden (Hildreth et al., 2011). Nevertheless, some wildlife meat in Sweden does end up in a public setting (such as schools) (Krantz, 2015). The testing restrictions on donated venison in Michigan resemble the restrictions for wildlife meat sale in Sweden (MDNR, n.d.b; SNFA, 2007). In both locations, hunters can use commercial processes to aid in wildlife meat processing (Clarin & Karlsson, 2013; Frawley, 2022).

Outcomes

Provisional Ecosystem Services

Michigan and Sweden produce almost the same amount of wildlife meat and the per capita wildlife meat production is nearly identical. Despite that, hunters in Sweden end up with almost double the amount of wildlife meat per capita than hunters in Michigan, if you assume every hunter is successful. However, harvest success rates in Michigan are reported at 53%, suggesting that only slightly more than half of Michigan hunters actually harvest a deer any given year (Frawley, 2022). Harvest success rates from Sweden are not available for comparison.

In both locations, wildlife meat production also remained relatively stable over the past 10 years. Sweden's land area is approximately 3 times larger than Michigan's, resulting in greater meat production per square kilometer in Michigan. This size difference means that meat travels farther geographically in Sweden to be distributed throughout the population. Despite having the larger landmass and farther potential distance for meat to move, more people in Sweden consume wildlife meat on an annual basis than in Michigan. Approximately 20% more of the general population consumes wildlife meat in Sweden, compared to Michigan (Ericsson & Heberlein, 2002; Goguen & Riley, 2020; Hellstadius, 2011). This gap is even greater for non-hunters, as about 30% more non-hunters consume wildlife meat on an annual basis in Sweden than in Michigan (Goguen & Riley, 2020; Ljung et al., 2012). Monthly wildlife meat consumption amongst the general population has a smaller gap, with consumption in Sweden being only 3% greater than in Michigan (Goguen & Riley, 2020; Ljung et al., 2014).

The techniques used to estimate the consumption rates in Michigan and Sweden are not identical and cannot be precisely compared. The comparable wildlife meat consumption data available from Michigan focuses solely on venison consumption; however, most wildlife meat

available in Michigan is venison (an estimated 96% of people who report consuming wildlife meat consume venison; Goguen & Riley, 2020). While the wildlife meat consumption estimates from Sweden encompass all wildlife species, large ungulates comprise an estimated 97% of wildlife meat produced in Sweden (Wiklund & Malmfors, 2014). Thus, estimates of wildlife meat consumption from Sweden may be slightly greater, since they include all species, while estimates from Michigan might be slightly less, as they include only venison. The differences in consumption, however, are great enough to safely conclude that wildlife meat consumption rates are greater in Sweden. This is further supported by the fact that moose consumption in Sweden was 10% higher than venison consumption in Michigan, despite moose meat comprising only 57% of the total Swedish harvest (Goguen & Riley, 2020; Ljung et al., 2014; Wiklund & Malmfors, 2014).

Cultural Ecosystem Services

Wildlife meat provided similar cultural ecosystem services to hunters in Michigan and Sweden. All of the hunters interviewed across both locations consumed and shared the wildlife meat they harvested. Moreover, sharing wildlife meat was an important aspect of hunting for many hunters in both locations. Hunters from Michigan and Sweden identified wildlife meat as special because it symbolized the effort they put into harvesting it. Due to its special status, hunters in both locations often chose to share wildlife meat with people they considered important, such as family or close friends. Wildlife meat also played an important role in the social relations of hunters from Michigan and Sweden. Hunters used it to demonstrate reciprocity and aid others, even providing wildlife meat to hunters who could no longer harvest it themselves. Wildlife meat was also used to celebrate non-religious holidays. In Michigan, donating venison through commercial processors played a role in providing cultural ecosystem

services, while donation programs were not discussed in Swedish interviews. Despite Michigan's donation programs, wildlife meat was more often directly provided to those in need by hunters from both locations. Processing the harvested wildlife was also an opportunity for hunters to deepen their social relations, although this was more prominent in Sweden, where a team's pooled resources could provide better equipment. Moreover, teams that harvested multiple animals per season spent more time processing animals together. Hunting teams added an extra dimension to sharing wildlife meat in Sweden, as they often had elaborate distribution systems.

Wildlife meat played an important role in hunters' individual and cultural identities in both locations, particularly in relation to self-fulfillment. A sense of self-reliance born from harvesting their own food and providing it to others was an important element of hunting for hunters from Michigan and Sweden. Swedish hunters also perceived wildlife meat as inherently Swedish; thus, consuming it contributed to their sense of national identity. In contrast, hunters from Michigan did not frame wildlife meat as a part of their identity as either a Michigan resident or as an American. While Michigan hunters emphasized the cultural heritage of hunting more strongly, examples of wildlife meat providing cultural heritage ecosystem services existed in both locations, particularly those related to the preparation of traditional dishes and recipes. Hunters from both locations perceived the heart of harvested wildlife as an important piece of wildlife meat. Hunters in Michigan most often consumed it themselves. Nevertheless, sometimes the heart was shared at deer camps. Swedish hunters were more likely to share the heart with others, often giving it to the shooter or dog handler as a sign of their importance to the hunting team.

Across Michigan and Sweden, wildlife meat provided cultural ecosystem services in the form of education and knowledge systems. In both locations, processing wildlife meat was used

to teach children about biology, while sharing wildlife meat was used to teach non-hunters about hunting and wildlife management. The knowledge systems built by wildlife meat differed in each location, due to differences in environment and hunting; however, much of the built knowledge across both locations was associated with processing wildlife meat. In terms of spiritual and religious cultural ecosystem services, Michigan hunters talked more about a spiritual or religious element to wildlife meat, but hunters from both locations used wildlife meat to celebrate religious holidays.

The only cultural ecosystem service that was present in Sweden and not Michigan was tourism cultural ecosystem services created by Sweden's markets in wildlife meat. Tourists in Sweden (either of Swedish or international origin) can purchase wildlife meat in a store to cook at home or consume wildlife meat in a restaurant. As the sale of hunter-harvested meat is prohibited in the United States, this type of interaction with venison does not legally occur in Michigan. In Sweden, hunters can also profit from tourism ecosystem services, as they can sell wildlife meat that then enters the tourism market.

Discussion

The similarities and differences in the outcomes of the IAD framework can be compared to the similarities and differences in the biophysical/material conditions, community attributes, and rules-in-use between Sweden and Michigan to identify potential causes for these outcomes. Overall, the provisional and cultural ecosystem services provided by wildlife meat in Sweden and Michigan are remarkably similar, despite differences in geography, culture, and governance. Although Sweden has regulated markets for wildlife meat, most wildlife meat stays with Swedish hunters, who derive similar ecosystem services from their meat to hunters in Michigan. Swedish hunters expressed a preference for sharing rather than selling, and I hypothesize that

this is influenced by the cultural ecosystem services that wildlife meat provides for hunters when they share wildlife meat. Based on my comparison, the provisional and cultural ecosystem services that hunters derive from wildlife meat appear ubiquitous, regardless of the presence or absence of markets for wildlife meat.

The main differences between the ecosystem services provided by wildlife meat in Sweden and those in Michigan related to non-hunters' access to wildlife meat. The legal commercialization of wildlife meat appears to increase access to wildlife meat, primarily for non-hunters. Wildlife meat is more accessible in Sweden, where consumption rates are higher. Markets appear to increase the accessibility of wildlife meat for non-hunter consumers in Sweden, who can purchase wildlife meat in stores and restaurants. Research from Sweden indicates that wildlife markets increase consumption in urban areas; however, wildlife meat was still more frequently consumed in the rural north, despite the increased access to markets in southern Sweden (Ljung et al., 2014). Although an important component of the overall system, Swedish markets for wildlife meat are relatively small and consumption rates in Sweden are only greater than in Michigan when it comes to consumers infrequently (one or twice a year) eating wildlife meat. Although frequency of consumption is associated with more positive attitudes towards hunting, attitudes toward hunting were similar in Sweden and Michigan (Ljung et al., 2012). The effect of this limited annual consumption of wildlife meat is unknown and an avenue for future research.

The introduction of markets in wildlife meat can have cultural consequences (LaRocco, 2020). However, in Sweden, markets appear not to limit the cultural ecosystem services that wildlife meat provides, and, in fact, enabled wildlife to provide more services to more people. Not only did markets increase access to wildlife meat, they also enabled wildlife meat to provide

additional cultural ecosystem services in the form of recreation and tourism. However, Sweden has a long history of selling wildlife meat, and its current hunting culture developed alongside those markets for wildlife meat (Bergström et al, 1992). The commodification of wildlife meat, however, can have negative effects on the cultural ecosystem services that wildlife meat provides (Nuttall, 1991). It remains unclear how introducing markets to systems where they do not currently exist would affect the cultural ecosystem services that wildlife meat provides.

Institutions in Sweden and Michigan affect the harvest and distribution of wildlife meat. I have demonstrated that institutions can determine how the costs and benefits of wildlife meat are distributed (Cumming et al., 2020). Furthermore, my analysis indicates that institutions define and mediate how people relate to wildlife meat, and more broadly, wildlife (de Vasconcellos Pegas et al., 2015). In both locations, formal and informal institutions determine who has access to wildlife meat. Formal institutions set rules for obtaining a hunting license and for selling wildlife meat. Despite the influence of formal institutions on who can access wildlife meat and how it is used, the majority of wildlife meat in both locations was distributed based on hunters' discretion, with little oversight. Thus, the informal institutions of social norms and networks of hunters are a key element of wildlife meat distribution (Goguen & Riley, 2020; Ljung et al., 2012). Research from Michigan indicates that this dependence on hunters' social networks for distribution may limit who has access to wildlife meat (Goguen & Riley, 2020). In both Sweden and Michigan, hunters tended to be white, male, and older, with ties to rural areas (Lindberg, 2010; USFWS, 2023). Since much of the distribution of wildlife meat depends on hunters, it is pivotal to consider how institutions influence who hunts and who can access wildlife meat.

One major concern about the presence of markets in wildlife meat is their potential negative effect on wildlife populations (Bennet & Robinson, 2000; VanVliet & Mbazza, 2011;

Wilkie & Carpenter, 1999). This concern stems from partially or completely unregulated markets (Bennet & Robinson, 2000). In Sweden, there are institutions in place that tightly regulate the taking of wildlife and the populations of harvested species have been restored to historic levels (Ericsson et al., 2018). Thus, in Sweden is appears that markets in wildlife meat do not have negative effects on wildlife populations. Similarly, in the United States, despite a ban on markets selling wildlife meat from desirable game species, there are still markets for meat and other animal parts from furbearers, which effectively function to meet objectives of wildlife management (Organ et al., 2012). Institutions and enforcement is essential to limit the negative effects of markets on wildlife populations (Bennett & Robinson, 2000).

In Sweden, selling wildlife meat was not identified as a motivation for harvest. One exception to this is large farms/estates (Större gårdar) that specialize in harvesting wildlife and selling wildlife meat for profit. Hunters indicated that they fill their freezer first, then use markets as an outlet for surplus, to avoid waste. This lack of economic motivation for harvest is likely also tied to factors beyond regulation. Sweden and the United States are two of the wealthiest nations in the world and becoming a hunter requires some initial investment. Markets for wildlife meat exist in other wealthy European nations with similar effects (Corradini et al., 2022). It is difficult to draw firm conclusions about whether tight regulation, cultural or economic factors, or a combination of both contribute to how hunters use markets for wildlife meat in Sweden. It is clear, however, that markets do not always result in declines in wildlife abundance or diversity, as long as there are institutions that hinder overharvest. However, the economic incentive of Swedish markets does not appear to be a strong enough motivator for additional harvest from most hunters, drawing into question if markets are an effective strategy for controlling abundant wildlife populations in these locations. Currently, Sweden is facing

issues with an exponentially growing wild boar population, and is exploring ways of using markets to encourage and ethically use excess harvest (Krantz, 2015). A similar phenomenon is emerging in the United States, where the introduction of markets has been proposed to aid in the control of abundant wildlife species (Thogmartin, 2006; Vercauteren et al., 2011).

Markets in wildlife meat can also raise concerns around public health (Volpato et al., 2020). Nevertheless, no major outbreaks of disease have been reported from wildlife meat sold on the market in Sweden. In Sweden institutions exist to ensure food safety and quality for wildlife meat that enters the market (Wiklund & Malmfors, 2014). Similar efforts are in place for donated venison in Michigan (MDNR, n.d.b). However, responsibility for the food hygiene and safety of the majority of the wildlife meat consumed in Sweden and Michigan falls to hunters (Hedman et al., 2020; Wiklund & Malmfors, 2014). As the disease and contaminate landscape changes in both locations, efforts to educate hunters on wildlife meat hygiene and safety may bolster public health.

The commercialization of wildlife meat is sometimes perceived as synonymous with the privatization of wildlife (Geist, 1988; Vercauteren et al., 2011). However, in Sweden, living wildlife is owned by no one (von Essen et al., 2017). The commercialization of wildlife meat has not led to the privatization of wildlife in Sweden. Land ownership in Michigan and Sweden appears to be the most effective way of controlling access to wildlife for hunting. In Sweden, hunting rights are tied to land ownership and landowners profit from selling their hunting rights (Bergström et al, 1992; Sandström et al., 2013). In Michigan, you cannot hunt on a property without the landowner's consent, and landowners can charge for access to their property for hunting. Additionally, in Sweden, the Right to Public Access allows people to engage in outdoor recreational activities on anyone's property. No such right exists in Michigan, yet large tracts of

public land that are open to hunting exist throughout the state. The presence of large farms/estates (Större gårdar) in Sweden that harvest wildlife and sell their meat for profit, also challenge the notion of privatizing wildlife. However, the wildlife on these properties is available for anyone to enjoy; they just cannot harvest it.

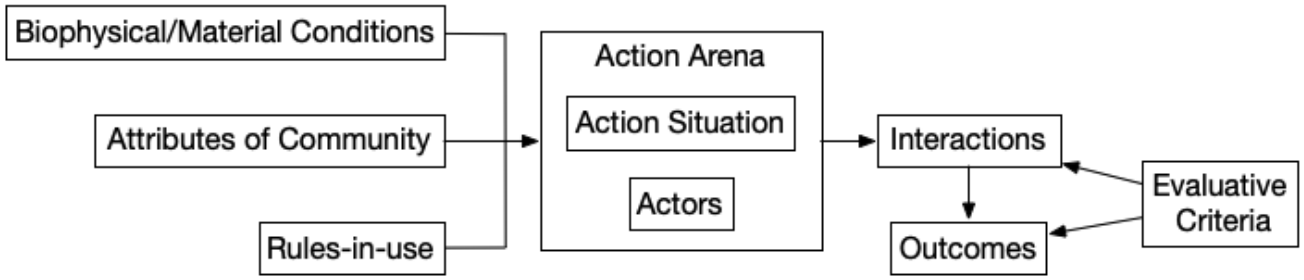
Conclusion

The provisional and cultural ecosystem services that hunters derive from wildlife meat appear ubiquitous, regardless of the presence or absence of markets for wildlife meat. To the contrary, the commercialization of wildlife meat in Sweden appears to have increased access to wildlife meat for non-hunters and provided additional cultural ecosystem services in the form of recreation and tourism. Formal and informal institutions in Michigan and Sweden determine who can access wildlife meat. Nevertheless, informal institutions play a greater role in how wildlife meat is actually distributed throughout society. In Sweden, markets for wildlife meat did not cause declines in wildlife populations or outbreaks of zoonotic disease. Regulation appears to play an important role in preventing the potential negative effects of commercializing wildlife meat. Additionally, in Sweden, markets did not lead to the privatization of wildlife. In both Sweden and Michigan, the primary method of controlling access to hunting is private land ownership.

FIGURES

Figure 5.1:

The Institutional Analysis and Development (IAD) framework.



Note. The action arena is the conceptual space where actors gather information, consider alternatives, make decisions, take action, and experience consequences. It is made up of the action situation and the actors. The factors that influence the action arena are physical and material conditions, community attributes, and rules-in-use. The interactions and outcomes from this system are the evaluative criteria for policy assessment. Source: Adapted from Ostrom et al., 1994 and Polski & Ostrom, 2017.

Figure 5.2:

Geographic location of Michigan, USA and Sweden.

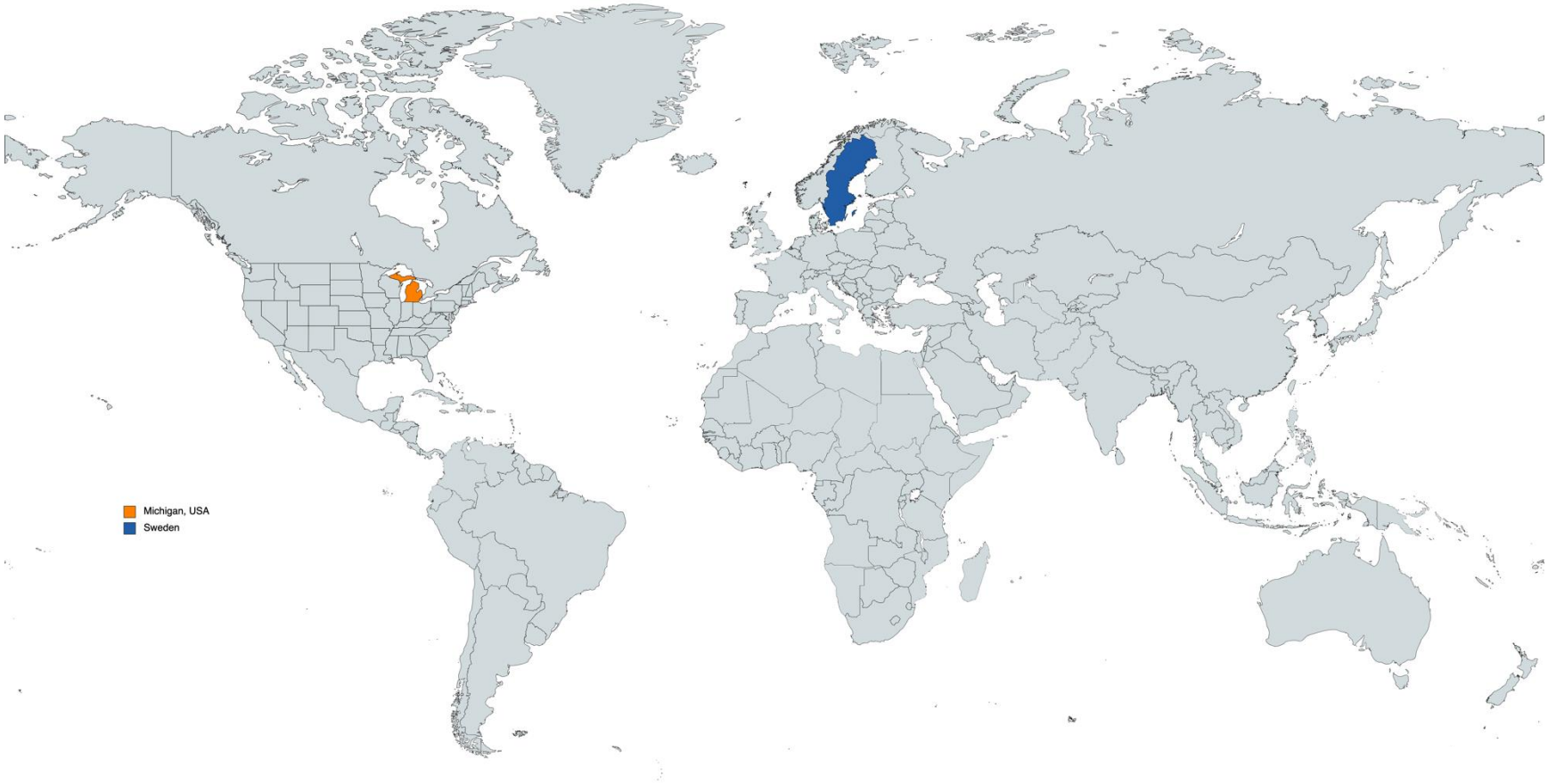


Figure 5.3:

Governance structure for wildlife meat use and distribution in Michigan, USA from the international to the individual level.

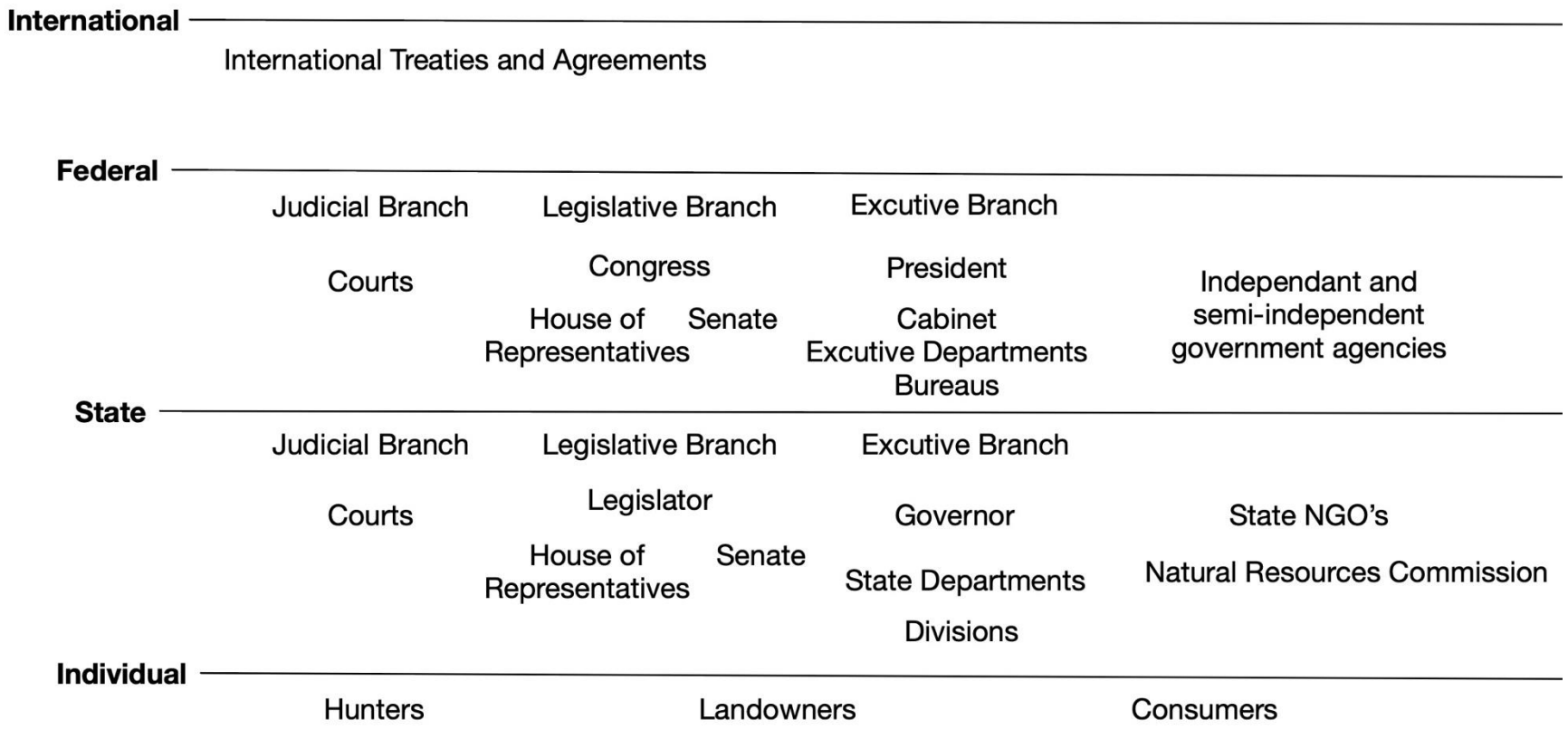
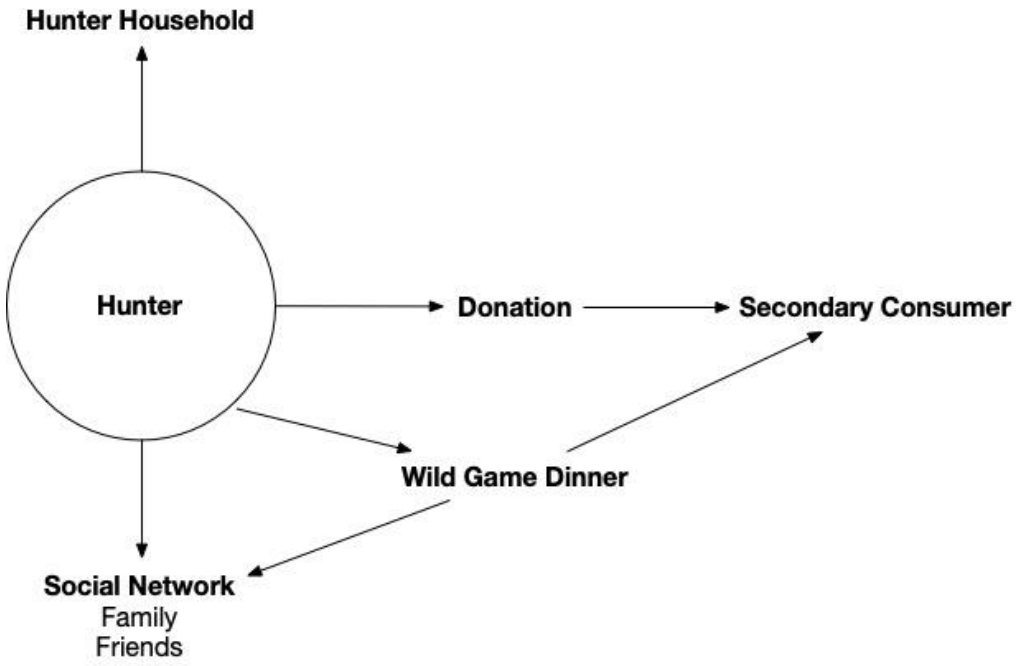


Figure 5.4:

Governance structure for wildlife meat use and distribution in Sweden from the international to the individual level.

Figure 5.5:

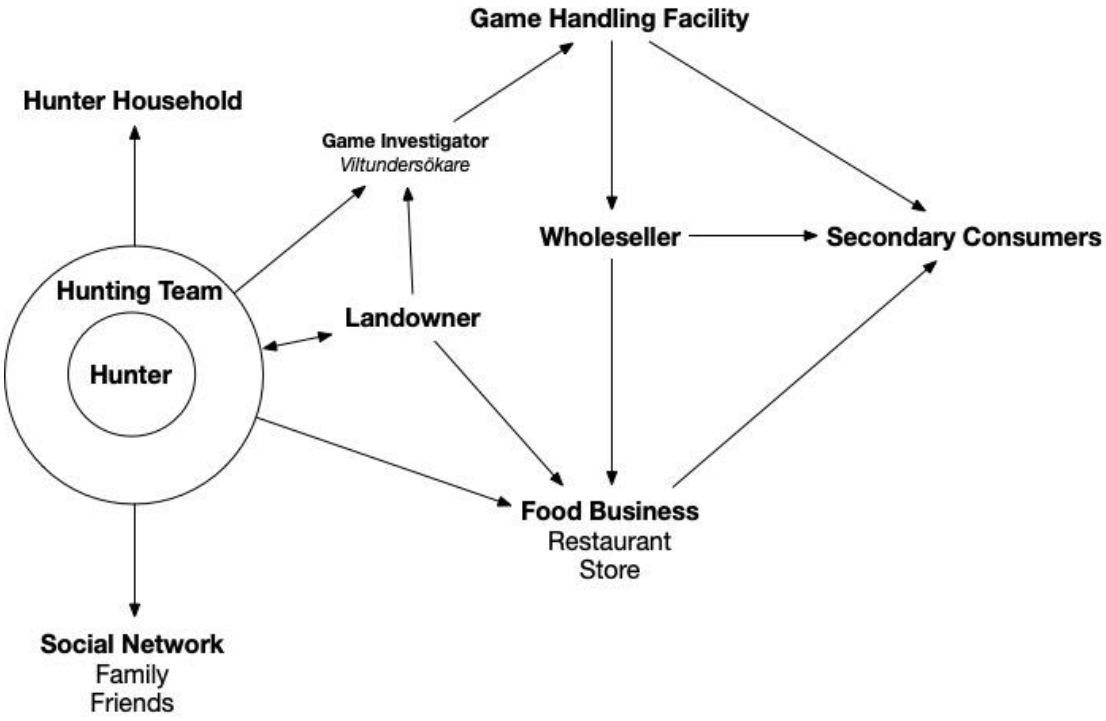
Wildlife meat distribution channels in Michigan, USA.



Note. In Michigan, wildlife meat is harvested by a hunter and shared within their household, social network, at wild game dinners, or though donation programs. Secondary consumers are people who consume venison, but do not have a direct social connection to the hunter who harvested that meat. Hunters provide venison to members of their social network (i.e. friends, family, neighbors, coworkers) either by sharing a meal or gifting raw meat. Wild game dinners are also popular, where a church or other community organization may host a wild game dinner for their members, as a fundraiser, or to aid those in need. Often, as members of the community in which a wild game dinner is taking place, hunters will share meat with members of their social network, but also their harvest may go to others they may not know well or at all. Venison can also be donated to local food banks or kitchens though programs like Sportsmen Against Hunger, where venison is processed at a commercial facility, tested for certain diseases and metal fragments, and then donated.

Figure 5.6:

Wildlife meat distribution channels in Sweden.



Note. Wildlife meat that is harvested by a team is distributed among team members. Hunters share their meat with members of their household or their social network (i.e. friends, family, neighbors, coworkers) either by sharing a meal or gifting raw meat. Landowners may retain some wildlife meat as part of the hunting rights transfer or be gifted wildlife meat from the hunting team. Additionally, a hunter, hunting team, or landowner can sell wildlife meat to a game handling facility, a food business, or other private persons, but restrictions on quantity and form exist. Ultimately, wildlife meat sold to game handling facilities or food businesses ends up on the table of secondary consumers. Secondary consumers are people who consume wildlife meat, but do not have a direct social connection to the hunter who harvested that meat. Secondary consumers may reside within Sweden or outside of the country.

TABLES

Table 5.1:

Total amount of edible wildlife meat in kilograms produced by large ungulates in Michigan USA, and Sweden from 2011- 2021.

Species	**White Tailed Deer**		**All Species Sweden**	
Year	**Total Harvest**	**Meat (kg)**	**Total Harvest**	**Meat (kg)**
2011	422,014	14,517,282	283,308	12,117,009
2012	420,217	14,455,465	333,271	13,366,020
2013	385,302	13,254,389	333,233	13,043,090
2014	329,040	11,318,976	326,873	12,501,876
2015	334,612	11,510,653	336,126	12,502,809
2016	348,222	11,978,837	342,812	12,581,338
2017	385,554	13,263,058	366,055	13,465,347
2018	367,652	12,647,229	356,819	13,147,868
2019	370,948	12,760,611	405,675	14,214,378
2020	420,071	14,450,442	439,101	14,993,470
2021	403,695	13,887,108	386,801	12,902,787
Average	**380,666**	**13,094,914**	**355,461**	**13,166,909**

Note. Edible venison from white tailed deer was calculated using an average of 34.4 kg of edible meat per harvested deer. This calculation is derived from Goguen et al., 2018 which used age class structure and multiple edible venison calculation equations. See Table 5.2 for a description of how edible meat for all species from Sweden was calculated.

Table 5.2:

Total amount of edible wildlife meat in kilograms produced by large ungulates in Sweden. from 2011- 2021.

Species	Moose (Älg)		Red Deer (Kronhjort)		Fallow Deer (Dovhjort)		Roe Deer (Rådjur)		Wild Boar (Vildsvin)	
Year	Total Harvest	Meat (kg)	Total Harvest	Meat (kg)	Total Harvest	Meat (kg)	Total Harvest	Meat (kg)	Total Harvest	Meat (kg)
2011	99,492	8,675,702	5,231	224,933	28,661	521,630	93,998	1,005,779	55,926	1,688,965
2012	96,134	8,382,885	6,476	278,468	34,128	621,130	94,962	1,016,093	101,571	3,067,444
2013	95,076	8,290,627	7,337	315,491	38,823	706,579	106,047	1,134,703	85,950	2,595,690
2014	87,093	7,594,510	7,744	332,992	35,711	649,940	102,799	1,099,949	93,526	2,824,485
2015	82,996	7,237,251	8,361	359,523	41,094	747,911	102,198	1,093,519	101,477	3,064,605
2016	82,120	7,160,864	8,885	382,055	39,243	714,223	107,448	1,149,694	105,116	3,174,503
2017	84,767	7,391,682	11,600	498,800	45,978	836,800	103,486	1,107,300	120,224	3,630,765
2018	83,059	7,242,745	11,133	478,719	50,518	919,428	97,370	1,041,859	114,739	3,465,118
2019	80,354	7,006,869	11,123	478,289	58,165	1,058,603	105,722	1,131,225	150,311	4,539,392
2020	82,827	7,222,514	8,814	379,002	71,565	1,302,483	115,003	1,230,532	160,892	4,858,938
2021	73,232	6,385,830	9,065	389,795	70,602	1,284,956	113,930	1,219,051	119,972	3,623,154
Average	**86,105**	**7,508,316**	**8,706**	**374,370**	**46,772**	**851,244**	**103,906**	**1,111,791**	**109,973**	**3,321,187**

Note. Average carcass weight was derived from Wiklund & Malmfors, 2014 which incorporated age class structure of the Swedish harvest (Moose: 122.8 kg; Red Deer: 57.3; Fallow Deer: 25.6kg; Roe deer: 12.1kg; Wild boar: 50.4). The carcass weight is the skinned and trimmed carcass without head and shanks but includes bones, fat, tallow, and tendons (Wiklund & Malmfors, 2014). In order to calculate edible meat, the average carcass weight was multiplied by the percentage of the carcass weight that is edible meat (Moose: 71% (Hawley et al., 1983); Red Deer: 75% (Kwiatkowska et al., 2009); Fallow Deer: 71% (Fitzhenry et al., 2019); Roe deer: 88% (Weiner, 1973) ; Wild boar: 60% (Wiklund & Malmfors, 2014): The average edible meat per harvested animal (Moose: 87.2 kg; Red Deer: 43.0 kg; Fallow Deer: 18.2 kg; Roe deer: 10.7 kg; Wild boar: 30.2 kg) was multiplied by the total number of harvested animals to make total meat production estimations.

Table 5.3:

Summary comparison of Institutional Analysis and Development (IAD) domain categories between Michigan and Sweden.

IAD Domain		Michigan, USA	Sweden
Biophysical/Material Conditions	Land area	146,570 km²	447,425km^2
	Landscape Features	Forests, wetlands, grasslands, agriculture, lakes, and urban developments	Forests, agriculture, grasslands, mires, lakes, mountains, and urban development
	Large Ungulate Species (* hunted)	Moose (*Alces alces*) elk (*Cervus canadensis*) *white-tailed deer (*Odocoileus virginianus*) feral swine (wild boar; *Sus scrofa Linnaeus),*	*Moose (Älg; *Alces alces*) *red deer (Kronhjort*; Cervus elaphus*) *fallow deer (Dovhjort; *Dama dama*) *roe deer (Rådjur; *Capreolus capreolus*) *wild boar (Vildsvin; *Sus scrofa Linnaeus*) European mouflon (Mufflon; *Ovis orientalis*)
Community Attributes	Population	10.1 million	10.5 million
	Total Number hunters	660,933	~300,000
	Hunters % population	7%	3%
Rules in Use	Government Type	Constitutional federal republic	Constitutional monarchy
	Key Organizations managing wildlife	Primarily managed at state level Michigan Department of Natural Resources Natural Resource Commission At the federal level: Department of Agriculture Department of Interior Environmental Protection Agency	Swedish Environmental Protection Agency (Naturvårdsverket) Swedish Association of Hunting and Wildlife Management (*Svenska* Jägareförbundet) County Administration Boards (länsstyrelserna)
	Key Laws wildlife and hunting	Public Trust Doctrine Michigan Wildlife Conservation Order	Jaktlag (1987:259) Jaktförordning (1987:905)

Table 5.3 (cont'd)

		(WCO) Michigan Natural Resource and Environmental Protection Act	
	Key Organizations managing wildlife meat	Primarily managed at state level Michigan Department of Agriculture and Rural Development At the federal level: Department of Commerce Department of Agriculture Food and Drug Administration	Swedish National Food Agency (Livsmedelsverket) European Union
	Key wildlife meat law	Lacey Act FDA Food Code 2022 Michigan Food Law Act 92 of 2000 Michigan Wildlife Conservation Order Michigan Natural Resource and Environmental Protection Act	EU Regulation (EC) No 852/2004 Regulation (EC) No 853/2004 EU Regulation (EC) No. 178/2002 Food Ordinance 2005:20
	Who owns living wildlife?	Wildlife is held in trust by the government (federal or state) for the benefit of current and future generations	No one owns living wildlife, and it is thought of as a public resource
	Who owns dead wildlife?	Game lawfully taken, acquired, and transported may be possessed by any person	Landowners possess the hunting rights to their property, and this includes the right to any wildlife found dead or killed in contexts other than hunting, with exceptions for certain vulnerable species
	Process to hunt	Take a hunter's safety course, obtain a hunting weapon, pay a license fee, and find land to hunt on	Pass the hunting proficiency test, obtain a firearm permit and firearm, pay a hunting fee, and find land to hunt on
	Can wildlife meat be sold?	No	Yes
Outcomes	Total harvest large ungulates	380,666 animals	355,461 animals

Table 5.3 (cont'd)

	Total wildlife meat	13.1 million kg	13.2 million kg
	Per capita wildlife meat	1.2 kg per person per year	1.3 kg per person per year
	Wildlife meat per km^2	89.3 kg per km^2	29.3 kg per km^2
	% Population consume wildlife meat per year	49% (venison)	68-70% (all species)
	Non-hunters consume wildlife meat per year	34% (venison)	65% (all species)
	% Population consume wildlife meat monthly	19% (venison)	22% (all species)
	Cultural Ecosystem Services provided by wildlife meat	Social relations Identity Cultural heritage Education Knowledge systems Spiritual and religious	Social relations Identity Cultural heritage Education Knowledge systems Spiritual and religious Recreation and tourism

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