

THE PALM OIL CRISIS:
PROVIDING AN OUTREACH FRAMEWORK
TO INCREASE AWARENESS IN U.S. ZOOS

by

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ABSTRACT

The Palm Oil Crisis: Providing an Outreach Framework to Increase Awareness in U.S. Zoos

Allison Wyatt

Worldwide demand for palm oil has created an impending extinction crisis in tropical regions, particularly Southeast Asia, and shows no signs of declining. An increasing need for better communication of palm oil agriculture impacts has been recognized by zoos across the United States as well as by the accrediting body Association of Zoos and Aquariums. Currently, Woodland Park Zoo has limited palm oil outreach available to their one million visitors each year and is looking to expand their communication. With my research, I sought to answer 1. What outreach programs have other zoos developed and/or implemented in the United States around the issue of palm oil? and 2. Can these programs and techniques be applied to a new and innovative palm oil outreach program at Woodland Park Zoo? To address these questions, a survey to assess baseline knowledge levels of zoo visitors relating to palm oil was designed and distributed to 60 Woodland Park Zoo visitors. Survey results showed that Woodland Park Zoo visitors do not correlate palm oil with the deforestation of tropical forests, highlighting the need for palm oil outreach. Next, five AZA zoos were contacted and their palm oil programs were summarized based on their responses and available online content. Primary recommendations to help Woodland Park Zoo increase their outreach include: promoting a clear palm oil mission statement, advising responsible consumerism through support for companies dedicated to using deforestation-free and/or Certified Sustainable Palm Oil, maintaining online content (across zoo's website and social media), using events as a platform for outreach both inside and outside the zoo, staying involved in international conservation projects and communicating their purposes and successes to zoo visitors, using resources from other AZA institutions, maintaining internal education, and discouraging palm oil boycotts. Zoos like Woodland Park Zoo must continue to grow and evaluate their palm oil conservation outreach initiatives in efforts to reduce threats to tropical biodiversity.

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1. Introduction: On a Trajectory toward Disaster

Tropical forests and the large amount of biodiversity found there have been faced with anthropogenic threats throughout time (Ehrlich and Wilson, 1991) and are particularly vulnerable in today's world (Bradshaw et al., 2009). Habitat loss and degradation, such as from deforestation, has been a main driver of extinction rates in the tropics. Bradshaw et al. (2009) suggested that "we are already squarely in the midst of a tropical biodiversity tragedy and on a trajectory toward disaster." Important ecosystem functions and services the tropics provide are being lost too. This includes, but is not limited to, functions such as the sequestration of carbon, reduced pollination, and disrupted water cycling; these functions impact services such as flood control and the production of non-timber forest products.

Millions of hectares of tropical forests are cleared every year for a variety of reasons, often for pasture or agricultural uses (Kricher, 2011). One increasingly popular agricultural crop is palm oil, which is produced and consumed more than any other vegetable oil in the world today (Hansen et al., 2015, MPOB, 2014). Palm oil, harvested from the fruit of the oil palm, grows particularly well in tropical regions of the world, primarily within a range of 10° on either side of the equator (Donald 2004). In addition to its uses in cooking and food products, palm oil is also used in other commodities including soap and cosmetics. Just two years after planting oil palms, plantations can begin commercial oil production, and may remain productive for up to 30 years. Per hectare, palm oil is the world's highest yielding vegetable oil, adding to its popularity (Donald, 2004, MPOB, 2014).

Many scientists and environmental organizations, such as those involved in the Roundtable on Sustainable Palm Oil (RSPO), agree that palm oil agriculture contributes to a variety of detrimental impacts on the environment and that changes need to be made to the practice, especially as demand is expected to increase (Corley, 2009). However, consumers in the United States are likely unaware of these impacts because the majority of palm oil agriculture occurs in Southeast Asia. For the purposes of this project, I am focusing on deforestation in the tropical regions of Indonesia and Malaysia--the primary producers of palm oil in the world. The expanding worldwide demand for palm oil has been identified as a major driver of large scale deforestation and biodiversity loss in Southeast Asia (Wilcove and Koh, 2010) and growth of the palm oil industry in tropical regions and subsequent deforestation and biodiversity loss has revealed a pressing need for the sustainable production of palm oil (Hansen et al., 2015).

What are the best techniques for communicating these issues to U.S. consumers? Woodland Park Zoo in Seattle, WA is particularly interested in increasing education and awareness of their visitors concerning the detrimental environmental impacts of palm oil agriculture. The zoo wants to create changes in consumer behavior that will demand more sustainable practices, with the goal of making a large enough impact on their visitors to inspire action and drive policy change in the United States. They would like to know what actions to suggest to their visitors that will be most effective in meeting their goals. Because Woodland Park Zoo does not currently have materials about this subject available to their visitors, my research may serve as an important guide to fulfill their goals in setting up an outreach program. I seek to answer several questions, specifically:

1. What outreach programs have other zoos developed and/or implemented in the United States around the issue of palm oil?
2. Can these programs and techniques be applied to a new and innovative palm oil outreach program at Woodland Park Zoo?

In the chapters that follow, I will provide an introduction to the tropics and tropical forests, palm oil production in Southeast Asia, and the role U.S. zoos play in conservation outreach. I will then review my methods, results, and discussion showing how Woodland Park Zoo can move forward in improving their palm oil outreach.

2. Literature Review

The increasing demand for palm oil threatens biodiversity-rich tropical forests around the world. Nowhere is this more apparent than in Southeast Asia, where palm oil agriculture has been argued to be the “the greatest immediate threat to biodiversity” (Wilcove and Koh, 2010). This chapter will provide an overview of the tropics and why they are ecologically important, the current state of palm oil agriculture with a focus in Southeast Asia, sustainable palm oil, and palm oil awareness in zoos.

2.1 The tropics

The tropics are located around the Earth’s equator, extending north to the Tropic of Cancer ($23^{\circ}27'N$) and south to the Tropic of Capricorn ($23^{\circ}27'S$), encompassing the Earth’s largest circumference (Kricher, 2011). Consistently warm and wet, average temperature and rainfall are generally high in the tropics with no periods of cold or snow except at very high elevations. Residing within the tropics are some of the densest, poorest, and fastest growing human populations. Countries located within the tropical zone can be seen in Figure 1.



Figure 1. Political map showing nations that are located within the tropics, between the Tropic of Cancer and the Tropic of Capricorn

Source: Kricher, 2011

a. Biodiversity in the tropics

The tropics contain many different ecosystems, including tropical rain forests (Kricher, 2011) which contain at least 50% of all known species (Myers, 1988), creating an uneven distribution of species worldwide (Gaston, 2000). In fact, tropical forests have the highest biodiversity levels of any terrestrial ecosystem (Kricher, 2011). In addition to sustaining high and disproportionate levels of biodiversity, tropical forests support high levels of endemism and species richness (Figure 2). Endemism and species richness levels help define “hotspots,” or biological communities that warrant high conservation efforts (Figure 3) (Kricher, 2011). For example, endemic species are particularly vulnerable to extinction when their localized habitat is disturbed (Myers, 1988).

Additional criteria for determining hotspot locations include areas facing unusually high

levels of anthropogenic destruction. Consequently, hotspot locations are highly correlated to areas of high population growth (Kricher, 2011).

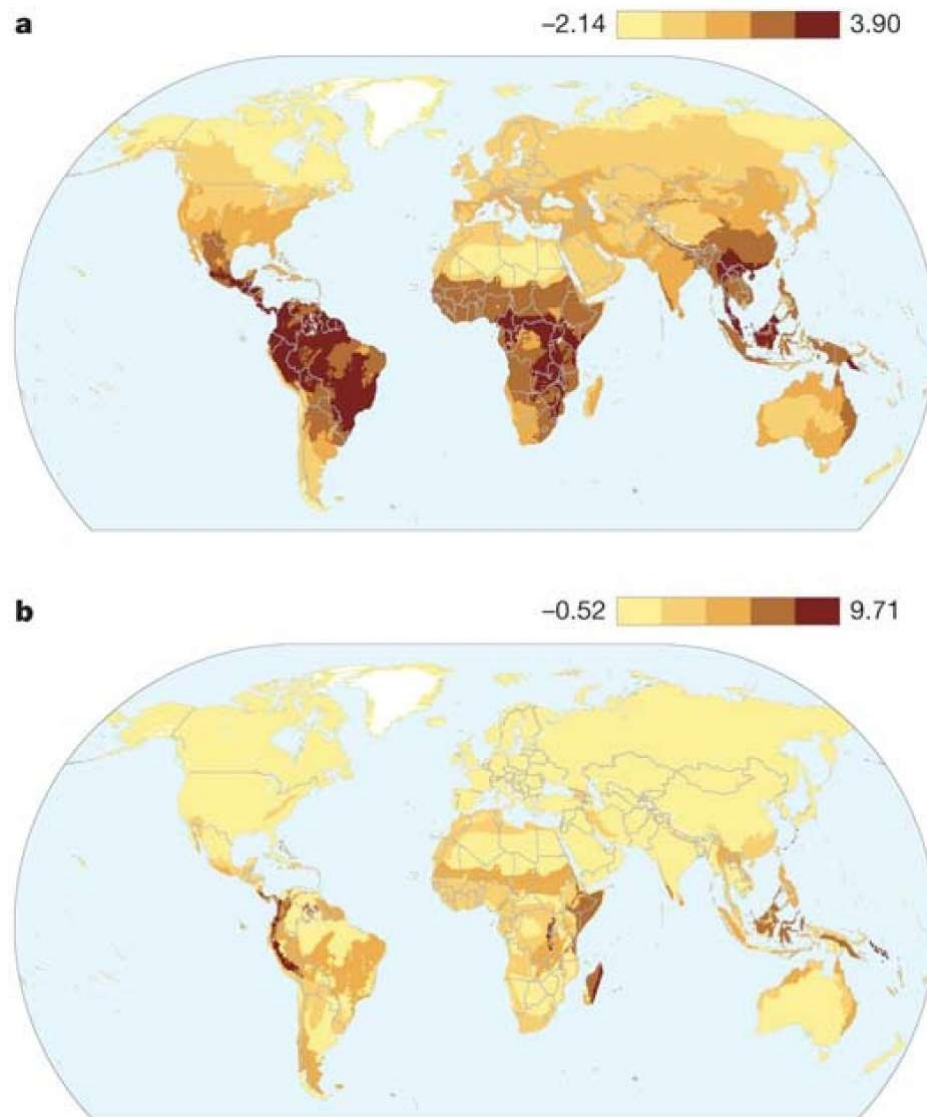


Figure 2. Relative levels of terrestrial vertebrate biodiversity ranging from low (yellow) to high (red) in a. species richness and b. species endemism

Source: Lamoreux et al., 2006

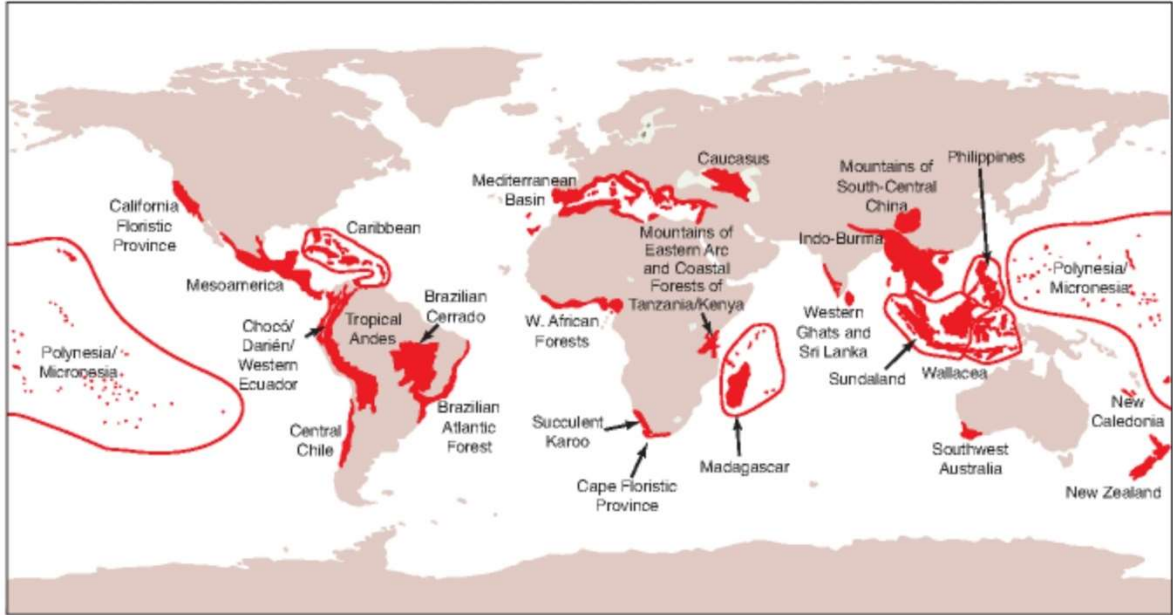


Figure 3. Twenty-five global hotspots as determined by endemic plant species

Source: Kricher, 2011

b. Tropical forests

Tropical forests account for the highest levels of terrestrial biodiversity worldwide (Kricher, 2011), and anthropogenic activities have led to higher biodiversity loss in tropical forests than anywhere else in the world (Ehrlich and Wilson, 1991). The degradation of forests in tropical areas has been shown to generate severe consequences (Foley et al., 2007), as biodiversity is critical for maintaining the quality of ecosystem services (Ehrlich and Wilson, 1991). Each species plays a role in an ecosystem's functioning and contributes to its stability (Loreau et al., 2001). When people deforest the land for economic gain, such as for logging or agriculture, the ecosystem services once provided by that land are simultaneously compromised (Foley et al., 2007). "The loss of healthy forests can degrade key ecosystem services, such as carbon storage in biomass and soils, the regulation of water balance and river flow, the modulation of regional climate patterns, and the amelioration of infectious diseases" (Foley et al., 2007). This

provides a strong economic justification for biodiversity conservation instead (Dobson et al., 2006). Ehrlich and Wilson (1991) argue no type of human-created replacement can imitate the processes that ecosystem services are able to provide.

Land use changes have been suggested to degrade ecological functions within ecosystems, and systems depending on long-term functioning are especially vulnerable (Foley et al., 2007). In tropical rainforests, anthropogenic land use changes (including deforestation) severely alter ecosystem functions, including the balance of different gaseous components in the atmosphere, causing unnatural and rapid changes (Ehrlich and Wilson, 1991). When forests are lost or degraded, the carbon originally stored within the vegetation is released to the atmosphere if burned, partially returned to the soil if left on the land, or converted into products such as lumber (Foley et al., 2007). If burning occurs, carbon dioxide is returned to the atmosphere much faster than through natural processes. Such burning contributes to the global store of anthropogenic greenhouse gas emissions, now higher than ever before (Intergovernmental Panel on Climate Change, 2014). As a result, the earth's climate system has undergone unprecedented warming, creating widespread impacts over both human and natural systems. It has been suggested by the Intergovernmental Panel on Climate Change that "the most cost-effective mitigation options [to help address climate change] in forestry are afforestation, sustainable forest management and reducing deforestation" (2014).

Some suggest that the most critical underlying cause of tropical deforestation is due to rising population levels in tropical regions (Laurance, 1999). Population increases put further pressure on changes in land use, such as agricultural intensification. Palm oil and rubber crops dominate Malaysia's agricultural sector (The Business Year, 2016).

And one of the largest threats to tropical forests is the growing palm oil industry--the land must be cleared in order to make way for plantations. Further specifics about palm oil agriculture and its environmental impacts are discussed in the next section.

2.2 Current state of palm oil agriculture

a. What is palm oil?

Palm oil is produced from the fruit of the oil palm (*Elaeis guineensis*), which is native to Africa and grows only in wet, tropical regions 10 degrees north and south of the equator (Donald, 2004). The oil palm is very productive for several reasons: it yields more oil per unit area than any other vegetable oil, its fruit can be harvested within two years of planting, and a single oil palm can be commercially productive for up to 30 years. In addition to the cost effectiveness of the tree itself, the properties of palm oil make it an ideal choice for cooking because of its consistency even under high temperatures and its use as a preservative because it can extend the shelf life of products (Roundtable on Sustainable Palm Oil, 2016a).

As of 2013, palm oil accounted for a third of the world's total vegetable oil consumption (Singh et al., 2013). Globally, the rise in palm oil production has been driven by a combination of rising demands for products that contain palm oil, both for human and livestock consumption, as well as for use in cosmetics and use as a biofuel (McCarthy, 2010). A wide range of common products contain palm oil, including but not limited to margarine, chocolate, ice cream and cosmetics (Roundtable on Sustainable Palm Oil, 2016a). There are many by-products of palm oil production, such as palm kernel oil and palm kernel meal (Langeveld et al., 2014). Demand for palm oil as a

biofuel option is also increasing because it gives the highest biodiesel yield per hectare of any other major oil crop.

The countries whose residents consume the most palm oil include India, China, Indonesia and Europe (Roundtable on Sustainable Palm Oil, 2016a). However, a recent determination by the U.S. Food and Drug Administration, Department of Health and Human Services (2015) may be a catalyst to increase the use of palm oil in food products in the United States. The determination states that partially hydrogenated oils (PHOs), which is the primary ingredient in trans fats, is unsafe for human consumption, therefore requiring food manufactures to remove PHOs from processed foods within three years. Because palm oil is a commonly used substitute for trans fats in foods, it is expected that demand for palm oil may increase further in the United States (Mongabay, 2015). This has already been documented because as many manufacturers have anticipated this determination, they have already been working towards eliminating trans fats in their products and replacing them with palm oil, fueling an increase in palm oil imports to the United States.

Although the ruling by the U.S. Food and Drug Administration suggests an increased demand for trans fats alternatives, there is not necessarily a better substitution than palm oil. As previously mentioned, palm oil is a very productive crop, requiring less time and land than any other vegetable oil (Donald, 2004). Using other oils such as sunflower, soybean or rapeseed could result in even higher levels of environmental issues (Roundtable on Sustainable Palm Oil 2015a). These other types of oils may not offer the same taste or texture in food products, making them less desirable for the consumer. Additionally, millions of people depend on the palm oil industry as their main source of

income, including 4.5 million people across Indonesia and Malaysia. Finally, because the majority of the labor force in Indonesia depends on agriculture for its income (Langeveld et al., 2014), the loss of palm oil as a crop would have the potential to create severe and widespread consequences for many people.

b. Palm oil in Southeast Asia

Southeast Asia has among the highest levels of biodiversity in the world, and overlaps with four of the biodiversity hotspots identified by Myers et al. (1988). Adachi et al. (2011) found that the tropical forests of Southeast Asia are also among the most carbon-abundant ecosystems in the world. However, this region is experiencing habitat destruction at higher rates than other tropical regions (Achard et al., 2002), as well as the highest rates of deforestation worldwide (Langner and Siegert, 2009), contributing to carbon emissions (Adachi et al., 2011). Castelletta et al. (2000) suggest that deforestation also has severe negative impacts on forest bird species throughout the Southeast Asian countries, specifically Indonesia and Malaysia, and recommend that these countries reconsider their large-scale deforestation practices. If not, the possibility of further biodiversity loss and extinction exists due to habitat loss caused by deforestation. Unfortunately, the same features that support biodiversity in the region make it ideal for growing oil palms; Indonesia and Malaysia have the highest rates of palm oil production in the world and contribute 85.7% of global production (Index Mundi, 2015) (Figure 4). By a 2015 estimate of palm oil exports, Indonesia exported 24,500 metric tons and Malaysia exported 18,150 metric tons, while the next highest exporters included Papua New Guinea (590 metric tons), Benin (580 metric tons), and Guatemala (400 metric tons). Though Indonesia and Malaysia lead the world in palm oil production, other

countries in Asia, Africa, and Latin America are working to increase their production, putting more habitat at risk for destruction (Union of Concerned Scientists, 2013).



Figure 4. Relative levels of production of palm oil by country

Source: The Guardian, 2014

Southeast Asia also has a substantial amount of natural tropical peatlands that have undergone land use changes, including extensive drainage and degradation (Mishra et al., 2014). These peatlands formed over millennium as partially decayed vegetation accumulated in areas which were typically low-lying and susceptible to inundation by water. Although they only account for 2-3% of the Earth's landmass, they store about one-third of all soil carbon; in fact, peatlands demonstrate the highest carbon storage density per area than any other ecosystem in the world (Freeman et al., 2012). Southeast Asia accounts for 77% of the tropical peatland carbon pool (25 million hectares) with the majority located in Indonesia (65%, or 23.4 million hectares) (Mishra et al., 2014). These ecosystems have been subjected to intense burning and draining in order to prepare them for agriculture or human settlement uses. Miettinen et al. (2012a) found that 2.2 million hectares in Indonesia already have been converted to commercial oil palm plantations

with temporary human settlements scattered within them. Based on current projections and policies, peatlands will become scarce in Southeast Asia by 2020.

c. Impacts of palm oil agriculture

Palm oil agriculture may be the “the greatest immediate threat to biodiversity in Southeast Asia (and a growing threat elsewhere)” (Wilcove and Koh, 2010). Not only do plantations demand high levels of maintenance and agrochemicals (Donald, 2004), but increased oil palm agriculture also puts pressure upon remaining rainforests (Singh et al., 2013). Many forest-restricted endemic species live in the rainforests of Southeast Asia where the majority of palm oil agriculture occurs, raising the concerns for biodiversity loss as deforestation increases (Koh and Wilcove, 2008). Over time, forests may recover from selective logging and continue to support forest-dwelling species, while oil palm plantations do not (Wilcove and Koh, 2010). In Malaysia, much of the deforestation that has occurred has been the result of unsustainable logging and creation of plantations for the harvesting of palm oil, and the decline of mammal populations there has largely been attributed to habitat loss and increased landscape fragmentation (WWF-Malaysia, 2012).

As indicated above, habitat loss due to expanding palm oil agriculture affects many species. Some of the larger and more charismatic animals affected by palm oil agriculture include Sumatran tigers and rhinoceroses, Asian elephants, sun bears, orangutans, and gibbons. Palm oil plantations only support an average of 15% of the species once found in the primary forest (Fitzherbert et al., 2008). Biodiversity only slightly increases with the protection of riparian buffers, the retention of forest patches within plantations, and allowing understory plants to grow (Koh, 2008). Koh and

Wilcove (2008) suggest that the only option to conserve biodiversity affected by palm oil agriculture is to put an end to the clearing of forests for plantations.

In Indonesia, palm oil plantations have been also shown to affect local hydrology and drainage patterns (Friends of the Earth, LifeMosaic and Sawit Watch, 2008). At times, river water levels are lower than expected due to water diversion and decreased land permeability; during the rainy seasons, increased and recurrent flooding have been reported for similar reasons. Toxic runoff associated with growing oil palms and the processing of palm oil has contributed to increasing levels of pollution in rivers, killing fish and other organisms and making it unfit for human use and consumption.

The creation of palm oil plantations has also contributed to carbon dioxide emissions and, as a result, Indonesia's greenhouse gas emissions levels rank among the highest of any country across the globe (Friends of the Earth, LifeMosaic and Sawit Watch, 2008). A study of carbon emission levels related to deforestation between 2000 and 2005 showed that Indonesia was one of the primary emitters, largely due to the conversion of land from forests and peat bogs to land suitable for agricultural purposes (Harris, 2012) (See Figure 5). This type of land use change as a source of anthropogenic carbon has been difficult to quantify. Even so, because the link between deforestation, carbon emissions, and warming of the climate system has been documented, we must address this urgent issue (Intergovernmental Panel on Climate Change, 2014).

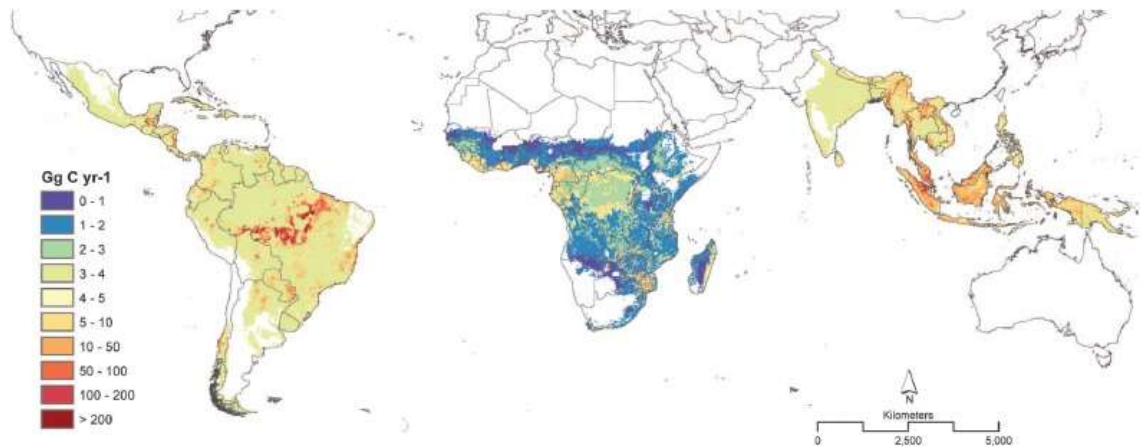


Figure 5. Annual carbon emission distribution resulting from gross forest cover loss between 2000 and 2005

Source: Harris et al., 2012

Using fire seasonally in the slash-and-burn technique, farmers can cheaply clear land in preparation for palm oil agriculture (The Guardian, 2015). However, the high concentrations of resulting smoke have serious health and environmental impacts in densely populated areas. A study by Kim et al. (2015) brought new insight into air quality concerns that were previously poorly quantified; the authors found that fires occurring in Southeast Sumatra represent a serious threat due to their proximity to the adjacent population, and recommend a policy to protect the peat swamps there from burning to improve air quality. Other data shows that from mid-2015 through the end of the year, fires raged uncontrollably throughout the tropical forests of Indonesia (The Guardian, 2015). At least 19 deaths have been attributed to the fires, with hundreds of thousands of people developing respiratory complications. It was not clear whom was responsible for the fires, but many occurred adjacent to land utilized by palm oil producers. In addition, the burning is illegal but little enforcement has occurred.

The influences of palm oil agriculture are far-reaching, both on the environment and human health. As previously mentioned, palm oil is a very profitable crop because of its small space requirements, fast harvest rate, and tree longevity (Donald, 2004). Therefore, many countries that lie within the tropical regions that support oil palms have supported the expansion of plantations, particularly in Indonesia and Malaysia (Wilcove and Koh, 2010). Palm oil agriculture has been prolific in countries with low wages--it is not easy to mechanize the labor intensive process of harvesting the oil palm (Donald, 2004). Indonesia and Malaysia have experienced economic booms due to their rapidly expanding palm oil production, which has risen substantially in recent decades (Figure 6).

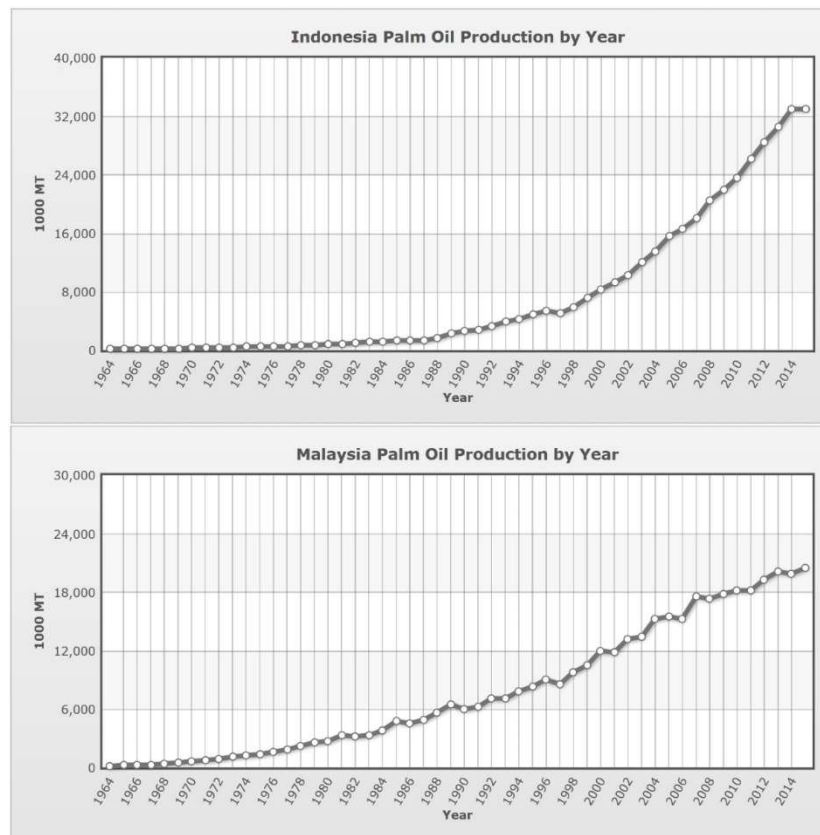


Figure 6. Production of palm oil per year in metric tons in Indonesia (top) and Malaysia (bottom)

Source: Index Mundi, 2015

In Indonesia, the local governments have limited peoples' rights to land in favor of companies that support state development plans (Friends of the Earth, LifeMosaic and Sawit Watch, 2008). Some communities have been restricted from accessing water that is now located on privatized lands. Water use has been restricted further as effluent from palm oil agriculture overflows or is illegally discharged into rivers. Improper management of this toxic waste contaminates the water that people rely on for drinking and washing. Frequent flooding of the polluted rivers has contributed to the displacement and death of many people. Furthermore, many villagers have noticed an increase in the cost of living due to an inability to live off the land as they were able to before the expansion of palm oil plantations. Palm oil companies have taken millions of hectares of land from communities, creating widespread conflict.

d. Expected future and sustainability

Future demand for edible use of vegetable oil is expected to rise with global population increase, as shown in data compiled by Corley (2009) (Figure 7). This model also takes into account demand for other vegetable oil and concludes that palm oil will continue to be prevalent, with the demand rising to between 93 and 256 Mt/year by 2050.

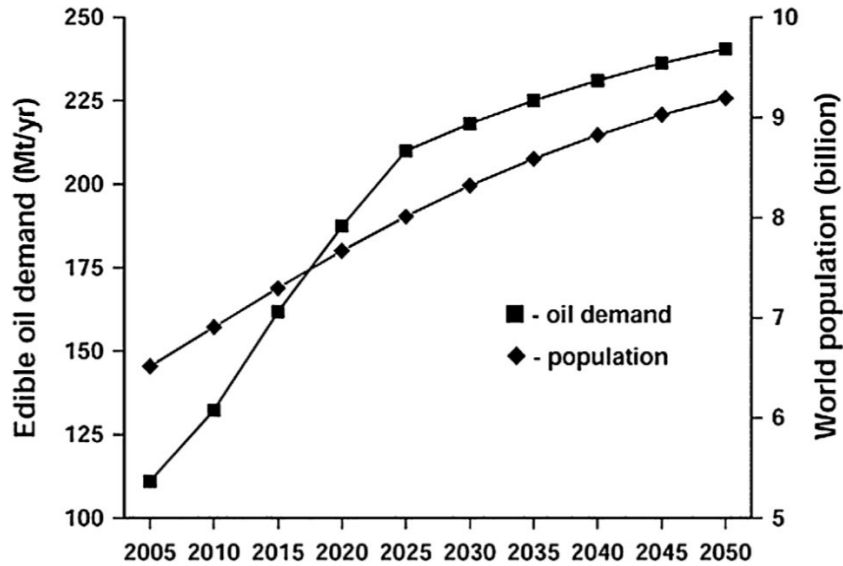


Figure 7. Expected world population and estimated edible oil trends

Source: Corley, 2009

Moving the palm oil industry towards sustainability, which will be discussed in the next section, means decreasing deforestation and subsequent land degradation. It has been suggested that there is enough land available and suitable for the development of palm oil plantations that will not require deforestation (Fitzherbert et al., 2008) and future demands for palm oil can be met without further environmental damage (Corley, 2009). Additionally, Smit et al. (2013) developed a method of identifying degraded or deforested land in which palm oil plantations could be expanded while complying with sustainability standards of social and environmental economic growth.

Hansen et al. (2015) argue that future research on the sustainability issues of palm oil production is needed. They suggest a more holistic framework with a multi-disciplinary approach for sustainable palm oil research, allowing for multi-stakeholder participation between local, international, and agricultural parties. In this way, the palm oil industry development can be supported alongside new sustainable production

techniques, providing researchers and policymakers a better platform for moving the industry towards a more sustainable future. Koh and Lee (2012) suggest that if consumers in emerging and developed countries could limit wasteful consumption of vegetable oil, the environmental destruction associated with agriculture in the tropics could be considerably alleviated.

e. The Roundtable on Sustainable Palm Oil and Certified Sustainable Palm Oil

The Roundtable on Sustainable Palm Oil (RSPO) defines themselves as:

A not-for-profit that unites stakeholders from the 7 sectors of the palm oil industry: oil palm producers, processors or traders, consumer goods manufacturers, retailers, banks/investors, and environmental and social non-governmental organisations (NGOs), to develop and implement global standards for sustainable palm oil. The RSPO has developed a set of environmental and social criteria which companies must comply with in order to produce Certified Sustainable Palm Oil (CSPO). (Roundtable on Sustainable Palm Oil, 2016b)

The RSPO classifies CSPO as palm oil which reduces “negative impacts of palm oil cultivation on the environment and communities” (Roundtable on Sustainable Palm Oil, 2016a). Companies who produce sustainable palm oil adhere to the following criteria:

- Fulfill an increasing global food demand
- Support affordable food prices
- Support poverty reduction
- Safeguard social interests of communities and workers
- Protect the environment and wildlife

The RSPO aims to restrict the amount of deforestation that occurs, particularly in areas of high biodiversity, fragile ecosystems, or that are central to upholding the basic needs of communities (Roundtable on Sustainable Palm Oil, 2016a). Palm oil can only be marketed as CSPO if the producer has been approved by the RSPO (Roundtable on Sustainable Palm Oil, 2016c). The RPSO can withdraw their accreditation at any point if the member infringes upon the rules and standards at any point in the production process. The RSPO monitors each of these steps in an effort to ensure the palm oil meets the CSPO requirements. This is especially important, as the palm oil supply chain is often incredibly complex (See Figure 8). After the palm fruit leaves the plantation, it often goes through many different factories spanning thousands of miles. Members that meet these requirements can then use the RSPO Trademark Logo on their products, showing consumers the palm oil used was sourced sustainably.



Figure 8. Simplified version of the palm oil supply chain

Source: Roundtable on Sustainable Palm Oil, 2015c

As of April 2016, 13.7 million metric tons, or 21% of global palm oil production, was certified sustainable by the RSPO (Roundtable on Sustainable Palm Oil, 2016d). This includes 345 certified palm oil mills, 66 growers, 1,884 companies with supply chain certificates, and 3,199 facilities with supply chain certificates. The RSPO has a total of 2,798 members, 176 of which are in the United States. Indonesia, the largest producer of palm oil, has 113 members while the second highest producer, Malaysia, has 125 members. A total of 3.66 million hectares of land has been certified by the RSPO, including approximately 1.6 million in Indonesia and 1.5 million in Malaysia.

It has been suggested that if further expansion of the palm oil industry is in accordance with RSPO principles, it “can meet the demand [for vegetable oil in the future] and also continue to be an important force for rural poverty alleviation, without serious damage to biodiversity” (Corley, 2009). However, this is largely dependent on whether the internationally recognized RSPO certification is required by countries that demand large amounts of edible oil and if the demand for palm oil as a biofuel increases. Therefore, there is a great need for education in both the industry and to public consumers to push for sustainability. In the next section, I will address the potential role for zoos in public education and how it pertains to palm oil outreach.

2.3 Palm oil awareness in U.S. zoos

a. The role of zoos in conservation and outreach

By the 1970s and 80s, zoos were taking part in the conservation of endangered species and wildlife as it became clear that species worldwide were facing extinction due to numerous anthropogenic threats (Keulartz, 2015). The role zoos should play in conservation further advanced with the creation of the first *World Zoo Conservation*

Strategy in 1993. The strategy called for zoos to make conservation of species and wildlife a primary focus within their institutions, effectively becoming conservation centers.

Today, the zoo is standing at a crossroads—and has to decide if it will fully commit to the new paradigm and develop into a conservation center or if it will degenerate (further) into a venue for entertainment that will provoke increasing criticism, not only from animal protectionist but also from wildlife conservationists. (Keulartz, 2015)

According to the non-profit organization Association of Zoos and Aquariums (AZA), zoos and aquariums receive over 175 million visitors per year in the United States (2014a). The AZA is committed to the advancement of conservation, education, science, and recreation in North American zoos and aquariums. To become AZA accredited, the institution must meet the standards set forth by the definition of a zoological park or aquarium:

A permanent institution which owns and maintains wildlife, under the direction of a professional staff, provides its animals with appropriate care and exhibits them in an aesthetic manner to the public on a regular basis. The institution, division, or section shall further be defined as having as their primary mission the exhibition, conservation, and preservation of the earth's fauna in an educational and scientific manner. (Association of Zoos and Aquariums, 2016a)

In addition, accreditation requires conservation--active stewardship of the natural environment--be included as a primary component of the zoo's mission statement (Association of Zoos and Aquariums, 2016a). A few of the numerous ways conservation

can be promoted within a zoo include participating in AZA animal management programs, having interpretive materials and programs available, on-site efforts, and providing support for cooperative conservation programs. Each zoo must submit to the AZA a conservation action plan or strategy outlining their involvement in conservation. Additionally, they must support and participate in AZA wildlife conservation programs, particularly Species Survival Plans, for every species they house.

b. U.S. zoos and palm oil outreach

As previously mentioned, the agriculture of palm oil poses a huge risk to tropical biodiversity; it has even been referred to as the “greatest immediate threat to biodiversity in Southeast Asia” (Wilcove and Koh, 2010). Because AZA accredited zoos are required to play a role in a variety of conservation related programs, many are involved in those related to the palm oil crisis. The AZA’s official position on palm oil, as approved in July 2014, is as follows:

The AZA recognizes that unsustainable palm oil production results in massive deforestation, rapid biodiversity loss in tropical ecosystems and significant greenhouse gas emissions. Global consumption of palm oil and its derivatives is increasing, requiring strong conservation action to save species. By facilitating change through audience and stakeholder engagement, AZA-accredited zoos and aquariums are well positioned to help break the link between palm oil production and deforestation. (Association of Zoos and Aquariums, 2014c)

The AZA supports the engagement of zoo and aquarium visitors on the topic of palm oil with the goal of breaking the cycle between palm oil production and deforestation (Association of Zoos and Aquariums, 2014c). Strategies recommended to

reach this goal include using the combined power of visitors to influence change and providing visitors with effective tools they can use to advocate for deforestation-free palm oil to make it the industry standard. “These strategies, and their associated objectives and outcomes, are intended to provide a framework for the use and development of measurable tools that allow zoos and aquariums addressing the palm oil conservation crisis to achieve the goal of habitat protection that sustains wildlife” (Association of Zoos and Aquariums, 2014c).

One of the AZA’s conservation initiatives that specifically involves the palm oil issue is the AZA Ape Taxon Advisory Group (TAG) Conservation Initiative--the creation of palm oil plantations threatens orangutans in Borneo and Sumatra. This initiative allows zoos to be valuable contributors to ape conservation, helping them to persist in their natural habitats by allowing zoos to provide support to a multitude of projects (Association of Zoos and Aquariums, 2009). One of the goals of this initiative includes “providing zoos with resources to convey their conservation messages to their visitors and demonstrate their commitment to the preservation of apes in the wild” (Association of Zoos and Aquariums, 2009). Zoos can join at three different membership levels which cost a certain amount per year: silver (\$1,000), gold (\$5,000) and platinum (\$10,000). The Woodland Park Zoo in Seattle, WA counts itself among the Gold Supporters of the AZA Ape TAG Conservation Initiative (Ape TAG, 2010). Additional AZA conservation initiative topics that may help wildlife impacted by palm oil include climate change, tigers, and elephants.

c. How research applies to the needs of Woodland Park Zoo

The Woodland Park Zoo in Seattle, WA was founded in 1899 and is a non-profit, AZA member that receives approximately 1 million visitors per year (Woodland Park Zoo, 2015a). The zoo houses 1,000 animals representing over 300 different species. The zoo “saves animals and their habitats through conservation leadership and engaging experiences, inspiring people to learn, care and act” (Woodland Park Zoo, 2015a). Zoos provide a unique experience for visitors of all ages to learn about environmental issues, and Woodland Park Zoo has a particular interest in conservation.

Woodland Park Zoo’s strategic plan, Growing Our Reach and Impact, outlines some of their goals for 2015-2018 (Woodland Park Zoo, 2015b). This plan mentions implementing new conservation, consumer, and awareness campaigns to engage more people in saving habitats and wildlife, including those threatened by palm oil. Thus, Woodland Park Zoo currently is developing an outreach program that focuses on the issues of palm oil agriculture, with the objective of achieving effective communication of this multifaceted industry to their visitors. Their goal is to make a large enough impact on their visitors to inspire action and drive policy change in the United States. Since they have never tackled an issue as large as this one, they have questions about what should be communicated, where communication should take place, and how to do it. Some of the main concerns for the zoo, to be addressed in this research, include:

- Does Woodland Park Zoo need palm oil outreach?
- What are the most important facts zoo visitors should be aware of concerning the palm oil industry?

- Where, on zoo grounds or elsewhere, should outreach be focused to generate the most impact?
- What types of displays and techniques are most effective in communicating main points of interest?
- What kind of actions should be communicated to visitors?

2.4 Conclusion

The rise in palm oil agriculture and subsequent loss of habitat for wildlife serves as a substantial risk to tropical biodiversity around the world, especially in Southeast Asia (Wilcove and Koh, 2010). AZA zoos across the United States are developing relatively new conservation outreach initiatives based on this issue, including Woodland Park Zoo. Next, I will address my methods, including a palm oil awareness survey for Woodland Park Zoo visitors and personal communications with several AZA accredited zoos. I examine what outreach programs these zoos have developed and/or implemented on the issue of palm oil, and based on these programs, make recommendations to Woodland Park Zoo on how to continue developing their palm oil outreach.

3. Methods

This section will review the methods used to gather data about the particular outreach programs at five different zoos across the United States. It also covers the survey research conducted to better understand what zoo goers at Woodland Park Zoo know about palm oil and the related deforestation crisis.

3.1 Survey

A survey was designed to gain further understanding into the level of awareness Woodland Park Zoo visitors have about palm oil and its detrimental environmental impacts, as well as their interest in learning more about tropical deforestation (See Appendix 1 for the survey; specific questions are also addressed in the results section). The survey was printed and handed out to be completed in person, and visitors were asked to participate in the survey on a voluntary basis at various locations around the zoo. Zoo employees and volunteers were omitted from the sample in an effort to reduce bias. A total of 60 surveys were completed during zoo visits on January 30, 2016 and February 27, 2016. Participants were also asked if they resided within or outside of Seattle and if they were members of Woodland Park Zoo.

3.2 Personal communications

To explore palm oil outreach programs in more detail, five zoos were chosen based on interest expressed in them by Woodland Park Zoo, and additional research concerning the amount of online resources they had available. The zoos contacted include: Cheyenne Mountain Zoo, Indianapolis Zoo, Oakland Zoo, Philadelphia Zoo, and San Diego Zoo Global. I also contacted Houston Zoo but did not include them in the

study because of their lack of response. Note that all zoos included in this study are currently accredited by the AZA (Association of Zoos and Aquariums, 2014b).

Initial emails were sent out to Conservation Directors or Coordinators of the zoos, including a brief introduction into the purpose of the research project, Woodland Park Zoo's interests and needs, and the request that they answer specific questions about the palm oil outreach they have implemented or to forward the email along to a colleague who could answer these questions. The five zoos responded with interest, and questions were either relayed through email or over the phone with further follow-ups made when necessary. Modified slightly for each individual zoo, these questions included:

1. Can you briefly describe what the primary position of your zoo is on palm oil?
2. When did you start your outreach on palm oil?
3. Where is your palm oil display located within the zoo and why? Are there multiple locations?
4. Are there additional ways you promote palm oil awareness within the zoo?
(Special events, keeper talks, interactive activities/displays, videos, etc.)
5. Besides online content, do you advocate for palm oil awareness outside the zoo?
6. Do you have materials concerning palm oil that visitors can take with them after their visit to the zoo?
7. What have you seen as your best communication strategies?
8. What kinds of actions do you recommend to your visitors to take regarding helping to minimize detrimental environmental impacts of palm oil agriculture?
9. Have you used social media to promote information regarding palm oil?

10. If guests could walk away with one take-home message about palm oil and the best action to take, what would it be?

I also examined the resources and materials each zoo had available online. This was an important component of my research as it supplemented my personal communications, which were of variable usefulness; additionally, maintaining an online presence was a key to the outreach strategies of all zoos.

3.3 Scope of study

There were several areas beyond the scope of this study that were not addressed. Palm oil outreach programs at the zoos I surveyed were not examined for effectiveness; instead, I focused on how they have approached palm oil outreach, the areas they have been focusing on, and what they have recognized as best practices. Similarly, factors including specific display content, reading level, and social marketing techniques were not included. Finally, neither the Woodland Park Zoo visitor palm oil awareness survey nor the survey of the five zoos generalize all visitors or all U.S. zoos; instead, they provided a baseline of data from which to make recommendations for Woodland Park Zoo, as discussed in the following sections.

4. Results

4.1 Survey

Using the program JMP (SAS Institute, Inc), a multivariate correlation matrix was created to determine the strength of the relationships between the responses of each question. Data was assumed to meet standard parametric assumptions.

As indicated above, a total of 60 surveys were administered. The survey questions included:

- Question 1: I am familiar with the term "palm oil."
- Question 2: I know where palm oil comes from.
- Question 3: The palm oil industry affects my choices as a consumer.
- Question 4: I am aware of products in my household that contain palm oil.
- Question 5: I am aware of environmental impacts associated with the unsustainable production of palm oil.
- Question 6: I am concerned about deforestation and the loss of habitat for species.
- Question 7: I know which species at Woodland Park Zoo are affected by the palm oil industry.
- Question 8: I am interested in learning more about the palm oil industry.
- Question 9: I am interested in learning what actions I can take to contribute to a more sustainable future for tropical forests.

Participants were asked to respond on a 1-5 likert scale to measure their awareness in relation to palm oil related questions, where 1 = Strongly Agree and 5 = Strongly Disagree (Chandler and Munday, 2011). All questions had an N = 60 except for

question 3 (N = 58) and question 4 (N = 59). The distribution of responses for each question can be seen in Figure 9.

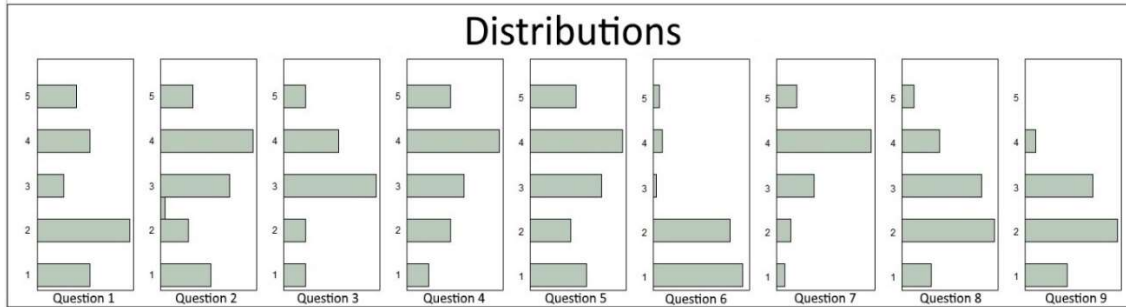


Fig. 9: Distribution of responses per survey question

At the 95% confidence level ($\alpha = 0.05$), there were many significant correlations between survey questions, where the null hypothesis (there is no correlation) was rejected in favor of the alternative hypothesis (there is correlation). A full list of the pairwise correlations is located in Appendix 2. The five strongest correlations occurred between questions 2 and 5 (correlation coefficient = 0.87, $p = <0.0001$), 1 and 2 (correlation coefficient = 0.81, $p = <0.0001$), 4 and 5 (correlation coefficient = 0.8, $p = <0.0001$), 1 and 5 (correlation coefficient = 0.77, $p = <0.0001$), and 8 and 9 (correlation coefficient = 0.72, $p = <0.0001$) (Figure 10). The five weakest correlations occurred between questions 5 and 9 (correlation coefficient = 0.21, $p = 0.1064$), 2 and 9 (correlation coefficient = 0.23, $p = 0.0793$), 4 and 9 (correlation coefficient = 0.23, $p = 0.0784$), 6 and 8 (correlation coefficient = 0.26, $p = 0.0461$), and 7 and 9 (correlation coefficient = 0.26, $p = 0.0445$) (Figure 11).

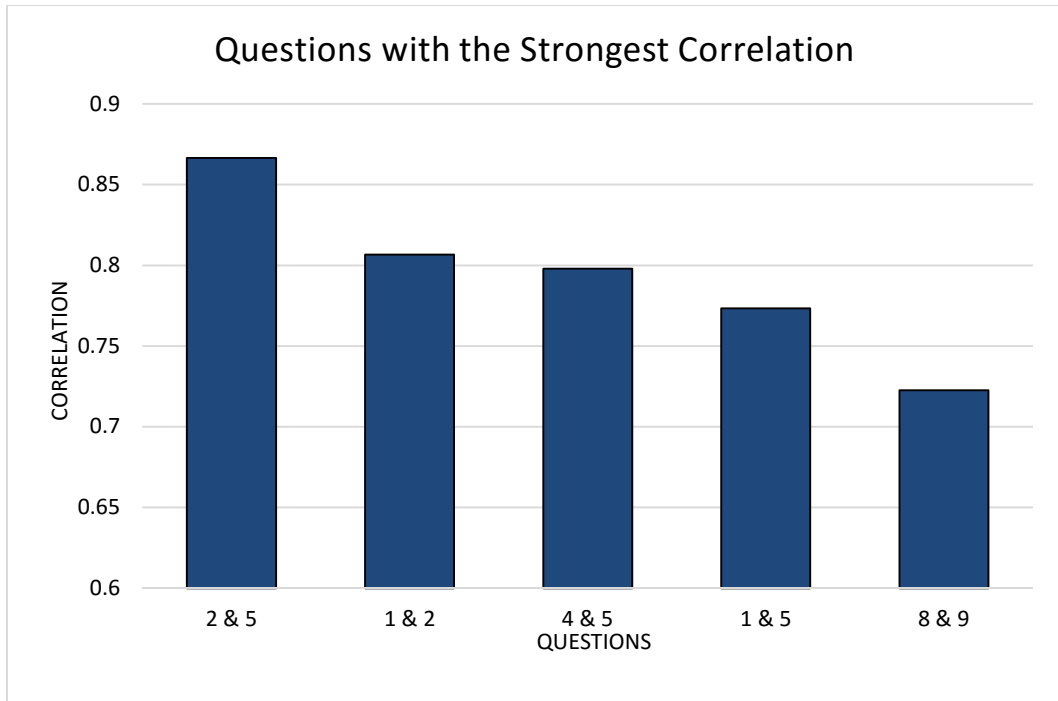


Figure 10. Palm oil survey questions that demonstrated the highest levels of correlation

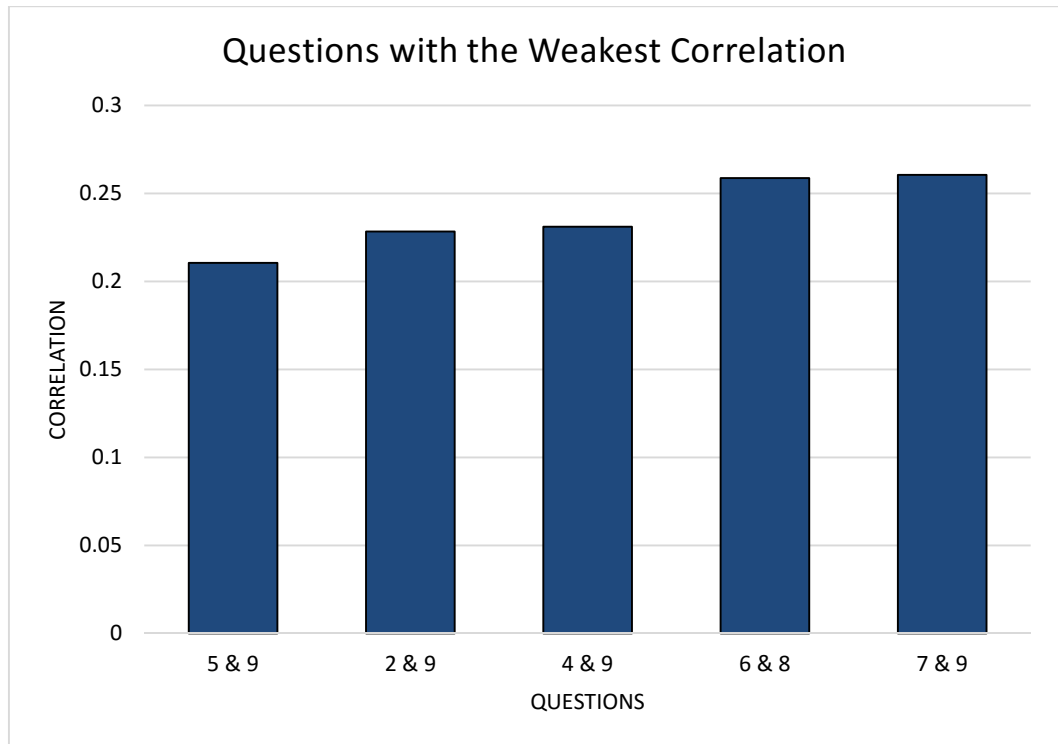


Figure 11. Palm oil survey questions that demonstrated the lowest levels of correlation

Of the 60 zoo visitors, 27% were members of Woodland Park Zoo while 73% were not. Forty-five percent of respondents resided within Seattle, 40% resided outside of Seattle but within Washington State, and only 15% resided outside of Washington. These results may vary by season; I only sampled in the winter, a time Seattle experiences reduced tourism. It is unclear how this may influence survey results.

An optional comment section was also provided at the conclusion of the survey (Question 10). Unfortunately, only two comments were received: “Important issue!” and “I’m aware of palm oil because I make soap.” Both respondents strongly agreed that they were familiar with the term “palm oil.”

4.2 Case Studies: zoo palm oil awareness strategies and resources

a. Cheyenne Mountain Zoo

Palm oil awareness mission statement: “to make a difference for wild orangutans by raising awareness about the palm oil crisis and encouraging people to take action by providing tools and information that will allow them to make globally responsible consumer choices” (Bredahl, 2015).

Cheyenne Mountain Zoo is an independent, non-profit organization founded in 1926 in Colorado Springs, CO (Cheyenne Mountain Zoo, 2010), housing more than 950 animals representing over 200 species (Cheyenne Mountain Zoo, 2016a). Their mission statement reads: “A leader in conservation, captive breeding and animal care, Cheyenne Mountain Zoo connects people with wildlife and wild places through experiences that inspire action” (Cheyenne Mountain Zoo, 2016b).

I reached out to Dina Bredahl, the Animal Care Manager at Cheyenne Mountain Zoo, and Secretary of the Orangutan Species Survival Plan (SSP), an organization that

partners with AZA accredited zoos and other primate organizations in the United States to further orangutan research, education, advocacy, conservation and husbandry (Orangutan Species Survival Plan, 2015). Instead of addressing my specific questions, she provided a document summarizing the zoo's palm oil program that also had been sent to the Zoological Society of London (last updated November 3, 2015, prepared by Dina Bredahl) (Bredahl, 2015).

According to that document and their online material, Cheyenne Mountain Zoo began their palm oil awareness campaign in 2008 and made it their mission to be a role model for other zoos in the United States, becoming the first of several zoos to join the Roundtable on Sustainable Palm Oil (RSPO) in 2010 (Bredahl, 2015). Their palm oil outreach program involves several aims to provide other AZA organizations information and resources that can be communicated to zoo guests across the country and to offer actions to consumers that will inspire companies to use CSPO in their products. The ultimate objective is to ensure that the production of palm oil worldwide is “certified sustainable by the RSPO, 100% traceable, deforestation-free and no new plantings on peat of any depth.”

Cheyenne Mountain Zoo strongly discourages boycotting products containing palm oil because it is “not a realistic or responsible solution to the palm oil crisis” (Bredahl, 2015). However, until 2010, they did advocate for avoiding products containing palm oil. In that year they learned more about the multitude of issues surrounding the industry. They changed their message to reflect RSPO principles and continue to maintain that being involved in and supporting the RSPO is the most important step to achieving their ultimate goal of driving change.

To support their campaign, Cheyenne Mountain Zoo uses funding from their “Quarters for Conservation” program (Bredahl, 2015). This program allows visitors to pick from six different causes to which they can donate 25 cents of their admission fee (Association of Zoos and Aquariums, 2016b). The six eligible projects are voted on by staff members each year. Since the creation of Cheyenne Mountain Zoo’s palm oil awareness program, it has been one of the Quarters for Conservation options. The funding goes towards visits to sustainable palm oil plantations, observations of orangutan rehabilitation, and participation in meetings and learning experiences about the issues faces by the people in Malaysia and Indonesia. Additionally, the funding has allowed the creation of the online toolkit of resources available to other AZA institutions.

Cheyenne Mountain Zoo representatives have also been active within the AZA in their promotion for palm oil outreach (Bredahl, 2015). They participated in a task force in which the “Palm Oil Position Statement” was approved. Additionally, they have participated in sharing palm oil awareness material at AZA’s National Conference since 2012. Within the RSPO, they have presented on AZA progress on palm oil outreach. Cheyenne Mountain Zoo also utilizes a food and retail service provider who recently became a member of the RSPO. Additional palm oil awareness outreach has been presented to the Orangutan SSP (2010-2015), the gibbon conference (2012) and the Elephant Managers Association (2012).

On zoo grounds, Cheyenne Mountain Zoo promotes palm oil awareness through a number of different and reoccurring educational events that target a variety of different age groups (Bredahl, 2015). These include but are not limited to:

- “Missing Orangutan Mothers” and “Red Ape Rally Days” in which different interactive activities are held; these activities include orangutan natural behavior and painting demonstrations, writing letters, coloring, painting shirts, and a grocery shopping game featuring orangutan-friendly choices.
- Preschool programs including ones dedicated to orangutans, including “Animal Artists,” “1,2 Count the Zoo,” and “Party with the Primates.” These family friendly events feature information about apes and protecting their habitat.
- “Girl Scout Day,” an annual event for girl scouts that features different learning stations including one about palm oil and its relation to orangutans.
- Teacher workshops about the palm oil crisis and conservation actions.
- Integration of palm oil awareness into the zoo’s summer camp (ages 7-12) through themes such as “Playful Primates.”
- Additional events used to promote the zoo’s palm oil awareness campaign include “Groovin’ for Gibbons” Day and Earth Day.

Cheyenne Mountain Zoo has used events outside of the zoo as a platform to promote palm oil awareness. In 2011 they participated in “Annual Pikes Peak Earth Day” in the community of Colorado Springs, where they spoke with attendees about the palm oil crisis, their shopping app, the RSPO, and the importance of purchasing products from companies that belong to the RSPO through their shopping game (Association of Zoos and Aquariums, 2016b).

To track the progress of palm oil awareness projects in other AZA institutions over time, Cheyenne Mountain Zoo created a survey which was administered to institutions in 2011 and again in 2015 (Bredahl, 2015). As Figure 12 shows, in 2011,

41% of zoos surveyed had no message about palm oil available to their visitors and 23% had conflicting messages. In 2015, only 13% had no message and only 3% had conflicting messages. In addition, support for advocating that consumers buy from RSPO member companies jumped up to 61% in 2015 from 17% in 2011. (It is not clear how many responses were included in the survey.)

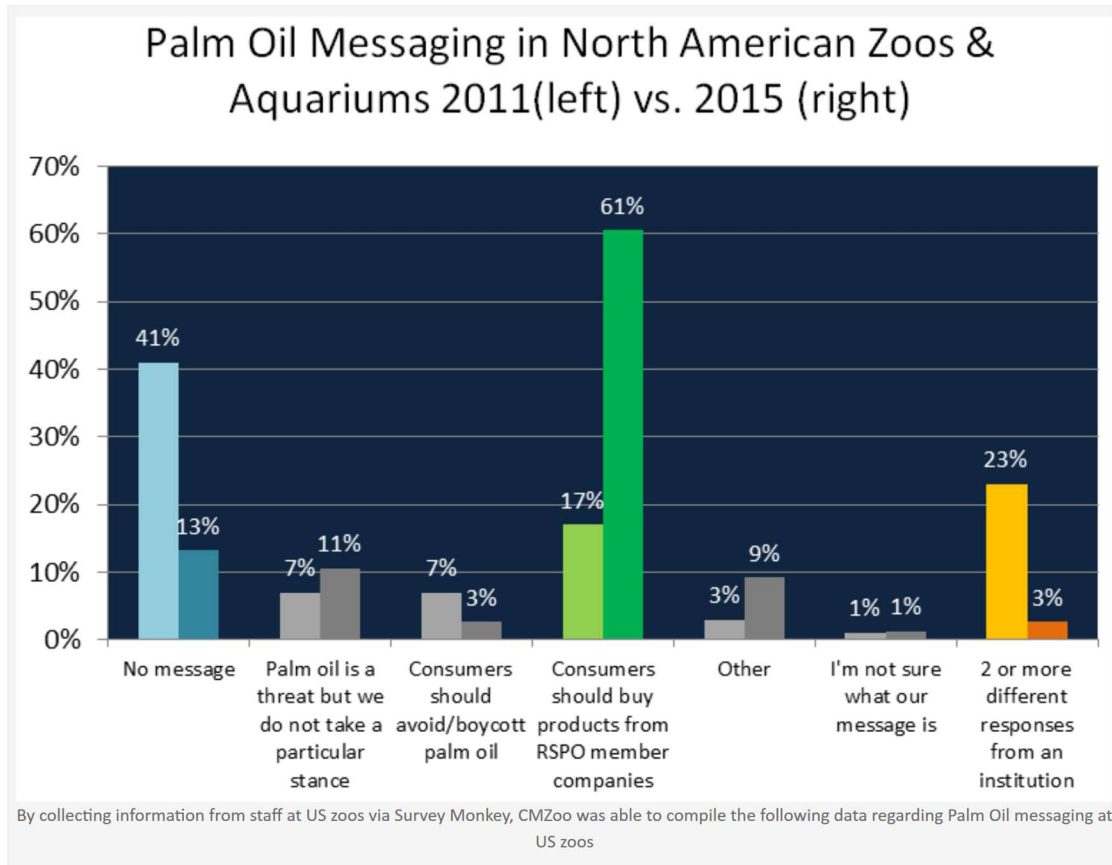


Figure 12: Progress of palm oil programs in AZA institutions in 2011 (left) and 2015 (right)

Source: Bredahl, 2015

Cheyenne Mountain Zoo’s website provides a multitude of online resources promoting palm oil awareness, including their large tool kit of resources specifically for other zoos (Cheyenne Mountain Zoo, 2016d). The tool kit promotes the message:

“PALM OIL CRISIS: Protect Orangutans by Promoting Sustainable Palm Oil & Product Labeling” and includes a large graphic library for other AZA zoos, a photo library with downloadable images, a resource kit with text, graphic and presentation files, and a library of videos about palm oil and orangutans. A 2015 survey indicated that 54 North American zoos and aquariums have utilized materials available in the tool kit (Bredahl, 2015). Cheyenne Mountain Zoo has also received positive feedback from web users and students who have been accessing their materials. Additionally, the zoo maintains palm oil email listserv that provides members an outlet to share news and updates about palm oil. As of October 2015, there were 254 members included.

Cheyenne Mountain Zoo’s webpage about the palm oil crisis is very comprehensive and provides visitors a single place to learn about many different aspects of the palm oil industry (Cheyenne Mountain Zoo, 2016c). Not only does it include basic information about what palm oil is and where it comes from, but it also provides a video entitled “Make a Difference for Wild Orangutans” and information about palm oil derivatives, boycotting, sustainability, impacts on local people, biodiversity in Indonesia, orangutan facts, palm oil as a biofuel, and what the RSPO is doing. This information can be expanded or collapsed so that the page does not overwhelm the viewer with text, and visitors can choose topics of interest to them. At the bottom of the page, Cheyenne Mountain Zoo recommends actions to combat “effects of NON-sustainable palm oil production on orangutan habitat.” These include:

- Using the sustainable palm oil shopping guide app for smart phones developed by Cheyenne Mountain Zoo to shop more responsibly by supporting companies that

belong to the RSPO. The guide has been available since 2013 and has included several updates.

- Writing to favorite restaurants and companies about joining the RSPO over concern for orangutans and the environment. Cheyenne Mountain Zoo has a sample letter available to download on this webpage that people can work with. Their app also allows an easy way to send emails to companies.
- Promoting better labeling by asking RSPO companies to label their products and indicating what percentage of the palm oil they use is certified sustainable and deforestation-free.
- Supporting wild orangutans through ecotourism.
- Continuing to learn and spread information about palm oil to friends and family. Cheyenne Mountain Zoo suggests one way to do this is by sending them a link to their video, which communicates actions meant to make a difference for orangutans.
- Writing to local legislators and the President about not exploring palm oil as a biofuel option.
- Writing to Indonesian and Malaysian government officials and asking them to protect their orangutans.
- Helping with reforestation projects, such as the Orangutan Land Trust, whose goal is to “provide sustainable solutions for the long-term survival of the orangutan in the wild by ensuring safe areas of forest for their continued existence” (Orangutan Land Trust, 2016).

- Purchasing art made by Cheyenne Mountain Zoo’s orangutans; half of each purchase goes towards orangutan conservation.

Cheyenne Mountain Zoo frames their suggestions with positivity and advocates that individuals can make a difference for wild orangutans. Finally, they have a dedicated email for those interested in knowing even more about palm oil issues: palmoil@cmzoo.org (Bredahl, 2015).

b. Indianapolis Zoo

Palm oil awareness mission statement: consumers need to make conscientious choices by supporting production of RSPO certified sustainable palm oil (Laurendine, 2016).

The Indianapolis Zoo, currently located in the White River State Park in Indianapolis, IN, opened in 1964 (Indianapolis Zoo, 2016d). It is a non-profit organization whose operations depend on money received from memberships, admissions, grants, donations, sales, and fundraisers. Not only does it include a zoo, but also an aquarium and botanical garden, housing approximately 1,400 animals and 31,000 plants. Its mission “is to empower people and communities, both locally and globally, to advance animal conservation” (Indianapolis Zoo, 2016b).

I corresponded through email with Indianapolis Zoo’s Conservation Public Relations Specialist, Melanie Laurendine, about their palm oil outreach. Since 2013, the Indianapolis Zoo has been a member of the RSPO (Laurendine, 2016). The Indianapolis Zoo’s outreach began around the development of their Simon Skjodt International Orangutan Center which officially opened in May 2014 (Figure 13). This state-of-the-art facility serves as a hub for orangutan education, research and conservation, and was

designed to stimulate the apes' tremendous physical, social and intellectual abilities (Indianapolis Zoo, 2016e). Additionally, the zoo has found it to be the best possible tool to promote palm oil awareness, on zoo grounds and elsewhere (Laurendine, 2016). Not only does it provide a space for palm oil communication, it inspires care and connection through their orangutans. Visitors can watch as orangutans interact with staff to solve a number of tasks, while learning about their similarities to humans and the researchers working to protect them. Since its opening, the zoo has used the Center as their primary location for palm oil related outreach. Due to its proximity to their orangutans, zoo staff hope their guests will gain a better sense of appreciation and understanding of the relationship between palm oil issues and the loss of ape habitat, and be more motivated to participate in conservation efforts (Laurendine, 2016).



Figure 13. An inside view of Indianapolis Zoo's Simon Skjodt International Orangutan Center

Source: Turner Construction Company, 2016

Indianapolis Zoo has found several communication techniques to be effective in sharing information about the complex issues of palm oil. The different ways they promote awareness within the Skjodt Center include:

- Displays connecting unsustainable palm oil agriculture as a threat to wild orangutans.
- Naturalists dedicated specifically to the center are available to speak with visitors about orangutans, conservation, and news pertaining to palm oil.
- Daily public research demonstrations, where orangutans collaborate on tasks.
- Videos detailing the importance of orangutan conservation and threats to the species in the wild.
- Interactive kiosks provide information about orangutan conservationists studying behavior and ecology working in the field as well as other orangutan conservation news. Kiosks also provide guests with an option to donate to habitat restoration efforts in Kutai National Park. Kutai National Park is a protected forest area located in East Kalimantan, Borneo, Indonesia, that was largely destroyed by fires and development, but is now being recognized as an important habitat for orangutans (Orangutan Conservancy, 2016).

Outside the zoo, palm oil outreach continues with staff members taking part in speaking opportunities at schools, meetings, and other organizations about upcoming projects, new exhibits or conservation initiatives (Laurendine, 2016). They also use social media outlets, including Facebook, YouTube, Twitter, and Instagram as tools to share information with a wider audience. Primarily, they share information about palm oil and conservation stories through blogs, news stories, videos, and more. One of the biggest

stories that have promoted has been Dr. Rob Shumaker's trip to Borneo to further Indianapolis Zoo's work in reforestation efforts in Kutai National Park, as a critical population of apes reside there. Rob Shumaker is Indianapolis Zoo's Supervising VP of Conservation, Science and Education and is also a member of the AZA's Palm Oil Task Force (Indianapolis Zoo, 2016e).

Indianapolis Zoo recommends several actions that their visitors can take to help minimize the detrimental environmental impacts of palm oil agriculture (Laurendine, 2016). They include:

- Learning more about certified sustainable palm oil.
- Purchasing products from companies (food, beauty, etc.) that are orangutan-friendly by using fact sheets and the shopping guide app.
- Sharing knowledge of palm oil with others to increase awareness.
- Supporting reforestation efforts financially, if possible.

The most important message that Indianapolis Zoo wants communicate to their visitors about palm oil is that while orangutans are in trouble and face a conservation crisis because of increased habitat loss, there is still time to help them (Laurendine, 2016). Becoming aware of the effects of palm oil agriculture, finding alternatives and sustainable choices to palm oil, and sharing knowledge about palm oil are all ways to make small and easy lifestyle changes that can have a big impact for these apes and other wildlife.

Since the focus of palm oil outreach within the zoo resides within the Simon Skjodt International Orangutan Center, the primary location of palm oil discussions on Indianapolis' Zoo website is on the page dedicated to the Center (Indianapolis Zoo,

2016e). The page provides a brief introduction to the Center as well as several drop down menus to learn more about orangutans, how the Center was designed for them, the center's green roof, and orangutan facts. Two more tabs discuss Indianapolis Zoo's support for reforestation in Kutai National Park and their support for sustainable palm oil and the RSPO. In the sustainable palm oil section, a link is also provided to their Halloween Candy and Snack Guide, a factsheet provides information about what palm oil is, how palm oil agriculture affects orangutans, and a link to the RSPO to learn more (Indianapolis Zoo, 2016c). The guide also suggests that the best way to promote sustainable palm oil is through supporting companies that are committed to using 100% sustainable palm oil in their products. It shows companies that produce candy and some of their well-known products in two parts: "Best Choices" that include options from companies whose products that do not contain palm oil or which use orangutan friendly palm oil only, and "Alternative Choices" that list companies that have taken some steps towards using orangutan friendly palm oil.

In addition to using social media, Indianapolis Zoo makes blog posts accessible from their website (Indianapolis Zoo, 2016a). Many of these blog post deal with different topics related to the terrestrial and aquatic wildlife as well as botanicals at the zoo. They have many posts about the palm oil issue since the blog began in March 2014. These palm oil posts relay information about current news and tie into events such as "Orangutan Caring Week" and "World Orangutan Day." They have also used the blog to promote their candy guide in relation to Halloween and the Cheyenne Mountain Zoo's shopping guide app, as well as information, pictures, and a video of the zoo's role in the reforestation project in Kutai National Park.

c. Oakland Zoo

Palm oil awareness mission statement: because palm oil threatens wildlife, it is imperative that consumers know their role (Gotliffe, 2016b).

The Oakland Zoo was first established in 1922 in downtown Oakland, CA (Oakland Zoo, 2013c). The non-profit organization currently occupies about 100 acres in Knowland Park in southeastern Oakland, and provides homes to over 660 species. Their mission is “to inspire respect for and stewardship of the natural world, while providing a quality visitor experience” (Oakland Zoo, 2013b).

I communicated by email with Amy Gotliffe, Oakland Zoo’s Conservation Director. The Oakland Zoo began their palm oil outreach around 2008 (Gotliffe, 2016b). With their outreach, they hope to “get the word out about the plight of wildlife impacted by the unregulated palm oil practices and educate people on how to avoid supporting unsustainable palm oil in their everyday lives” (Oakland Zoo, 2013a). Thus, they advocate for consumers to buy sustainable palm oil, or avoid the product, and speak out on behalf of the affected wildlife. The primary species the Oakland Zoo uses as a platform for discussion on this topic are their sun bears, next to which their palm oil display is located (Gotliffe, 2016b).

Oakland Zoo has a web page devoted specifically to information about palm oil under their “Take Action” section (Oakland Zoo, 2013a). This page offers a brief introduction to palm oil and its impacts on the environment, and lists some consumer products known to contain palm oil. The page also delves into conservation issues surrounding palm oil, possible solutions, and the zoo’s role in outreach and education,

help for wildlife, and in-field expertise. Lastly, some actions visitors can take to mitigate the impacts of palm oil agriculture are listed, including:

- Purchasing products without palm oil or with CSPO.
- Supporting companies that have joined the RSPO, with the help of Cheyenne Mountain Zoo's shopping app.
- Writing to restaurants and companies about concerns over unsustainable palm oil use and asking them to join the RSPO; a sample letter is provided.
- Increasing the value of tropical rainforests that are threatened by palm oil agriculture by travelling to them. The Hutan Project, which studies orangutans in Malaysian Borneo (HUTAN Kinabatangan Orang-utan Conservation Programme, 2016), and the Bornean Sun Bear Conservation Centre, an rescue, rehabilitation, and awareness center in Sabah, Malaysia (BSBCC, 2015) are mentioned as resources to further look in to.
- Sending letters to local legislators as well as the President expressing concern over using palm oil as a biofuel.
- Writing to the government leaders of Indonesia and Malaysia about preserving habitat for their unique wildlife.
- Supporting land conservation by becoming involved in organizations purchasing land for this purpose.

While Oakland Zoo recommends buying products from RSPO companies committed to using CSPO, they also believe that RSPO standards are not adequate enough because the guidelines still allow for habitat destruction (Oakland Zoo, 2013a). Instead, they promote “responsible palm oil” that does not contribute to the destruction of

either forests or peat lands. This is somewhat contradictory and confusing since on the same web page the Oakland Zoo tells visitors that RSPO labels can be misleading and thus they must avoid all products containing palm oil, and later asks them to support companies that have joined the RSPO and promote -sustainable palm oil.

Oakland Zoo targets younger demographics with their palm oil outreach as well. They have put together a palm oil factsheet designed specifically for kids (Oakland Zoo, 2016). This factsheet focuses on how kids can help elephants that are impacted by the palm oil industry, such as by having their parents use the palm oil shopping app or educating fellow students about elephants. A link to the “Official Elephant Kids Club” is provided to get kids excited about learning more.

In a document from 2013 entitled “Communicating Conservation: Using Volunteers to Spread Your Message,” the importance of using volunteers to increase the knowledge and awareness of different issues to zoo visitors is presented (Burnett and Sievert, 2013). Specifically concerning palm oil, Oakland Zoo has used several techniques to better communicate conservation issues to its visitors through volunteers. Volunteers assist at “Rainforest Stations” which promote the palm oil shopping guide with a palm oil shopping game. They reinforce the message that consumers need to make informed shopping choices in order to protect rainforests, and that the most responsible decision supports companies that belong to the RSPO. Volunteers also advise against boycotting of palm oil products because Oakland Zoo does not believe that is a viable or responsible solution.

In addition to outreach onsite, Oakland Zoo participates in several conservation efforts relating to the issue of palm oil (Oakland Zoo, 2013a). They include:

- Hosting eco-trips to Borneo.
- Partnering with Southeast Asian conservation non-profits such as the Bornean Sun Bear Conservation Centre.
- Providing medical assistance and other volunteer support to sun bears at the Bornean Sun Bear Conservation Centre.

Oakland Zoo is active on many social media platforms, including Facebook, Twitter, and YouTube. They have a newsletter and a blog, which has several posts mentioning palm oil. In a post from January 2016, the issues surrounding palm oil agriculture are reiterated as are the actions mentioned on the zoo's palm oil page in relation to shopping for the upcoming Valentine's Day (Gotliffe, 2016a). In particular, products containing palm oil should not be purchased unless the palm oil is sustainable, as indicated by the Cheyenne Mountain Zoo's shopping guide app. Other social media posts echo similar concerns in conjunction with purchasing Easter candy.

d. Philadelphia Zoo

Palm oil mission statement: to stop deforestation in order to protect habitat for wildlife (Peckham, 2016). "By driving demand for palm oil that's 'deforestation-free,' reducing waste, and reusing and recycling paper products, UNLESS Project advocates can help protect the forests where gorillas and other wildlife live. Together, we can save them" (Philadelphia Zoo, 2016c).

The Philadelphia Zoo is America's first zoo, officially opening in 1874. It currently spans 42 acres, houses more than 1,300 animals, and has approximately 1.35 million visitors each year (Philadelphia Zoo, 2016a). The zoo hopes that "by connecting

people with wildlife, the Philadelphia Zoo creates joyful discovery and inspires action for animals and habitats” (Philadelphia Zoo, 2016d).

Valerie Peckham serves as the Conservation Program Manager at the Philadelphia Zoo. We spoke on the phone and communicated through several follow-up emails. Philadelphia Zoo has named their outreach program on palm oil “the UNLESS Project”, and they use multiple tactics within the program to promote their position on palm oil: that palm oil agriculture needs to be deforestation-free (Peckham, 2016). The Philadelphia Zoo started their palm oil outreach in 2012 using their orangutans as a platform. One of their first projects was called “Leaves of Gratitude” with a station set up near the orangutan exhibit. This program allowed visitors of the Philadelphia Zoo to advocate about palm oil in positive way by sending messages (on leaf shaped paper) to companies committed to using certified sustainable palm oil. Philadelphia Zoo then sent these “leaves” in bulk to each company. The zoo heard back from about 30% of the companies wanting to know more about the palm oil program or to become involved. Although the project is no longer running, it demonstrates one way of successfully jumpstarting a palm oil awareness initiative.

As mentioned, the UNLESS Project lies at the root of Philadelphia Zoo’s current palm oil outreach program (Philadelphia Zoo, 2016c). Ultimately, the UNLESS Project will build a database of advocates and will facilitate communication between consumers and manufacturers using palm oil (Peckham, 2016). The project’s webpage includes a variety of ways people can take action to help mitigate deforestation and habitat loss for wildlife caused by palm oil agriculture as well as the demand for pulp and paper (Philadelphia Zoo, 2016c). The various options include:

- Send a message

This is a quick and easy online extension of the “Leaves of Gratitude” project.

Anyone can easily fill out the form, which includes selecting one of four companies, filling out personal information, and sending either a pre-fabricated or personal message thanking them for promising to use deforestation-free palm to protect wildlife. The number of supporters and names of recent supporters also appear on the page.

- Follow Gerry

Gerry Ellis is a photojournalist and conservation partner to the Philadelphia Zoo.

This page offers the opportunity to learn more about his project “Great Apes 2020” which includes traveling throughout Africa and Asia to determine if great apes and other primates will still be able to survive in the wild by the year 2020 with all the challenges they face, including habitat loss due to palm oil agriculture. A video and map are included as well as a form to fill out personal information to join the UNLESS Project and learn more. As a way for people to become more interactive, the hashtag #AskGerryEllis is provided for anyone who would like to ask Gerry a question, which he answers from the field during his regular updates which are shared through Philadelphia Zoo’s social media outlets, as well as their Gorilla Grumbles blog.

- Stop your junk mail

This page allows users to opt out of receiving “junk” mail in order to use less paper and therefore forest products, ultimately helping to protect wildlife. While

this initiative is not directly tied to palm oil agriculture, it does promote habitat conservation by reducing deforestation.

- Little cats for big cats

This action focuses on supporting Kellogg's, a leading company in committing to deforestation-free palm oil. Philadelphia Zoo believes that by supporting Kellogg's, big cats such as Sumatran tigers may be one step closer to not having to face habitat loss. Through this action, the user can upload a picture of their own cat and send it and a message to support Kellogg's, and to encourage them to keep sharing the milestones they reach on the way to using guaranteed deforestation free palm oil. This part of the UNLESS Project is also promoted within the Philadelphia Zoo at their Big Cat Center. Note: As of April 2016, the page was last updated in summer 2015.

- News and updates

This page lists articles relevant to palm oil news and updates; however, as of April 2016, there were been no new posts since July 2015.

- #Fieldfotofriday

The most recent Instagram post relating to Gerry Ellis' field work appears on this page with the option to look through older posts.

A majority of palm oil advocacy takes place in Philadelphia Zoo's Big Cat Center, where visitors have access to a photo booth where they can pose with a replicated big cat and computer stations where they can access their photograph and sign up with the UNLESS Project (Peckham, 2016). The photos then become part of a larger mosaic of pictures depicting a tiger face. Such activities connect visitors to big cats through their

own housecats, and allow the zoo to continue building their database of names and emails of people interested in learning more about and promoting deforestation-free palm oil. Also located in the Big Cat Center are drone videos (ConservationDrones.org, 2016) of deforested land and palm plantations to show visitors how widespread and devastating the impacts of palm oil agriculture can be. Finally, Philadelphia Zoo also uses infographics such as the one below (Figure 14).

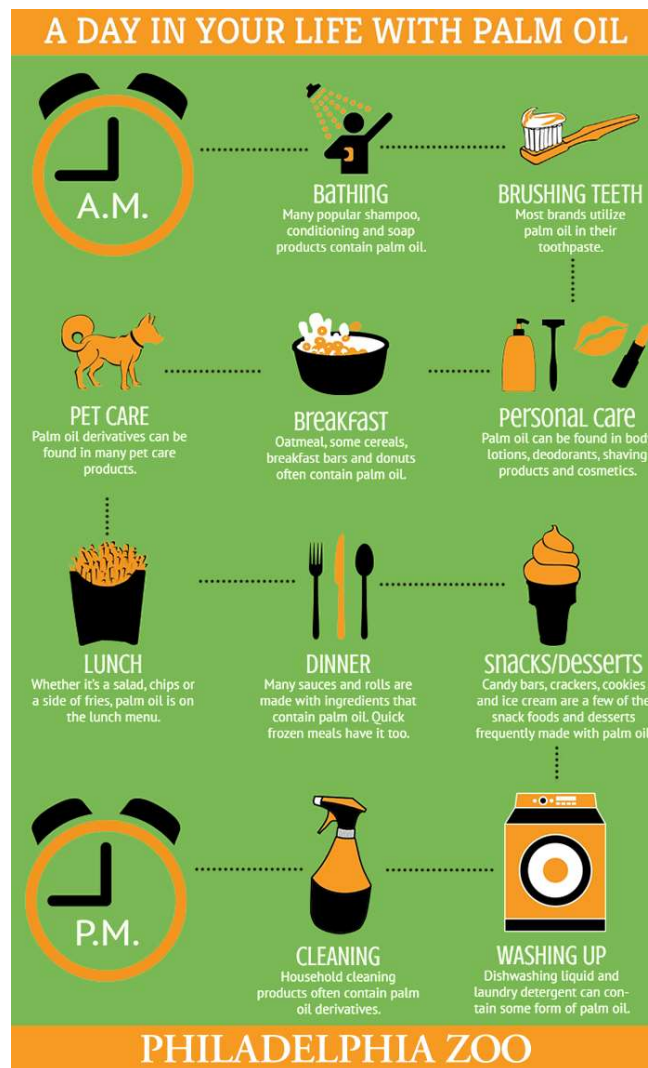


Fig 14: Infographic used at Philadelphia Zoo showing use of products that may contain palm oil throughout a typical day

Source: Valerie Peckham, 2016

Palm oil awareness promoted in other areas of the zoo involve keeper talks and behind-the-scenes tours, although work is needed to make the message more effective (Peckham, 2016). Other efforts include information about palm oil in displays in multiple locations by species affected by its agriculture. Internal training of both employees and volunteers help continue education. Bi-weekly member newsletters also keep zoo members informed about palm oil issues. Philadelphia Zoo does not hand out any materials about palm oil to visitors; instead, they focus on electronic content. They feel that by encouraging visitors to sign up for the UNLESS Project, they can keep the interested parties up-to-date on palm oil issues and invite them to programs or dialogues. It also allows them to stay in touch with, engage, and create a comprehensive database of people who are interested in advocating for deforestation-free palm oil. In this way, the awareness can travel beyond the zoo grounds.

Philadelphia Zoo used to have a wallet card available to visitors, and in fact, the card can be seen online (Philadelphia Zoo, 2012). The card, produced in 2012, lists “Companies Committed to Sustainable Palm Oil” and focuses on providing information about Sumatran orangutans, impacted by habitat loss. The purpose of the card was not only to educate people about palm oil issues but also to inform them about which companies they should support based on a list from the RSPO. The zoo has changed their message about palm oil since 2012, and no longer use the card because they no longer fully endorse the RSPO’s position on sustainable palm oil (Peckham, 2016). The zoo’s position is that the RSPO is not doing enough by just advocating for sustainability: they believe CSPO does not necessarily mean deforestation-free. In this way, the Philadelphia Zoo prefers to avoid using the word sustainable in favor of deforestation-free as not to

confuse visitors. While they do not have a current wallet card available, they are not against having one; they just recommend it be updated at least twice a year due to keep up with the most recent information available.

The most important message Philadelphia Zoo communicates to its visitors concerning palm oil is the importance of letting manufactures know they care about the environmental issues surrounding palm oil and that they would like to know how the palm oil manufactures use is deforestation free, because consumers have the power to influence companies (Peckham, 2016). Thus, Philadelphia Zoo recommends their visitors promote deforestation-free palm oil by focusing on the positive: by providing encouraging feedback to companies and manufacturers that have pledged to use deforestation-free palm oil in their products. They ask that their visitors write to these companies thanking them for their commitments and to show the positive impact they are having on wildlife habitat. This, in turn, may put pressure on other companies to do the same. They also would like to make it clear to their visitors that boycotting manufactures will not solve the problem; they want their visitors to focus on making sure palm oil is grown without destroying habitat. Philadelphia Zoo has taken the position that boycotting is likely to be ineffective in part because palm oil is an economic driver that is not projected to diminish in the near future.

Philadelphia Zoo promotes several social media outlets on their webpage, including Facebook, YouTube, Twitter, and Pinterest. They have found that Twitter works best for starting conversations and Instagram works best for getting people to click on a link (Peckham, 2016). They feel that using any type of social media is an opportunity to make connections but that every zoo is different and should find which

platform works best for them with the help of a social media specialist. They also have a several blogs, including Gorilla Grumbles, Frog Blog, Big Cat Blog, Rodrigues Fruit Bats, and Dr. Baker Visits China (Philadelphia Zoo, 2016b). These blogs focus on conservation and allow people to keep up with what zoo staff are doing to help animals both locally and internationally. Both the Gorilla Grumbles and Big Cat Blogs allow visitors to discuss the challenges faced in palm oil agriculture.

e. San Diego Zoo

Palm oil mission statement: San Diego Zoo Global supports the RSPO in its endeavors to make the palm oil industry more sustainable (Hall, 2016).

Dr. Harry Wegeforth founded the San Diego Zoo in 1916; today the non-profit organization San Diego Zoo Global operates the zoo, the San Diego Zoo Safari Park and the San Diego Zoo Institute for Conservation Research, the largest based conservation center in the world (San Diego Zoo Global, 2016a). “San Diego Zoo Global is committed to saving species worldwide by uniting our expertise in animal care and conservation science with our dedication to inspiring passion for nature” (San Diego Zoo Global, 2016a). Today, the 100-acre zoo houses more than 3,700 animals representing over 650 species. It also has a large botanical collection of over 700,000 plants. The San Diego Safari Park, opened in 1972, covers over 1,800 acres in the San Pasqual Valley (about 30 miles away from the zoo), and contains over 2,600 animals representing more than 300 species. San Diego Zoo Global has the largest number of members of any zoological association in the world, with more than half a million people.

I spoke with Suzanne Hall, Research Coordinator for Conservation Partnership Development at the San Diego Zoo Institute for Conservation Research about the palm

oil outreach occurring in the San Diego Zoo and Safari Park. San Diego Zoo Global has been an active RSPO member since 2012 and has recognized habitat destruction due to palm oil agriculture as an important issue for years before that (Hall, 2016). At the beginning, zoo staff were unsure how to best address this complex issue, and decided to eliminate palm oil from all of their products. Further direction from the conservation community and the RSPO led them towards sustainability instead of boycotting, and they verified that all new products used or sold at the zoo and Safari Park containing palm oil came from RSPO member companies.

On site, there is not a large focus in educating visitors about the palm oil crisis (Hall, 2016). This is largely due to a concern over promoting specific brands as more sustainable than others when it comes to palm oil usage. Thus, the San Diego Zoo does not provide shopping guides or lists to their visitors as do many other zoos. The staff may simply advise their visitors to check out the RSPO website to learn more about sustainable products. The San Diego Zoo does take a stand against boycotting palm oil--they believe boycotting absolves the individual of the ability to have an impact on the industry; instead, individuals need to stay involved and help push consumers towards companies committed to using sustainable palm oil.

During a visit to the San Diego Zoo, I observed most of the information about palm oil was located on signs adjacent to the orangutan exhibit. These signs provided general information about palm oil and how palm oil production affects orangutans in the wild. The signs urge readers to visit the RSPO website to learn more about palm oil and the efforts it more sustainable (See Figure 15).



Figure 15: Palm oil displays by the orangutan exhibit at the San Diego Zoo, December 2015

Source: Allison Wyatt

San Diego Zoo also provided a wallet card the size of a business card that visitors could take with them available on a table by the orangutan exhibit (Figure 16). This card briefly describes palm oil's relation to deforestation and orangutans, and lists palm oil derivatives found among the ingredients list of many packaged foods. However, it does not advise any specific actions to take regarding consumption of products that contain palm oil or its derivatives; it simply encourages readers to “know before you buy,” suggesting that palm oil should be avoided. I was advised that many times there would be a docent at the table to further educate visitors, although during my visit that docent was absent.

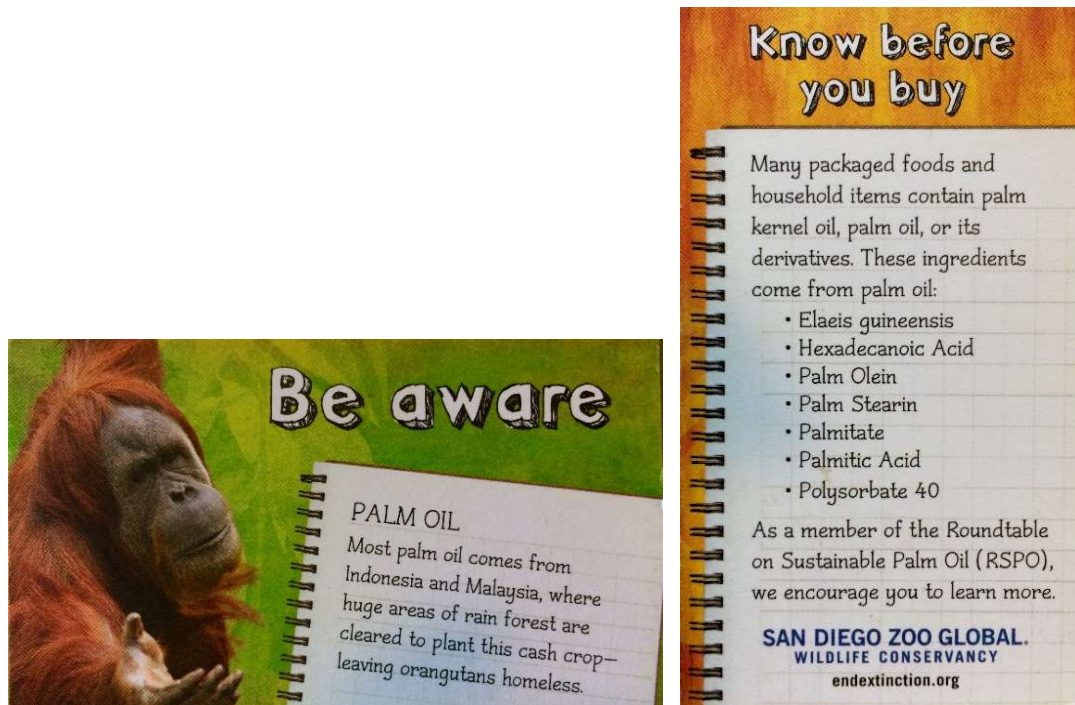


Figure 16: San Diego Zoo palm oil wallet card, front and back

Source: Allison Wyatt

At the San Diego Zoo Safari Park, a sign at the Sumatran tiger exhibit briefly mentions how the environment is affected by removing animal habitat and replacing it with palm oil plantations (Figure 17). A zoo keeper inside the tiger exhibit also mentioned the threats the tigers faced in the wild, including increased land clearing for palm oil agriculture. Additionally, the San Diego Zoo Safari Park has a number of bird species affected by palm oil agriculture, mentioned during a slide show before one of their bird shows commenced. The slide show recommended visiting the RSPO website to learn more.

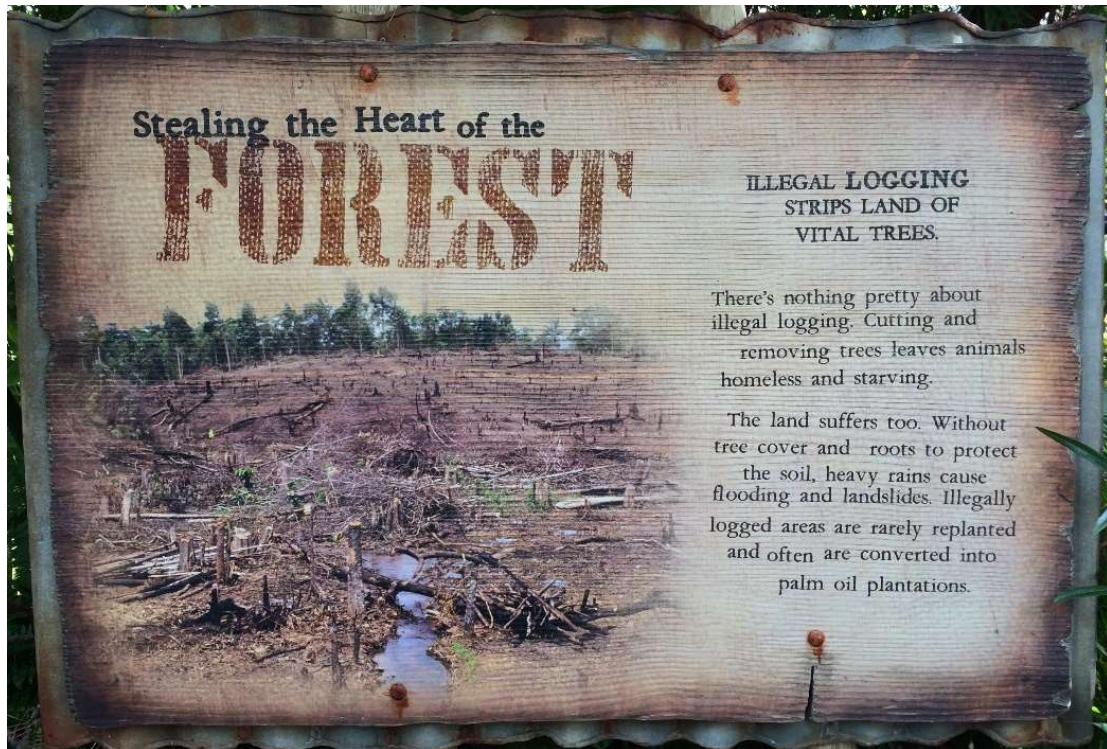


Figure 17: Sign at the Sumatran tiger exhibit, San Diego Zoo Safari Park, December 2015

Source: Allison Wyatt

Because San Diego Zoo Global is less aggressive in their palm oil outreach than many other zoos, they do participate behind the scenes in palm oil conservation issues. They focus much of their efforts on being active within the RSPO, such as being involved in conferences, voting in general assemblies, engaging in discussions, attending all sessions, and taking trips to Southeast Asia to gain further understanding of how the industry affects the region (Hall, 2016). Internally, they educate their staff on a regular basis about palm oil and why they support the RSPO and sustainable palm oil through talks and employee newsletters. This is especially important as new employees are brought in and for keeping everyone up-to-date with new information.

Outside of the zoo, San Diego Zoo Global has participated in collaborations with companies such as Nuobia San Francisco (Wildlife Friendly Enterprise Network, 2015).

This confectioner has committed to using ingredients that are wildlife friendly and humanely sourced. San Diego Zoo Global joined in community events as well. In 2008, their booth at the Living Expo in San Francisco helped increase awareness and raise funds for orangutan conservation, specifically orangutans orphaned in Borneo due to the palm oil industry (Fernandez, 2008). To do this, they showcased orangutan photos and artwork by one of their Bornean orangutans, had pamphlets and orangutan plush toys available to visitors, and collected cash and online donations.

Unlike the other zoos I examined, the San Diego Zoo website does not have a specific page on their website devoted to palm oil. Instead, the majority of information regarding palm oil is located within their blog (San Diego Zoo Global, 2016c). Multiple blog posts detail the complex issues that come with the palm oil industry, the species in their zoo and safari park affected in the wild by loss of habitat for palm oil plantations (namely Sumatran tigers, sun bears, and orangutans), and advocacy for the RSPO and certified sustainable palm oil. One of the reoccurring themes in these blog posts is to support those companies which are progressing toward a sustainable future for the palm oil industry by becoming RSPO members. Many of these post include pictures or videos of these animals affected by habitat loss due to increasing plantations. Another feature of the blog is the ability of anyone to post comments, which has resulted in an open dialogue between interested readers.

Additional information about palm oil on the website includes articles in newsletter ZOONOOZ, sent to members and available online (San Diego Zoo Global, 2016d). The San Diego Zoo occasionally uses social media outlets, including Twitter and Facebook, to spread awareness about palm oil issues. Also available is a large online

library of conservation resources regarding palm oil (San Diego Zoo Global, 2016b). It contains references to books, videos, and journals on the subject, as well as key websites which include organizations with up-to-date information and news related to palm oil and consumer links, and items like shopping guides and company lists produced by organizations including other zoos. Lastly, the webpage provides a bibliography of recommended peer-reviewed articles with free access online.

5. Discussion and Recommendations for Woodland Park Zoo

I have several recommendations for Woodland Park Zoo based on the results of the palm oil awareness survey conducted on zoo grounds and the outreach programs of the zoos I surveyed across the United States. They will address my research questions, 1. What outreach programs have other zoos developed and/or implemented in the United States around the issue of palm oil? and 2. Can these programs and techniques be applied to a new and innovative palm oil outreach program at Woodland Park Zoo?

5.1 Palm oil awareness survey

The survey completed by Woodland Park Zoo visitors suggests that zoo goers connect the term palm oil with knowledge of where it comes from and its detrimental impacts on the environment. The understanding of palm oil agriculture's detrimental environmental impacts also correlates strongly with knowing where palm oil comes from and being aware of products in the household which contain palm oil. Lastly, there is a correlation between being interested in learning more about the palm oil industry and in learning actions that can contribute to a more sustainable future for tropical forests. This shows that Woodland Park visitors are interested in learning more about conservation issues.

There were several survey questions that demonstrated weak correlations. Namely, visitors had trouble linking their interest in learning about actions they should take contribute to a more sustainable future for tropical forests with 1. knowing where palm oil comes from, 2. being aware of household products containing palm oil, 3. understanding the detrimental environmental impacts of palm oil agriculture, and 4. identifying Woodland Park Zoo species impacted by palm oil agriculture. Additionally,

there was little correlation between being concerned about deforestation and habitat loss for species with an interest in learning more about the palm oil industry.

The results broadly suggest that Woodland Park Zoo visitors who answered the survey are aware of palm oil also understand where it comes from and its impacts on the environment, and may even be aware of some of the products that contain palm oil. These results were expected since palm oil is often mentioned in conjunction with those same details. The results also highlighted that those interested in learning more about palm oil were also interested in protecting tropical forests; conversely, those who were neutral or not interested in learning more about palm oil also felt the same way about the protection of tropical forests. The weak correlations between survey questions shows that awareness about many aspects of palm oil does not relate to the interest that Woodland Park Zoo visitors have in protecting tropical forests. This suggests that many do not connect palm oil to the deforestation of tropical forests, showing a great need to stress this aspect in the palm oil awareness programs in Woodland Park Zoo. The connection between palm oil and deforestation also shows up in the weak correlation between concern about deforestation/habitat loss for species and an interest in learning more about the palm oil industry. Because deforestation of tropical forests due to the expanding palm oil industry is decreasing habitat and subsequently threatening the survival of many species (Wilcove and Koh, 2010), it is problematic that many visitors do not understand the close relationship between these topics. This directly relates to the AZA's position on palm oil and its "goal of habitat protection that sustains wildlife" by breaking the link between palm oil production and deforestation (Association of Zoos and Aquariums, 2014c). Woodland Park Zoo should therefore take the following recommendations into

account while tying them back to the relationships between palm oil, deforestation, and habitat loss.

5.2 Personal communications

a. Mission statement and position on palm oil

All zoos I examined have a clear position statement on palm oil (though not all were available online), which is key to successful communication because it sums up the zoo's general views on the topic and sets visitors up for learning more about why the zoo feels the way that it does. The Cheyenne Mountain Zoo and Philadelphia Zoo have modified their positions since they first began their outreach as new information about palm oil has become available. Since the palm oil industry is in a state of rapid growth and expansion (Index Mundi, 2015), zoos need to keep up with the current research and have the flexibility to adjust outreach goals and information in order to stay relevant. The zoo's position statements take a positive approach: each zoo wants their visitors to realize that they can personally contribute to mitigating the impacts of the palm oil industry and that the species affected by it can still exist in the wild. It's not too late to do something.

For example, palm oil position statements may include:

- Cheyenne Mountain Zoo: "To make a difference for wild orangutans by raising awareness about the palm oil crisis and encouraging people to take action by providing tools and information that will allow them to make globally responsible consumer choices" (Bredahl, 2015).
- Indianapolis Zoo: "The most conscientious choice we can make in the palm oil crisis is to support the production of certified sustainable palm oil (CSPO)" (Laurendine, 2016).

- Oakland Zoo: “Palm oil is a great threat to wildlife. It is imperative that consumers know their role. Each of us must choose to buy sustainable palm oil or avoid the product and speak out on behalf of the affected wildlife” (Gotliffe, 2016b).
- Philadelphia Zoo: “By driving demand for palm oil that’s ‘deforestation-free,’ reducing waste, and reusing and recycling paper products, UNLESS Project advocates can help protect the forests where gorillas and other wildlife live. Together, we can save them” (Philadelphia Zoo, 2016c).
- San Diego Zoo: “We support the RSPO in its endeavors to make the palm oil industry more sustainable” (Hall, 2016).

During the course of my research, I realized the need for clear definitions of terminology. This begins with zoo’s palm oil positions. Valerie Peckham (2016) of Philadelphia Zoo noted that zoo visitors can easily get confused if they are being told too many different things. This is why they choose to advocate for “deforestation-free” palm oil. Words such as “sustainable” can mean different things to different people, and likely do not understand how it applies to palm oil. Caro (2010, p. 3) also underscores the importance of having these types of conservation “buzzwords” clearly defined with clear objectives if they are to be effective. Woodland Park Zoo may also consider defining words such as plantation, monoculture, slash and burn, boycott, conservation, and preservation, to name a few, which visitors may not understand, particularly in the context of the palm oil industry.

b. Awareness within the zoo, activities, and special events

Charismatic megafauna are often used in promoting conservation because they attract the attention of the public (Caro, 2010, p.283). These species act as surrogate species, which “are used to represent other species or aspects of the environment to attain a conservation initiative” (Caro, 2010, p. 1). While information about palm oil may be spread throughout the zoo, namely in relation to the animals affected by its agriculture in the wild, many zoos concentrate their efforts around a single surrogate species. Many species typical in zoos lose habitat due to palm oil agriculture, including orangutans, tigers, and sun bears. Indeed, orangutans have overwhelmingly become the surrogate species for the palm oil crisis, and zoos like Cheyenne Mountain and the Indianapolis Zoo enlists their orangutans as the primary species in the promotion of palm oil awareness. Other large, rare, and charismatic species are used in other zoos: Philadelphia Zoo promotes palm oil awareness with their big cats while Oakland Zoo focuses on sun bears. Indianapolis Zoo has found that by concentrating their palm oil outreach efforts within the Simon Skjodt Orangutan Center, they are able to connect their visitors emotionally to the plights of wild orangutans through exhibits, videos, naturalist speakers, and interactive kiosks (Laurendine, 2016). Philadelphia Zoo similarly focuses their palm oil outreach in their big cat center, which includes interactive computers to encourage visitors to advocate for wild cats through their housecats (Peckham, 2016). Woodland Park Zoo has several species, including orangutans and Sumatran tigers, which may effectively serve as their palm oil outreach surrogate species. Based on the recommendations of the surveyed zoos, Woodland Park Zoo should focus their outreach

around one species while continuing to promote palm oil awareness throughout the zoo when relevant to another species whenever possible.

The zoos studied for this thesis have used onsite activities to help their visitors of all ages learn about the impacts of palm oil agriculture. At Philadelphia Zoo, this included their leaves of gratitude activity and interactive computer programs (Peckham, 2016). The zoos have designed these activities to advise visitors of companies committed to reducing the environmental impacts of palm oil. With leaves of gratitude, thousands of messages written on “leaves” were sent to multiple companies, and about a third of companies responded back wanting to know more about the project. Philadelphia Zoo found success with this project because it allowed people to advocate about palm oil in a positive way while giving companies positive attention.

Cheyenne Mountain Zoo in particular mentioned having children involved in learning about palm oil through several different preschool programs, summer camps, and programs for girl scouts (Bredahl, 2015). Oakland Zoo provides an online Kids Palm Oil Factsheet (Oakland Zoo, 2016). Providing children with activities about wildlife affected by palm oil is an opportunity for a fun learning experience as well as helps educate their parents.

Zoos also use other platforms like zoo keeper talks or animal encounters to educate visitors about palm oil. Employees and volunteers who are available for questions about palm oil near the zoo’s primary palm oil display is also an important communication tool in terms of educating zoo visitors. Special events provide additional platforms in which to increase palm oil awareness. These events can relate to wildlife affected by palm oil agriculture such as “Orangutan Caring Week” in November and

“World Orangutan Day” which is August 19. Holidays like Easter, Valentine’s Day, and Halloween are often associated with candy, and because many types of candy contain palm oil, provide an opportune time to promote buying candy from companies that are committed to using only sustainable or deforestation-free palm oil. Woodland Park Zoo can increase their palm oil awareness by taking advantage of these techniques.

Only the San Diego Zoo provided visitors with physical material related to palm oil; the other zoos instead referred to online resources, including but not limited to shopping guides, the RSPO website, and other literature. This not only saves money when it comes to printing costs but also paper resources. These online materials can also be continually updated, for example, when a company updates their sustainable palm oil commitment. Furthermore, it opens the door for increased communication beyond the zoo regarding palm oil, which will be discussed below.

c. Awareness outside the zoo

There are many ways for zoos to advocate for palm oil awareness outside the zoo itself. Indianapolis Zoo’s staff takes part in speaking opportunities at schools, meetings, and other organizations to speak about conservation initiatives and their Simon Skjodt International Orangutan Center (Laurendine, 2016). While not heavily involved in visitor outreach, San Diego Zoo Global stays involved in conferences and zoo staff trips to Southeast Asia (Hall, 2016). Oakland Zoo hosts eco-trips to Borneo and supports the Bornean Sun Bear Conservation Centre (Gotliffe, 2016). Cheyenne Mountain Zoo has lead trips to and worked with conservation organizations in Indonesia and Malaysia, presented in numerous conferences, and has spoken about palm oil at community Earth Day events (Bredahl, 2015). Philadelphia Zoo recommends compiling a database of

individuals most interested in palm oil issues, gathered through their kiosks and UNLESS Project website (Peckham, 2016). Those on the database can be invited to programs and informal gatherings to keep the conversation about palm oil going to continue spreading awareness beyond the zoo. In sum, education about palm oil issues does not end when people leave the zoo.

d. Internal communication

Several zoos, including those in Philadelphia, San Diego, and Oakland, mentioned the importance of keeping staff and volunteers educated about the issues of palm oil. This is especially important to do on a regular basis with the addition of new staff and the current events and news within the palm oil industry. Staff and volunteers serve as the face of the organization, so it is imperative that they are able to answer questions and speak knowledgeably with visitors about palm oil. They also must know the zoo's position on the subject and why; for example, why sustainability is recommended and boycotting is discouraged. This can be done through regular trainings, presentations, and newsletters. Additionally, knowledgeable staff and volunteers can assist in palm oil related activities at the zoo and elsewhere.

e. Action: consumer choices

All zoo representatives who participated in this research were in agreement that the best way for people across the United States to help mitigate the palm oil crisis revolves around purchasing products strategically based on company's palm oil policies. Those from zoos that are members of the RSPO (Cheyenne Mountain Zoo, Indianapolis Zoo, and San Diego Zoo Global) specifically mention supporting companies which have joined the RSPO and are committed to using CSPO. Philadelphia Zoo prefers to promote

deforestation-free palm oil instead of CSPO by the RSPO--the requirements for CSPO are not strong enough to prevent all deforestation, and preventing deforestation is the best way to protect habitat for wildlife. Oakland Zoo has similar views about the RSPO, however, they still recommend supporting companies belonging to the RSPO as a primary action.

The AZA's palm oil statement supports "market transformation by driving demand for traceable palm oil not linked to deforestation and a transparent process to ensure this shift is moving forward" (Association of Zoos and Aquariums, 2014c). While the Association acknowledges and supports the work of the RSPO and their role in moving the palm oil industry towards sustainability, it does not believe current RSPO certification criteria are quite strong enough to ensure truly CSPO. The AZA believes that citizens from developed countries such as the United States are key to driving the global market towards deforestation-free CSPO.

Encouraging sustainable palm oil use by companies in the United States depends largely on public support (Wilcove and Koh, 2010). Koh and Lee (2012) agree that changing consumer behaviors influences the severity of environmental impacts of vegetable oil agriculture like palm oil. Their model suggests that the business-as-usual course of action will increase demands for oil, leading to more deforestation in tropical regions. However, even minor changes in consumer behavior could reduce pressure on the environment. They found that if each person in the European Union and United States were to reduce their daily oil consumption by 25 grams (just 5 teaspoons), demand for vegetable oil such as palm oil would be reduced by half, substantially alleviating pressure to increase agriculture in the tropics. Fitzherbert et al. (2008) suggest that producers who

are committed to using palm oil sourced in a more environmentally friendly way is commendable but not enough to protect tropical biodiversity; instead, governments in countries that produce palm oil must take a bigger role in controlling and regulating palm oil plantations. Wilcove and Koh (2010) found that in order to sufficiently address the threats to biodiversity from palm oil agriculture, pressure must be put upon Southeast Asian governments to stop converting forests to plantations.

f. Additional actions

In addition to supporting companies dedicated to sourcing deforestation-free and/or CSPO, zoos provided visitors with several other actions to help reduce harmful impacts of the palm oil industry, including:

- Using the Cheyenne Mountain shopping guide, as well as other available shopping and candy lists, to inform purchases.
- Writing to companies and restaurants about joining the RSPO or thanking them for their commitment to sustainable palm oil.
- Asking RSPO members to label their products with the RSPO logo for easy identification.
- Supporting wildlife like orangutans through ecotourism; this will increase the value of species habitat.
- Learning more about CSPO and educating family and friends about palm oil.
- Writing to local legislators and the President about not using palm oil as biofuel.
- Writing to the Indonesian and Malaysian governments about protecting their wildlife.
- Become involved in organizations focused on land conservation.

- Donating to reforestation projects.
- Purchasing artwork made by the orangutans of Cheyenne Mountain Zoo.
- Follow projects such as “Great Apes 2020” to see how conservationists are addressing palm oil issues in real time.
- Staying up to date with news and current events related to palm oil.

Suggesting a combination of these actions may be more successful than suggesting just a single action so that visitors will have a chance to choose how they would like to become involved.

g. No boycotting

No zoos advocated boycotting of palm oil; in fact, all zoos specifically refuted boycotting as an acceptable or effective way of taking action against issues related to the palm oil crisis. The San Diego, Philadelphia, and Cheyenne Mountain zoos made it clear that advocating against boycotting was one of the main points they try to communicate to their visitors. The AZA does not recommend boycotting because of the economic role palm oil agriculture plays in developing countries and because there currently is not a better substitute for palm oil available for many of its uses (Association of Zoos and Aquariums, 2014c). As mentioned earlier, Suzanne Hall of San Diego Zoo Global (2016) believes that boycotting palm oil absolves the individual from being capable of having an impact on the industry; instead, it is more effective to be involved and push consumer good manufactures towards CSPO. Additionally, because palm oil is contained in so many different consumer goods and in many different derivative forms, it is virtually impossible to completely eliminate palm oil from the household, so choosing to support companies using CSPO is effectively easier and more accurate. Wilcove and Koh (2010)

agree that pressuring companies likely will have more impact and be more successful than boycotting palm oil.

In a study of 24 ecological boycotts (boycotts used to promote sustainability), Friedman (2002) found that the majority of boycotts were *not* successful. Although boycotts often appear as an attractive tactic for consumers, the inherent complexities of many ecological issues do not lend themselves to directing successful boycott campaigns. Friedman noted that successful boycotts were characterized by simple and catchy slogans, the procurement of news media coverage, and organizations with the funds to financially sustain them. Additionally, consumers need to be able to identify the consumer goods that are being boycotted to effectively refrain from purchasing them. As mentioned, this is almost impossible in the case of palm oil. While all zoos advocate against the boycott of palm oil, they all recommend supporting companies committed to CSPO and deforestation-free palm oil instead; in a way, calling for the boycott of those companies not yet committed to these standards. Many zoos encourage visitors to send letters to these companies expressing their concerns that the palm oil used is not “orangutan-friendly” with the hopes that the companies will change their palm oil policies with the application of enough consumer pressure.

h. Online presence

Zoos use social media to spread information about palm oil. Woodland Park Zoo relies on Twitter, Facebook, and Instagram for posting palm oil messages. Philadelphia Zoo has found that Instagram is one of the best vehicles for posting about palm oil, but each zoo is different, and a social media expert should determine the best outlet for effective communication to its particular members (Peckham, 2016). Zoos also

communicate palm oil issues in blog posts, which can be linked to social media accounts. Woodland Park Zoo has a blog where palm oil is often mentioned, many times in relation to candy lists (Woodland Park Zoo, 2016d). Blog posts about palm oil and current events in the palm oil industry should continue to raise awareness.

All zoos except for San Diego Zoo Global included a specific page on their website dedicated to palm oil. These pages often include the zoo's primary position on palm oil, background information about the environmental issues and threats it poses to wildlife, and actions U.S. citizens could take to mitigate these issues. During the course of this study Woodland Park Zoo produced a webpage dedicated to palm oil which clearly states their position: "Woodland Park Zoo supports certified sustainable palm oil that is deforestation-free" (Woodland Park Zoo, 2016c). All website pages should be continually updated to stay in sync with the zoo's position on palm oil and relevant to changes in the palm oil industry.

- i. Resources

Cheyenne Mountain Zoo has been promoting palm oil awareness perhaps longer than any other zoo, becoming the first AZA institution to join the RSPO (Bredhal, 2015). They provide a large tool kit of resources for other AZA zoos to use that includes a variety of informational graphics, photos, educational resources, activities for children, sample letters targeted towards specific companies or people, and a library of videos (Cheyenne Mountain Zoo, 2016d). For each resource, an upload date is included, which is important since the issue of palm oil is an evolving one and some early information may become outdated. Cheyenne Mountain Zoo also has a shopping app available for smartphones with an easy to understand rating system to help consumers understand the

level of commitment companies have towards CSPO. I highly recommend the use of this app to reduce the use of non-CSPO and to best inform consumer choices. It is more convenient and more comprehensive than any of the shopping guides or candy lists I have examined.

Although no zoos specifically mentioned it, the Zoological Society of London (“London Zoo”) has created a Sustainable Palm Oil Transparency Toolkit (SPOTT) with numerous amounts of resources including those of AZA institutions (Zoological Society of London, 2016b). The London Zoo has compiled a large database of companies that produce palm oil as well as current “scores” regarding their available information on operations and commitments to environmental and social best practices when it comes to palm oil agriculture (Zoological Society of London, 2016a). Additional resources include maps and infographics, as well as links to current news updates, reports from multiple organizations, scorecards, and shopping guides.

A number of educational videos have also been produced on the subject of palm oil. The Cheyenne Mountain Zoo Tool Kit has a very large library of videos, half of them focusing on orangutans and the other half focusing mainly on the agricultural processes of several locations (Cheyenne Mountain Zoo, 2016d). Other organizations have informational videos available, such as the World Wildlife Fund (2016) and the RSPO (2015a). Several zoos mentioned having videos in their exhibits, including Indianapolis and Philadelphia. Valerie Peckham (2016) of Philadelphia Zoo mentioned using drone videos (ConservationDrones.org, 2016) to make a powerful statement to visitors about the impacts of palm oil agriculture on the environment. These video resources can be

used at Woodland Park Zoo as educational tools both within the zoo and on the zoo's website.

j. Funding for palm oil related projects

I did not specifically ask about funding in my personal communications, but a common theme for funding includes Quarters for Conservation, in which visitors donate 25 cents of their entry fee to the conservation initiative of their choice, including those involved in mitigating impacts of palm oil agriculture. Woodland Park Zoo also has a Quarters for Conservation program in place, and one of their current choices "Hutan Asian Elephant Conservation Project," works to mitigate human-elephant conflict which can be exacerbated by landscapes fragmented by palm oil plantations (Woodland Park Zoo, 2016b). Making it easy and quick for visitors to donate to such projects, such as during events or through donation stations, may also enhance donations levels, as seen at Indianapolis Zoo. Kiosks at Indianapolis Zoo allow visitors to donate to habitat restoration efforts in Kutai National Park (Laurendine, 2016). Zoos also use some creative options to allow their visitors to help with the palm oil crisis. Cheyenne Mountain Zoo sells paintings done by their orangutans with half the proceeds going towards preventing deforestation. Woodland Park Zoo recently had an orangutan who enjoyed painting pass away (Woodland Park Zoo, 2016a); if other orangutans there know or were taught how to paint, their paintings could be sold to help fund Woodland Park Zoo's own palm oil outreach projects.

5.3 Future research

Zoos across the United States, including Woodland Park Zoo, should evaluate their palm oil outreach techniques on a regular basis to measure their effectiveness at

communicating their messages. A survey, such as the one I administered, may be useful in tracking effectiveness over time. A more comprehensive study of palm oil outreach in all AZA zoos may provide a clearer picture of what else is being done to educate U.S. zoo visitors on the subject and what is most effective. Palm oil outreach programs should also be adaptable and continually updated to stay current and relevant to this evolving issue.

5.4 Conclusion

Woodland Park Zoo has the opportunity to share conservation messages with a million zoo visitors each year (Woodland Park Zoo, 2015a) and thousands more through their website and social media. One conservation issue they are currently working on expanding their communication on is palm oil and its impacts on wildlife. My survey results show that Woodland Park Zoo has a great need for a palm oil outreach program, and my analysis of how five AZA zoos approach their palm oil outreach provides multiple techniques and resources that Woodland Park Zoo can use to communicate this issue to their visitors. In the final section, I will focus specifically on recommendations for Woodland Park Zoo based on my research.

6. Conclusion: A New Trajectory for Tropical Forests and Palm Oil

Tropical regions supporting the highest terrestrial levels of biodiversity worldwide (Kricher, 2011) are being threatened with destruction and deforestation--none at higher rates than those of Southeast Asia (Achard et al., 2002, Langner and Siegert, 2009). One of the reasons the biodiversity in this region is so highly affected is due to increased palm oil agriculture driven by an expanding worldwide demand (Wilcove and Koh, 2010). Palm oil agriculture been argued to be “the greatest immediate threat to biodiversity in Southeast Asia (and a growing threat elsewhere)” (Wilcove and Koh, 2010). The growth of the palm oil industry in tropical regions and subsequent deforestation and biodiversity loss has revealed a pressing need for the sustainable production of palm oil (Hansen et al., 2015).

Zoos in the United States have the potential to provide valuable education and outreach to their visitors on conservation issues such as palm oil, and more specifically, the impacts of its agriculture on wildlife. The AZA supports the engagement of zoo and aquarium visitors on the topic of palm oil with the goal of breaking the link between palm oil production and deforestation (Association of Zoos and Aquariums, 2014c). Woodland Park Zoo in Seattle, WA, is especially interested in increasing palm oil awareness in their visitors but have been unsure about what should be communicated, where communication should take place, and how to do it. Their ultimate goal is to make a large enough impact on their visitors to inspire action and drive policy change in the United States.

To address Woodland Park Zoo’s concerns, I first designed a survey to gather baseline of the knowledge level of zoo visitors relating to palm oil. The results demonstrated that Woodland Park Visitors are only somewhat aware of what palm oil is,

and generally do not link it to deforestation. Consequently, there is a definite need for further palm oil outreach at Woodland Park Zoo. I then examined the palm oil outreach programs in five U.S. zoos: Cheyenne Mountain Zoo, Indianapolis Zoo, Oakland Zoo, Philadelphia Zoo, and San Diego Zoo. Based on these programs, recommendations for improving palm oil outreach to Woodland Park visitors include:

- Suggesting a primary action of responsible consumerism through support for companies dedicated to using deforestation-free and/or CSPO.
- Providing visitors with multiple ways to become involved.
- Having a dedicated webpage to enhance visitor's knowledge of palm oil and what actions they can take to contribute to a more sustainable future for palm oil. This page should be updated regularly to stay relevant; several webpages of multiple zoos I examined in this study were clearly not maintaining the outdated content.
- Continue posting about palm oil issues on social media sites and the zoo blog, including current events and recent developments.
- Using membership newsletters and listservs to further communication.
- Targeting younger age groups through activities and programs.
- Sticking to clear terminology with a simple overall message concerning the zoo's position on palm oil. Messages should be positive but urgent.
- Maintaining regular internal training for zoo staff and volunteers.
- Promoting palm oil awareness through events on- and off-site.
- Staying involved in international conservation projects and communicating their purposes and successes to zoo visitors.

- Showing videos related to palm oil agriculture, deforestation, and wildlife to make a powerful impact on visitors.
- Using resources from other AZA institutions, such as the Cheyenne Mountain Zoo's tool kit and shopping guide app.
- Advising against palm oil boycotts.

It is especially important to keep zoo visitors involved and informed about palm oil because encouraging sustainable palm oil use by companies in the United States depends largely on public support (Wilcove and Koh, 2010). Many zoos advocate for support of the RSPO, whose palm oil sustainability standards include protecting the environment and wildlife by restricting the amount of deforestation that occurs. Zoo visitors should understand that while there is an impending extinction crisis in the tropics, particularly Southeast Asia (Wilcove and Koh, 2010), there is still an opportunity to mitigate the impacts of palm oil agriculture. The literature shows that there is enough land available and suitable for the development of palm oil plantations that will not require deforestation (Fitzherbert et al., 2008) and that future demands for palm oil can be met without further environmental damage (Corley, 2009). Zoos like Woodland Park Zoo must continue to grow and evaluate their palm oil conservation outreach initiatives in efforts to reduce the threats to tropical biodiversity, not just in Southeast Asia, but around the world.



Figure 18. Young orphaned orangutans in Borneo

Source: Iwago, 2014

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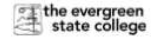
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8. Appendices



Palm Oil Awareness Survey

Your participation in this survey is completely voluntary; you do not have to answer any questions you do not wish to.

To what extent do you agree or disagree with each of the following statements?

Please select one answer per question by circling the number that most aligns with your answer.

	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
I am familiar with the term "palm oil."	1	2	3	4	5
I know where palm oil comes from.	1	2	3	4	5
The palm oil industry affects my choices as a consumer.	1	2	3	4	5
I am aware of products in my household that contain palm oil.	1	2	3	4	5
I am aware of environmental impacts associated with the unsustainable production of palm oil.	1	2	3	4	5
I am concerned about deforestation and the loss of habitat for species.	1	2	3	4	5
I know which species at Woodland Park Zoo are affected by the palm oil industry.	1	2	3	4	5
I am interested in learning more about the palm oil industry.	1	2	3	4	5
I am interested in learning what actions I can take to contribute to a more sustainable future for tropical forests.	1	2	3	4	5

Where do you currently reside?

- Seattle area
- Outside of Seattle but within Washington
- Out-of-state
- Out-of-country

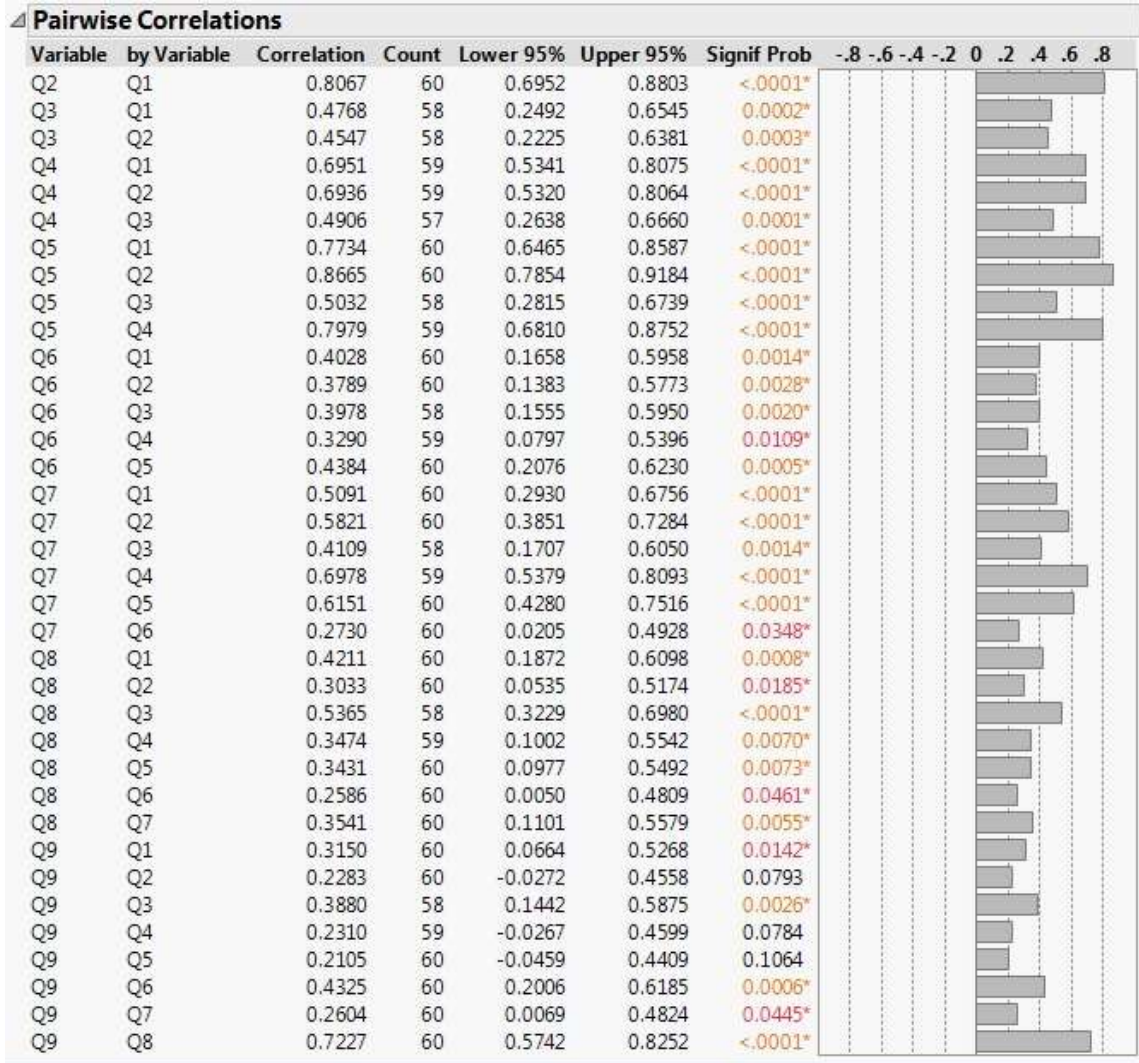
Are you a member of Woodland Park Zoo?

- Yes
- No

Optional: Comments

Thank you for your participation!

Appendix 1. Palm oil awareness survey distributed to Woodland Park Zoo visitors



Appendix 2. Palm oil awareness survey results: pairwise correlations