THE ANTHROPOGEOMORPHIC IMPACTS OF CAMPING ACTIVITIES AND LIVESTOCK ENCLOSURES ON ZOOGEOMORPHOLOGICAL PROCESSES AND ACTIVITY IN THE KUWAITI DESERT

by

Faisal Anzah, B.A., M.S.

A dissertation submitted to the Graduate Council of
Texas State University in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy with
a Major in Geography
May 2019

Committee Members:

David R. Butler, Chair

Richard W. Dixon

Jason P. Julian

Clayton Whitesides

FAIR USE AND AUTHOR'S PERMISSION STATEMENT

Fair Use

Duplication Permission

DEDICATION

I would like to dedicate this dissertation to my parents, who have taught me how to be self-reliant and who fostered a sense of persistence and ambition in me. This dissertation is also dedicated to my wife and my two sons, who have supported me by travelling with me and being with me for every second of my journey through my PhD degree.

ACKNOWLEDGEMENTS

First of all, I would like to thank God for giving me help and assistance in all the challenges that I have faced. Second, I would like to thank my advisor, Dr. Butler, who has supported me with his academic skill and knowledge. Without his guidance, this dissertation would not have been accomplished. In addition, I would like to thank Dr. Dixon, Dr. Julian and Dr. Clayton for their important advice. Lastly, I would also like to thank Allison for her frequent and generous help.

TABLE OF CONTENTS

LIST OF TABLES

Table **Page**

LIST OF FIGURES

Figure **Page**

ABSTRACT

The purpose of this study was to evaluate the impact of anthropogeomorphic disturbances on zoogeomorphic processes and patterns in the Kuwaiti desert. Specific objectives were focused on evaluating post-disturbance zoogeomorphic conditions between non-disturbed sites and human camps 2010, human camps 2017, livestock enclosures 2010, and livestock enclosures 2017. Site variables are soil compaction and zoogeomorphic conditions. Zoogeomorphic conditions are classified into small mammal, small reptile, invertebrate, and total zoogeomorphic features. Fieldwork and remote sensing data collection techniques were followed as an approach to adequately evaluate the impact of anthropogeomorphic disturbances on zoogeomorphic processes and patterns. Results revealed that 1) soil compaction differed significantly between non-disturbed sites and all other disturbed sites; 2) with an exception to non-disturbed sites vs. human camps 2017, small mammal zoogeomorphic features were not significantly different between the non-disturbed sites vs the other disturbed sites; 3) small reptile, invertebrate, and total zoogeomorphic features were only significantly different between non-disturbed sites and human camps 2010, and non-disturbed sites vs livestock enclosures 2017. The functional response approach was used to understand how human activities impact zoogeomorphic processes and patterns. Soil compaction was the primary proxy used to understand the interrelationship between human activities and zoogeomorphic processes and patterns. Soil compaction is a significant factor that plays an important role in the abundance of zoogeomorphic features. However, according to the

functional response model of this dissertation, other factors such as organic matter availability and topographic protection seemed to limit the impact of soil compaction on zoogeomorphic processes and play an important role in the abundance of zoogeomorphic features. These results contribute to advancing knowledge of anthropogeomorphic disturbance and zoogeomorphic processes and provide applied information for desert ecosystem management.

I. INTRODUCTION

Throughout the last century, and more recently, studying the human influence on the geomorphic system has been a strong tradition in geomorphology. The impact of deforestation on sediments fluxes (Grant and Wolff 1991) and the influence of agricultural practices on erosion and deposition (e.g., Happ, Rittenhouse, and Dobson 1940) are two examples of the geomorphic impact of humans. The geomorphic impact of humans is called anthropogeomorphology. The anthropogeomorphic disturbance is ongoing because the human population is continuously increasing. This, in turn, is negatively impacting the physical environment and its biotic resources such as animals. For instance, human activities such as mining, military practices, and camping that happen on the surface of the Earth are affecting animal habitat. In the natural environment, zoogeomorphically-active animals can live because of their geomorphic activities. These include digging for food, burrowing for habitat construction, trampling on the soil for foraging purposes, and other activities (Butler 1995). The geomorphic role of animals is called "zoogeomorphology." Because of anthropogeomorphic practices, however, most of the natural environments that animals use as habitats are disturbed. To survive, these animals are forced to inhabit these modified environments. This research aimed to construct a bridge that links two sub-disciplines of biogeomorphology, namely, anthropogeomorphology and zoogeomorphology. The camping activities in the Kuwait desert provide an excellent opportunity in which the link between these two sub-disciplines of biogeomorphology can be constructed. Thus, this research sought to utilize fieldwork-based and remote sensing data collection to reveal the impact of camping activities and livestock enclosures on the spatial pattern of zoogeomorphic processes.

Hypotheses

In the Kuwaiti desert, human activities can be divided into two categories, namely human camps and livestock enclosures. Human camps are built and used for camping while livestock enclosures are built by livestock holders. Human camp 2010 is a human camp utilized in 2010, as revealed on satellite imagery, and subsequently abandoned and not re-occupied until the date (1/7/2017 to 25/8/2017) of the data collection of this dissertation took place whereas human camp 2017 was utilized in 2017 and subsequently abandoned and not re-occupied until the same date. Livestock enclosures 2010 is a livestock enclosure utilized in 2010, as revealed on satellite imagery, and subsequently abandoned and not re-occupied until the date of data collection whereas livestock enclosure 2017 was utilized in 2017 and subsequently abandoned and not re-occupied until the same date.

The following hypotheses are tested to explain the spatiotemporal impact of human camping and livestock enclosures on soil compaction and the spatial pattern of zoogeomorphic processes:

$H_0$1: There is no difference in soil compaction between non-disturbed sites and human camps 2010, human camps 2017, livestock enclosures 2010, and livestock enclosures 2017.

$H_0$2: There is no difference in the counts of small mammal zoogeomorphic features between non-disturbed sites and human camps 2010, human camps 2017, livestock enclosures 2010, and livestock enclosures 2017.

$H_0$3: There is no difference in the counts of small reptile zoogeomorphic features between non-disturbed sites and human camps 2010, human camps 2017, livestock enclosures 2010, and livestock enclosures 2017.

$H_0$4: There is no difference in the counts of invertebrate zoogeomorphic features between non-disturbed sites and human camps 2010, human camps 2017, livestock enclosures 2010, and livestock enclosures 2017.

$H_0$5: There is no difference in the counts of total zoogeomorphic features between non-disturbed sites and human camps 2010, human camps 2017, livestock enclosures 2010, and livestock enclosures 2017.

The year represents the last time that the utility was occupied. Since the non-disturbed sites are considered as constant in all above comparisons, then, comparisons of non—disturbed vs human camping sites and livestock enclosures are indirectly referring to comparison within the disturbed sites groups (e.g., human camps 2010 vs human camps 2017). Therefore, to avoid redundancy, comparison within disturbed sites was not done. Also, the produced figures in the result and discussion chapters are believed to deliver the reader with the necessary information regarding this type of comparisons.

II. LITERATURE REVIEW

Biogeomorphic Disturbance Mechanisms

Understanding the anthropogeomorphic and zoogeomorphic impacts on the environment requires an understanding of the geomorphic mechanisms through which humans intentionally and unintentionally alter the geomorphic system and an understanding of the geomorphic mechanism through which terrestrial burrowing animals alter the geomorphic system. These mechanisms are soil compaction (indirect) and soil pedoturbation (direct). We understand that there are other types of biogeomorphic mechanisms, such as eroding sediments from mountains to construct roads and tunnels; however, these are outside of the scope of this literature review for two reasons: (1) soil compaction and bioturbation are the only soil-disturbance mechanisms that correspond to anthropogeomorphology and zoogeomorphology; and (2) these two mechanisms are the most widespread disturbance mechanisms.

Soil Compaction

Soil compaction is one of the biggest environmental issues resulting from recreational activities such as camping, hiking, mountain biking, and horse riding (James et al. 1979; Stohlgren and Parsons 1986; Pickering et al. 2010). Soil becomes compacted when its particles are compressed together, which in turn reduces the pore space between the soil's particles. An average undisturbed soil has a 50 percent porosity, whereas compacted soil has about 30 percent porosity, which affects the capacity of water and air containment (Williams and Brevik 2010). Compaction reduces pore space, which reduces the capacity of the soil to contain water and air, leading to a decrease of water infiltration, which in turn increases runoff and soil erosion. Moreover, reducing the capacity of the soil to contain water and air may result in oxygen shortage (Grable and Siemer 1968) and a shortage of dissolved nutrients in the soil (Kemper, Stewart, and Porter 1971). Consequently, mineralization of organic matter will be reduced (Whisler, Engle, and Baughman 1965). Soil compaction also affects the abundance of soil animals. In compacted soil, the population density of soil animals, especially mesofaunal organisms that have a body diameter between 0.1 and 2.0 mm (e.g., Collembola (*springtails*), Acari (*mites*), Enchytraeidae (*potworms*)), is reduced because of the reduction in pore spaces which serve as a habitat for these mesofaunal organisms (Beylich et al. 2010). Also, compacted soil restricts earthworms' burrowing activities, which in turn may result in detrimental functional changes in the soil (Brussaard and Van Faassen 1994). Beside its negative effects on soil animals, soil compaction is also responsible for the limitation of the plant population. Plants' roots can easily penetrate uncompacted soil, whereas they penetrate compacted soil only with difficulty because of the small pore spaces (Lipiec and Hatano 2003).

Soil Bioturbation

The most common definition of bioturbation/biopedoturbation is the mixing of soils by biotic factors (human, animal, and plant). The mixing of soil by humans is called "anthroturbation," by animals "faunalpedoturbation," and by plants "floralpedoturbation" (Butler and Cavin 2014). Other common definitions of bioturbation include the biologically driven mixing of materials in the soil layer between the subsurface geological formations and the overlaying atmosphere (Smallwood, Morrison, and Beyea 1998), and "the churning and stirring of sediment by organisms" (Bates and Jackson 1984, p. 56). Some authors (Whitford and Kay 1999; Eldridge 2004; Eldridge and Rath

2002) also refer to bioturbation as the disturbance of soil by animals. Therefore, bioturbation can be defined as the vertical and horizontal (oblique direction) disturbance of the soil, by animals, plants, and humans, which must involve the integration of three processes: soil erosion, soil transportation, and soil deposition. It is believed that this definition encompasses the previous definitions of bioturbation and encompasses all mechanisms that are involved in bioturbation.

Regarding the outcome of bioturbation, bioturbation is divided into proisotropic and proanisotropic bioturbation. "Proisotropic pedoturbation encompasses processes that tend toward soil randomness and disorder, disrupting, blending, or destroying soil horizons and causing morphologically simplified soil profiles to form from more-ordered ones. Proanisotropic pedoturbation by plants and animals includes processes that aid or lead to the formation and maintenance of soil horizons or layers and cause an overall increase in soil profile order" (Butler and Cavin 2014, p. 2).

As was intimated, the scope of this research is to create a linkage between anthropogeomorphology and zoogeomorphology. Therefore, I only concentrated on anthroturbation and faunalpedoturbation. It has been shown that anthroturbation and faunalpedoturbation have a substantial impact on the Earth's surface, with a larger impact attributed to anthroturbation. This is because of the variations in the depths and nature of anthroboturbation compared with faunalpedoturbation, which represents a different phenomenon (Zalasiewicz, Waters, and Williams 2014). Faunalpedoturbation in subterrestrial settings typically affects tens of centimeters to a few meters of the substrate, the deepest cited burrows being those of Nile crocodiles (*Crocodylus niloticus*), which can reach 12 m, and of foxes and wolves, which can reach up to four meters (Voorhies

1975). In contrast, anthroturbation ranges from simple individual structures, such as quarries, to several kilometers, such as borehole and deep mining (Zalasiewicz, Waters, and Williams 2014). The impact of bioturbation is discussed in later sections of this research.

Anthropogeomorphology: Humans as Geomorphic Agents

Anthropogeomorphology is the study of the human role in the creation of landforms and the alteration of the operation of geomorphological processes (Golomb and Eder 1964). Despite the term's recent origins (the 1960s), scientists have recognized the impact of human on the geomorphologic system for a long time (Goudie 2013). The observations of de Saussure (1796) on the Alpine lakes' water level lowering in the recent period because of deforestation is early historical evidence of anthropogeomorphic work. Moreover, in 1800 von Humboldt and his partner Bonpland concluded that the gradual drying and lowering of the water level of the Venezuelan lake basin (Lake Valencia) was a result of deforestation, the clearing of plains, irrigation, and the cultivation of indigo (Boussingault 1845; Cushman 2011). In the early nineteenth century, Surell (1841) researched torrents in the European Alps that powerfully documented an understanding of humankind's ability to alter the environment. Marsh (1864) also pointed to the influence of humans on the acceleration of erosion, flooding, and the movement of coastal dunes. Nevertheless, the 1930s and 1940s were when a major stage of work on human influence on the geomorphic system, such as the menace posed by soil erosion, took place. This can be illustrated by the work of Bennett (1938) and Lowdermilk (1934, 1935) and their advocacy of the importance of soil erosion. Their research motivated other scientists to do such work. For instance, Dale and Carter's

(1955) *Topsoil and Civilization* discussed global soil erosion over the last 6,000 years. The above examples reveal the long history of studying the impact of humans on geomorphology, which is categorized by geomorphologists as direct and indirect anthropogeomorphic influence.

Direct and Indirect Anthropogeomorphic Influences

As was intimated above, geomorphological landforms can be produced by direct and indirect processes. According to Goudie and Viles (2016), direct processes involve relatively obvious landform formations that were produced intentionally. Direct anthropogeomorphic processes can result in constructional landforms (from depositional processes), such as spoil tips, or destructional landforms (from removal processes), such as quarries. On the other hand, indirect processes tend to be produced unintentionally. Therefore, landforms produced by indirect influences are hard to recognize because they result from the acceleration of natural processes rather than producing new landforms in a short period. The indirect influences are more important to anthropogeomorphology because they are widespread and hard to recognize. Examples of indirect processes are a modification (increasing) of rates of erosion because of removal of plants that cover the soil or because of soil compaction produced by human trampling and camping activities. There are many examples of indirect influence such as modifying weathering processes due to accelerated salinization in irrigation sites, and landslides and debris flows triggered by the modification of landcover (Goudie and Viles 2016). Goudie and Viles (2016) should be consulted for an in-depth discussion of these issues.

Anthropogeomorphic Disturbance

Every type of anthropogeomorphic disturbance (e.g., mining, bombturbation, and landfilling) that involves excavation of Earth surface materials results in depositing. Excavation and depositing most often occur at the same time (when one excavates soil from site A and deposits it in site B, or site A and B share the same location or site A is located within a short distance of site B). Here we review the anthropogeomorphic activities that cause the most disturbance, resulting in the exposure of the Earth's surface material, possibly allowing it to be occupied by geomorphologically active animals.

Bombturbation, Mining, and Landfilling

Bombturbation is the disturbance of soil by the detonation of bombs (Butler and Cavin 2014). This includes soil surface cratering and soil mixing by bombs, which usually occur during wars and military practices (Hupy and Schaetzl 2006). Bombturbation can erode large quantities of soil and have long-term implications that result in changing the micro- and mesotopography of landscapes (Hupy and Koehler 2012). Therefore, bombturbation results in destroyed soil horizons and dramatic soil mixing (Hupy and Schaetzl 2006). Hupy and Koehler 2012 suggested that in the twentieth century, billions of cubic meters of soil were displaced by bombturbation. The indirect impact of bombturbation can be seen in the breaking of the impermeable bedrock and soil layers by cratering, preventing the vegetation from accessing its previous shallow water sources, which results in reducing reforestation (Hupy and Schaetzl 2006).

Waste landfills and mining have a similar long-term impact on the soil and topography to bombturbation, but with a greater magnitude. This is because the impact of mining is vertically deeper and horizontally larger. The only purpose of a landfill is for the dumping of wastes, but mining is practiced for many reasons, including coal extraction, diamond extraction, mineral extraction, and many others. Conceptually, all the above three anthropogeomorphic practices have similar geomorphic impacts with different magnitudes; they start with excavating (eroding) and fragmentation of the soil and bedrock and removing vegetation (if it exists), which results in accelerating soil erosion by wind and water. Another shared impact is destroying the soil's horizons, which limits vegetation regrowth.

Agricultural Practices

Agricultural practices, among other anthropogeomorphic activities, can substantially modify the geomorphic system of large regions over a period of thousands of years from the use of different tillage techniques (Gottschalk 1945; Costa 1975). For land uses, erosion rates resulting from agricultural practices are among the highest rates (García-Ruiz and Lana-Renault 2011) and can surpass most natural erosion processes (Massa et al. 2012). Recent changes in agricultural techniques (e.g., using large equipment) have made soil compaction widespread. Heavy equipment that exceeds 10 tons in loads, such as loaded combines and manure tankers that exceed 20–30 tons, produce soil compaction to a greater depth which surpasses the bearing strength of the soil. Soil compaction can reduce crop production by up to 50% and limit the existence of plant nutrients (Wolkowski and Lowery 2008). Soil translocation by tillage is also responsible for causing soil problems but through a different mechanism. Tillage directly causes soil erosion and the soil loss that is associated with it. Moreover, tillage produces maximum erosion at sudden convex slope positions, resulting in decreasing slope angle and infilling of hollows, which, over time, results in changing the topography and producing new topographic features. Therefore, tillage may indirectly accelerate water and wind erosion (Gruver 2013).

Camping Activities

Camping activities as recreational use of the wilderness have an inevitable negative impact on the ecosystem. Camping activities mainly affect the soil through a disturbance mechanism called soil compaction (pitching tents and human trampling), which in turn triggers many other problems, such as loss of soil moisture and organic matter and decreased water infiltration (Grable and Siemer 1968; Kemper, Stewart, and Porter 1971; Williams and Brevik 2010). These causes contribute to land degradation. In the U.S., it is fortunate that campsites are localized (McEwen and Cole 1997). Thus, camping has limited spatial impact. It also has a limited temporal impact because campers only camp for few days during the whole year. However, in Kuwait, Bahrain, Qatar, and other Middle Eastern countries, where there are no mountains, rivers, and forests, the desert is the only place that can accommodate the deep desire to go camping.

To illustrate, in Kuwait, campsites are considered as winter homes in which people spend the winter season. People construct their campsites at the beginning of November and remove them at the end of March. During these months, people visit and spend their nights at their campsite every weekend. Moreover, some people, despite their jobs, spend almost the entire winter season in their campsites. They do this by traveling every day from their campsites to their work. Two reasons contribute to this camping behavior. The first reason is the small spatial extent of the country, as one can cross the country by car from the northernmost end to the southernmost end or from the easternmost end to the westernmost end in approximately one and a half hours at a normal speed (120 km/h). The other reason is the luxury life that people tend to live when camping, as they construct living rooms, restrooms, shower rooms, kitchens, and bedrooms in the shape of tents in their campsites. Moreover, to create borders to a camp, campers tend to fence their camps with barriers (berms) from the top soil (Figure 1 and 2). Thus, the soil is bioturbated. Moreover, whereas campsites are localized in the U.S., they are not in the State of Kuwait. Thus, their spatial impact may be much worse. For instance, a single family could construct its campsite in a different location every year, which produces soil degradation issues in a larger spatial extent. Their temporal impact also may be much worse because Kuwaiti campers spend much more time in their campsites than do American campers. Therefore, in Kuwait and other Middle Eastern countries, camping activities have a substantial impact on the environment because they result in soil compaction and bioturbation with a higher magnitude and a larger spatial extent than in Western countries.

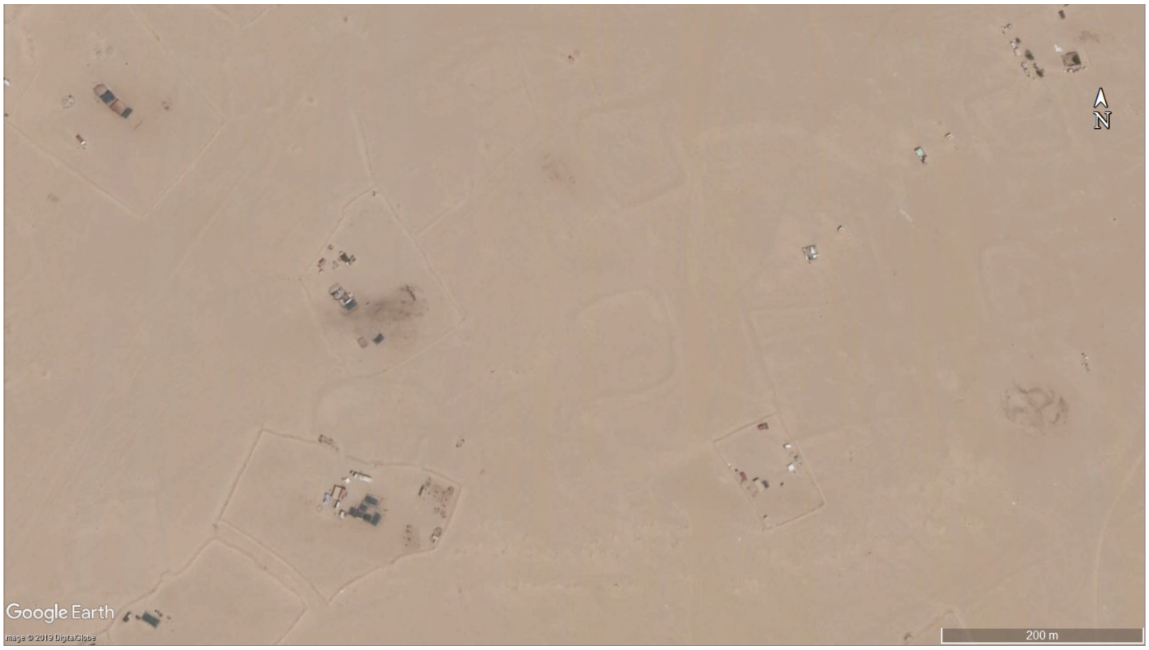

Figure 1. An aerial photo shows the barrier/border of the camps. Image credit to Google Earth.

Figure 2. On site photo that shows the barrier/border of a representative camping site; car key in lower center part of photograph was ca. 7.5 cm long. Locations of burrows are highlighted by red arrows.

Domesticated Animals and Grazing

The impact of domesticated animals falls into a set that overlaps between anthropogeomorphology and zoogeomorphology. This is because they are introduced into the environment by humans for economic purposes, such as livestock, and their geomorphic impact is zoogeomorphic. Domesticated animals such as camels, sheep, goats, and cows, have a substantial direct and indirect impact on the geomorphic system. A direct impact can be seen when camels trample on sand dunes and *nabkhas* mounds and cause erosion of these geomorphic features. Indirect effects include compaction of the soil, which results in the acceleration of soil erosion by water and wind. Furthermore, in the desert of Kuwait, Al-Hurban (2014) found that overgrazing by camels, sheep, and goats in unprotected areas of the Kuwaiti desert, which uproots plants and restrains plant growth, is responsible for substantial plant cover losses and is thought to be the main cause of the deterioration and passing of rugged vegetated sand sheets. More information on the impact of grazing can be found below in the section entitled "Zoogeomorphically-active Animals as a Driver of Geomorphic Disturbance."

Zoogeomorphology: Animals as a Geomorphic Agent

Animals and their geomorphic abilities have been long ignored by scientists such as geomorphologists and geologists, who are responsible for identifying such interactions. It was not until the late 1980s that Heather Viles, as a geomorphologist, defined biogeomorphology as "an approach to geomorphology which explicitly considers the role of organisms" (Viles 1988, p. 1) in her edited volume *Biogeomorphology* (Butler and Sawyer 2012**)**. However, that was based on ecological rather than geomorphological literature (Butler and Sawyer 2012**)**. Viles' research concentrated more on phytogeomorphology, rather than on animal–geomorphic interaction (Butler and Sawyer 2012). For such interactions, it was not until 1992 that Butler announced the term "zoogeomorphology" in his paper entitled "The grizzly bear as an erosional agent in mountainous terrain." Butler defined "zoogeomorphology" as "the study of the geomorphic effects of animals." Butler continued to support his term "zoogeomorphology" by writing his book entitled *Zoogeomorphology: Animals as Geomorphic Agents***.** Despite Butler's contribution, animals' geomorphic abilities had been noticed almost 111 years before Butler's creation of the term "zoogeomorphology" by Charles Darwin in his observations on the work of earthworms in his backyard's soil. Darwin's research concentrated on the role of worms as invertebrate animals in the bioturbation of soil (soil mixing) (Darwin 1881). According to Butler (1992), zoogemorphology is a term that emphasizes the geomorphic role of animals. The geomorphic role of animals can result in disturbing and enriching the soil. Geomorphologically-active animals are categorized into vertebrate and invertebrate, marine and terrestrial. Here, I only considered the role of geomorphologically-active animals in terrestrial system.

Zoogeomorphically-active Animals as a Drivers of Geomorphic Disturbance in Terrestrial Ecosystem

Geomorphology is the study of the landforms of the Earth's surface and the processes that produce these landforms. These processes are abiotic and biotic processes. Abiotic processes are those that do not involve living organisms, such as uplifting tectonics and erosion and deposition by wind, and water. In contrast, biotic processes are those that involve living organisms, such as humans, animals, and plants, that have a geomorphic role. Although the geomorphic role of humans has been discussed above, the role of plants as geomorphic agents falls outside the scope of this research.

Animals become geomorphologically active when they search for food and establish their habitats (Butler 1995). Animals' searches for food are associated with both direct geomorphic alteration, such as bioturbation and indirect geomorphic alteration, such as changing vegetation properties and soil compaction, especially with large herbivore animals, whereas establishing a habitat is usually associated with bioturbation. For instance, while establishing habitats (burrows), rabbits were found to be responsible for excavating between 475 and 71308 kg of soil per hectare on forested hillslopes in Belgium (Voslamber and Veen 1985). In the Netherlands, particularly in a coastal sand dune environment, it was documented that rabbits were responsible for extensive caves that resulted in both direct geomorphic impacts, such as causing slope failure and indirect ones, such as the increased possibility for fluvial and aeolian transport (Rutin 1992). Gophers also have direct and indirect geomorphic influences. As a direct influence, in the Front Range of Colorado, northern pocket gophers were documented to be responsible for lowering the average surface elevation of the area by 0.0037 cm yr^{-1} (Burns 1979). Ellison (1946) recorded that northern pocket gophers were responsible for bringing 11.0-15.5 t ha^{-1} yr^{-1} of soil to the surface. Many reptiles are also zoogeomorphically-active. Sand-burrower reptiles create patent tunnels and do not need morphological and physiological modifications for under-sand breathing (Bauer and Russel 1991). Furthermore, Dhub lizards or Spiny-tailed lizards, create burrows up to 10 m in length, and 1.8 m in depth and live in them for many years (Nemtzov 2005). Regarding the zoogeomorphic work of insects, ants and termites are considered as leading moderators of soil and geomorphic processes. While creating their nests and excavating interconnecting tunnels, they disrupt surface and subsurface soil and this soil bioturbation has an essential impact on soil infiltration of water, clay mineralogy, and soil chemical properties (Whitford and Eldridge 2013).

Regarding indirect influence, many studies have proven that gophers alter the chemical soil and vegetation properties surrounding their habitat (Grant, French, and Folse 1980; Reichman and Smith 1985; Carlson and Crist 1999; Rogers, Hartnett, and Elder 2001; Sherrod and Seastedt 2001). Thus, indirect geomorphic effects such as increased erosion may take place (Butler et al. 2013). Regarding animals' searches for food, in Glacier National Park, Montana, USA, sediment produced by 100-year storm avalanches was found to be less than the annual erosion sediment that appears to be caused by grizzly bears (Butler 1992).

Zoogeomorphically-active mammals and reptiles can cause indirect inducing of erosion by changing chemical soil and vegetation properties, other animals, especially large mammals and domisticated animals, can directly erode sediment and indirectly initiate or induce erosion by causing soil compaction through their trampling on the surface (Butler, Whitesides, and Tsikalas 2013). Boelhouwers and Scheepers (2004), in a hyper-arid environment, documented that antelope trampling was responsible for cutback initiation, and continued trampling on the tracks deepened the cutback, which finally and indirectly resulted in gully creation because the runoff from the upper slope terrace was channeled toward the antelope tracks. Lock (1972) documented the soil compaction produced by hippopotamuses and moose which led to the reduction of the rapid infiltration of rainwater, aiding water erosion.

Zoogeomorphically-active Animals as a Driver of Ecological Enrichment in Terrestrial Ecosystem

Ecological enrichment by zoogeomorphically-active animals has been of interest to zoogeomorphologic research (Eldrige 2012; Zaitlin and Hayashi 2012), mainly regarding looking to uncover the potential beneficial impact that zoogeomorphic activities such as bioturbation can have on the soil and vegetation properties within a specific ecological site. Ecosystem characteristics and processes are influenced by small mammals through their burrowing, foraging for food, and digging seed caches, which disturb the integrity of the surface crust, establish spaces and depressions that can store seeds and organic materials, and generate bioturbated soil with intact surficial soil (Whitford and Kay, 1999). Moreover, the foraging pits of burrowing mammals serve as a resource for trapping soil, litter, feces, seeds, and nutrients (Boeken et al. 1995; Eldridge 2004; Garkaklis, Bradley, and Wooller 2004; James and Eldridge 2007). In Mongolia, particularly in abandoned cropland, where the soil crust restrained vegetation regrowth, the burrowing activities of the Mongolian gerbil (*Meriones unguiculatus*) and probably Brandt voles (*Microtus brandti*) and hamsters (*Phodopus spp*.) has assisted in vegetation regrowth (Yoshihara et al. 2009). Similarly, in Australia, the formation of soil crust, erosion, and loss of vegetation has been profound because of the loss of burrowing animals (Martin 2003). Davidson and Lightfoot (2008) found that the combined effect of Gunnison's prairie dogs (*Cynomys gunnisoni*) and banner-tailed kangaroo rats (*Dipodomys spectabilis*) increased the landscape heterogeneity and the richness of vegetation by establishing a mosaic of diverse patches on the landscape. The Dhub, or Spiny-tailed lizard is an important physical ecosystem engineer in desert ecosystems. Its large burrow provides a shelter for many organisms that cannot dig in hard substrata (Nemtzov 2005).

Anthropogeomorphic–Zoogeomorphic Interaction

Animals, including terrestrial burrowing mammals, exist in natural environments. However, with the increase in the human population and anthropogeomorphic practices, animals' natural habitats are threatened, and they have been forced to deal with this threat through inhabiting anthropogeomorphic landforms to survive. In natural environments, the survival of these animals depends on their geomorphic abilities to create habitat and search for food. Similarly, to survive in human-modified environments, the same rules apply. Unfortunately, in the scientific community, very little attention has been given to the interaction between zoogeomorphic and anthropogeomorphic patterns. In the geomorphology literature, this type of interaction is completely absent. In South Africa, particularly, in heavy diamond mining environments, areas colonized by Brant's whistling rat (*Parotomys brantsii*) had lower electrical conductivity and higher microbial respiration than the nearby uncolonized areas. Moreover, the colonized areas were the only sites that had vegetation (Desmet and Cowling 1999). In a landfill located in central New Jersey, Lore and Flannelly (1978) found that most of the burrows of Norway rats (*Rattus noruegicus)* were found in loose sandy soil that had been recently altered by earth-moving tools or in recently dredged soil that was organically rich. Moreover, they found that Norway rats selected burrow locations that reduced the travel distance to the main food source and permanent water source. Also, Norway rats frequently chose to construct their burrows on sloping terrain and in loose soil because it is easy to dig in (Lore and Flannelly 1978). In the Hanford Nuclear Reservation in south-central

Washington, where radioactive wastes from the production of nuclear weapons were injected into the surface of the ground and within engineered burial structures, Smallwood and Morrison (1997) recorded a number of different burrowing animals such as northern pocket gophers (*Thomomys talpoides*), coyotes (*Canis latrans*), badgers (*Taxidea taxus*), Great Basin pocket mice (*Perognathus parvus*), and other species. Because of the vertical and lateral transport of these animals, radionuclides remain vulnerable. More recently, ecologists showed that roadside verges often shelter a high biodiversity of grassland species such as lizard-orchids (*Himantoglossum* spp.) (Fekete et al. 2017). In eastern France, researchers concluded that badgers and foxes widely use abandoned WWII military bunkers that were located in crops, forests, or groves (Jumeau et al. 2018). In the Hortobágy National Park, Great Hungarian Plain, East Hungary, researchers showed that kurgans, which are prehistoric man-made burial mounds that are characterized by hill-like structure, loose soil and undisturbed condition, provide suitable habitats for ecosystem engineers such as foxes (Godó et. al 2018).

Anthropogeomorphic–zoogeomorphic interaction is not limited to mining and waste sites. In the southeastern part of the Kuwaiti desert, I had personally observed many Lesser Jerboa burrows in human-created soil mounds that were constructed to fence campsites (Figure 2). Moreover, I observed some burrows in camping pits that were excavated to be used as latrines for human waste. Similar observations were made within livestock sites (camels and sheep enclosures). Moreover, in the southeastern part of the Kuwaiti desert, some feral dogs and fox burrows (Figure 3) were observed in illegal soil dumping (human-created mounds) and excavation sites (human- excavated pits).

Figure 3. Fox burrow in human-excavated pit.

III. METHODOLOGY

Study Area

The study (29.14°, 29.19° N and 47.85°, 47.91° E) is conducted in the Bar Al-Juwaihel area located approximately 25 km to the southwest of Kuwait City (Figure 4). In Arabic, "Bar" means desert and Al-Juwaihel is a Kuwaiti family. The ground elevation ranges between 45 to 65 m above sea-level. It covers about 33.5 km^2. Kuwait is an extremely small country with an area of about 17,818 km^2 and 0 to 300 m of ground elevation range (Kusky and Cullen 2010). Therefore, climatic variation does not exist across the country. The climate in Kuwait, a classic hot desert (BWh), is characterized by two seasons: a long, hot, and dry summer, and short, cold winter. In summer, air temperature can reach up to 50°C, whereas in winter, the air temperature falls to about 0°C (Al-Yamani et al. 2004). The mean July temperature is 38.2°C, while mean maximum temperature during the same month is 45.6°C. In winter, the mean temperature in January is 12.7°C with mean minimum temperature in January around 7.5°C. The mean of annual precipitation is 119 mm, and an average of annual potential evapotranspiration exceeds 2270 mm. Annual precipitation ranges from 30 and 250 mm, the majority falls in winter and spring (Halwagy, Moustafa, and Kamel 1982; Al-Sayegh 2017). In the winter season, limited rainfall happens suddenly and occasionally (Kusky and Cullen 2010). Relative humidity ranges from 20% in summer and 60% in winter, whereas the evaporation rate reaches 4.6 mm/d in January and 22.9 mm/d in June. In Kuwait, winds mostly blow from the northwest with the annual mean speed of 13.6 km/h which cause prevailing dust and sand storms. Between May and July, 50% of dust storms occur (El-Baz and Al Sarawi 2000; Almedeij 2014; Al-Sayegh 2017). During November, Kuwait is exposed to the southwestern wind.

The surface of the Kuwaiti desert is mostly covered by a thin blanket of recent aeolian deposits. Anthropogenic activities resulted in the baring of the vegetation cover and the exposure of dry, loose sediments to aeolian activities. Kuwait is intensively exposed to aeolian activities evidenced by the recurrence of sand and dust storms. Southern Iraq (northwest of Kuwait) is where the dust storms are usually initiated which results in thick clouds of dust that are finally settled in the northern part of the Arabian Gulf where Kuwait is located. Saltation is another aeolian transport mechanism that occurs during summer season whenever wind speed attains 5.4 m/s. In Kuwait, the main annual sand drift is approximately 20 m^3 yr^{-1} with the preponderance taking place between May-August, to the southeast. Sand dune migration is also recognized in Kuwait. Sand dunes are predominantly existing as small barchans of approximately 3 m height which usually migrate about 20 m in nine months for a barchan with average height. Sand encroachment is another aeolian phenomenon that occurs due to the high rate of sand transport that is triggered by extensive anthropogenic activities in desert areas. It is significantly affecting almost all roads, farms, and urban structures (Khalaf and Al-Ajmi 1993). The desert of Kuwait supports a variety of zoogeomorphically-active animals including small burrowing mammals (Lesser Jerboa, Sundevall's Jird, Cape Hare, and Ethiopian Hedgehog), large burrowing mammals such as Red Fox and Honey Badger, small burrowing reptiles such as Arabian Worm Lizard, Stone Gecko, Fringe-toed Sand Lizard and Blue Throat Agama (Jaman and Meakins 1998), large burrowing reptiles such as Dhub (Al-Sayegh 2017), False Cobra, and Caspian Whip Snake (Jaman and Meakins 1998), and insects such as termites (Abushaman and Al-Houty 1988), ants and different types of beetles. Domesticated animals such as camels, sheeps, and goats are ubiquitous in the Kuwait desert.

The study area is located in a moderate sand encroachment area (Figure 5). Moreover, the northern border of the study area is fenced with trees that help in mitigating sand encroachment by trapping sand particles that are transported by saltation mechanism because of the northwest wind. The surface geology of the study area consists of smooth sand sheets (Figure 6) that have relatively flat surfaces, sometimes covered with a very thin veneer of residual granules (Al-Hurban 2014). The study area is mainly bare desert land. However, Cyperus conglomerates, a perennial desert plant, are sparsely distributed through the study area. The study area is dominated by extensive anthropogenic disturbance such as human activities which includes human camping for leisure purpose and livestock enclosures. This makes it an excellent choice to study the impact of camping on soil compaction and the spatial pattern of zoogeomorphic processes.

Campers and livestock breeders usually build berms or border their sites by a fence to create privacy. This results in a variation in the microtopography in all camping and grazing areas in the Kuwait desert. This anthropogeomorphic process can be classified into direct-berm and indirect-berm building. Direct-berm building occurs when campers intentionally build the berm by eroding the adjacent surface to create a border for privacy purposes (Figure 2). The height of the berm ranges from 0.5 to 2 m. On the other hand, indirect-berm building occurs when the campers border their camps or livestock enclosures by a fabric or nylon fence connected by woody or metal poles (Figure 7). When human camps or livestock enclosures are abandoned at the end of the season, the fence is collapsed due to wind attack and then sand sediments are trapped by the fence, creating a loose, small, and low berm. Within the camp border, the camp floor area, is where campers construct their tents or livestock breeders keep their herds in, which leads to the compaction of the soil surface.

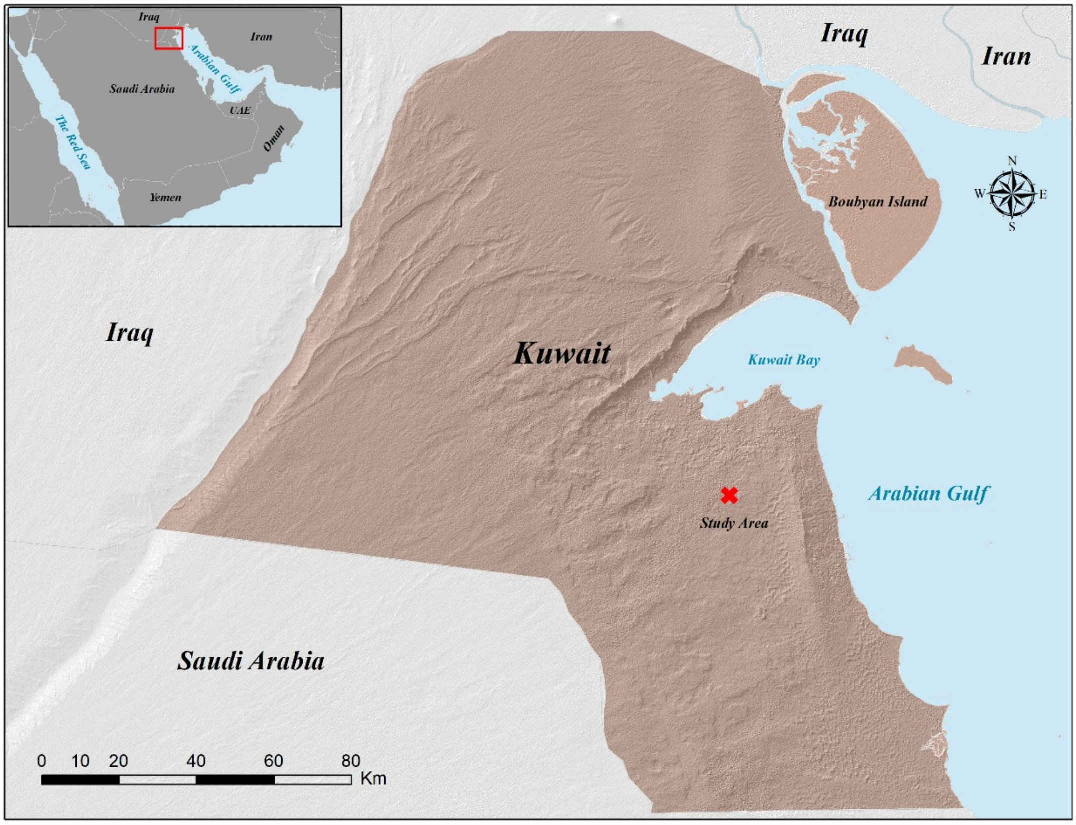

Figure 4. Map of the study area.

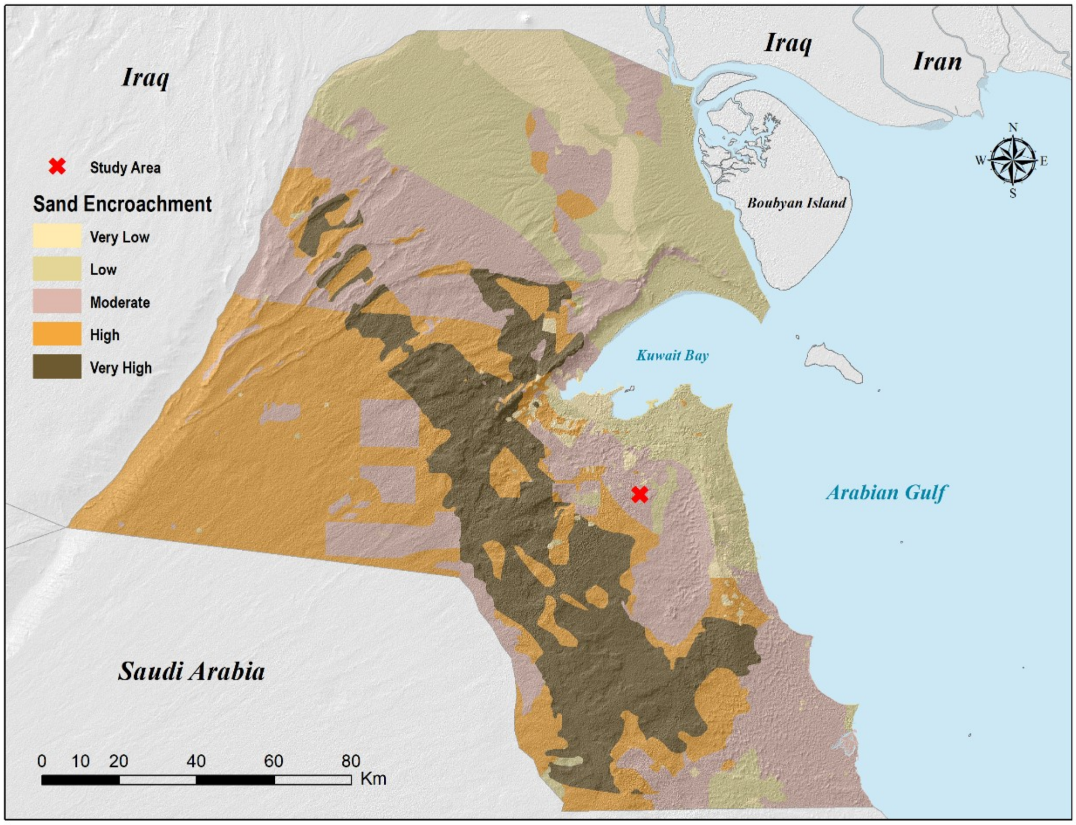

Figure 5. Sand encroachment susceptibility (modified after Al-Helal and Al-Awadhi 2006).

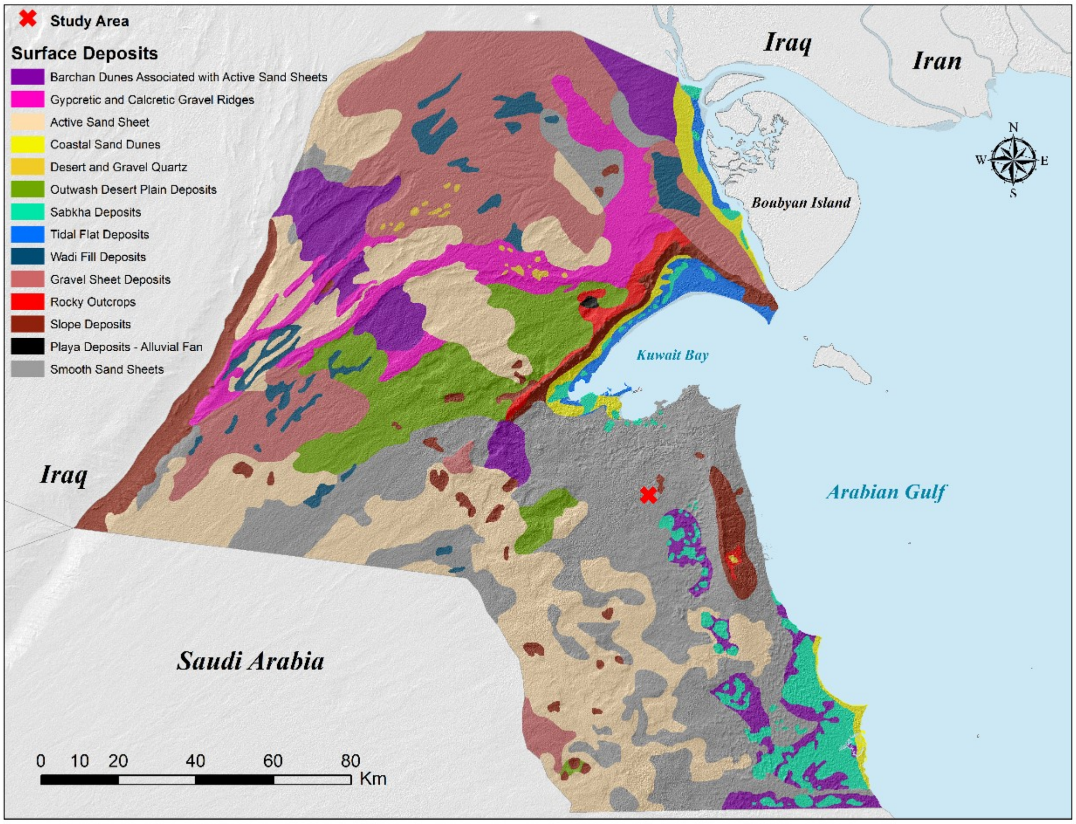

Figure 6. Surface deposits of the State of Kuwait (modified after Al-Hurban 2014).

Figure 7. Shows how indirect berm is formed; soft drink can in center part of photograph ca. 13 cm tall.

Methods

The method section is sequentially divided into multiple sections in order to facilitate the understanding of this section. These sections are (1) building human camps and livestock enclosures inventory for human camps and livestock enclosures located within the geographic extent of the study area, (2) data collection, and (3) data analysis.

Building Camps Inventory

Building human camps and livestock enclosures inventory is the first step in my methodological framework. The ultimate purpose of building an inventory is to make sure that there is a sufficient number of human camps and livestock enclosures (samples) which can lead to robust statistical results. To illustrate, if the study area does not contain a sufficient number of human camps and livestock enclosures within two different temporal classes (e.g., 2010 and 2017) and if each of these temporal classes does not contain a sufficient number of samples within each anthropogeomorphic class (human camps and livestock enclosures), the study area was considered as invalid for this study case. The building human camps and livestock enclosures inventory is divided into two parts, with each part containing multiple steps.

The first part of building the human camps and livestock enclosures inventory is done by using Google Earth to map each site (human camp and livestock enclosure) that is in the study area. The result of this part is to give an idea of the number of sites that are contained within a study area. The steps of this part are as followed:

1- Uploading Google Earth map into my google account from which it can be opened using a smartphone to navigate to each site and do the second part of the inventory.

2- Each site was visited and classified according to camp type (human or livestock), status (empty camp or full camp), berm type (directly-built berm or indirectly-built berm), and confidence or possibility of being a human camp or livestock enclosure in percent. If the site is classified as an empty and directly-built berm, confidence above 50 percent, regardless of its type, it was considered as a valid site. If not, it was excluded as invalid site. Valid sites were classified based on examining physical evidences into multiple percentages of confidence (Table 3). This step was accomplished by building a smartphone-application for data collection and storage via AppSheet, which is a free Add-on plug in available in a Google sheet (Figure 8).

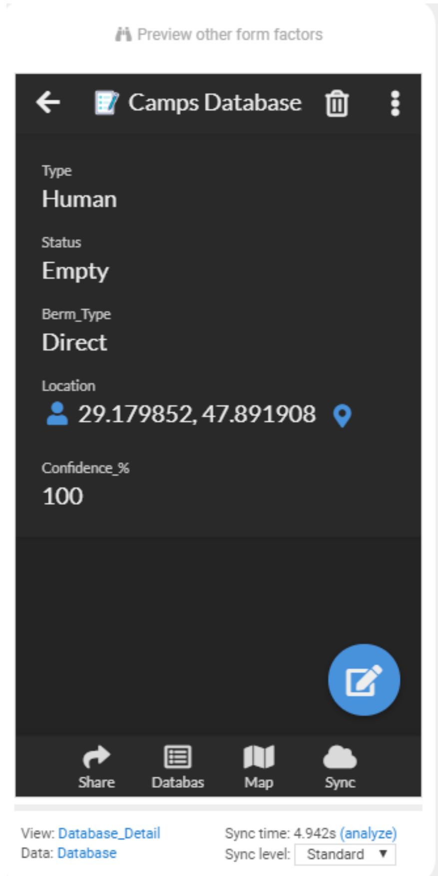

Figure 8. A prototype of the AppSheet field data collection interface.

The second part was classifying the valid human camps and livestock enclosures into multiple temporal classes via the use of Google Earth timeline views. For periods that were not covered by Google Earth, high resolution satellite images were obtained (Table 1). For each year, two images were needed in which one covers the camping season (November-April) and the other covers the end of the camping season or the period before the next camping season (Table 1). The database was exported as an Excel file, and valid human camps and livestock enclosures were separated from the invalid ones, based on the mentioned criteria above. Then, the valid human camps and livestock enclosures were overlaid with the historical images to assign the year associated with each human camp and livestock enclosure. Then, the updated information of human camps and livestock enclosures was exported into a new database. After that, the total number of human camps and livestock enclosures for each camping season were counted to find the appropriate temporal scale for comparison based on the sampling size for each season. The years 2010 and 2017 had the most valid human camps and livestock enclosures. Therefore, those years were chosen. After deciding the temporal scale (2010 vs 2017), sites that had the highest confidence in each utility type group (e.g., human camps 2010) were chosen. To illustrate, if there are more than seven human camps or livestock enclosures that had 100 percent confidence, random selection was used to choose seven human camps or livestock enclosures from the ones that had one hundred percent confidence. However, if there are fewer than seven, the ones that had highest confidence were chosen (e.g., five human camps of 100%) and the rest were chosen from the ones that had the second highest confidence (e.g., 90%) (Table 2). Some chosen samples that had one hundred percent confidence were replaced by less confidence site because they were invalid at the time of data collection.

Table 1. Shows the date, source, and resolutions of satellite images used in this research. DigitalGlobe only provide images that are less than 2 m spatial resolution (*https://dgv4-cms production.s3.amazonaws.com/uploads/document/file/126/Constellation_Brochure_2018.pdf*). The acquired CNES/Airbus Google Earth images have a spatial resolution that is comparable to DigitalGlobe Google Earth. Please see the Appendix section for comparison.

Year	First Image Date (Source, Resolution)	Second Image Date
2010	21/1/2010 (Google Earth: DigitalGlobe, less than 2 m)	27/4/2010 (Google Earth: DigitalGlobe, less than 2 m)
2011	13/2/2011 (WorldView2, 0.5 m)	2/7/2011 (Google Earth: DigitalGlobe, less than 2 m)
2012	6/2/2012 (WorldView1, 0.5 m)	25/9/2012 (Google Earth, less than 2 m)
2013	29/11/2012 (Google Earth: DigitalGlobe, less than 2 m) and 1/2/2013 (Pleiades, 0.5 m)	14/8/2013 (Google Earth: DigitalGlobe, less than 2 m) and 6/10/2013 (Google Earth: DigitalGlobe, less than 2 m)
2014	11/3/2014 (Google Earth: DigitalGlobe, less than 2 m)	25/6/2014 (SPOT image, 1.5 m)
2015	2/2/2015 (SPOT image, 1.5 m)	31/5/2015 (SPOT image, 1.5 m)
2016	28/1/2016 (Google Earth: DigitalGlobe, less than 2 m)	12/7/2016 (Pleiades, 0.5 m)
2017	3/11/2016 (Google Earth: DigitalGlobe, less than 2 m) and 7/1/2017 (Google Earth: CNES/Airbus, less than 2 m)	Field survey in summer 2017

Table 2. Shows the number of the chosen sites with their associated confidence in each group.

	Utility Type			
Site	**Human Camps 2010**	**Human Camps 2017**	**Livestock Enclosures 2010**	**Livestock Enclosures 2017**
1	90%	100%	100%	100%
2	90%	100%	100%	100%
3	90%	100%	100%	100%
4	90%	100%	100%	100%
5	80%	100%	90%	100%
6	80%	100%	90%	100%
7	80%	100%	80%	100%

Data Collection

Data collection was started by visiting each site that was chosen via the random selection to measure the length of each side (berm) of the camp. For instance, the north, east, south, and west berms were measured with a tape measure to the nearest centimeter. Also, a mark (flag) was placed at the start and end of each berm to indicate where the measurement took place (Figure 9). Afterwards, Google Earth was used to delineate the border of the site, and all delineated sites (human camps and livestock enclosures) were exported as Keyhole Markup Language (KML) files and imported to ArcGIS. All sites were projected into Transverse Mercator and the Minimum Bounding Geometry tool was used to superimpose a perfect rectangle on each site. Based on the longer length of each side, the perfect rectangle was divided into multiple divisions. As an example of this process, if the length of the north berm is 78 m and the south is 52 m, the north side of the perfect rectangle was divided according to the nearest tenth of the length of longer berm (78 m was rounded to 80) and divided by ten (80/10 = 8 north/south divisions). The divisions were connected to the opposite side to create quadrats. The same was done to the east and west sides.

To divide each site into quadrats in the field, a sketch of each site was created in ArcMap and was printed for scaling and usage in the field as a guide. To properly scale each site sketch, the length of one side (berm) was measured in the layout view using the drawing tool to obtain the length (e.g., 11 cm) of the side that the map was printed in. This tool is more accurate and easier than measuring the length of the printed sketch by using a ruler. According to the length in the field and its length on the sketch, the printed sketch was scaled. Using the printed map, a protractor was used to measure the bearing directions from a particular starting point to the next intersection point of the quadrat (N-S and E-W directions). Horizontal (E-W direction) and vertical (N-S direction) walking distances were measured. Declination value was subtracted from each bearing measurement. In the field, the sketch that contains the measurements (directions and distances) calculated from the steps mentioned above, was used to divide each site into quadrats (Figure 10). Quadrats that were outside the camp borders (berm) or covered less than 50 percent of the actual site floor were not considered for taking measurements. The sample size for each utility type class in each year was seven samples (e.g., seven camps in human 2010 and human 2017, and seven enclosures in livestock 2010, and livestock 2017).

Figure 9. Mark of the start point.

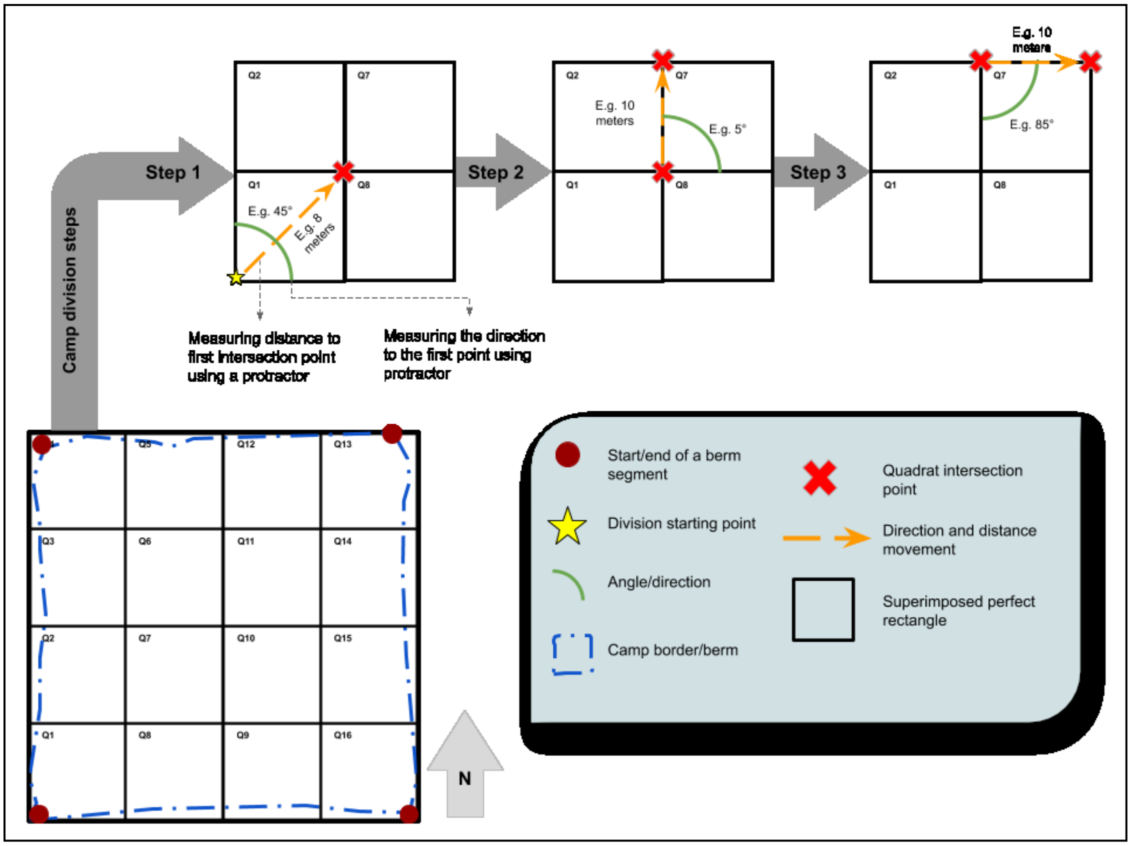

Figure 10. Diagram explains the steps that were followed to divide each camp into quadrats.

Soil compaction measurement and zoogeomorphic counting

Soil compaction was collected using a pocket penetrometer. For each quadrat, in each site, three measurements were recorded per quadrat (no berms measurements were done). A foot adapter was used with low strength cohesive sand and the obtained measurements were divided by 16 to obtain unconfined compressive strength. Furthermore, an active burrow counting technique (Oakley 2012) was used to count burrows and other zoogeomorphic features (ant and termite mounds) in each quadrat. It is basically counting the number of active (e.g., uncluttered opening, feces, tracks) burrow openings in each quadrat. Burrows were classified based on animal type and size (small mammal, large mammal, small reptile, large reptile). I only considered counting animals' burrows that have distinct and easily recognized burrows and mounds such as the Lesser Jerboa, Sundevall's Jird (small mammal) (Figure12 and 13, respectively) Red Fox (large mammal) (Figure 14), small reptile (Figure15), Dhub (large reptile), ant and termite (invertebrate) (Figure 16 and 17, respectively). In more details, a number of methods were used to identify and classify zoogeomorphic features. These included observing the animal at the feature itself (Jerboa burrow, Jird burrow and colony, small reptile burrow, and ant mound), conversations with and the knowledge of the local area among Bedouins living in the area (Jird burrow and colony), and published literature for Jerboa burrow (Anzah, Butler, and Dixon 2017) and termite mound (Al-Houty 2015).

To measure the anthropogeomorphic impact on zoogeomorphic activities, all above steps and procedures were repeated to obtain measurements on three non-disturbed/control sites (Figure 11) which allowed for comparison between camping and non-disturbed sites. The non-disturbed sites were located 500-1000 m from the southern edge of the study area. It is an area where camping and grazing are prohibited. The width (northwest corner to northeast corner and south west corner to south east corner) of the non-disturbed site was determined by calculating the average length of all the north and south segments of all disturbed sites. The length (southwest corner to the northwest corner and southeast corner to the northeast corner) of the non-disturbed was determined by calculating the average length of all the east and west segments of all disturbed sites. The final shape of all non-disturbed sites was a perfect rectangle.

Organic matter availability (wastes of humans and domesticated animals) was visually assessed in order to be used as a proxy variable in discussing the results. To illustrate, little organic matter was observed in human camps 2017 as people had left some wastes. For human camps 2010, it is assumed that most of the wastes were eroded by aeolian activities. For livestock enclosures 2017, it was observed that animal dung completely covered the surface, whereas in livestock enclosure 2010 less animal dung was observed (eroded by aeolian activities and mixed into the subsurface by zoogeomorphically-active animals). Therefore, in the disturbed sites, human camps 2010 was considered to have the least amount of organic matter whereas livestock enclosures 2017 to have the most. No human or animal dung were observed in non-disturbed sites. Instead, extremely small shrubs were observed that did not provide a significant amount of organic matter.

Table 3. Shows a criterion to be used and its corresponding confidence.

Livestock Enclosure		Human Camp	
Physical Evidence	**Confidence (%)**	**Physical Evidence**	**Confidence (%)**
No evidence	50%	No evidence	50%
Some distributed animal dung	60%	Cement sheet	60%
Some distributed wood logs	70%	One toilet and cement sheet	70%
Wood logs and dung	80%	Two or more toilets, tents parts	80%
Wood logs, dung, and buried food bags	90%	All previous evidences, human clothes	90%
Highly concentrated and sunbaked dung, all previous evidences, and aerial image scene	100%	All previous evidences plus aerial image scene	100%

Figure 11. Sampling one of the non-disturbed sites. Camps and caravans located in the background are located in the disturbed area within a distance of 500-1000 m from non-disturbed sites.

Figure 12. Lesser jerboa burrow; pocket penetrometer in center part of photograph ca. 15 cm long.

Figure 13. Small mammal colony (Sundevall's Jird colony); mineral water bottle in lower part of photograph ca. 20 cm long.

Figure 14. Large mammal burrow (red fox); smartphone left side of the burrow ca. 15 cm long.

Figure 15. Small reptile burrow; silver pocket penetrometer in center part of photograph ca. 15 cm long.

Figure 16. Ant mound.

Figure 17. Termite mound; scale is in centimeters (upper) and inches (lower).

Statistical Analysis

The statistical analyses were based on the counts of zoogeomorphic features within the flat area in each site. It is common to test the normality of data prior to determining whether to use parametric or nonparametric tests to statistically analyze the data. However, normality tests, namely Kolmogorov-Smirnov and Shapiro–Wilk tests are unreliable when applied on large amounts of data (Kim 2013). Another way to evaluate normality of the data is to use skewness and kurtosis. However, with very large sample size, skewness and kurtosis procedures are not recommended (Ghasemi and Zahediasl 2012). According to central limit theorem, when a large number of random samples are drawn from a population, the mean of the samples is approximately normal even though the population is non-normal (McDonald 2009). Moreover, if non-normality of the data is assumed, the only non-parametric test that is appropriate to test the hypotheses of this dissertation is the Kruskal-Wallis test. According to McDonald (2009), the Kruskal-Wallis test is inappropriate if the data has unequal variance and Welch's ANOVA (One-way ANOVA for unequal variance) should be used instead. Based on Levene's test, all the variables of this dissertation have unequal variance. Therefore, use of the Kruskal-Wallis test is inappropriate. Moreover, One-way ANOVA is not sensitive to deviations from normality (McDonald 2009).

Therefore, each hypothesis mentioned above in the introduction chapter was tested by conducting Welch's ANOVA Test followed by Tamhane's T2 pairwise comparisons test (Table 4). Due to their minimal counts, large mammal and large reptile zoogeomorphic features were excluded.

Table 4. Shows the variables and statistical tests that are used to test the above hypotheses.

Variables	**Groups**	**Statistical test**
Soil Compaction	Non-disturbed sites against human camps 2010, human camps 2017, livestock enclosures 2010, and livestock enclosures 2017.	Welch's ANOVA
Soil Compaction	Non-disturbed sites against human camps 2010.	Tamhane's T2 test
Soil Compaction	Non-disturbed sites against human camps 2017.	Tamhane's T2 test
Soil Compaction	Non-disturbed sites against livestock enclosures 2010.	Tamhane's T2 test
Soil Compaction	Non-disturbed sites against livestock enclosures 2017.	Tamhane's T2 test
Small Mammal Zoogeomorphic Features	Non-disturbed sites against human camps 2010, human camps 2017, livestock enclosures 2010, and livestock enclosures 2017.	Welch's ANOVA
Small Mammal Zoogeomorphic Features	Non-disturbed sites against human camps 2010.	Tamhane's T2 test
Small Mammal Zoogeomorphic Features	Non-disturbed sites against human camps 2017.	Tamhane's T2 test
Small Mammal Zoogeomorphic Features	Non-disturbed sites against livestock enclosures 2010	Tamhane's T2 test
Small Mammal Zoogeomorphic Features	Non-disturbed sites against livestock enclosures 2017.	Tamhane's T2 test
Small Mammal Zoogeomorphic Features	Non-disturbed sites against human camps 2010.	Tamhane's T2 test

Variables	Groups	Statistical test
Small Reptile Zoogeomorphic Features	Non-disturbed sites against human camps 2010, human camps 2017, livestock enclosures 2010, and livestock enclosures 2017.	Welch's ANOVA
Small Reptile Zoogeomorphic Features	Non-disturbed sites against human camps 2010.	Tamhane's T2 test
Small Reptile Zoogeomorphic Features	Non-disturbed sites against human camps 2017.	Tamhane's T2 test
Small Reptile Zoogeomorphic Features	Non-disturbed sites against livestock enclosures 2010.	Tamhane's T2 test
Small Reptile Zoogeomorphic Features	Non-disturbed sites against livestock enclosures 2017.	Tamhane's T2 test
Invertebrate Zoogeomorphic Features	Non-disturbed sites against human camps 2010, human camps 2017, livestock enclosures 2010, and livestock enclosures 2017.	Welch's ANOVA
Invertebrate Zoogeomorphic Features	Non-disturbed sites against human camps 2010.	Tamhane's T2 test
Invertebrate Zoogeomorphic Features	Non-disturbed sites against human camps 2017.	Tamhane's T2 test
Invertebrate Zoogeomorphic Features	Non-disturbed sites against livestock enclosures 2010.	Tamhane's T2 test
Invertebrate Zoogeomorphic Features	Non-disturbed sites against livestock enclosures 2017.	Tamhane's T2 test
Total Zoogeomorphic Features	Non-disturbed sites against human camps 2010, human camps 2017, livestock enclosures 2010, and livestock enclosures 2017.	Welch's ANOVA
Total Zoogeomorphic Features	Non-disturbed sites against human camps 2010.	Tamhane's T2 test
Total Zoogeomorphic	Non-disturbed sites against	Tamhane's T2

Variables	**Groups**	**Statistical test**
Features	human camps 2017.	test
Total Zoogeomorphic Features	Non-disturbed sites against livestock enclosures 2010.	Tamhane's T2 test
Total Zoogeomorphic Features	Non-disturbed sites against livestock enclosures 2017.	Tamhane's T2 test

IV. RESULTS

The results chapter is organized into seven primary sections – the first section is concerned with the description and illustration of the field sampling step. The second section examines testing the homogeneity of variance for each variable. Section three compares soil compaction between non-disturbed and disturbed sites. Section four compares the number of small mammal zoogeomorphic features in non-disturbed versus all disturbed sites. Section five does the same for small reptile zoogeomorphic features, section six for invertebrate zoogeomorphic features, and section seven compares the number of total zoogeomorphic features in non-disturbed versus all other disturbed sites.

Field Sampling

Seven sites were sampled in each type of the disturbed sites, and three sites in the non-disturbed sites were also sampled. The number of quadrats varies within the disturbed sites and between the disturbed and non-disturbed sites. In human camps 2010, a total of 429 quadrats were sampled, 338 quadrats in human camps 2017, 415 quadrats in livestock enclosures 2010, 450 quads in livestock enclosures 2017, and 192 quadrats in the non-disturbed sites (Table 5). Three soil compaction measurements were recorded in each quadrat to calculate the average soil compaction per quadrat.

For the non-disturbed sites, Lesser Jerboa burrows (small mammal burrows), small reptile burrows, and ant and termite mounds were observed. No Sundevall's Jird colony burrows were observed. Small Cyperus conglomerates seedlings dominated the non-disturbed areas (Figure 11). Human camps 2010 and 2017 had similar observed zoogeomorphic features to the non-disturbed sites. However, Cyperus conglomerates seedlings were limited in human 2010 and extremely limited in human 2017 compared to the non-disturbed areas. Livestock enclosures 2010 and 2017 had similar observed zoogeomorphic features and Cyperus conglomerates seedlings to the other disturbed sites except for Lesser Jerboa burrows and Sundevall's Jird colonies and burrows. Sundevall's Jird colonies and burrows dominated the livestock enclosures and no Lesser Jerboa burrows were observed. This is because in human camps, only individual burrows were found, and no colonies were found. In livestock enclosures 2010 and 2017 colonies and individual burrows that mostly associated with surfaces covered by domesticated animal dung were found. Sundevall's Jird is sometimes gregarious, living in colonies, but individuals may at times be solitary animals that feed on the dung of domesticated animals (Qumsiyeh 1996). Also, the dimensions and the shape of the burrows found in human camps were different than the burrows found in the livestock enclosures and were identical to Lesser Jerboa burrows.

Despite its limited number compared to the non-disturbed sites, Cyperus conglomerates seedlings are larger in size in the disturbed sites (Figure 18). The invertebrate zoogeomorphic features represent termites and ant mounds. Termite mounds represent a much larger proportion as the ant mounds did not exceed ten counts in the non-disturbed areas and fifty counts in each of the other disturbed sites. The surface of the livestock enclosures 2017 were mainly covered by a hard-crusted veneer of domesticated animal dung that look similar to biocrust (Figure 19). For livestock enclosure 2010, it is believed that zoogeomorphic processes had contributed to the loosening and mixing up of this crust in which little remains apparent on the surface and the subsoil is dark in color (higher litter depth) (Figure 20).

Table 5. Summary of field sampling step.

	Non-disturbed Sites	Human Camps 2010	Human Camps 2017	Livestock Enclosures 2010	Livestock Enclosures 2017
Number of Sites	3	7	7	7	7
Number of Quadrats	192	429	338	415	450
Number of Soil Compaction Measurements	576	1287	1014	1245	1350
Counts of Small Mammal Zoogeomorphic Features	58	112	51	153	136
Counts of Small Reptile Zoogeomorphic Features	59	47	71	111	63
Counts of Invertebrate Zoogeomorphic Features	438	2138	955	1026	649
Counts of Total Zoogeomorphic Features	555	2297	1077	1290	848

Figure 18. Size of Cyperus conglomerates seedlings in the disturbed areas; mineral water bottle in upper right part of photograph was ca. 20 cm long.

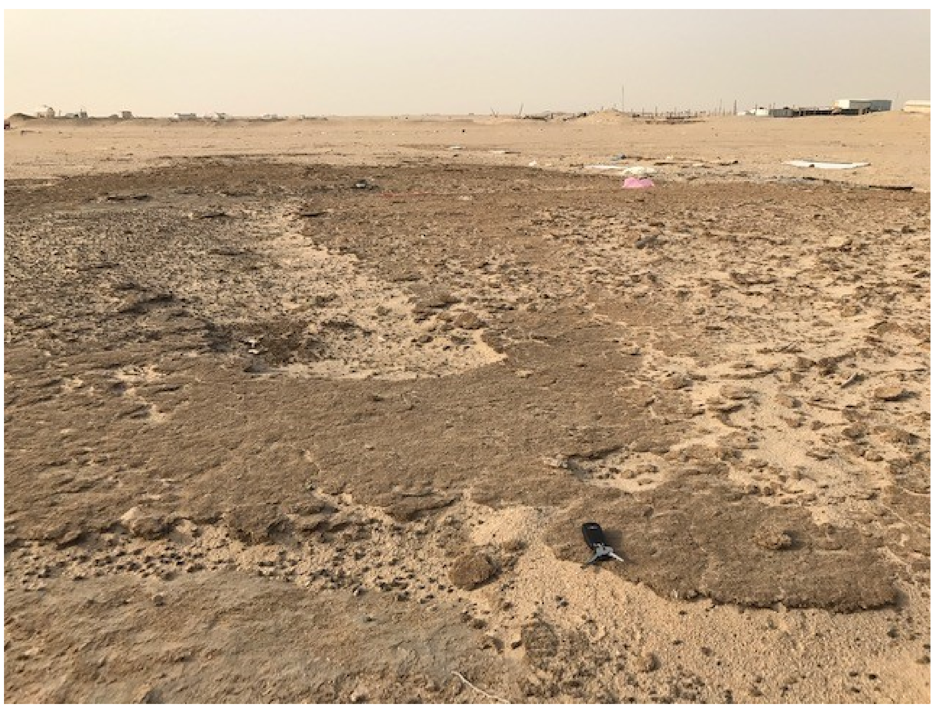

Figure 19. The dung-crusted surface in Livestock enclosures 2017; car key in lower center part of photograph was ca. 7.5 cm long.

Figure 20. The dark-colored subsoil in Livestock Enclosures 2010; ballpoint pen in upper part of photograph ca. 12 cm long.

Test of Homogeneity of Variance

As it was intimated in the method section, all variables yielded a significance value less than 0.05; therefore, the null hypothesis is rejected with p values < 0.05 (Table 6). Since all variables have unequal variance, Kruskal-Wallis Test (non-parametric ANOVA) is invalid, and Welch's ANOVA Test followed by Tamhane's T2 pairwise comparisons test were used to test if there is a difference in the values of each variable between the non-disturbed sites and all the other disturbed sites.

Table 6. Shows the homogeneity of variance of each variable. The significance level is P < 0.001.

Test of Homogeneity of Variances

	Statistics			
	Levene Statistic	df1	df2	Sig.
Soil Compaction	25.004	4	1819	.000
Small Mammals Zoogeomorphic Features	5.512	4	1819	.000
Small Reptiles Zoogeomorphic Features	24.384	4	1819	.000
Invertebrates Zoogeomorphic Features	53.154	4	1819	.000
Total Number of Zoogeomorphic Features	44.225	4	1819	.000

Hypothesis 1 – Soil Compaction

This hypothesis examines whether there are differences in soil compaction between the non-disturbed sites and the other disturbed sites, namely human camps 2010, human camps 2017, livestock enclosures 2010, and livestock enclosures 2017. The descriptive statistics of this variable are highlighted in Table 7. The statistical results of Welch's ANOVA Test and the Tamhane's T2 pairwise comparisons tests are summarized in Table 8 and Table 9, respectively. Welch's ANOVA Test and the Tamhane's T2 pairwise comparisons tests are based on the average value per quadrat (mean of three measurements per quadrat).

Welch's ANOVA is based on comparing the means between the groups (utility types). Welch ANOVA test yielded a significance value less than 0.05 ($W_{4,784.5} = 206.2$, $P < 0.0001$) (Table 8), therefore, the null hypothesis is rejected. Thus, Welch's ANOVA test result states that the mean of soil compaction was statistically different between non-disturbed sites and disturbed sites. The Tamhane's T2 post-hoc pairwise comparisons test revealed a statistically significant difference in soil compaction between non-disturbed sites and human camps 2010 (P<0.0001) (Table 9) with a mean value of 0.90 kg/cm^2 for non-disturbed sites and 2 kg/cm^2 for human camps 2010 (Figure 21). The same test also revealed a statistically significant differences in soil compaction between non-disturbed sites and human camps 2017 (P<0.0001) with a mean value of 0.90 kg/cm^2 for non-disturbed sites and 3.10 kg/cm^2 for human camps 2017. Non-disturbed sites and livestock enclosures 2010 also significantly varied (P<0.0001) with a mean value of 0.90 kg/cm^2 for non-disturbed sites and 1.99 kg/cm^2 for livestock enclosures 2010. Lastly, non-disturbed sites and livestock enclosures 2017 significantly varied (P<0.0001) with a mean value of 0.90 kg/cm^2 for non-disturbed sites and 2.86 kg/cm^2 for livestock enclosures 2010.

Soil Compaction Recovery Rate

It can be seen that utility type and time had played an important role in the recovery of the compacted surfaces. Regarding human camps, the average soil compaction in non-disturbed sites (0.90 kg/cm^2) is 55% lower than human camps 2010 (2.00 kg/cm^2) and 71% lower than human camps 2017 (3.10 kg/cm^2) (Figure 21). Regarding Livestock enclosures, the average soil compaction in non-disturbed sites (0.90 kg/cm^2) is 55% lower than livestock enclosures 2010 (1.99 kg/cm^2) and 69% lower than livestock enclosures 2017 (2.86 kg/cm^2).

Table 7. Shows the descriptive statistics for soil compaction within each utility type.

Descriptives			
Utility Type			**Statistic**
Soil Compaction	HUMAN CAMPS 2010	Mean	2.00
		Median	2.00
		Variance	0.61
		Std. Deviation	0.78
		Minimum	0.10
		Maximum	4.50
		Range	4.40
	HUMAN CAMPS 2017	Mean	3.10
		Median	3.42
		Variance	1.34
		Std. Deviation	1.16
		Minimum	0.10
		Maximum	4.50
		Range	4.40
	LIVESTOCK ENCSLOSURES 2010	Mean	1.99
		Median	2.00
		Variance	0.88
		Std. Deviation	0.94
		Minimum	0.09
		Maximum	4.50
		Range	4.41
	LIVESTOCK ENCSLOSURES 2017	Mean	2.86
		Median	3.08
		Variance	1.45
		Std. Deviation	1.21
		Minimum	0.11
		Maximum	4.50
		Range	4.39
	NON-DISTURBED SITES	Mean	0.90
		Median	0.54
		Variance	0.73
		Std. Deviation	0.85
		Minimum	0.08
		Maximum	3.17
		Range	3.09

Table 8. Summary result of Welch's ANOVA for soil compaction. Significant value is in bold.

Welch's ANOVA test	
W (DFn, DFd)	206.2 (4.000, 784.5)
P value	**<0.0001**
P value summary	****
Significant diff. among means ($P < 0.05$)?	Yes

Table 9. Summary result of Tamhane's T2 multiple comparisons test for Soil Compaction. Significant value is in bold.

Tamhane's T2 multiple comparisons test	**Mean Diff.**	**Adjusted P Value**
Non-disturbed sites vs. Human Camps 2010	-1.1010	**<0.0001**
Non-disturbed sites vs. Human Camps 2017	-2.2060	**<0.0001**
Non-disturbed sites vs. Livestock Enclosures 2010	-1.0900	**<0.0001**
Non-disturbed sites vs. Livestock Enclosures 2017	-1.9630	**<0.0001**

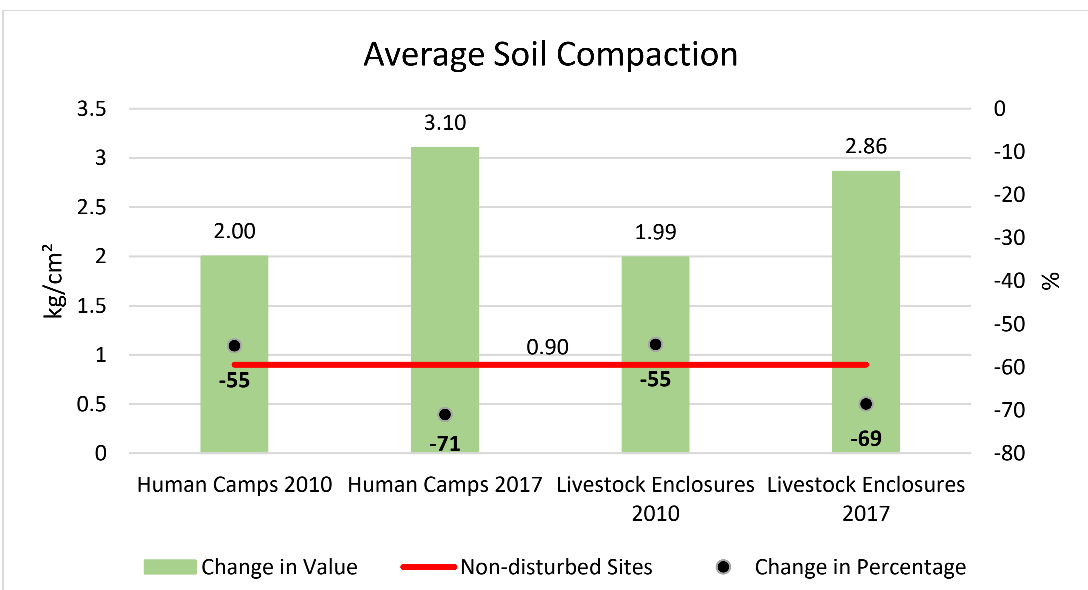

Figure 21. Comparison of average soil compaction between non-disturbed sites and disturbed sites.

Hypothesis 2 – Small Mammal Zoogeomorphic Features

This hypothesis examined whether there were differences in the counts of small mammal zoogeomorphic features between the non-disturbed sites and the other disturbed sites. The descriptive statistics of this variable are highlighted in Table 10. The statistical results of Welch's ANOVA Test and the Tamhane's T2 pairwise comparisons tests are summarized in Table 11 and Table 12, respectively. Welch's ANOVA Test and the Tamhane's T2 pairwise comparisons tests are based on the counts value per quadrat.

Welch's ANOVA test yielded a significance value less than 0.05 ($W_{4,\ 791.2}$= 5.663, P = 0·0002) (Table 11). Therefore, the null hypothesis is rejected. Thus, Welch's ANOVA test result states that the mean counts of small mammal zoogeomorphic features were statistically different between non-disturbed sites and disturbed sites. The Tamhane's T2 post-hoc pairwise comparisons test revealed statistically insignificant differences in the mean counts of small mammal zoogeomorphic features between non-disturbed sites and human camps 2010 (P = 0.9360) (Table 12) with a mean value of 0.30 count/quadrat for non-disturbed sites and 0.26 count/quadrat for human camps 2010 (Figure 22). The same test revealed a statistically significant difference in the mean counts of small mammal zoogeomorphic features between non-disturbed sites and human camps 2017 (P = 0.0369) with a mean value of 0.30 count/quadrat for non-disturbed sites and 0.15 count/quadrat for human camps 2017. Non-disturbed sites and livestock enclosures 2010 varied insignificantly (P = 0.7697) with a mean value of 0.30 count/quadrat for non-disturbed sites and 0.37 count/quadrat for livestock enclosures 2010. Lastly, non-disturbed sites and livestock enclosures 2017 were also insignificantly varied (P<0.0009) with a mean value of 0.30 count/quadrat for non-disturbed sites and

0.30 count/quadrat for livestock enclosures 2010.

Unlike soil compaction, which is a static phenomenon, zoogeomorphic features are dynamic phenomena that are related to the movement of the animal. Therefore, the term "recovery" is not applicable.

Average Counts of Small Mammal Zoogeomorphic Features per Utility Type

Rather than dividing the sum of counts of the small mammal zoogeomorphic features by the number of quadrats in each utility type, the average counts per utility type is calculated by dividing the sum of counts by the number of sites in each group (three for undisturbed sites and seven for the disturbed sites). This is done to control the variation in the number of observations (number of quadrats). Utility types that had a slight difference in the number of quadrats result in a per utility type graph that had a similar trend compared to the per quadrat graph and the ones that had significant difference, show different trends. However, both of them explain the results of the inferential statistics (Welch's ANOVA and Tamhane's T2 tests). The same rule applies to the other variables.

It can be seen that utility type and time had played an important role in the distribution of small mammal zoogeomorphic features. Regarding human camps, the average counts of small mammal zoogeomorphic features in the non-disturbed sites (19.3 count/utility type) is 21% higher than human camps 2010 (16 count/utility type) and 165% higher than human camps 2017 (7.3 count/utility type) (Figure 23). Regarding Livestock enclosures, the average counts of small mammal zoogeomorphic features in non-disturbed sites (19.3 count/utility type) is 12% lower than livestock 2010 (21.9 count/utility type) and essentially the same as livestock enclosures 2017 (19.4 count/utility type).

Table 10. Shows the descriptive statistics for small mammal zoogeomorphic features within each utility type.

Descriptives			
Utility Type			**Statistic**
Small Mammals Zoogeomorphic Features	HUMAN CAMPS 2010	Mean	0.26
		Median	0.00
		Variance	0.46
		Std. Deviation	0.67
		Minimum	0.00
		Maximum	4.00
		Range	4.00
	HUMAN CAMPS 2017	Mean	0.15
		Median	0.00
		Variance	0.26
		Std. Deviation	0.51
		Minimum	0.00
		Maximum	4.00
		Range	4.00
	LIVESTOCK ENCSLOSURES 2010	Mean	0.37
		Median	0.00
		Variance	0.69
		Std. Deviation	0.83
		Minimum	0.00
		Maximum	6.00
		Range	6.00
	LIVESTOCK ENCSLOSURES 2017	Mean	0.30
		Median	0.00
		Variance	3.08
		Std. Deviation	1.75
		Minimum	0.00
		Maximum	33.00
		Range	33.00
	NON-DISTURBED SITES	Mean	0.30
		Median	0.00
		Variance	0.49
		Std. Deviation	0.70
		Minimum	0.00
		Maximum	4.00
		Range	4.00

Table 11. Summary result of Welch's ANOVA for small mammal zoogeomorphic features. Significant value is in bold.

Welch's ANOVA test	
W (DFn, DFd)	5.663 (4.000, 791.2)
P value	0.0002
P value summary	***
Significant diff. among means (P < 0.05)?	Yes

Table 12. Summary result of Tamhane's T2 multiple comparisons test for small mammal zoogeomorphic features. Significant value is in bold.

Tamhane's T2 multiple comparisons test	**Mean Diff.**	**Adjusted P Value**
Non-disturbed Sites vs. Human Camps 2010	0.0410	0.9360
Non-disturbed Sites vs. Human Camps 2017	0.1512	**0.0369**
Non-disturbed Sites vs. Livestock Enclosures 2010	-0.0666	0.7697
Non-disturbed Sites vs. Livestock Enclosures 2017	-0.0001	>0.9999

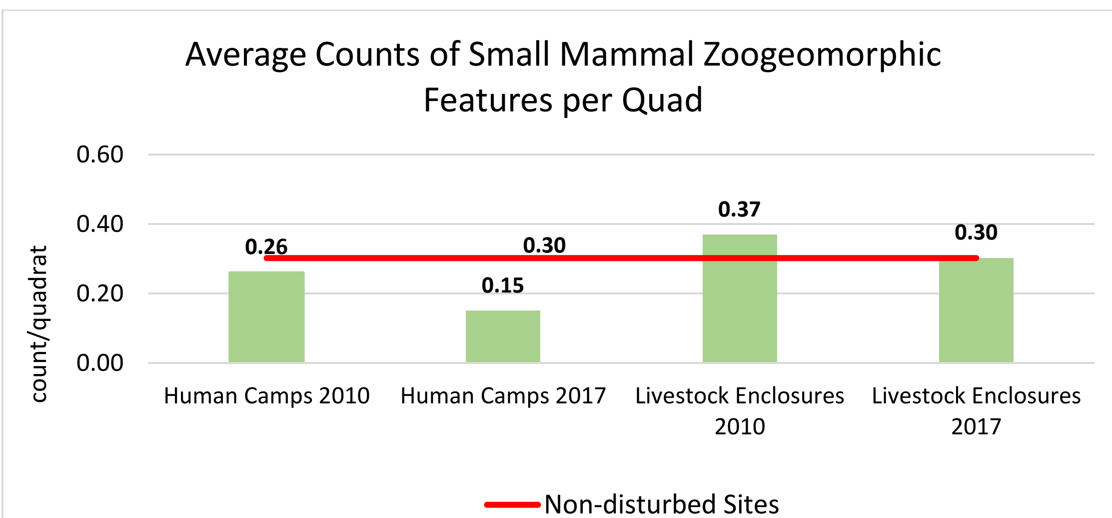

Figure 22. Comparison of average counts of small mammal zoogeomorphic features between non-disturbed sites and disturbed sites. The comparison is based on average counts per quadrat.

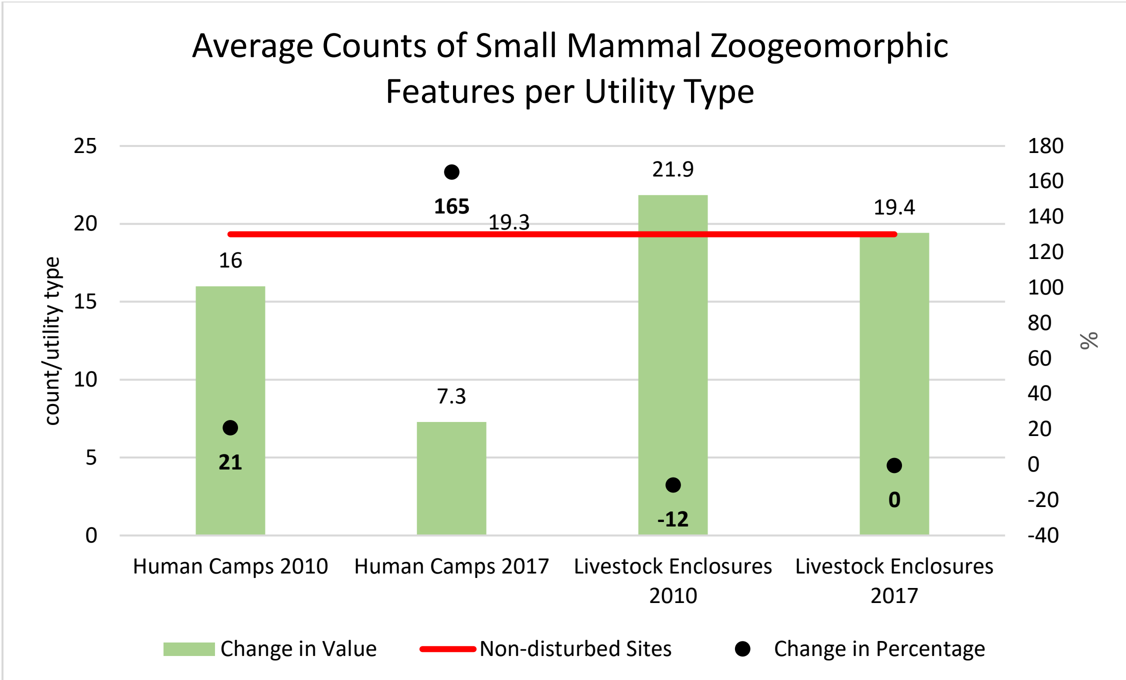

Figure 23. Comparison of average counts of small mammal zoogeomorphic features between non-disturbed sites and disturbed sites. The comparison is based on average counts per utility type.

Hypothesis 3 – Small Reptile Zoogeomorphic Features

This hypothesis examines whether there are differences in the count of small reptile zoogeomorphic features between the non-disturbed sites and the other disturbed sites. The descriptive statistics of this hypothesis are highlighted in Table 13. The statistical results of the Welch's ANOVA Test and the Tamhane's T2 pairwise comparisons tests are summarized in Table 14 and Table 15, respectively. Welch's ANOVA Test and the Tamhane's T2 pairwise comparisons tests are based on the counts value per quadrat.

Welch's ANOVA test yielded a significance value less than 0.05 ($W_{4,\ 745.7}$= 7.764, $P < 0{\cdot}0001$) (Table 14), therefore, the null hypothesis was rejected. Thus, Welch's ANOVA test result states that the mean counts of small reptile zoogeomorphic features were statistically different between the non-disturbed sites and the other disturbed sites.

The Tamhane's T2 post-hoc pairwise comparisons test revealed statistically significant differences in the counts of small reptile zoogeomorphic features between non-disturbed sites and human camps 2010 (P = 0.0002) (Table 15) with a mean value of 0.31 count/quadrat for undisturbed sites and 0.11 count/quadrat for human camps 2010 (Figure 24). The same test revealed a statistically insignificant difference in the counts of small reptile zoogeomorphic features between non-disturbed sites and human camps 2017 (P = 0.2606) with a mean value of 0.31 count/quadrat for non-disturbed sites and 0.21 count/quadrat for human camps 2017. Non-disturbed sites and livestock enclosures 2010 also varied insignificantly (P = 0.9373) with a mean value of 0.31 count/quadrat for non-disturbed sites and 0.27 count/quadrat for livestock enclosures 2010. Lastly, non-disturbed sites and livestock enclosures 2017 varied significantly (P = 0.0036) with a mean value of 0.31 count/quadrat for non-disturbed sites and 0.14 count/quadrat for livestock enclosures 2010.

Average Counts of Small Reptile Zoogeomorphic Features per Utility Type

It can be seen that utility type and time had played an important role in the distribution of small reptile zoogeomorphic features. Regarding human camps, the average counts of small reptile zoogeomorphic features in non-disturbed sites (19.67 count/utility type) is 193% higher than human camps 2010 (6.71 count/utility type) and 94% higher than human camps 2017 (10.14 count/utility type) (Figure 25). Regarding Livestock enclosures, the average counts of small reptile zoogeomorphic features in non-disturbed sites (19.67 count/utility type) is 24% higher than livestock 2010 (15.86 count/utility type) and 119% higher than livestock enclosures 2017 (9 count/utility type).

Table 13. Shows the descriptive statistics for small reptile zoogeomorphic features within each utility type.

Descriptives			
Utility Type			**Statistic**
Small Reptile Zoogeomorphic Features	HUMAN CAMPS 2010	Mean	0.11
		Median	0.00
		Variance	0.12
		Std. Deviation	0.35
		Minimum	0.00
		Maximum	2.00
		Range	2.00
	HUMAN CAMPS 2017	Mean	0.21
		Median	0.00
		Variance	0.31
		Std. Deviation	0.56
		Minimum	0.00
		Maximum	3.00
		Range	3.00
	LIVESTOCK ENCSLOSURES 2010	Mean	0.27
		Median	0.00
		Variance	0.62
		Std. Deviation	0.79
		Minimum	0.00
		Maximum	8.00
		Range	8.00
	LIVESTOCK ENCSLOSURES 2017	Mean	0.14
		Median	0.00
		Variance	0.23
		Std. Deviation	0.48
		Minimum	0.00
		Maximum	5.00
		Range	5.00
	NON-DISTURBED SITES	Mean	0.31
		Median	0.00
		Variance	0.38
		Std. Deviation	0.62
		Minimum	0.00
		Maximum	3.00
		Range	3.00

Table 14. Summary result of Welch's ANOVA for small reptile zoogeomorphic features. Significant value is in bold.

Welch's ANOVA test	
W (DFn, DFd)	7.764 (4.000, 745.7)
P value	**<0.0001**
P value summary	****
Significant diff. among means (P < 0.05)?	Yes

Table 15. Summary result of Tamhane's T2 multiple comparisons test for small reptile zoogeomorphic features. Significant value is in bold.

Tamhane's T2 multiple comparisons test	**Mean Diff.**	**Adjusted P Value**
Non-disturbed sites vs. Human Camps 2010	0.1977	**0.0002**
Non-disturbed sites vs. Human Camps 2017	0.0972	0.2606
Non-disturbed sites vs. Livestock Enclosures 2010	0.0398	0.9373
Non-disturbed sites vs. Livestock Enclosures 2017	0.1673	**0.0036**

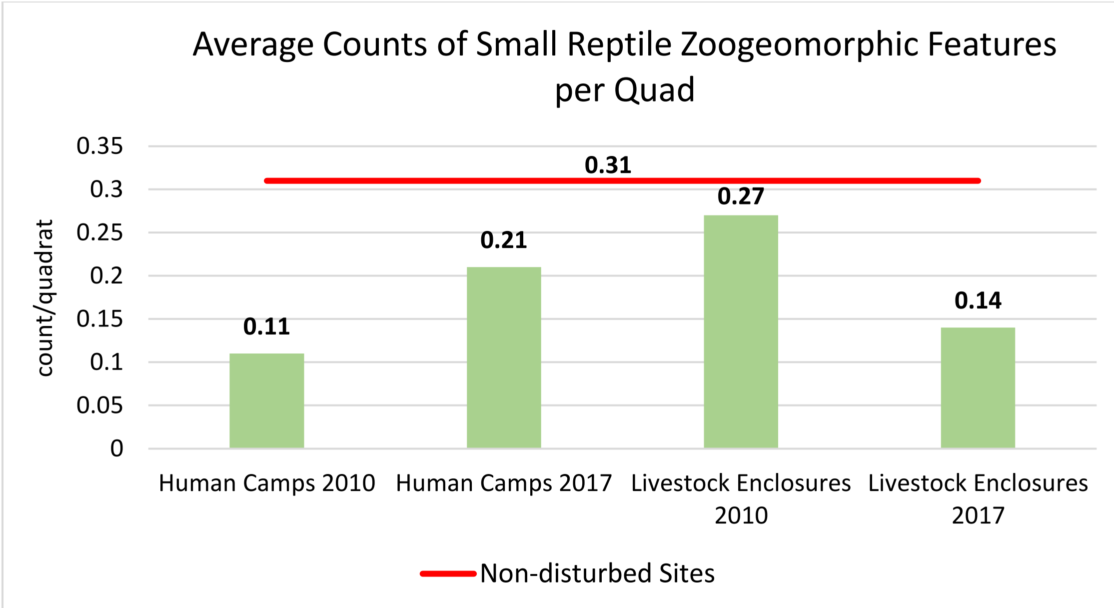

Figure 24. Comparison of average counts of small reptile zoogeomorphic features between non-disturbed sites and disturbed sites. The comparison is based on average counts per quadrat.

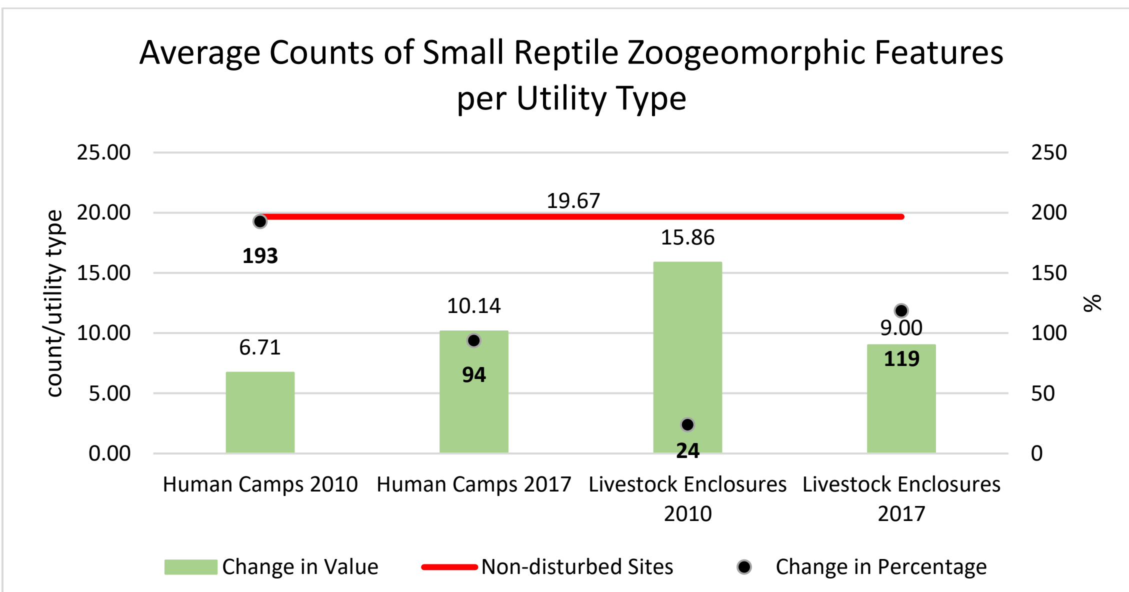

Figure 25. Comparison of average counts of small reptile zoogeomorphic features between non-disturbed sites and disturbed sites. The comparison is based on average counts per utility type.

Hypothesis 4 – Invertebrate Zoogeomorphic Features

This hypothesis examines whether there were differences in the count of invertebrate zoogeomorphic features between the non-disturbed sites and the other disturbed sites. The descriptive statistics of this hypothesis are highlighted in Table 16. The statistical results of the Welch's ANOVA Test and the Tamhane's T2 pairwise comparisons tests are summarized in Table 17 and Table 18, respectively. Welch's ANOVA Test and the Tamhane's T2 pairwise comparisons tests are based on the count value per quadrat.

Welch's ANOVA test yielded a significance value less than 0.05 ($W_{4,\ 784.9}$= 24.30, $P < 0{\cdot}0001$) (Table 17), therefore, the null hypothesis is rejected. Thus, Welch's ANOVA test result states that the mean counts of invertebrate zoogeomorphic features were statistically different between the non-disturbed sites and the other disturbed sites. The Tamhane's T2 post-hoc pairwise comparisons test revealed statistically significant differences in the counts of invertebrate zoogeomorphic features between non-disturbed sites and human camps 2010 (P <0.0001) (Table 18) with a mean value of 2.28 count/quadrat for non-disturbed sites and 4.98 count/quadrat for human camps 2010 (Figure 26). The same test revealed a statistically insignificant differences in the counts of invertebrate zoogeomorphic features between non-disturbed sites and human camps 2017 (P = 0.4067) with a mean value of 2.28 count/quadrat for non-disturbed sites and 2.82 count/quadrat for human camps 2017. Non-disturbed sites and livestock enclosures 2010 also varied insignificantly (P = 0.9647) with a mean value of 2.28 count/quadrat for non-disturbed sites and 2.47 count/quadrat for livestock enclosures 2010. Lastly, non-disturbed sites and livestock enclosures 2017 were significantly varied (P = 0.0286) with a mean value of 2.28 count/quadrat for non-disturbed sites and 1.44 count/quadrat for livestock enclosures 2010.

Average Counts of Invertebrate Zoogeomorphic Features per Utility Type

It can be clearly seen that utility type and time had played an important role in the distribution of invertebrate zoogeomorphic features. Regarding human camps, the average counts of invertebrate zoogeomorphic features in non-disturbed sites (146 count/utility type) is 52% lower than human camps 2010 (305.43 count/utility type) and 7% higher than human camps 2017 (136.43 count/utility type) (Figure 27). Regarding Livestock enclosures, the average counts of invertebrate zoogeomorphic features in non-disturbed sites (146 count/utility type) is 0% higher/lower than livestock 2010 (146.57 count/utility type) and 57% higher than livestock enclosures 2017 (92.71 count/utility type). There is a slight difference in the trend between Figure 26 and 27 in regard to human camps 2017 and livestock enclosures 2010. This is due to the variation of the number of observations that Figure 26 was based on.

Table 16. Shows the descriptive statistics for invertebrate zoogeomorphic features within each utility type.

Descriptives			
Utility Type			**Statistic**
Invertebrate Zoogeomorphic Features	HUMAN CAMPS 2010	Mean	4.98
		Median	2.00
		Variance	49.09
		Std. Deviation	7.01
		Minimum	0.00
		Maximum	44.00
		Range	44.00
	HUMAN CAMPS 2017	Mean	2.83
		Median	1.00
		Variance	17.88
		Std. Deviation	4.23
		Minimum	0.00
		Maximum	24.00
		Range	24.00
	LIVESTOCK ENCSLOSURES 2010	Mean	2.47
		Median	0.00
		Variance	16.67
		Std. Deviation	4.08
		Minimum	0.00
		Maximum	26.00
		Range	26.00
	LIVESTOCK ENCSLOSURES 2017	Mean	1.44
		Median	0.00
		Variance	11.54
		Std. Deviation	3.40
		Minimum	0.00
		Maximum	37.00
		Range	37.00
	NON-DISTURBED SITES	Mean	2.28
		Median	1.00
		Variance	13.57
		Std. Deviation	3.68
		Minimum	0.00
		Maximum	23.00
		Range	23.00

Table 17. Summary result of Welch's ANOVA for invertebrate zoogeomorphic features. Significant value is in bold.

Welch's ANOVA test	
W (DFn, DFd)	24.30 (4.000, 784.9)
P value	**<0.0001**
P value summary	****
Significant diff. among means (P < 0.05)?	Yes

Table 18. Summary result of Tamhane's T2 multiple comparisons test for invertebrate zoogeomorphic features. Significant value is in bold.

Tamhane's T2 multiple comparisons test	**Mean Diff.**	**Adjusted P Value**
Non-disturbed sites vs. Human Camps 2010	-2.7020	**<0.0001**
Non-disturbed sites vs. Human Camps 2017	-0.5442	0.4067
Non-disturbed sites vs. Livestock Enclosures 2010	-0.1910	0.9647
Non-disturbed sites vs. Livestock Enclosures 2017	0.8390	**0.0286**

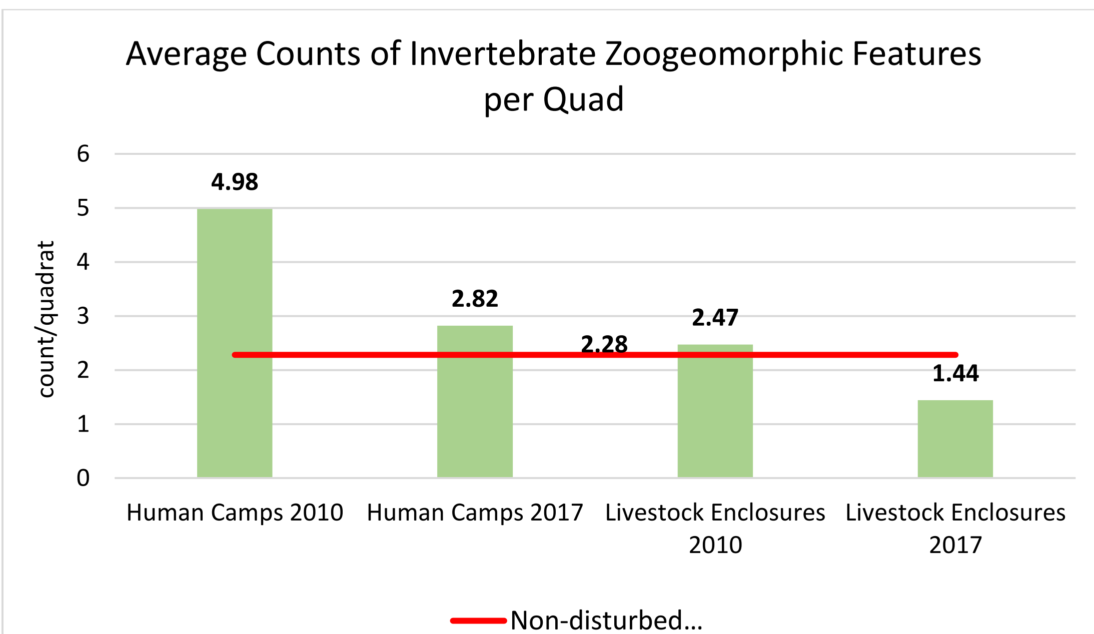

Figure 26. Comparison of average counts of invertebrate zoogeomorphic features between non-disturbed sites and disturbed sites. The comparison is based on average counts per quadrat.

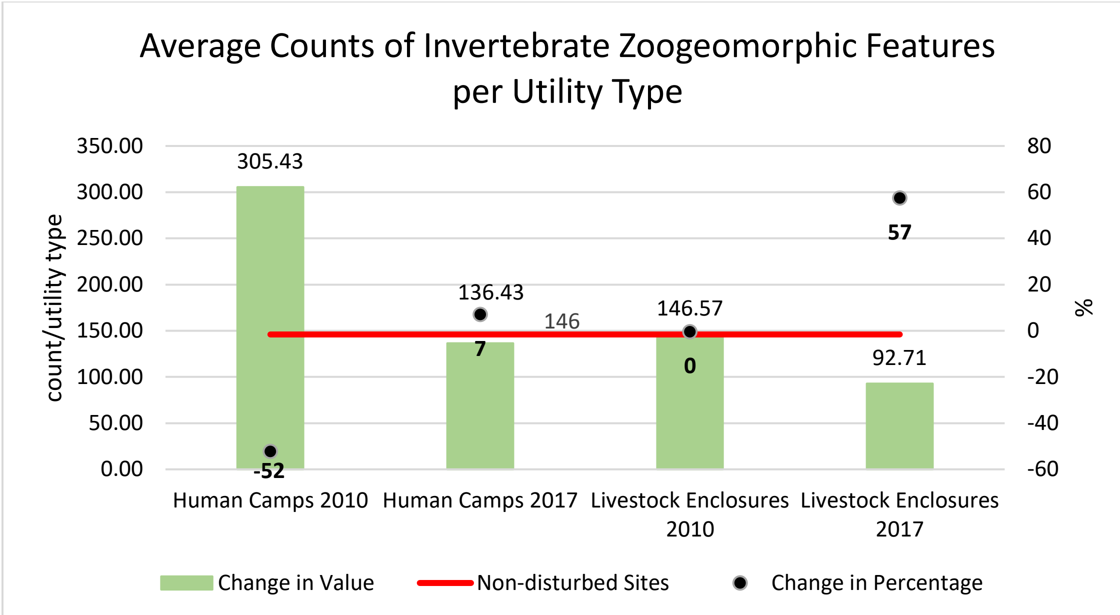

Figure 27. Comparison of average counts of invertebrate zoogeomorphic features between non-disturbed sites and disturbed sites. The comparison is based on average counts per utility type.

Hypothesis 5 – Total Zoogeomorphic Features

This hypothesis examines whether there are differences in the count of total zoogeomorphic features between the non-disturbed sites and the other disturbed sites. The descriptive statistics of this hypothesis are highlighted in Table 19. The statistical results of the Welch's ANOVA Test and the Tamhane's T2 pairwise comparisons tests are summarized in Table 20 and Table 21, respectively. Welch's ANOVA Test and the Tamhane's T2 pairwise comparisons tests are based on the counts value per quadrat.

Welch's ANOVA test yielded a significance value less than 0.05 ($W_{4,\ 792.0}$= 21.62, $P < 0{\cdot}0001$) (Table 20), therefore, the null hypothesis is rejected. Thus, Welch's ANOVA test result states that the mean counts of total zoogeomorphic features were statistically different between the non-disturbed sites and the other disturbed sites. The Tamhane's T2 post-hoc pairwise comparisons test revealed statistically significant differences in the counts of total zoogeomorphic features between non-disturbed sites and human camps 2010 (*P* <0.0001) (Table 21) with a mean value of 2.89 count/quadrat for non-disturbed sites and 5.35 count/quadrat for human camps 2010 (Figure 28). The same test revealed a statistically insignificant differences in the counts of total zoogeomorphic features between non-disturbed sites and human camps 2017 (*P* = 0.8813) with a mean value of 2.89 count/quadrat for non-disturbed sites and 3.18 count/quadrat for human camps 2017. Non-disturbed sites and livestock enclosures 2010 also varied insignificantly (*P* = 0.9507) with a mean value of 2.89 count/quadrat for non-disturbed sites and 3.10 count/quadrat for livestock enclosures 2010. Lastly, non-disturbed sites and livestock enclosures 2017 were significantly varied (*P* = 0.0090) with a mean value of 2.89 count/quadrat for non-disturbed sites and 1.88 count/quadrat for livestock enclosures 2010.

Average Counts of Total Zoogeomorphic Features per Utility Type

It can be clearly seen that utility type and time had played an important role in the distribution of total zoogeomorphic features. Regarding human camps, the average counts of total zoogeomorphic features in non-disturbed sites (185 count/utility type) is 44% lower than human camps 2010 (328.14 count/utility type) and 20% higher than human camps 2017 (153.86 count/utility type) (Figure 29). Regarding Livestock enclosures, the average counts of total zoogeomorphic features in non-disturbed sites (185 count/utility type) is 0% higher/lower than livestock 2010 (184.29 count/utility type) and 53% higher than livestock enclosures 2017 (121.14 count/utility type). The same explanation applies in regard to the variation between Figure 28 and 29.

Table 19. Shows the descriptive statistics for total zoogeomorphic features within each utility type.

Descriptives			
Utility Type			**Statistic**
Total Zoogeomorphic Features	HUMAN CAMPS 2010	Mean	5.35
		Median	3.00
		Variance	49.82
		Std. Deviation	7.06
		Minimum	0.00
		Maximum	44.00
		Range	44.00
	HUMAN CAMPS 2017	Mean	3.19
		Median	1.00
		Variance	18.67
		Std. Deviation	4.32
		Minimum	0.00
		Maximum	24.00
		Range	24.00
	LIVESTOCK ENCSLOSURES 2010	Mean	3.11
		Median	1.00
		Variance	18.42
		Std. Deviation	4.29
		Minimum	0.00
		Maximum	26.00
		Range	26.00
	LIVESTOCK ENCSLOSURES 2017	Mean	1.88
		Median	0.00
		Variance	14.34
		Std. Deviation	3.79
		Minimum	0.00
		Maximum	37.00
		Range	37.00
	NON-DISTURBED SITES	Mean	2.89
		Median	2.00
		Variance	14.41
		Std. Deviation	3.80
		Minimum	0.00
		Maximum	23.00
		Range	23.00

Table 20. Summary result of Welch's ANOVA for total zoogeomorphic features. Significant value is in bold.

Welch's ANOVA test	
W (DFn, DFd)	21.62 (4.000, 792.0)
P value	**<0.0001**
P value summary	****
Significant diff. among means (P < 0.05)?	Yes

Table 21. Summary result of Tamhane's T2 multiple comparisons test for total zoogeomorphic features. Significant value is in bold.

Tamhane's T2 multiple comparisons test	**Mean Diff.**	**Adjusted P Value**
Non-disturbed sites vs. Human Camps 2010	-2.4640	**<0.0001**
Non-disturbed sites vs. Human Camps 2017	-0.2958	0.8813
Non-disturbed sites vs. Livestock Enclosures 2010	-0.2178	0.9507
Non-disturbed sites vs. Livestock Enclosures 2017	1.0060	**0.0090**

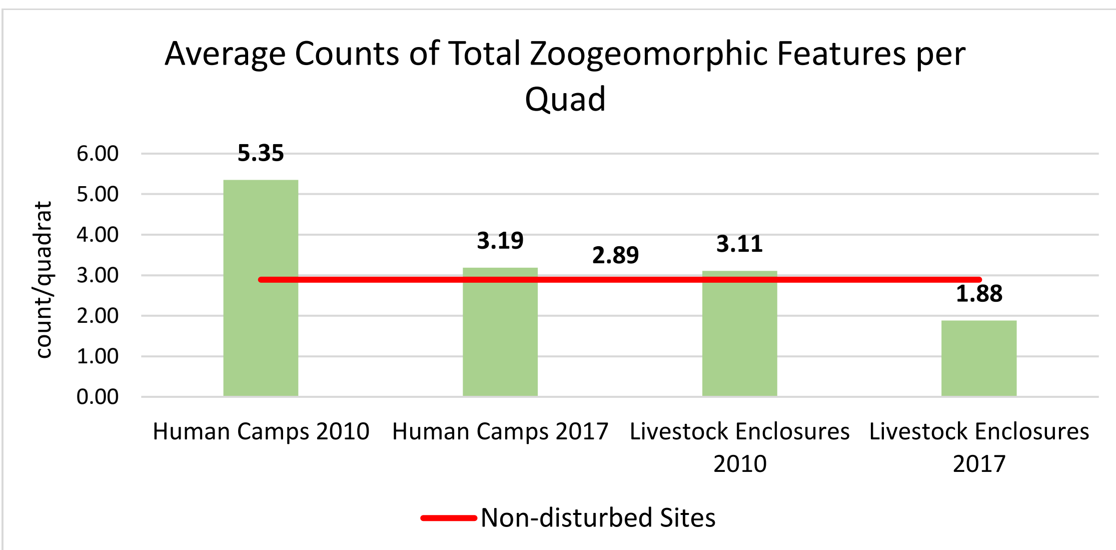

Figure 28. Comparison of average counts of total zoogeomorphic features between non-disturbed sites and disturbed sites. The comparison is based on average counts per quadrat.

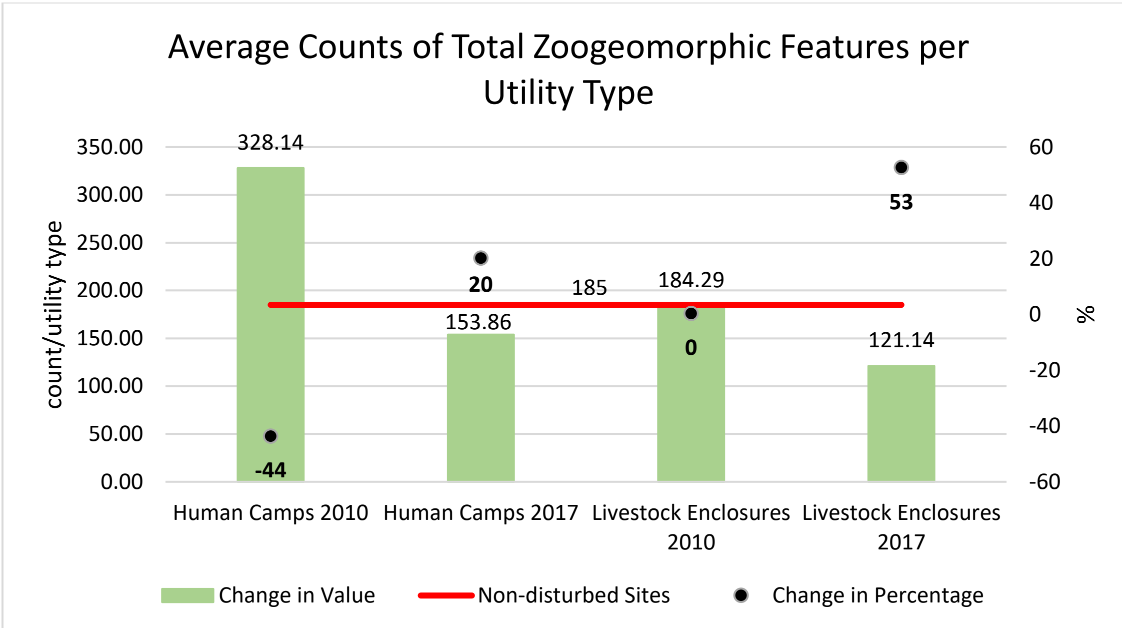

Figure 29. Comparison of average counts of total zoogeomorphic features between non-disturbed sites and disturbed sites. The comparison is based on average counts per utility type.

IV. DISCUSSION AND CONCLUSIONS

Summary and Discussion

Zoogeomorphically-active animals inhabit landscapes to meet their needs, and the availability of environmental conditions may force trade-offs in the selection of habitat. For instance, animals in hot regions may favor thermal cover at the cost of reduced foraging efficiency (Street et.al 2016). In ecology, this is called the functional response. Habitat selection by animals is a complex process that depends on multiple conditions. The functional response model is used in the discussion of the results to lead to more efficient understanding of the impact of human activities in desert landscapes on the zoogeomorphological processes and processes.

Soil compaction is a limiting factor for burrowing activities (Brussaard and Van Faassen 1994), but specific thresholds of compaction that may impede burrowing have not been identified in the zoogeomorphic literature. Moreover, as it was noted above, soil in the non-disturbed sites is significantly less compacted than the other disturbed sites. Therefore, soil compaction is used as a proxy to explain the difference in the counts of zoogeomorphic features between the non-disturbed sites and the other disturbed sites. Based on the literature, organic matter availability is another factor that also plays an important role for determining the abundance of zoogeomorphic features (Davidson et al. 2018). Topographic protection is another factor that may play an important role in the abundance of zoogeomorphic features. It is believed that zoogeomorphically-active animals may use topographic protection (choose sites surrounded by berms) as a refuge from the intense prevailing wind and off-road vehicles. Therefore, the discussion of the results of these hypotheses is based on considering soil compaction, organic matter addition, and topographic protection as the primary factors that control the abundance of zoogeomorphic features (Figure 30). Other factors that are specifically related to each animal type (e.g., small reptiles) are also considered.

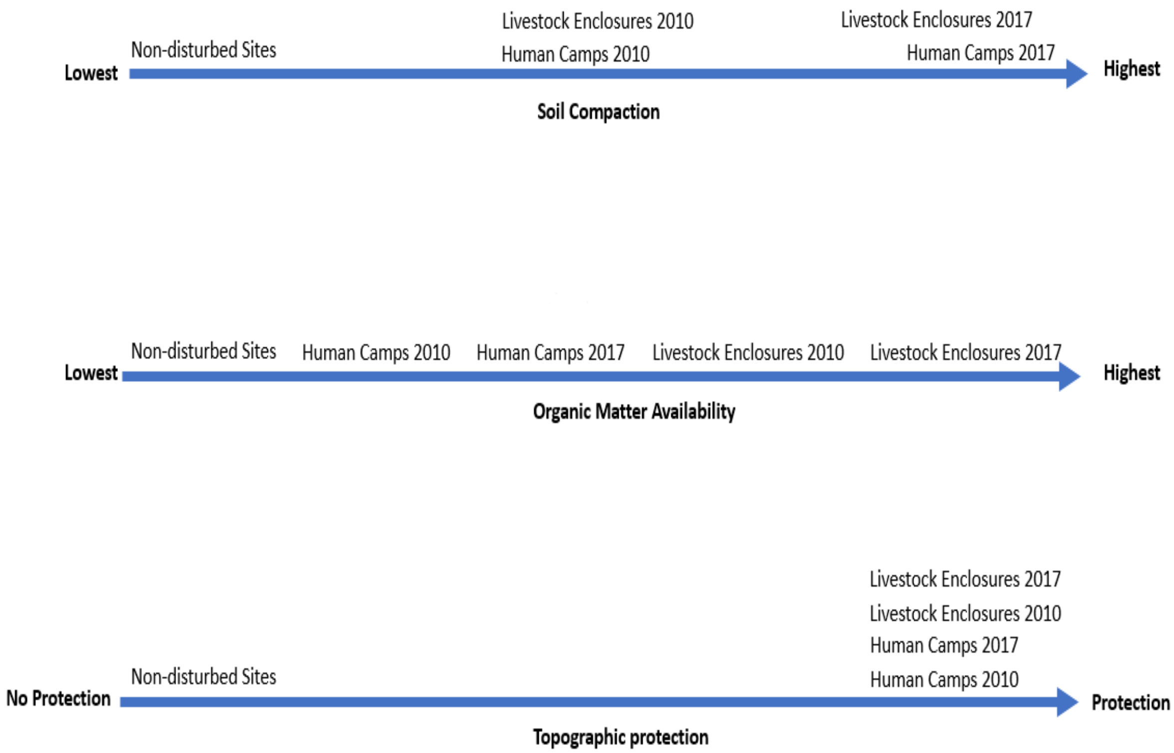

Figure 30. Primary factors that are used in the discussion the results. Soil compaction: according to the result of this dissertation, the surface of the non-disturbed sites is the least compacted surface whereas human camps 2017 is the highest. Organic matter availability: according to field work evidence and type of disturbance, non-disturbed sites had the lowest organic matter availability and livestock enclosures 2017 support the highest organic matter availability (fresh and lightly consumed dung). Human camps had less organic matter availability (food and limited wastes) than livestock enclosures because human do not produce dung the same way as animals. Topographic protection: the disturbed sites are surrounded by berm whereas the non-disturbed sites are not.

In the non-disturbed sites and human camps 2010 and 2017, small mammal geomorphic features are most likely related to Lesser Jerboa. Lesser Jerboa is a solitary animal (Anzah, Butler, and Dixon 2017). This is because only individual burrows were found, and no colonies were found in those sites. In livestock enclosures 2010 and 2017, small mammal geomorphic features are most likely related to Sundevall's Jird. This is because colonies and individual burrows that are mostly associated with surfaces covered by animal dung were found. Sundevall's Jird can be either a gregarious or a solitary animal that feeds on the dung of domesticated animals (Qumsiyeh 1996).

Hypothesis 1 – Soil Compaction

As was noted above, soil compaction was statistically different between non-disturbed sites and all the disturbed sites. This result was highly expected as the role of human activities in compacting the soil is well-established in the academic literature. The non-disturbed sites are 55% less compacted than human camps 2010 and 71% than human camps 2010 (Figure 21). This can be attributed to two factors, namely, relaxation period and zoogeomorphic processes. At the time of fieldwork data collection, human camps 2017 had only less than a year since they were disturbed by human activities (less relaxation time), whereas human camps 2010 had about 7 years. Therefore, the compacted soil in human camps 2010 had more time to recover than the compacted soil in human camps 2017. The other factor that is believed to play an important role in the recovery process is the zoogeomorphic process. This factor is also highly related to relaxation time. After seven years, human camps 2010 had a mean count value of 5.35 per quadrat for total zoogeomorphic features, whereas after less than a year, human camps 2017 had 3.19 count/quadrat. The longer the time, the more zoogeomorphic processes can take place.

Regarding livestock enclosure, the non-disturbed sites were 55% less compacted than livestock enclosures 2010 and 69% than livestock enclosures 2017 (Figure 21). This can be attributed to the same two factors mentioned above as livestock enclosures 2010 had seven years of relaxation period with a mean count value of 3.11 per quadrat for total zoogeomorphic features, whereas livestock enclosures 2017 had only less than a year with a mean of 1.88 count/quadrat. In the Kuwaiti desert, Monsef and Abahussain (2013) studied the impact of camping activities on soil compaction and used bulk density as an indicator of soil compaction. Monsef and Abahussain (2013), found that the bulk density of the soil in camping sites have greater bulk density by an average of about 12% compared to soils not affected by camping activities.

Hypothesis 2 – Small Mammal Zoogeomorphic Features

The statistical result indicates that the difference in the counts of small mammal zoogeomorphic features between the non-disturbed sites and human camps 2010 is statistically insignificant. By examining Figure 31, despite the less compacted surface in the non-disturbed sites, both had similar counts of small mammal zoogeomorphic features with human camps 2010 having slightly fewer counts. This indicates that Lesser Jerboa had adapted to dig their burrows in moderately compacted surfaces in favor of slightly more organic matter and topographic protection.

The statistical result indicates that the difference in the counts of small mammal zoogeomorphic features between the non-disturbed sites and human camps 2017 is statistically significant. By examining Figure 31, it can be seen that because soil is much less compacted in the non-disturbed sites, the non-disturbed sites had greater counts of Lesser Jerboa burrows than human camps 2017. This indicates that Lesser Jerboa had not adapted to dig their burrows in highly compacted surfaces in sites that had slightly more organic matter and had topographic protection. In other words, despite slightly higher organic matter availability, and existence of topographic protection, the soil is highly compacted, which makes it hard to be excavated by Lesser Jerboa.

The statistical result indicates that the difference in the counts of small mammal zoogeomorphic features between the non-disturbed sites and livestock enclosures 2010 is statistically insignificant. By examining Figure 31, despite the less compacted soil in the non-disturbed sites, both sites had similar counts of small mammal zoogeomorphic features with livestock enclosures 2010 having slightly greater counts. This indicates that Sundevall's Jird had adapted to dig their burrows in moderately compacted surfaces in favor of more organic matter and topographic protection.

The statistical result indicates that the difference in the counts of small mammal zoogeomorphic features between the non-disturbed sites and livestock enclosures 2017 is statistically insignificant. By examining Figure 31, despite the less compacted soil in the non-disturbed sites, both sites had similar counts of small mammal zoogeomorphic features with livestock enclosures 2017 having slightly less counts. This indicates that Sundevall's Jird had adapted to dig their burrows in highly compacted surfaces that had much more organic matter and had topographic protection.

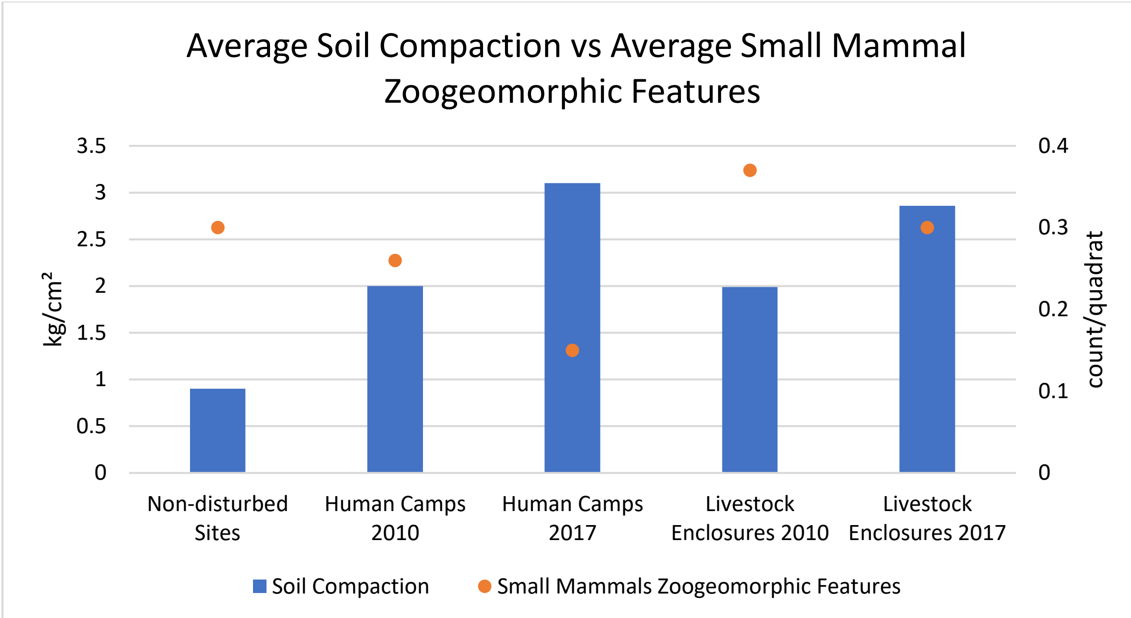

Figure 31. Shows the relationship between soil compaction and the counts of small mammal zoogeomorphic features.

Hypothesis 3 – Reptile Zoogeomorphic Features

The statistical result indicates that the difference in the counts of small reptile zoogeomorphic features between the non-disturbed sites and human camps 2010 is statistically significant. By examining Figure 32, it can be seen that the surface in the non-disturbed sites is less compacted, as a result, the non-disturbed sites have many more small reptile zoogeomorphic features than human camps 2010. This indicates that small reptiles had not adapted to dig their burrows in moderately compacted surfaces in favor of slightly more organic matter and topographic protection. In other words, small reptiles were not willing to exert more effort by excavating in moderately compacted soil in favor of slightly more organic matter and topographic protection.

The statistical result indicates that the difference in the counts of small reptile zoogeomorphic features between the non-disturbed sites and human camps 2017 is statistically insignificant. By examining Figure 32, despite the less compacted surface in the non-disturbed sites, the non-disturbed sites have slightly higher counts of small reptile zoogeomorphic features than human camps 2017. This suggests that small reptiles exerted more effort by excavating highly compacted soil in order to live in a site that had more organic matter and had topographic protection.

The statistical result indicates that the difference in the counts of small reptile zoogeomorphic features between the non-disturbed sites and livestock enclosures 2010 is statistically insignificant. By examining Figure 32, despite the less compacted surface in the non-disturbed sites, both had similar counts of small reptile zoogeomorphic features with the non-disturbed having slightly more counts. This indicate that small reptiles had adapted to dig their burrows in moderately compacted surfaces in favor of much more organic matter, topographic protection, higher surface roughness (larger Cyperus conglomerates mounds), and higher litter depth (James 2003).

The statistical result indicates that the difference in the counts of small reptile zoogeomorphic features between the non-disturbed sites and livestock enclosures 2017 is statistically significant. By examining Figure 32, it can be seen that the surface in the non-disturbed sites is less compacted, therefore, the non-disturbed sites had much larger counts of small reptile zoogeomorphic features than livestock enclosures 2017. This indicate that small reptiles had not adapted to dig their burrows in highly compacted surfaces in favor of much more organic matter, topographic protection, and higher surface roughness (larger Cyperus conglomerates mounds). It is also believed that because of the hard-crusted veneer of domesticated animal, these sites are more suitable to Sundevall’s Jird than other animals studied in this research.

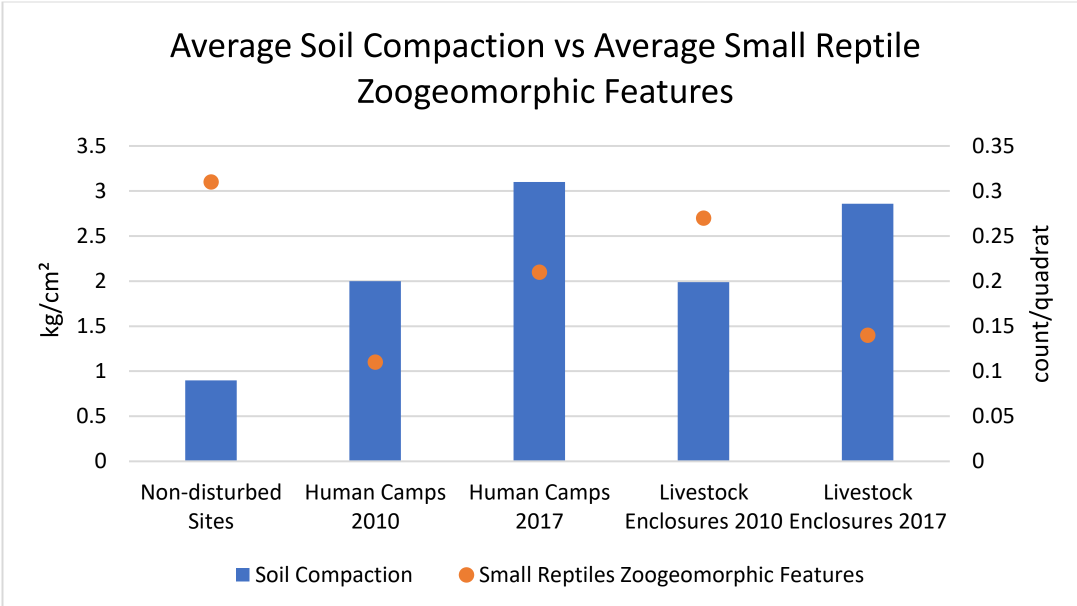

Figure 32. Shows the relationship between soil compaction and the counts of small reptile zoogeomorphic features.

Hypothesis 4 – Invertebrate Zoogeomorphic Features

The statistical result indicates that the difference in the counts of invertebrate zoogeomorphic features between the non-disturbed sites and human camps 2010 is statistically significant. By examining Figure 33, despite the less compacted surface in the non-disturbed sites, human camps 2010 have many more counts. This indicates that invertebrates had adapted to construct their mounds in moderately compacted surfaces in favor of slightly more organic matter and topographic protection, and possibly because surface roughness (larger plants mounds) is higher than the non-disturbed sites. However, it is believed that the most important factor is the abundance of small reptile because reptiles are termite eaters (Abensperg-Traun 1994). By examining Figure 32 and 33, it can be seen that there is a negative relationship between the counts of invertebrates and small reptile zoogeomorphic features.

The statistical result indicates that the difference in the counts of invertebrate zoogeomorphic features between the non-disturbed sites and human camps 2017 is statistically insignificant with human camps 2017 having slightly higher counts. By examining Figure 33, despite the less compacted surface in the non-disturbed sites, human camps 2017 had slightly higher counts. This indicates that invertebrates had adapted to construct their mounds in highly compacted surfaces in favor of more organic matter, topographic protection and lower counts of small reptile zoogeomorphic features.

The statistical result indicates that the difference in the counts of invertebrate zoogeomorphic features between the non-disturbed sites and livestock enclosures 2010 is statistically insignificant with livestock enclosures 2010 having slightly higher counts. By examining Figure 33, despite the less compacted surface in the non-disturbed, livestock enclosures 2010 had slightly higher counts. This indicates that invertebrates had adapted to construct their mounds in moderately compacted surfaces in favor of more organic matter, topographic protection and lower counts of small reptile zoogeomorphic features.

The statistical result indicates that the difference in the counts of invertebrate zoogeomorphic features between the non-disturbed sites and livestock enclosures 2017 is statistically significant with the non-disturbed sites having higher counts. By examining Figure 33, it can be seen that the surface in the non-disturbed sites is much less compacted, therefore, the non-disturbed sites had larger counts of invertebrate zoogeomorphic features than livestock enclosures 2017. This indicates that invertebrates had not adapted to construct their mounds in highly compacted surfaces in favor of more organic matter, topographic protection, and lower counts of small reptile zoogeomorphic features. It is also believed that because of the hard-crusted veneer of domesticated animal, these sites are more suitable to Sundevall's Jird than other animals studied in this research.

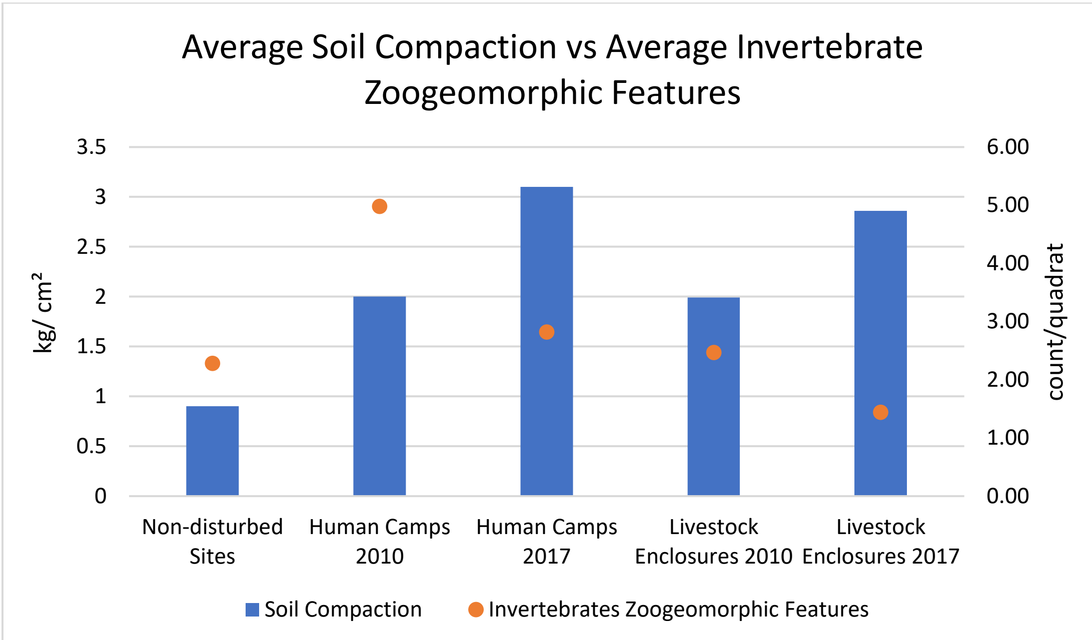

Figure 33. Shows the relationship between soil compaction and the counts of invertebrate zoogeomorphic features.

Hypothesis 5 – Total Zoogeomorphic Features

The statistical result indicates that the difference in the counts of the total zoogeomorphic features between the non-disturbed sites and human camps 2010 is statistically significant. By examining Figure 34, despite the less compacted surface in the non-disturbed sites, human camps 2010 have many more counts. This indicates that zoogeomorphically-active animals had adapted to construct their zoogeomorphic features in moderately compacted surfaces in favor of slightly more organic matter and topographic protection.

The statistical result indicates that the difference in the counts of the total zoogeomorphic features between the non-disturbed sites and human camps 2017 is statistically insignificant. By examining Figure 34, despite the less compacted surface in the non-disturbed sites, human camps 2017 had slightly higher counts. This indicates that zoogeomorphically-active animals had adapted to construct their zoogeomorphic features in highly compacted surfaces in favor of more organic matter and topographic protection.

The statistical result indicates that the difference in the counts of the total zoogeomorphic features between the non-disturbed sites and livestock enclosures 2010 is statistically insignificant. By examining Figure 34, despite the less compacted surface in the non-disturbed sites, livestock enclosures 2010 sites had slightly more counts. This indicates that zoogeomorphically-active animals had adapted to construct their zoogeomorphic features in moderately compacted surfaces in favor of more organic matter and topographic protection.

The statistical result indicates that the difference in the counts of the total zoogeomorphic features between the non-disturbed sites and livestock enclosures 2017 is statistically significant. By examining Figure 34, it can be seen that the surface in the non-disturbed sites is less compacted, therefore, the non-disturbed sites have larger counts. This indicates that zoogeomorphically-active animals had not adapted to construct their zoogeomorphic features in highly compacted surfaces in favor of much more organic matter and topographic protection. It is also believed that because of the hard-crusted veneer of domesticated animal, these sites are more suitable to Sundevall’s Jird than other animals studied in this research.

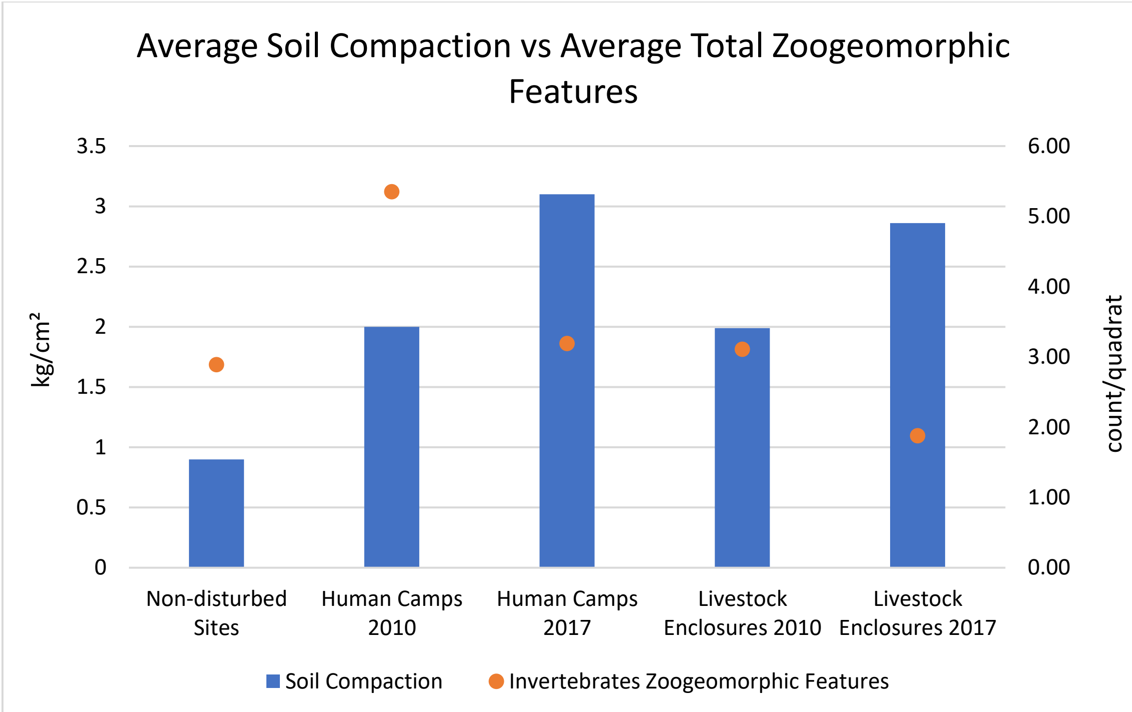

Figure 34. Shows the relationship between soil compaction and the counts of total zoogeomorphic features.

Spatial and Temporal Properties of the Disturbance

An essential importance to ecology and conservation is the recognition of the stability of ecosystems such as their ability to recover and persist in the face of natural and human disturbances (May 1973; Neubert and Caswell 1997; Loreau and de Mazancourt 2013). As it was discussed in the literature chapter, many studies have dealt with the impact of anthropogeomorphic activities on the zoogeomorphic processes and patterns. However, I am not aware of any study that analyzed or discussed the spatial and temporal scale of this interaction (Anthropogeomorphic-zoogeomorphic interaction). Most of these studies concluded that zoogeomorphically-active animals were able to adapt to the disturbance. To understand the spatial and temporal properties of the human camping and livestock enclosures activities in the Kuwaiti desert, a conservative calculation is used to reveal the minimum spatial and temporal impact. It is considered conservative because of several reasons; (1) it is only based on camping activities that are authorized by the ministry of municipality in Kuwait, (2) most camping actives occur outside of the authorized camping areas and a large number of human camps are not authorized (Figure 35), and (3) livestock enclosures are not included in this calculation. The ministry of municipality in Kuwait has restricted camping activities to twelve specific areas that cover about 804 km² (Figure 36). Each family or camper must provide the latitude/longitude of its camp to the ministry of municipality. Each camp must not cover more than 1000 m².

In 2017, 1240 human camps each covering no more than 1000 m² were authorized by the ministry of municipality in Kuwait. In 2019, 1074 human camps each covering 1000 m² are authorized by the ministry of municipality in Kuwait. Out of 1240 human camps, only 36 human camps were reoccupied in 2019. The mean of the two years is 1157 authorized human camps per year. These human camps cover an area of 1,157,000 m²/year (1.157 km²/year). By using the results of soil compaction measurements of this dissertation, it can be concluded that each year, 1,157,000 m²/year of the desert of Kuwait is experiencing an increase in soil compaction from 0.9 kg/cm² (non-disturbed sites) to 3.10 kg/cm² (human camps 2017). If the impacted area remained undisturbed for seven years, soil compaction decreased from 3.10 to 2 kg/cm². Under current camping regulations.

Based on the calculation above, it will take about 695 years of camping activities for the permitted camping area to be completely impacted.

Unfortunately, numerous numbers of human camps are located outside of the permitted camping areas with each camp covering an average area of 5715 m² (based on the 14 human camps in this dissertation). At this point, due to the unavailability of the number of human camps located outside of the permitted camping areas, calculation of the yearly impacted area cannot be made.

Zoogeomorphically, each camping site had an average of 153.86 counts/sites compared to 185 counts/sites in the non-disturbed sites (Figure 29). However, after seven years of post-disturbance, each human camp site had an average of 328.14 counts/site while the non-disturbed sites had only 185 counts/site. Given the fact that a large number of human camps are annually constructed outside of the permitted camping areas, and each camp covers an average of 5715 m^2, zoogeomorphically-active animals seemed to benefit from this type of disturbance in which seven years of post-disturbance recovery had occurred, the disturbance sites surpass the natural habitat (non-disturbed sites) in the counts of zoogeomorphic features. Unfortunately, spatial and temporal properties of the impact of disturbance on zoogeomorphically-active animals cannot be calculated at this point. This is because the average camp area that the calculation of the mean count was based on is 5715 m^2 (unavailable nation-wide data on the total number of unauthorized human camps), not 1000 m^2 (unavailable zoogeomorphic data).

Figure 35. Shows camping activities outside of the permitted camping areas. The green polygons represent the permitted areas. East of the image, numerous camps are constructed in the restricted areas. Data source: Kuwait Municipality website (https://camp.baladia.gov.kw/).

Figure 36. Shows the location of the twelve permitted camping areas. Data source: Kuwait Municipality website (https://camp.baladia.gov.kw/).

Conclusion

The results from this research demonstrate that human camping activities and livestock enclosures had a negative impact on soil compaction. However, after abandonment by humans, the constructed anthropogeomorphic features provide a suitable habitat for the zoogeomorphically-active animals. By inhabiting these anthropogeomorphic sites, zoogeomorphically-active animals and their zoogeomorphic processes create a negative feedback in which they reduce soil compaction.

This research has stated that small mammals, particularly, Sundevall's Jirds had adapted well and showed resistance to the disturbance only after less than one year of relaxation period when they occupied livestock enclosures activities. On the other hand, within the same relaxation period (less than one year), other small mammals, particularly, Lesser Jerboas had not adapted well to human camping activities. However, after seven years of relaxation period, this research showed that small mammals adapted well to both human camping and livestock enclosures activities.

This research has shown that small reptiles had not adapted well to anthropogeomorphic disturbances despite the length of relaxation period. Livestock enclosures 2017 and human camps 2010 are the only types of disturbance that small reptiles had not adapted well to inhabit in the same degree that they inhabit the natural sites.

This research has shown that invertebrates had adapted well to anthropogeomorphic disturbances despite the length of relaxation period. In most of the disturbed sites, the counts of invertebrates zoogeomorphic features surpass the count in the natural sites. Livestock enclosures 2017 is the only type of disturbance that invertebrates had not adapted well to inhabit in the same degree that they inhabit the natural sites.

This research has stated that the total zoogeomorphically-active animals had adapted well to inhabit anthropogeomorphically-disturbed sites. Most of the disturbed sites supported higher counts of total zoogeomorphic features than the natural sites. Livestock enclosures 2017 is the only type of disturbance that invertebrates had not adapted well to inhabit in the same degree that they inhabit the natural sites. A summary of statistical results can be visualized in Table 22.

Table 22. A summary table of statistical tests. HC 2010 = Human Camp 2010, HC 2017 = Human Camp 2017, LE 2010 = Livestock Enclosure 2010, and LE 2017 = Livestock Enclosure 2017. Values represent mean difference between the non-disturbed sites and disturbed sites.

Average Soil Compaction				
	HC 2010	HC 2017	LE 2010	LE 2017
Non-disturbed	**<u>-1.1010</u>**	**<u>-2.2060</u>**	**<u>-1.0900</u>**	**<u>-1.9630</u>**
Small Mammal Zoogeomorphic Feature (count/quad)				
	HC 2010	HC 2017	LE 2010	LE 2017
Non-disturbed	0.04101	**0.1512**	-0.0666	-0.0001
Small Reptile Zoogeomorphic Feature (count/quad)				
	HC 2010	HC 2017	LE 2010	LE 2017
Non-disturbed	**<u>0.1977</u>**	0.0972	0.0398	**0.1673**
Invertebrate Zoogeomorphic Feature (count/quad)				
	HC 2010	HC 2017	LE 2010	LE 2017
Non-disturbed	**<u>-2.7020</u>**	-0.5442	-0.1910	**0.8390**
Total Zoogeomorphic Feature (count/quad)				
	HC 2010	HC 2017	LE 2010	LE 2017
Non-disturbed	**<u>-2.4640</u>**	-0.2958	-0.2178	**1.0060**

Recommendations and Future Research

1- The ministry of municipality in Kuwait must enforce their camping regulation and increase the penalties for those who do not construct their camps within the permitted area.

2- The ministry of municipality must apply the same regulations to livestock enclosures.

3- The ministry of municipality in Kuwait must not remove the anthropogeomorphic features for the reason cleaning and surface leveling as these features play an important role in the desert ecosystem of Kuwait.

4- This research has shown that the desert ecosystem in Kuwait is undergoing natural rehabilitation. Therefore, the ministry of the municipality should not consider using artificial rehabilitation that might cause a defect in the ecosystem.

5- For future research, I suggest that similar data collection and analyses should occur on the berms to determine how berm sites function in comparison to the non-disturbed sites, the disturbed compacted camping sites, and the disturbed livestock enclosure sites.

APPENDIX SECTION

AC = Average Compaction, SM = Small Mammal Zoogeomorphic Features, SR = Small Reptile Zoogeomorphic Features, A = Ant Zoogeomorphic Features, T = Termite Zoogeomorphic Features, INV= Invertebrates Zoogeomorphic Features, and Total = Total Zoogeomorphic Features.

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2010	77	1	2.1666667	1	1	0	0	0	2
Human Camps 2010	77	2	3.0833333	0	0	1	0	1	1
Human Camps 2010	77	3	1.9218750	0	0	0	1	1	1
Human Camps 2010	77	4	2.0833333	1	0	0	2	2	3
Human Camps 2010	77	7	2.1666667	2	0	0	0	0	2
Human Camps 2010	77	8	2.5000000	0	0	0	1	1	1
Human Camps 2010	77	9	2.8333333	0	0	0	0	0	0
Human Camps 2010	77	10	1.8333333	1	0	0	0	0	1
Human Camps 2010	77	11	2.1666667	0	0	0	2	2	2
Human Camps 2010	77	12	3.0000000	0	0	0	7	7	7
Human Camps 2010	77	13	3.3333333	0	0	0	0	0	0
Human Camps 2010	77	14	2.5000000	1	0	1	0	1	2
Human Camps 2010	77	17	2.2500000	0	1	0	5	5	6
Human Camps 2010	77	18	2.5000000	0	0	0	0	0	0
Human Camps 2010	77	19	2.9166667	0	0	0	2	2	2
Human Camps 2010	77	20	2.0833333	1	0	0	2	2	3
Human Camps 2010	77	21	2.1666667	2	0	0	3	3	5
Human Camps 2010	77	22	2.5833333	0	0	0	2	2	2
Human Camps 2010	77	23	2.2500000	0	0	0	2	2	2
Human Camps 2010	77	24	2.2500000	2	0	1	0	1	3

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2010	77	26	1.5833333	2	0	0	1	1	3
Human Camps 2010	77	27	1.7500000	0	0	0	0	0	0
Human Camps 2010	77	28	1.6666667	0	0	0	0	0	0
Human Camps 2010	77	29	2.0000000	3	0	0	0	0	3
Human Camps 2010	77	30	2.5000000	3	0	3	6	9	12
Human Camps 2010	77	31	1.6666667	3	0	0	2	2	5
Human Camps 2010	77	32	2.5000000	0	0	0	4	4	4
Human Camps 2010	77	33	1.7500000	0	0	0	4	4	4
Human Camps 2010	77	34	1.8333333	1	0	0	8	8	9
Human Camps 2010	77	35	1.5833333	2	0	1	0	1	3
Human Camps 2010	77	36	1.8333333	0	0	2	0	2	2
Human Camps 2010	77	37	2.5000000	0	0	0	5	5	5
Human Camps 2010	77	38	2.1666667	0	0	0	2	2	2
Human Camps 2010	77	39	2.3333333	0	0	0	3	3	3
Human Camps 2010	77	40	2.6666667	2	0	0	6	6	8
Human Camps 2010	77	41	2.0833333	0	0	1	6	7	7
Human Camps 2010	77	42	2.1666667	0	0	0	3	3	3
Human Camps 2010	77	43	2.2500000	1	1	0	7	7	9
Human Camps 2010	77	44	2.4166667	0	0	1	2	3	3
Human Camps 2010	77	45	0.1666667	0	0	0	0	0	0
Human Camps 2010	77	46	0.1041667	0	0	0	0	0	0
Human Camps 2010	77	47	2.2500000	0	2	0	2	2	4
Human Camps 2010	77	48	1.4166667	0	0	0	2	2	2
Human Camps 2010	77	49	2.1666667	0	0	0	7	7	7

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2010	77	50	2.8333333	0	1	0	12	12	13
Human Camps 2010	73	3	0.6666667	0	0	0	32	32	32
Human Camps 2010	73	4	1.3333333	0	0	0	19	19	19
Human Camps 2010	73	5	1.6666667	0	0	0	26	26	26
Human Camps 2010	73	6	1.5000000	0	0	0	6	6	6
Human Camps 2010	73	7	1.0833333	1	0	0	0	0	1
Human Camps 2010	73	8	1.9166667	0	0	0	3	3	3
Human Camps 2010	73	9	4.1666667	0	0	0	0	0	0
Human Camps 2010	73	10	2.2500000	0	0	0	6	6	6
Human Camps 2010	73	11	2.8333333	0	0	0	2	2	2
Human Camps 2010	73	12	4.3333333	0	0	0	3	3	3
Human Camps 2010	73	13	2.0833333	0	0	0	25	25	25
Human Camps 2010	73	14	1.0000000	0	0	0	7	7	7
Human Camps 2010	73	15	1.3333333	1	0	0	6	6	7
Human Camps 2010	73	16	4.5000000	0	0	0	4	4	4
Human Camps 2010	73	17	2.9166667	0	0	1	27	28	28
Human Camps 2010	73	18	4.0000000	0	0	0	13	13	13
Human Camps 2010	73	19	3.8333333	0	0	0	0	0	0
Human Camps 2010	73	20	0.9166667	0	0	0	8	8	8
Human Camps 2010	73	21	0.171875	0	0	0	0	0	0
Human Camps 2010	73	22	0.1197917	0	0	0	0	0	0
Human Camps 2010	73	23	1.2500000	0	0	0	6	6	6
Human Camps 2010	73	24	2.9166667	0	0	0	0	0	0
Human Camps 2010	73	25	1.7500000	0	0	0	7	7	7

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2010	73	26	2.0833333	0	0	0	20	20	20
Human Camps 2010	73	27	2.4166667	0	1	0	3	3	4
Human Camps 2010	73	28	0.5885417	0	0	0	21	21	21
Human Camps 2010	73	29	1.5104167	0	0	0	0	0	0
Human Camps 2010	73	30	1.8333333	0	1	0	16	16	17
Human Camps 2010	73	31	2.8333333	0	0	0	6	6	6
Human Camps 2010	73	32	3.6666667	0	0	0	4	4	4
Human Camps 2010	73	33	4.2500000	0	0	3	8	11	11
Human Camps 2010	73	34	1.0833333	0	0	0	27	27	27
Human Camps 2010	73	35	0.3437500	0	0	0	34	34	34
Human Camps 2010	73	37	0.1562500	0	0	0	34	34	34
Human Camps 2010	73	38	3.1666667	0	0	0	13	13	13
Human Camps 2010	73	39	1.4166667	0	0	0	5	5	5
Human Camps 2010	73	40	2.0833333	0	0	1	4	5	5
Human Camps 2010	73	41	1.5833333	0	0	1	9	10	10
Human Camps 2010	73	42	0.6093750	1	0	0	13	13	14
Human Camps 2010	73	43	0.1510417	0	0	0	17	17	17
Human Camps 2010	73	44	0.1718750	0	0	0	22	22	22
Human Camps 2010	73	45	0.8177083	0	0	0	26	26	26
Human Camps 2010	73	46	0.4583333	0	0	0	24	24	24
Human Camps 2010	73	47	0.7604167	0	0	0	21	21	21
Human Camps 2010	73	48	0.5729167	1	0	0	27	27	28
Human Camps 2010	73	51	0.1250000	0	0	0	16	16	16
Human Camps 2010	73	52	0.1093750	0	0	0	44	44	44

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2010	73	53	0.1406250	0	0	0	23	23	23
Human Camps 2010	73	54	0.5208333	1	0	0	9	9	10
Human Camps 2010	91	2	1.0677083	0	0	0	4	4	4
Human Camps 2010	91	3	1.8385417	1	0	1	0	1	2
Human Camps 2010	91	4	1.7500000	2	0	0	0	0	2
Human Camps 2010	91	5	1.9166667	1	1	1	1	2	4
Human Camps 2010	91	6	1.9166667	2	1	0	0	0	3
Human Camps 2010	91	7	1.3437500	0	0	0	9	9	9
Human Camps 2010	91	8	2.3437500	0	0	0	2	2	2
Human Camps 2010	91	9	1.3333333	0	0	0	0	0	0
Human Camps 2010	91	10	2.3281250	0	0	0	12	12	12
Human Camps 2010	91	11	1.3333333	0	0	0	11	11	11
Human Camps 2010	91	12	2.1666667	0	0	3	2	5	5
Human Camps 2010	91	13	3.0000000	0	0	1	0	1	1
Human Camps 2010	91	14	2.7500000	0	0	0	3	3	3
Human Camps 2010	91	15	1.9166667	0	0	1	4	5	5
Human Camps 2010	91	17	2.2500000	0	0	1	2	3	3
Human Camps 2010	91	18	1.3333333	0	0	0	5	5	5
Human Camps 2010	91	19	3.0833333	0	0	0	12	12	12
Human Camps 2010	91	20	2.2500000	0	0	0	0	0	0
Human Camps 2010	91	21	2.0104167	1	0	0	7	7	8
Human Camps 2010	91	22	0.2500000	0	0	1	0	1	1
Human Camps 2010	91	23	2.2552083	0	0	2	10	12	12
Human Camps 2010	91	24	1.8437500	0	0	0	3	3	3

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2010	91	25	3.1666667	0	0	0	5	5	5
Human Camps 2010	91	26	1.7291667	0	0	1	8	9	9
Human Camps 2010	91	27	2.5833333	0	0	0	0	0	0
Human Camps 2010	91	28	1.1614583	0	0	0	2	2	2
Human Camps 2010	91	29	1.3229167	0	0	0	0	0	0
Human Camps 2010	91	30	1.7500000	0	0	0	9	9	9
Human Camps 2010	91	31	2.3333333	0	0	1	4	5	5
Human Camps 2010	91	32	2.2500000	1	0	0	0	0	1
Human Camps 2010	91	33	2.8333333	0	0	0	3	3	3
Human Camps 2010	91	34	1.6666667	0	0	0	0	0	0
Human Camps 2010	91	35	2.1666667	0	0	1	3	4	4
Human Camps 2010	91	36	2.9166667	0	0	0	3	3	3
Human Camps 2010	91	37	2.5000000	0	0	1	7	8	8
Human Camps 2010	91	38	1.7500000	0	0	0	7	7	7
Human Camps 2010	91	39	2.2500000	0	0	0	3	3	3
Human Camps 2010	91	40	1.3333333	0	0	0	6	6	6
Human Camps 2010	91	41	1.2500000	0	0	0	0	0	0
Human Camps 2010	91	42	1.4166667	0	0	0	1	1	1
Human Camps 2010	91	43	2.9166667	0	0	0	0	0	0
Human Camps 2010	91	44	2.5833333	0	0	0	0	0	0
Human Camps 2010	91	45	3.1666667	0	0	0	0	0	0
Human Camps 2010	91	46	1.7500000	0	0	0	4	4	4
Human Camps 2010	91	47	1.5833333	0	0	0	7	7	7
Human Camps 2010	91	48	2.7500000	0	0	0	9	9	9

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2010	91	49	1.0833333	0	0	0	6	6	6
Human Camps 2010	91	50	1.1666667	0	0	0	19	19	19
Human Camps 2010	91	51	2.7500000	0	1	0	10	10	11
Human Camps 2010	91	52	2.5833333	0	0	0	7	7	7
Human Camps 2010	91	53	2.0833333	0	0	0	0	0	0
Human Camps 2010	91	54	2.5833333	0	0	1	5	6	6
Human Camps 2010	91	55	2.0000000	0	0	0	0	0	0
Human Camps 2010	91	56	1.7500000	1	1	0	0	0	2
Human Camps 2010	91	58	1.4166667	0	0	0	3	3	3
Human Camps 2010	91	59	1.3333333	0	0	0	6	6	6
Human Camps 2010	91	60	1.6666667	0	0	0	4	4	4
Human Camps 2010	91	61	0.9166667	0	0	0	10	10	10
Human Camps 2010	91	62	2.6666667	0	0	0	9	9	9
Human Camps 2010	91	63	1.8333333	0	0	0	0	0	0
Human Camps 2010	93	6	2.0833333	0	0	1	0	1	1
Human Camps 2010	93	7	1.0104167	0	0	0	0	0	0
Human Camps 2010	93	8	2.1770833	0	0	0	0	0	0
Human Camps 2010	93	9	2.6666667	0	0	0	0	0	0
Human Camps 2010	93	10	1.3333333	0	0	0	0	0	0
Human Camps 2010	93	11	2.3333333	0	0	0	0	0	0
Human Camps 2010	93	12	1.5000000	0	0	0	0	0	0
Human Camps 2010	93	13	1.3437500	0	0	0	0	0	0
Human Camps 2010	93	14	1.5104167	2	0	0	0	0	2
Human Camps 2010	93	15	1.9166667	2	0	0	0	0	2

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2010	93	16	1.9166667	1	0	0	0	0	1
Human Camps 2010	93	17	2.1666667	0	0	0	0	0	0
Human Camps 2010	93	18	0.8437500	0	0	0	0	0	0
Human Camps 2010	93	19	1.6666667	0	0	0	0	0	0
Human Camps 2010	93	20	2.5833333	0	0	0	3	3	3
Human Camps 2010	93	21	2.4166667	0	0	0	0	0	0
Human Camps 2010	93	22	3.2500000	0	0	0	0	0	0
Human Camps 2010	93	26	0.8958333	0	0	0	0	0	0
Human Camps 2010	93	27	0.4062500	0	0	0	0	0	0
Human Camps 2010	93	28	2.0833333	0	0	1	5	6	6
Human Camps 2010	93	29	2.2500000	0	0	0	7	7	7
Human Camps 2010	93	30	2.4166667	0	0	1	8	9	9
Human Camps 2010	93	31	2.2500000	0	0	0	0	0	0
Human Camps 2010	93	32	1.7500000	0	0	0	2	2	2
Human Camps 2010	93	33	1.9166667	0	0	0	0	0	0
Human Camps 2010	93	34	2.8333333	1	0	0	0	0	1
Human Camps 2010	93	35	3.4166667	0	0	0	0	0	0
Human Camps 2010	93	36	1.9166667	0	0	0	0	0	0
Human Camps 2010	93	37	1.8333333	0	0	0	0	0	0
Human Camps 2010	93	38	1.2500000	0	0	0	0	0	0
Human Camps 2010	93	39	2.0000000	1	0	0	0	0	1
Human Camps 2010	93	40	2.0000000	0	0	0	3	3	3
Human Camps 2010	93	41	2.5833333	0	0	0	0	0	0
Human Camps 2010	93	42	2.1666667	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	S M	S R	A	T	IN V	Tota l
Human Camps 2010	93	43	2.7500000	0	0	0	0	0	0
Human Camps 2010	93	44	1.9166667	0	0	0	4	4	4
Human Camps 2010	93	45	1.9166667	1	0	0	4	4	5
Human Camps 2010	93	46	2.0000000	0	0	0	0	0	0
Human Camps 2010	93	47	3.0833333	0	0	0	0	0	0
Human Camps 2010	93	49	0.8333333	0	0	0	0	0	0
Human Camps 2010	93	50	1.5000000	0	0	0	4	4	4
Human Camps 2010	93	51	1.7500000	0	0	0	0	0	0
Human Camps 2010	93	52	2.3333333	1	2	0	0	0	3
Human Camps 2010	93	53	1.4166667	0	0	0	0	0	0
Human Camps 2010	93	54	2.5833333	0	0	0	0	0	0
Human Camps 2010	93	55	0.6666667	0	0	0	3	3	3
Human Camps 2010	93	56	1.5833333	0	0	0	0	0	0
Human Camps 2010	93	57	2.0000000	0	2	0	0	0	2
Human Camps 2010	93	58	2.5000000	1	0	0	1	1	2
Human Camps 2010	93	59	2.8333333	0	0	0	0	0	0
Human Camps 2010	93	60	2.3333333	0	1	0	2	2	3
Human Camps 2010	93	61	2.2500000	0	0	0	0	0	0
Human Camps 2010	93	62	2.3333333	0	1	0	0	0	1
Human Camps 2010	93	63	2.0833333	0	0	0	0	0	0
Human Camps 2010	93	64	2.4166667	0	0	1	0	1	1
Human Camps 2010	93	65	1.0833333	0	0	0	0	0	0
Human Camps 2010	93	66	3.0833333	0	0	0	0	0	0
Human Camps 2010	93	67	1.4166667	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2010	93	68	2.2500000	0	0	0	0	0	0
Human Camps 2010	93	69	1.4166667	0	0	0	0	0	0
Human Camps 2010	93	70	1.7500000	0	0	0	0	0	0
Human Camps 2010	93	71	2.8333333	0	0	0	0	0	0
Human Camps 2010	93	72	2.3333333	0	0	0	0	0	0
Human Camps 2010	93	74	2.1666667	0	0	0	0	0	0
Human Camps 2010	93	75	1.8333333	0	1	0	1	1	2
Human Camps 2010	93	76	2.3333333	0	0	0	0	0	0
Human Camps 2010	93	77	1.5833333	0	0	0	0	0	0
Human Camps 2010	93	78	2.9166667	0	0	0	0	0	0
Human Camps 2010	93	79	3.4166667	0	0	0	0	0	0
Human Camps 2010	93	80	3.6666667	0	0	0	0	0	0
Human Camps 2010	93	81	2.4166667	0	1	1	0	1	2
Human Camps 2010	93	82	3.1666667	0	0	0	0	0	0
Human Camps 2010	93	83	2.5833333	0	0	0	0	0	0
Human Camps 2010	93	84	2.2500000	0	0	0	0	0	0
Human Camps 2010	93	88	2.9166667	0	0	0	7	7	7
Human Camps 2010	93	89	2.1666667	0	0	0	6	6	6
Human Camps 2010	93	90	2.0000000	0	0	0	9	9	9
Human Camps 2010	93	91	3.0000000	0	0	0	3	3	3
Human Camps 2010	93	92	2.7500000	0	0	0	0	0	0
Human Camps 2010	93	93	1.4166667	0	0	0	0	0	0
Human Camps 2010	89	5	1.9166667	0	0	0	0	0	0
Human Camps 2010	89	6	2.6666667	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2010	89	7	1.5833333	0	0	0	0	0	0
Human Camps 2010	89	8	2.0000000	0	0	0	0	0	0
Human Camps 2010	89	9	1.9166667	0	0	0	0	0	0
Human Camps 2010	89	10	2.5000000	0	0	0	0	0	0
Human Camps 2010	89	11	2.2500000	0	0	0	0	0	0
Human Camps 2010	89	12	2.1666667	0	0	0	1	1	1
Human Camps 2010	89	13	2.0000000	0	0	0	0	0	0
Human Camps 2010	89	14	1.8333333	0	0	0	0	0	0
Human Camps 2010	89	15	1.8333333	0	0	0	0	0	0
Human Camps 2010	89	16	2.4166667	0	0	0	0	0	0
Human Camps 2010	89	17	1.8333333	0	0	0	0	0	0
Human Camps 2010	89	18	2.9166667	0	0	0	0	0	0
Human Camps 2010	89	19	2.5000000	3	0	0	0	0	3
Human Camps 2010	89	20	2.3333333	0	0	0	0	0	0
Human Camps 2010	89	21	1.4166667	0	0	0	0	0	0
Human Camps 2010	89	22	2.2500000	0	0	0	0	0	0
Human Camps 2010	89	23	2.5000000	0	0	0	0	0	0
Human Camps 2010	89	24	2.0833333	0	0	0	1	1	1
Human Camps 2010	89	25	2.5833333	0	1	0	0	0	1
Human Camps 2010	89	26	2.5000000	0	0	0	0	0	0
Human Camps 2010	89	27	2.4166667	3	0	0	0	0	3
Human Camps 2010	89	28	2.7500000	0	0	0	0	0	0
Human Camps 2010	89	29	3.2500000	0	0	0	0	0	0
Human Camps 2010	89	30	1.7500000	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2010	89	31	2.3333333	0	0	0	0	0	0
Human Camps 2010	89	32	2.7500000	0	0	0	0	0	0
Human Camps 2010	89	33	2.4166667	0	1	0	0	0	1
Human Camps 2010	89	34	2.7500000	0	0	0	0	0	0
Human Camps 2010	89	35	3.5833333	0	0	0	0	0	0
Human Camps 2010	89	36	2.5000000	0	0	0	0	0	0
Human Camps 2010	89	37	2.5833333	0	0	0	0	0	0
Human Camps 2010	89	38	3.0000000	0	0	0	0	0	0
Human Camps 2010	89	39	1.0000000	0	0	0	0	0	0
Human Camps 2010	89	42	1.2500000	0	0	0	0	0	0
Human Camps 2010	89	43	1.9166667	0	0	0	0	0	0
Human Camps 2010	89	44	2.0833333	0	0	0	0	0	0
Human Camps 2010	89	45	2.2500000	0	0	0	0	0	0
Human Camps 2010	89	46	2.0000000	0	0	0	0	0	0
Human Camps 2010	89	47	3.0833333	0	0	0	0	0	0
Human Camps 2010	89	48	1.7500000	1	0	0	0	0	1
Human Camps 2010	89	49	2.5000000	0	0	1	0	1	1
Human Camps 2010	89	50	2.2500000	0	0	0	0	0	0
Human Camps 2010	89	51	1.6666667	0	0	0	0	0	0
Human Camps 2010	89	52	1.6666667	0	0	0	0	0	0
Human Camps 2010	89	53	1.2500000	0	0	0	0	0	0
Human Camps 2010	89	54	1.9166667	0	0	0	0	0	0
Human Camps 2010	89	55	1.7500000	1	0	0	0	0	1
Human Camps 2010	89	58	1.4166667	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2010	89	59	2.0000000	0	0	0	0	0	0
Human Camps 2010	89	60	1.6666667	0	0	0	1	1	1
Human Camps 2010	89	61	3.0833333	0	0	0	0	0	0
Human Camps 2010	89	62	2.5833333	0	0	0	0	0	0
Human Camps 2010	89	63	1.2500000	0	0	0	0	0	0
Human Camps 2010	89	64	3.0833333	0	0	0	0	0	0
Human Camps 2010	89	65	2.4166667	0	0	0	0	0	0
Human Camps 2010	89	66	2.1666667	0	0	0	0	0	0
Human Camps 2010	89	67	2.1666667	0	0	0	0	0	0
Human Camps 2010	89	68	1.6666667	0	0	0	0	0	0
Human Camps 2010	89	69	2.1666667	0	0	0	0	0	0
Human Camps 2010	90	1	1.4166667	1	0	0	3	3	4
Human Camps 2010	90	2	1.5833333	0	0	0	1	1	1
Human Camps 2010	90	3	0.6666667	0	0	0	0	0	0
Human Camps 2010	90	4	1.6666667	3	1	0	2	2	6
Human Camps 2010	90	5	0.6510417	1	0	0	2	2	3
Human Camps 2010	90	6	2.0000000	0	1	1	11	12	13
Human Camps 2010	90	7	1.6666667	0	0	0	12	12	12
Human Camps 2010	90	8	1.0833333	0	0	0	4	4	4
Human Camps 2010	90	11	1.5937500	0	0	0	7	7	7
Human Camps 2010	90	12	1.0833333	0	0	0	10	10	10
Human Camps 2010	90	13	1.0937500	0	0	0	9	9	9
Human Camps 2010	90	14	0.6666667	0	0	0	0	0	0
Human Camps 2010	90	15	1.3333333	0	0	0	9	9	9

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2010	90	16	2.0000000	0	0	0	0	0	0
Human Camps 2010	90	17	1.2500000	0	0	0	1	1	1
Human Camps 2010	90	18	0.6354167	0	0	0	0	0	0
Human Camps 2010	90	19	1.8333333	0	1	0	6	6	7
Human Camps 2010	90	20	1.9166667	0	0	0	4	4	4
Human Camps 2010	90	21	2.3333333	0	0	0	4	4	4
Human Camps 2010	90	22	2.2500000	0	0	0	2	2	2
Human Camps 2010	90	23	1.4166667	0	0	0	0	0	0
Human Camps 2010	90	24	1.8333333	0	1	0	18	18	19
Human Camps 2010	90	25	1.6666667	0	0	0	8	8	8
Human Camps 2010	90	26	2.3333333	2	0	0	5	5	7
Human Camps 2010	90	28	0.9062500	0	0	0	0	0	0
Human Camps 2010	90	29	1.8333333	2	0	1	7	8	10
Human Camps 2010	90	30	2.3333333	3	0	0	3	3	6
Human Camps 2010	90	31	2.1666667	0	0	0	0	0	0
Human Camps 2010	90	32	1.6666667	1	0	0	3	3	4
Human Camps 2010	90	33	0.8125000	0	0	0	8	8	8
Human Camps 2010	90	34	0.8229167	0	0	0	18	18	18
Human Camps 2010	90	35	1.7500000	1	0	0	0	0	1
Human Camps 2010	90	36	1.3333333	2	0	0	10	10	12
Human Camps 2010	90	37	1.3333333	4	0	0	18	18	22
Human Camps 2010	90	38	1.7500000	0	0	0	11	11	11
Human Camps 2010	90	39	1.5833333	0	0	0	10	10	10
Human Camps 2010	90	40	2.1666667	0	0	1	7	8	8

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2010	90	41	1.5000000	0	0	0	18	18	18
Human Camps 2010	90	42	1.5833333	0	0	1	2	3	3
Human Camps 2010	90	43	1.7500000	1	0	0	4	4	5
Human Camps 2010	90	44	2.0000000	4	0	0	11	11	15
Human Camps 2010	90	45	1.6666667	1	0	0	0	0	1
Human Camps 2010	90	46	1.0833333	0	0	0	11	11	11
Human Camps 2010	90	47	1.1666667	0	0	0	5	5	5
Human Camps 2010	90	48	1.3333333	0	0	0	7	7	7
Human Camps 2010	90	49	1.8333333	0	0	0	0	0	0
Human Camps 2010	90	50	3.0000000	0	0	0	3	3	3
Human Camps 2010	90	51	1.5833333	0	0	0	0	0	0
Human Camps 2010	90	52	2.1666667	0	0	0	11	11	11
Human Camps 2010	90	53	1.1666667	0	0	0	7	7	7
Human Camps 2010	90	54	1.7500000	0	1	1	9	10	11
Human Camps 2010	90	56	1.5000000	0	0	0	17	17	17
Human Camps 2010	90	57	2.3333333	0	0	0	8	8	8
Human Camps 2010	90	58	2.1666667	0	0	0	3	3	3
Human Camps 2010	90	59	1.0833333	0	0	0	5	5	5
Human Camps 2010	90	60	1.5000000	0	0	0	11	11	11
Human Camps 2010	90	61	1.6666667	0	0	0	6	6	6
Human Camps 2010	90	62	1.7500000	0	0	0	9	9	9
Human Camps 2010	90	63	1.5833333	1	0	0	0	0	1
Human Camps 2010	90	64	1.0833333	1	0	0	9	9	10
Human Camps 2010	90	65	2.8333333	0	0	0	17	17	17

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2010	90	66	2.7500000	0	0	0	14	14	14
Human Camps 2010	90	67	2.5833333	1	1	0	21	21	23
Human Camps 2010	90	68	2.1666667	0	1	0	16	16	17
Human Camps 2010	90	69	1.6666667	0	0	0	11	11	11
Human Camps 2010	90	79	1.4166667	0	1	0	13	13	14
Human Camps 2010	90	80	1.5833333	0	0	1	7	8	8
Human Camps 2010	90	81	1.1666667	0	0	0	26	26	26
Human Camps 2010	74	1	1.9166667	1	0	0	4	4	5
Human Camps 2010	74	2	1.1666667	0	0	0	1	1	1
Human Camps 2010	74	3	2.0833333	1	0	1	2	3	4
Human Camps 2010	74	4	2.0000000	1	1	0	0	0	2
Human Camps 2010	74	5	0.9895833	0	1	0	3	3	4
Human Camps 2010	74	6	0.4010417	1	0	0	4	4	5
Human Camps 2010	74	7	2.4166667	0	0	0	2	2	2
Human Camps 2010	74	8	1.5000000	0	1	0	3	3	4
Human Camps 2010	74	9	1.6666667	0	0	1	2	3	3
Human Camps 2010	74	10	1.0833333	0	0	0	5	5	5
Human Camps 2010	74	11	3.1666667	0	0	0	12	12	12
Human Camps 2010	74	12	1.1666667	0	0	1	28	29	29
Human Camps 2010	74	13	2.6666667	0	0	4	9	13	13
Human Camps 2010	74	14	1.8333333	0	0	0	12	12	12
Human Camps 2010	74	15	1.0833333	0	0	0	9	9	9
Human Camps 2010	74	16	0.6354167	0	0	0	6	6	6
Human Camps 2010	74	17	1.7500000	1	0	0	12	12	13

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2010	74	18	2.4166667	0	0	1	17	18	18
Human Camps 2010	74	19	1.7500000	0	0	8	22	30	30
Human Camps 2010	74	20	2.6666667	0	0	0	16	16	16
Human Camps 2010	74	21	2.2500000	1	0	0	6	6	7
Human Camps 2010	74	22	1.4166667	0	0	1	13	14	14
Human Camps 2010	74	23	2.0000000	0	1	0	10	10	11
Human Camps 2010	74	24	2.1666667	0	0	0	3	3	3
Human Camps 2010	74	25	2.7500000	0	0	0	2	2	2
Human Camps 2010	74	26	2.5833333	0	0	0	6	6	6
Human Camps 2010	74	27	1.0833333	0	2	0	18	18	20
Human Camps 2010	74	28	3.2500000	0	0	0	6	6	6
Human Camps 2010	74	29	2.1666667	0	0	0	13	13	13
Human Camps 2010	74	30	2.0833333	0	0	4	11	15	15
Human Camps 2010	74	31	3.5833333	0	0	1	11	12	12
Human Camps 2010	74	32	1.1666667	2	0	0	16	16	18
Human Camps 2010	74	33	2.2500000	0	0	0	0	0	0
Human Camps 2010	74	34	3.3333333	0	0	0	1	1	1
Human Camps 2010	74	35	2.7500000	0	0	0	26	26	26
Human Camps 2010	74	36	2.5833333	0	0	0	14	14	14
Human Camps 2010	74	37	2.0000000	2	1	1	19	20	23
Human Camps 2010	74	38	2.4166667	1	0	0	12	12	13
Human Camps 2010	74	39	1.2500000	0	0	0	3	3	3
Human Camps 2010	74	42	1.9166667	0	1	0	4	4	5
Human Camps 2010	74	43	1.6666667	1	0	0	3	3	4

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2010	74	44	2.5000000	0	0	0	4	4	4
Human Camps 2010	74	45	3.3333333	0	0	0	3	3	3
Human Camps 2010	74	46	3.7500000	0	0	0	4	4	4
Human Camps 2010	74	47	3.2500000	0	0	0	5	5	5
Human Camps 2010	74	48	1.3333333	0	2	0	0	0	2
Human Camps 2010	74	49	1.8333333	4	0	0	5	5	9
Human Camps 2010	74	50	2.3333333	0	0	0	13	13	13
Human Camps 2010	74	51	3.7500000	0	0	0	3	3	3
Human Camps 2010	74	52	2.8333333	0	0	0	2	2	2
Human Camps 2010	74	53	2.8333333	0	0	0	6	6	6
Human Camps 2010	74	54	3.0833333	0	0	0	4	4	4
Human Camps 2010	74	55	1.7500000	0	1	0	4	4	5
Human Camps 2010	74	58	1.5833333	1	1	0	3	3	5
Human Camps 2010	74	59	2.0833333	0	0	0	4	4	4
Human Camps 2010	74	60	2.3333333	2	0	0	3	3	5
Human Camps 2010	74	61	3.9166667	0	1	0	2	2	3
Human Camps 2010	74	62	2.9166667	1	0	0	12	12	13
Human Camps 2010	74	63	3.0000000	0	0	0	11	11	11
Human Camps 2010	74	64	2.0000000	2	0	0	13	13	15
Human Camps 2010	74	66	1.6666667	1	0	0	21	21	22
Human Camps 2010	74	67	2.1666667	0	1	0	3	3	4
Human Camps 2010	74	68	3.9166667	0	1	0	3	3	4
Human Camps 2010	74	69	1.9166667	0	1	0	0	0	1
Human Camps 2010	74	70	2.9166667	0	0	0	3	3	3

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2010	74	71	2.1666667	0	1	0	0	0	1
Human Camps 2017	127	1	2.0000000	0	0	1	0	1	1
Human Camps 2017	127	2	1.0000000	1	0	0	0	0	1
Human Camps 2017	127	3	2.1666667	1	0	0	1	1	2
Human Camps 2017	127	4	0.6666667	0	0	0	1	1	1
Human Camps 2017	127	5	1.1562500	0	1	0	0	0	1
Human Camps 2017	127	6	1.0833333	0	1	1	4	5	6
Human Camps 2017	127	7	2.1666667	0	0	0	3	3	3
Human Camps 2017	127	8	2.1666667	0	0	0	7	7	7
Human Camps 2017	127	9	2.2500000	0	0	0	0	0	0
Human Camps 2017	127	10	2.4166667	0	0	0	7	7	7
Human Camps 2017	127	11	3.0833333	0	0	0	3	3	3
Human Camps 2017	127	12	2.2500000	0	1	0	0	0	1
Human Camps 2017	127	13	2.0833333	1	1	0	0	0	2
Human Camps 2017	127	14	2.0833333	1	0	0	2	2	3
Human Camps 2017	127	15	3.1666667	0	0	0	6	6	6
Human Camps 2017	127	16	3.1666667	0	0	0	0	0	0
Human Camps 2017	127	17	3.0833333	0	1	0	0	0	1
Human Camps 2017	127	18	1.0833333	0	0	0	7	7	7
Human Camps 2017	127	19	1.9166667	0	1	2	10	12	13
Human Camps 2017	127	20	3.2500000	0	0	0	0	0	0
Human Camps 2017	127	21	3.5833333	0	0	0	0	0	0
Human Camps 2017	127	22	2.5000000	0	0	0	12	12	12
Human Camps 2017	127	23	2.5833333	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2017	127	24	1.5000000	0	0	0	0	0	0
Human Camps 2017	127	25	1.0000000	4	2	0	0	0	6
Human Camps 2017	127	26	2.6666667	0	1	0	0	0	1
Human Camps 2017	127	27	4.0833333	0	0	0	13	13	13
Human Camps 2017	127	28	3.3333333	0	0	0	0	0	0
Human Camps 2017	127	29	3.0833333	0	0	0	0	0	0
Human Camps 2017	127	30	3.1666667	0	0	0	4	4	4
Human Camps 2017	127	31	2.4166667	0	0	0	0	0	0
Human Camps 2017	127	32	3.4166667	0	1	0	3	3	4
Human Camps 2017	127	33	4.0000000	0	0	0	2	2	2
Human Camps 2017	127	34	4.1666667	0	0	0	0	0	0
Human Camps 2017	127	35	3.4166667	0	1	0	21	21	22
Human Camps 2017	127	36	2.1666667	1	0	1	8	9	10
Human Camps 2017	127	37	2.0833333	1	2	0	13	13	16
Human Camps 2017	127	38	1.3333333	0	0	0	7	7	7
Human Camps 2017	127	39	2.5833333	0	0	0	0	0	0
Human Camps 2017	127	40	2.9166667	0	0	0	5	5	5
Human Camps 2017	127	41	3.6666667	0	0	0	7	7	7
Human Camps 2017	127	42	3.3333333	0	0	1	13	14	14
Human Camps 2017	127	43	2.0000000	0	0	1	7	8	8
Human Camps 2017	127	44	3.9166667	0	0	0	8	8	8
Human Camps 2017	127	45	3.5833333	0	0	0	3	3	3
Human Camps 2017	127	46	3.0833333	0	0	0	12	12	12
Human Camps 2017	127	47	1.8333333	0	0	0	7	7	7

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2017	127	48	2.5000000	2	3	0	6	6	11
Human Camps 2017	127	49	1.6666667	0	1	0	11	11	12
Human Camps 2017	127	50	1.5000000	0	0	0	7	7	7
Human Camps 2017	127	51	3.1666667	0	0	0	4	4	4
Human Camps 2017	127	52	3.5000000	0	0	0	9	9	9
Human Camps 2017	127	53	2.5833333	2	1	0	4	4	7
Human Camps 2017	127	54	3.7500000	0	0	1	6	7	7
Human Camps 2017	127	57	2.4166667	0	0	0	11	11	11
Human Camps 2017	127	58	2.5833333	1	1	0	15	15	17
Human Camps 2017	127	59	1.5000000	2	0	1	18	19	21
Human Camps 2017	127	60	2.7500000	0	2	1	0	1	3
Human Camps 2017	118	1	0.1354167	0	0	1	4	5	5
Human Camps 2017	118	2	2.7500000	3	0	1	1	2	5
Human Camps 2017	118	3	2.5000000	0	0	1	0	1	1
Human Camps 2017	118	4	4.0000000	0	0	1	0	1	1
Human Camps 2017	118	5	3.5000000	0	0	0	3	3	3
Human Camps 2017	118	6	4.1666667	0	0	0	0	0	0
Human Camps 2017	118	8	0.1406250	0	0	0	0	0	0
Human Camps 2017	118	9	4.1666667	0	0	0	0	0	0
Human Camps 2017	118	10	4.2500000	0	0	0	0	0	0
Human Camps 2017	118	11	2.6666667	0	0	0	3	3	3
Human Camps 2017	118	12	4.0000000	0	0	0	1	1	1
Human Camps 2017	118	13	3.5000000	0	1	0	3	3	4
Human Camps 2017	118	14	3.5000000	1	0	1	0	1	2

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2017	118	15	0.1354167	0	1	1	0	1	2
Human Camps 2017	118	16	2.3333333	0	1	0	2	2	3
Human Camps 2017	118	17	4.3333333	0	0	0	0	0	0
Human Camps 2017	118	18	3.0000000	1	3	0	5	5	9
Human Camps 2017	118	19	4.1666667	0	0	0	1	1	1
Human Camps 2017	118	20	4.0000000	0	0	0	0	0	0
Human Camps 2017	118	21	0.1093750	0	0	0	0	0	0
Human Camps 2017	118	22	0.1666667	0	0	0	0	0	0
Human Camps 2017	118	23	4.0833333	0	0	1	0	1	1
Human Camps 2017	118	24	4.0833333	1	0	2	0	2	3
Human Camps 2017	118	25	3.9166667	3	0	0	4	4	7
Human Camps 2017	118	26	3.6666667	1	1	0	3	3	5
Human Camps 2017	118	27	3.4166667	0	1	0	0	0	1
Human Camps 2017	118	28	0.1145833	0	0	0	0	0	0
Human Camps 2017	118	29	0.1250000	0	0	0	0	0	0
Human Camps 2017	118	30	2.7500000	0	1	0	0	0	1
Human Camps 2017	118	31	4.3333333	1	0	0	0	0	1
Human Camps 2017	118	32	4.3333333	3	0	0	0	0	3
Human Camps 2017	118	33	2.5000000	0	0	0	0	0	0
Human Camps 2017	118	34	4.5000000	0	0	0	0	0	0
Human Camps 2017	118	37	4.0000000	0	0	0	0	0	0
Human Camps 2017	118	38	1.6458333	1	0	0	0	0	1
Human Camps 2017	118	39	2.5520833	3	0	0	0	0	3
Human Camps 2017	118	40	4.0000000	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2017	118	41	2.5520833	2	0	0	4	4	6
Human Camps 2017	118	42	0.1145833	0	0	0	0	0	0
Human Camps 2017	118	43	0.1302083	0	0	0	0	0	0
Human Camps 2017	118	44	2.3854167	1	0	0	3	3	4
Human Camps 2017	118	45	3.3333333	0	2	0	0	0	2
Human Camps 2017	118	46	4.5000000	0	0	0	0	0	0
Human Camps 2017	118	47	4.2500000	0	0	0	0	0	0
Human Camps 2017	118	48	0.1093750	0	0	0	0	0	0
Human Camps 2017	118	52	2.0729167	0	0	0	0	0	0
Human Camps 2017	118	53	4.5000000	0	0	0	0	0	0
Human Camps 2017	118	54	4.5000000	0	0	0	0	0	0
Human Camps 2017	118	55	1.6145833	1	1	1	0	1	3
Human Camps 2017	118	56	0.1197917	0	0	0	3	3	3
Human Camps 2017	118	57	0.0989583	0	1	0	0	0	1
Human Camps 2017	118	58	3.1666667	0	1	2	0	2	3
Human Camps 2017	118	59	1.9218750	0	1	0	0	0	1
Human Camps 2017	118	60	4.5000000	0	0	0	0	0	0
Human Camps 2017	118	61	3.0677083	0	0	0	0	0	0
Human Camps 2017	118	66	2.4531250	0	0	0	0	0	0
Human Camps 2017	118	67	4.1666667	0	1	0	3	3	4
Human Camps 2017	118	68	0.9895833	0	1	0	0	0	1
Human Camps 2017	118	69	0.9270833	0	0	0	4	4	4
Human Camps 2017	118	70	3.4166667	0	0	0	0	0	0
Human Camps 2017	118	73	0.1979167	0	1	0	0	0	1

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2017	118	74	2.8333333	0	0	0	0	0	0
Human Camps 2017	106	1	4.3333333	1	0	0	0	0	1
Human Camps 2017	106	2	3.8333333	0	2	0	0	0	2
Human Camps 2017	106	3	3.8333333	0	1	0	0	0	1
Human Camps 2017	106	4	3.4166667	0	0	0	0	0	0
Human Camps 2017	106	5	3.0000000	1	0	0	0	0	1
Human Camps 2017	106	6	4.5000000	0	0	1	0	1	1
Human Camps 2017	106	9	3.4166667	1	0	0	2	2	3
Human Camps 2017	106	10	4.3333333	0	0	0	3	3	3
Human Camps 2017	106	11	4.1666667	0	2	0	5	5	7
Human Camps 2017	106	12	4.5000000	1	2	0	0	0	3
Human Camps 2017	106	13	2.7500000	0	0	0	0	0	0
Human Camps 2017	106	14	3.7500000	1	1	1	0	1	3
Human Camps 2017	106	15	2.3333333	0	0	0	0	0	0
Human Camps 2017	106	16	3.8333333	0	0	0	0	0	0
Human Camps 2017	106	17	3.0000000	0	0	0	0	0	0
Human Camps 2017	106	18	2.3333333	0	0	0	0	0	0
Human Camps 2017	106	19	4.5000000	0	3	0	0	0	3
Human Camps 2017	106	20	3.7500000	0	0	0	0	0	0
Human Camps 2017	106	22	3.2500000	0	2	0	0	0	2
Human Camps 2017	106	23	4.1666667	0	2	0	0	0	2
Human Camps 2017	106	24	3.2500000	0	2	0	0	0	2
Human Camps 2017	106	25	3.7500000	0	0	0	1	1	1
Human Camps 2017	106	26	1.6666667	0	0	0	1	1	1

TYPE	CAMP	QUADRAT	AC	S M	S R	A	T	IN V	Tota l
Human Camps 2017	106	27	3.7500000	0	0	0	0	0	0
Human Camps 2017	106	28	2.8333333	0	0	0	0	0	0
Human Camps 2017	106	29	2.0000000	0	0	0	0	0	0
Human Camps 2017	106	30	3.0000000	0	0	0	2	2	2
Human Camps 2017	106	31	3.0000000	0	0	0	0	0	0
Human Camps 2017	106	32	3.5000000	0	1	0	0	0	1
Human Camps 2017	106	33	2.6666667	0	0	0	0	0	0
Human Camps 2017	106	34	4.0833333	0	1	0	0	0	1
Human Camps 2017	106	35	3.5833333	0	0	0	0	0	0
Human Camps 2017	106	36	3.0833333	0	0	0	0	0	0
Human Camps 2017	106	37	4.0833333	0	2	0	0	0	2
Human Camps 2017	106	38	2.4166667	0	0	0	0	0	0
Human Camps 2017	136	6	3.4166667	0	0	0	1	1	1
Human Camps 2017	136	7	3.7500000	0	0	0	2	2	2
Human Camps 2017	136	8	3.9166667	0	0	0	1	1	1
Human Camps 2017	136	9	4.1666667	0	0	0	2	2	2
Human Camps 2017	136	10	3.3333333	0	0	0	1	1	1
Human Camps 2017	136	11	3.7500000	0	0	0	0	0	0
Human Camps 2017	136	12	2.5000000	0	0	0	0	0	0
Human Camps 2017	136	15	4.1666667	0	0	0	0	0	0
Human Camps 2017	136	16	4.3333333	0	0	0	1	1	1
Human Camps 2017	136	17	4.1666667	1	0	0	0	0	1
Human Camps 2017	136	18	4.5000000	0	0	0	0	0	0
Human Camps 2017	136	19	4.3333333	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2017	136	20	4.3333333	0	0	0	0	0	0
Human Camps 2017	136	21	3.5000000	0	0	0	0	0	0
Human Camps 2017	136	22	3.7500000	0	0	0	0	0	0
Human Camps 2017	136	23	3.9166667	0	0	0	0	0	0
Human Camps 2017	136	24	4.2500000	0	0	0	0	0	0
Human Camps 2017	136	25	4.2500000	0	0	0	0	0	0
Human Camps 2017	136	26	4.0000000	0	0	0	0	0	0
Human Camps 2017	136	27	3.5000000	0	0	0	2	2	2
Human Camps 2017	136	28	3.6666667	0	0	0	0	0	0
Human Camps 2017	136	29	4.3333333	0	0	0	1	1	1
Human Camps 2017	136	30	4.3333333	0	0	0	2	2	2
Human Camps 2017	136	31	3.0520833	0	0	0	1	1	1
Human Camps 2017	136	32	4.3333333	0	0	0	0	0	0
Human Camps 2017	136	33	4.5000000	0	0	0	3	3	3
Human Camps 2017	136	34	4.3333333	0	0	0	0	0	0
Human Camps 2017	136	37	4.0000000	0	0	0	1	1	1
Human Camps 2017	136	38	4.1666667	0	0	0	0	0	0
Human Camps 2017	136	39	4.1666667	0	0	0	0	0	0
Human Camps 2017	136	40	4.2500000	0	0	0	0	0	0
Human Camps 2017	136	41	4.0833333	0	0	0	9	9	9
Human Camps 2017	136	42	3.5000000	0	0	0	12	12	12
Human Camps 2017	136	43	4.0000000	0	0	0	2	2	2
Human Camps 2017	136	44	4.0833333	0	0	3	3	6	6
Human Camps 2017	136	45	4.1666667	0	0	0	2	2	2

TYPE	CAMP	QUADRAT	AC	S M	S R	A	T	IN V	Tota l
Human Camps 2017	136	46	3.3333333	0	0	0	0	0	0
Human Camps 2017	136	47	3.9166667	0	0	0	0	0	0
Human Camps 2017	136	48	3.5833333	0	0	0	1	1	1
Human Camps 2017	136	52	4.3333333	0	0	0	0	0	0
Human Camps 2017	136	53	4.2500000	0	0	0	3	3	3
Human Camps 2017	136	54	3.7500000	0	0	0	4	4	4
Human Camps 2017	136	55	4.0833333	0	0	0	1	1	1
Human Camps 2017	136	56	3.2500000	0	0	0	0	0	0
Human Camps 2017	138	1	3.5000000	0	0	0	0	0	0
Human Camps 2017	138	2	3.1666667	0	0	0	0	0	0
Human Camps 2017	138	3	0.1302083	0	0	0	3	3	3
Human Camps 2017	138	4	2.0000000	1	0	0	0	0	1
Human Camps 2017	138	5	1.4270833	0	0	0	0	0	0
Human Camps 2017	138	6	2.8750000	0	0	0	0	0	0
Human Camps 2017	138	7	4.3333333	0	0	0	1	1	1
Human Camps 2017	138	8	3.0833333	0	0	0	0	0	0
Human Camps 2017	138	9	4.5000000	0	0	0	0	0	0
Human Camps 2017	138	10	0.7447917	0	0	0	0	0	0
Human Camps 2017	138	11	0.1822917	0	0	0	0	0	0
Human Camps 2017	138	12	4.5000000	0	0	0	0	0	0
Human Camps 2017	138	13	2.9270833	0	0	0	0	0	0
Human Camps 2017	138	14	4.2500000	0	0	0	0	0	0
Human Camps 2017	138	15	4.5000000	0	0	0	0	0	0
Human Camps 2017	138	16	3.3333333	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2017	138	17	4.5000000	0	0	0	0	0	0
Human Camps 2017	138	18	3.5000000	1	0	0	0	0	1
Human Camps 2017	138	19	3.5000000	0	0	0	0	0	0
Human Camps 2017	138	20	0.1562500	0	0	2	7	9	9
Human Camps 2017	138	21	0.1406250	0	0	0	0	0	0
Human Camps 2017	138	22	4.1666667	0	0	0	0	0	0
Human Camps 2017	138	23	3.5833333	0	0	0	2	2	2
Human Camps 2017	138	24	2.7500000	1	0	0	0	0	1
Human Camps 2017	138	25	3.5000000	0	0	0	6	6	6
Human Camps 2017	138	26	0.1718750	0	0	0	0	0	0
Human Camps 2017	138	27	2.8333333	0	0	0	0	0	0
Human Camps 2017	138	28	0.1666667	0	0	0	0	0	0
Human Camps 2017	138	29	2.2500000	0	0	0	4	4	4
Human Camps 2017	138	30	0.1510417	0	0	0	4	4	4
Human Camps 2017	101	1	4.0833333	0	0	0	6	6	6
Human Camps 2017	101	2	2.6666667	0	0	0	5	5	5
Human Camps 2017	101	3	3.0833333	0	0	0	2	2	2
Human Camps 2017	101	4	2.7500000	1	0	0	3	3	4
Human Camps 2017	101	5	4.1666667	0	0	0	8	8	8
Human Camps 2017	101	6	3.5833333	0	0	0	10	10	10
Human Camps 2017	101	7	3.9166667	0	0	0	13	13	13
Human Camps 2017	101	9	2.9166667	0	0	1	3	4	4
Human Camps 2017	101	10	3.8333333	0	0	0	5	5	5
Human Camps 2017	101	11	3.8333333	0	0	0	4	4	4

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2017	101	12	3.4166667	0	0	1	9	10	10
Human Camps 2017	101	13	3.3333333	0	0	0	23	23	23
Human Camps 2017	101	14	3.5833333	0	0	0	11	11	11
Human Camps 2017	101	15	3.4166667	0	0	0	9	9	9
Human Camps 2017	101	16	2.4166667	0	0	0	4	4	4
Human Camps 2017	101	17	2.9166667	0	0	0	5	5	5
Human Camps 2017	101	18	4.3333333	0	0	0	24	24	24
Human Camps 2017	101	19	3.5833333	1	0	0	8	8	9
Human Camps 2017	101	20	4.1666667	0	0	1	10	11	11
Human Camps 2017	101	21	4.0000000	0	0	0	5	5	5
Human Camps 2017	101	22	4.3333333	0	0	0	0	0	0
Human Camps 2017	101	23	1.9166667	0	0	0	8	8	8
Human Camps 2017	101	26	4.0000000	0	0	0	7	7	7
Human Camps 2017	101	27	3.6666667	0	0	0	4	4	4
Human Camps 2017	101	28	3.1666667	0	0	0	5	5	5
Human Camps 2017	101	29	3.5833333	0	0	0	2	2	2
Human Camps 2017	101	30	3.7500000	0	0	0	3	3	3
Human Camps 2017	101	31	3.4166667	0	0	0	19	19	19
Human Camps 2017	101	34	3.2500000	0	0	0	9	9	9
Human Camps 2017	101	35	3.4166667	0	0	0	5	5	5
Human Camps 2017	101	36	3.3333333	0	0	0	7	7	7
Human Camps 2017	101	37	2.5000000	0	0	0	9	9	9
Human Camps 2017	101	38	3.0833333	0	0	0	8	8	8
Human Camps 2017	101	39	2.4166667	0	2	0	4	4	6

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2017	101	40	1.4166667	0	2	0	3	3	5
Human Camps 2017	101	41	3.0000000	0	0	0	8	8	8
Human Camps 2017	101	42	3.5833333	0	0	0	14	14	14
Human Camps 2017	101	43	4.0833333	0	0	0	8	8	8
Human Camps 2017	101	44	2.6666667	0	0	0	10	10	10
Human Camps 2017	101	45	3.7500000	0	0	0	8	8	8
Human Camps 2017	101	46	3.5833333	0	0	0	11	11	11
Human Camps 2017	101	47	1.6666667	0	0	0	0	0	0
Human Camps 2017	101	51	2.9166667	0	0	0	4	4	4
Human Camps 2017	101	52	3.0000000	0	3	0	5	5	8
Human Camps 2017	101	53	2.1666667	0	0	0	22	22	22
Human Camps 2017	101	54	3.3333333	0	0	0	11	11	11
Human Camps 2017	101	55	2.2500000	0	1	1	4	5	6
Human Camps 2017	101	56	2.0833333	1	1	0	7	7	9
Human Camps 2017	102	6	3.5833333	0	0	0	8	8	8
Human Camps 2017	102	7	2.8854167	0	0	1	5	6	6
Human Camps 2017	102	8	4.3333333	0	0	0	0	0	0
Human Camps 2017	102	9	3.8333333	0	0	0	0	0	0
Human Camps 2017	102	10	3.3333333	0	0	0	2	2	2
Human Camps 2017	102	11	3.6666667	0	0	0	1	1	1
Human Camps 2017	102	16	4.1666667	0	0	0	4	4	4
Human Camps 2017	102	17	3.4166667	0	0	1	1	2	2
Human Camps 2017	102	18	3.7500000	0	0	0	2	2	2
Human Camps 2017	102	19	3.8333333	0	0	2	4	6	6

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2017	102	20	3.6666667	0	0	0	8	8	8
Human Camps 2017	102	21	3.7500000	0	0	0	3	3	3
Human Camps 2017	102	22	2.9166667	0	0	0	5	5	5
Human Camps 2017	102	23	3.0677083	0	0	0	7	7	7
Human Camps 2017	102	24	4.5000000	0	0	0	1	1	1
Human Camps 2017	102	25	4.1666667	0	0	0	7	7	7
Human Camps 2017	102	26	3.1666667	0	0	0	3	3	3
Human Camps 2017	102	27	4.2500000	0	0	0	2	2	2
Human Camps 2017	102	28	0.1562500	0	0	0	0	0	0
Human Camps 2017	102	29	0.2395833	0	0	0	0	0	0
Human Camps 2017	102	30	4.3333333	0	0	0	0	0	0
Human Camps 2017	102	31	4.3333333	0	0	0	4	4	4
Human Camps 2017	102	32	4.3333333	0	0	0	1	1	1
Human Camps 2017	102	33	3.6666667	0	0	0	5	5	5
Human Camps 2017	102	34	3.0833333	0	0	0	0	0	0
Human Camps 2017	102	35	2.9166667	0	0	0	2	2	2
Human Camps 2017	102	36	3.6666667	0	1	0	2	2	3
Human Camps 2017	102	37	4.1666667	0	0	0	1	1	1
Human Camps 2017	102	38	2.5833333	0	0	0	2	2	2
Human Camps 2017	102	39	3.5000000	0	0	0	1	1	1
Human Camps 2017	102	40	3.6666667	0	0	1	0	1	1
Human Camps 2017	102	41	4.1666667	0	0	0	0	0	0
Human Camps 2017	102	42	1.5052083	0	0	0	2	2	2
Human Camps 2017	102	43	2.8020833	0	0	0	1	1	1

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2017	102	44	4.3333333	0	0	0	0	0	0
Human Camps 2017	102	45	3.9166667	0	0	0	0	0	0
Human Camps 2017	102	46	4.2500000	0	0	0	0	0	0
Human Camps 2017	102	47	3.0937500	0	0	0	0	0	0
Human Camps 2017	102	48	4.3333333	0	0	0	2	2	2
Human Camps 2017	102	49	3.4166667	0	0	0	1	1	1
Human Camps 2017	102	50	3.7500000	0	1	0	2	2	3
Human Camps 2017	102	51	4.4166667	0	0	0	0	0	0
Human Camps 2017	102	52	3.9166667	0	0	0	0	0	0
Human Camps 2017	102	53	3.9166667	0	0	0	0	0	0
Human Camps 2017	102	54	3.2500000	0	0	0	0	0	0
Human Camps 2017	102	55	4.2500000	0	0	0	0	0	0
Human Camps 2017	102	56	2.2500000	0	0	0	0	0	0
Human Camps 2017	102	57	2.0833333	0	0	0	0	0	0
Human Camps 2017	102	58	3.7500000	0	0	0	0	0	0
Human Camps 2017	102	59	3.0000000	0	0	0	0	0	0
Human Camps 2017	102	60	3.8333333	0	0	0	0	0	0
Human Camps 2017	102	61	4.3333333	0	0	0	0	0	0
Human Camps 2017	102	62	2.6666667	0	0	0	2	2	2
Human Camps 2017	102	63	4.0833333	0	0	0	6	6	6
Human Camps 2017	102	64	4.1666667	0	0	0	0	0	0
Human Camps 2017	102	65	3.6666667	0	0	0	0	0	0
Human Camps 2017	102	66	3.0000000	0	0	0	5	5	5
Human Camps 2017	102	67	2.7395833	0	0	0	4	4	4

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Human Camps 2017	102	68	1.5885417	0	0	0	5	5	5
Human Camps 2017	102	69	3.9166667	0	0	1	2	3	3
Human Camps 2017	102	70	3.6666667	0	0	0	1	1	1
Livestock Enclosures 2010	189	1	0.1510417	0	0	0	0	0	0
Livestock Enclosures 2010	189	2	0.1666667	0	0	0	0	0	0
Livestock Enclosures 2010	189	3	0.1093750	1	0	0	2	2	3
Livestock Enclosures 2010	189	4	0.1197917	0	0	0	0	0	0
Livestock Enclosures 2010	189	5	1.1458333	0	0	0	3	3	3
Livestock Enclosures 2010	189	6	1.9166667	0	0	0	1	1	1
Livestock Enclosures 2010	189	7	0.8333333	1	2	0	6	6	9
Livestock Enclosures 2010	189	8	1.4166667	1	1	0	4	4	6
Livestock Enclosures 2010	189	9	1.8333333	0	0	0	0	0	0
Livestock Enclosures 2010	189	10	1.6666667	0	1	0	0	0	1
Livestock Enclosures 2010	189	11	1.1666667	0	0	0	14	14	14
Livestock Enclosures 2010	189	12	0.0937500	0	0	0	6	6	6
Livestock Enclosures 2010	189	13	0.0989583	0	0	0	8	8	8
Livestock Enclosures 2010	189	14	0.1354167	0	0	0	5	5	5
Livestock Enclosures 2010	189	15	1.8333333	0	0	1	0	1	1
Livestock Enclosures 2010	189	16	1.3333333	0	0	0	0	0	0
Livestock Enclosures 2010	189	17	1.2500000	0	0	0	11	11	11
Livestock Enclosures 2010	189	18	0.0989583	0	0	0	4	4	4
Livestock Enclosures 2010	189	19	0.0989583	1	1	0	0	0	2
Livestock Enclosures 2010	189	20	2.0000000	0	0	0	0	0	0
Livestock Enclosures 2010	189	21	1.6666667	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2010	189	22	2.3333333	0	0	0	0	0	0
Livestock Enclosures 2010	189	23	1.1666667	0	0	0	0	0	0
Livestock Enclosures 2010	189	24	0.1614583	2	0	0	0	0	2
Livestock Enclosures 2010	189	25	0.1562500	4	0	0	0	0	4
Livestock Enclosures 2010	189	26	2.0000000	0	0	0	3	3	3
Livestock Enclosures 2010	189	27	2.0000000	0	0	0	0	0	0
Livestock Enclosures 2010	189	28	2.2500000	0	0	0	0	0	0
Livestock Enclosures 2010	189	29	2.0833333	1	0	0	0	0	1
Livestock Enclosures 2010	189	30	0.1458333	1	1	0	0	0	2
Livestock Enclosures 2010	189	31	0.1822917	0	0	0	0	0	0
Livestock Enclosures 2010	189	32	2.4166667	0	0	0	0	0	0
Livestock Enclosures 2010	189	33	3.0000000	0	0	0	0	0	0
Livestock Enclosures 2010	189	34	2.1666667	0	0	0	0	0	0
Livestock Enclosures 2010	189	35	1.5833333	0	0	0	0	0	0
Livestock Enclosures 2010	189	36	0.1145833	2	0	0	0	0	2
Livestock Enclosures 2010	189	37	0.1093750	2	1	0	8	8	11
Livestock Enclosures 2010	189	38	2.6666667	0	0	1	0	1	1
Livestock Enclosures 2010	189	39	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2010	189	40	2.9166667	0	0	0	0	0	0
Livestock Enclosures 2010	189	41	1.7500000	0	0	0	6	6	6
Livestock Enclosures 2010	189	42	0.1458333	1	2	0	0	0	3
Livestock Enclosures 2010	189	43	0.1406250	1	0	0	3	3	4
Livestock Enclosures 2010	189	44	0.1458333	1	2	0	0	0	3
Livestock Enclosures 2010	189	45	0.1302083	1	0	0	8	8	9

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2010	189	46	0.9166667	0	0	0	0	0	0
Livestock Enclosures 2010	189	47	2.2500000	2	0	0	0	0	2
Livestock Enclosures 2010	189	48	1.6666667	0	1	0	0	0	1
Livestock Enclosures 2010	189	49	0.1354167	0	1	0	2	2	3
Livestock Enclosures 2010	189	50	2.0000000	0	2	0	0	0	2
Livestock Enclosures 2010	189	51	0.1614583	1	1	0	0	0	2
Livestock Enclosures 2010	189	52	0.1354167	4	1	0	0	0	5
Livestock Enclosures 2010	189	53	0.1979167	3	2	0	4	4	9
Livestock Enclosures 2010	189	54	1.0937500	2	3	0	0	0	5
Livestock Enclosures 2010	193	1	2.2500000	0	0	0	0	0	0
Livestock Enclosures 2010	193	2	0.1875000	0	0	0	0	0	0
Livestock Enclosures 2010	193	3	1.2333333	0	0	0	0	0	0
Livestock Enclosures 2010	193	16	0.2239583	0	0	0	0	0	0
Livestock Enclosures 2010	193	17	0.2291667	0	0	0	0	0	0
Livestock Enclosures 2010	193	18	0.1458333	0	0	0	8	8	8
Livestock Enclosures 2010	193	19	0.2135417	0	0	0	0	0	0
Livestock Enclosures 2010	193	20	3.0833333	0	0	0	0	0	0
Livestock Enclosures 2010	193	21	1.5000000	0	0	0	0	0	0
Livestock Enclosures 2010	193	22	0.2135417	0	0	0	0	0	0
Livestock Enclosures 2010	193	23	0.2395833	0	0	0	0	0	0
Livestock Enclosures 2010	193	24	2.4166667	0	0	0	8	8	8
Livestock Enclosures 2010	193	25	3.2500000	0	0	0	2	2	2
Livestock Enclosures 2010	193	26	3.5833333	0	0	0	0	0	0
Livestock Enclosures 2010	193	27	2.8333333	0	1	0	0	0	1

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2010	193	28	2.5833333	0	0	0	0	0	0
Livestock Enclosures 2010	193	29	1.6666667	0	0	0	2	2	2
Livestock Enclosures 2010	193	30	2.6500000	0	0	0	0	0	0
Livestock Enclosures 2010	193	31	1.3333333	0	0	0	0	0	0
Livestock Enclosures 2010	193	34	0.1718750	0	0	0	0	0	0
Livestock Enclosures 2010	193	35	0.9635417	0	0	0	0	0	0
Livestock Enclosures 2010	193	36	2.9166667	0	0	0	0	0	0
Livestock Enclosures 2010	193	37	2.9166667	0	1	0	0	0	1
Livestock Enclosures 2010	193	38	3.1666667	0	0	0	0	0	0
Livestock Enclosures 2010	193	39	3.8333333	0	0	0	0	0	0
Livestock Enclosures 2010	193	40	2.5833333	0	0	0	0	0	0
Livestock Enclosures 2010	193	41	2.6666667	0	0	0	0	0	0
Livestock Enclosures 2010	193	42	1.9166667	0	0	0	0	0	0
Livestock Enclosures 2010	193	43	2.8333333	2	0	0	0	0	2
Livestock Enclosures 2010	193	44	0.2187500	0	0	0	0	0	0
Livestock Enclosures 2010	193	45	0.2656250	0	0	0	0	0	0
Livestock Enclosures 2010	193	46	2.1666667	4	0	0	3	3	7
Livestock Enclosures 2010	193	47	1.8333333	0	0	0	0	0	0
Livestock Enclosures 2010	193	48	3.3333333	0	0	0	0	0	0
Livestock Enclosures 2010	193	49	1.5000000	0	0	0	0	0	0
Livestock Enclosures 2010	193	50	1.1666667	0	0	0	0	0	0
Livestock Enclosures 2010	193	51	2.1666667	1	2	0	0	0	3
Livestock Enclosures 2010	193	52	2.0833333	0	0	0	0	0	0
Livestock Enclosures 2010	193	53	2.0000000	1	1	0	0	0	2

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2010	193	54	2.0000000	1	0	0	0	0	1
Livestock Enclosures 2010	193	55	2.8333333	0	0	0	0	0	0
Livestock Enclosures 2010	193	56	2.5833333	0	0	0	0	0	0
Livestock Enclosures 2010	193	57	0.7500000	0	2	0	0	0	2
Livestock Enclosures 2010	193	58	2.1666667	1	2	0	0	0	3
Livestock Enclosures 2010	193	59	4.0000000	0	0	0	0	0	0
Livestock Enclosures 2010	193	60	1.5000000	1	0	0	0	0	1
Livestock Enclosures 2010	193	61	2.2500000	0	0	0	0	0	0
Livestock Enclosures 2010	193	62	2.8333333	0	1	0	0	0	1
Livestock Enclosures 2010	193	63	3.2500000	0	0	0	0	0	0
Livestock Enclosures 2010	193	64	1.5833333	0	0	0	0	0	0
Livestock Enclosures 2010	193	65	1.6666667	0	0	0	0	0	0
Livestock Enclosures 2010	193	66	2.0833333	0	0	0	0	0	0
Livestock Enclosures 2010	193	67	1.3333333	0	0	0	1	1	1
Livestock Enclosures 2010	193	68	1.7500000	0	0	0	0	0	0
Livestock Enclosures 2010	193	69	2.7500000	0	0	0	0	0	0
Livestock Enclosures 2010	193	70	2.8333333	0	0	0	0	0	0
Livestock Enclosures 2010	193	71	3.1666667	0	0	0	0	0	0
Livestock Enclosures 2010	193	72	1.7500000	0	0	0	0	0	0
Livestock Enclosures 2010	193	73	2.0000000	0	0	0	0	0	0
Livestock Enclosures 2010	193	74	2.4166667	0	0	0	0	0	0
Livestock Enclosures 2010	193	75	2.2500000	0	0	0	0	0	0
Livestock Enclosures 2010	193	76	1.3333333	0	2	0	0	0	2
Livestock Enclosures 2010	193	77	2.0833333	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	S M	S R	A	T	IN V	Tota l
Livestock Enclosures 2010	193	78	1.8333333	0	0	0	0	0	0
Livestock Enclosures 2010	193	79	1.5000000	0	0	0	0	0	0
Livestock Enclosures 2010	193	80	1.6770833	0	0	0	0	0	0
Livestock Enclosures 2010	193	81	2.0000000	0	0	0	0	0	0
Livestock Enclosures 2010	193	82	2.1666667	0	0	0	0	0	0
Livestock Enclosures 2010	193	83	0.6666667	0	1	0	0	0	1
Livestock Enclosures 2010	193	84	2.3333333	1	3	0	2	2	6
Livestock Enclosures 2010	193	85	1.8333333	0	0	0	0	0	0
Livestock Enclosures 2010	193	86	1.4166667	0	0	0	0	0	0
Livestock Enclosures 2010	193	87	1.4166667	0	0	0	0	0	0
Livestock Enclosures 2010	193	88	2.7500000	0	0	0	0	0	0
Livestock Enclosures 2010	193	89	2.5000000	0	0	0	0	0	0
Livestock Enclosures 2010	193	90	1.8333333	0	0	0	0	0	0
Livestock Enclosures 2010	193	91	1.7500000	0	0	0	0	0	0
Livestock Enclosures 2010	193	92	2.4166667	0	0	1	2	3	3
Livestock Enclosures 2010	193	93	1.5833333	0	0	0	0	0	0
Livestock Enclosures 2010	177	1	2.9166667	0	1	0	0	0	1
Livestock Enclosures 2010	177	2	2.3333333	1	7	0	0	0	8
Livestock Enclosures 2010	177	3	2.4166667	0	0	0	0	0	0
Livestock Enclosures 2010	177	4	3.5833333	1	1	0	0	0	2
Livestock Enclosures 2010	177	5	2.3333333	0	0	0	0	0	0
Livestock Enclosures 2010	177	6	2.3333333	0	0	0	0	0	0
Livestock Enclosures 2010	177	7	1.7500000	0	0	0	0	0	0
Livestock Enclosures 2010	177	8	1.5000000	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2010	177	9	3.0833333	0	0	0	0	0	0
Livestock Enclosures 2010	177	10	2.8333333	0	3	0	0	0	3
Livestock Enclosures 2010	177	11	3.7500000	0	0	0	0	0	0
Livestock Enclosures 2010	177	12	3.3333333	0	0	0	0	0	0
Livestock Enclosures 2010	177	13	2.3333333	0	0	0	0	0	0
Livestock Enclosures 2010	177	14	3.3333333	0	0	0	0	0	0
Livestock Enclosures 2010	177	15	2.4166667	0	0	0	0	0	0
Livestock Enclosures 2010	177	16	3.2500000	0	0	0	3	3	3
Livestock Enclosures 2010	177	17	3.2500000	0	0	0	0	0	0
Livestock Enclosures 2010	177	18	2.5000000	0	0	0	0	0	0
Livestock Enclosures 2010	177	19	3.6666667	0	0	0	0	0	0
Livestock Enclosures 2010	177	20	2.3333333	0	0	0	0	0	0
Livestock Enclosures 2010	177	21	2.4166667	0	0	0	0	0	0
Livestock Enclosures 2010	177	22	2.9166667	0	0	0	0	0	0
Livestock Enclosures 2010	177	23	1.7500000	0	0	0	0	0	0
Livestock Enclosures 2010	177	24	2.5000000	0	0	0	0	0	0
Livestock Enclosures 2010	177	25	1.4166667	1	0	0	0	0	1
Livestock Enclosures 2010	177	26	2.1666667	0	3	0	0	0	3
Livestock Enclosures 2010	177	27	2.9166667	0	0	0	0	0	0
Livestock Enclosures 2010	177	28	3.9166667	0	0	0	2	2	2
Livestock Enclosures 2010	177	29	2.5000000	0	0	0	0	0	0
Livestock Enclosures 2010	177	30	2.2500000	1	8	0	0	0	9
Livestock Enclosures 2010	177	31	2.5833333	1	0	0	5	5	6
Livestock Enclosures 2010	177	32	3.8333333	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2010	177	33	3.7500000	0	0	0	0	0	0
Livestock Enclosures 2010	177	34	2.0000000	0	0	0	0	0	0
Livestock Enclosures 2010	177	35	1.5000000	1	0	0	0	0	1
Livestock Enclosures 2010	177	36	1.0000000	1	0	0	0	0	1
Livestock Enclosures 2010	177	37	2.5000000	0	1	0	0	0	1
Livestock Enclosures 2010	177	38	1.6666667	0	0	0	0	0	0
Livestock Enclosures 2010	177	39	3.6666667	0	0	0	0	0	0
Livestock Enclosures 2010	177	40	3.7500000	0	0	0	0	0	0
Livestock Enclosures 2010	185	6	1.7500000	0	0	0	0	0	0
Livestock Enclosures 2010	185	7	1.5833333	0	0	0	0	0	0
Livestock Enclosures 2010	185	8	1.3333333	0	0	0	1	1	1
Livestock Enclosures 2010	185	9	1.6666667	2	0	0	1	1	3
Livestock Enclosures 2010	185	10	2.6666667	0	1	0	0	0	1
Livestock Enclosures 2010	185	11	3.9166667	0	0	0	1	1	1
Livestock Enclosures 2010	185	12	2.4166667	0	0	0	0	0	0
Livestock Enclosures 2010	185	13	0.6614583	0	1	0	0	0	1
Livestock Enclosures 2010	185	14	1.6666667	0	0	0	0	0	0
Livestock Enclosures 2010	185	15	3.3333333	0	0	0	0	0	0
Livestock Enclosures 2010	185	18	1.5833333	0	0	0	0	0	0
Livestock Enclosures 2010	185	19	2.4166667	0	0	0	3	3	3
Livestock Enclosures 2010	185	20	4.0000000	0	0	0	3	3	3
Livestock Enclosures 2010	185	21	2.6666667	0	0	0	0	0	0
Livestock Enclosures 2010	185	22	2.5000000	0	0	0	2	2	2
Livestock Enclosures 2010	185	23	1.6666667	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2010	185	24	2.0000000	3	2	0	6	6	11
Livestock Enclosures 2010	185	25	1.8333333	0	2	0	0	0	2
Livestock Enclosures 2010	185	26	1.8333333	0	0	0	3	3	3
Livestock Enclosures 2010	185	27	2.1666667	1	0	0	0	0	1
Livestock Enclosures 2010	185	28	1.4166667	0	0	0	0	0	0
Livestock Enclosures 2010	185	29	2.6666667	0	0	0	0	0	0
Livestock Enclosures 2010	185	30	2.2500000	0	0	0	2	2	2
Livestock Enclosures 2010	185	31	3.0000000	0	0	0	1	1	1
Livestock Enclosures 2010	185	33	3.0000000	0	0	0	0	0	0
Livestock Enclosures 2010	185	34	3.3333333	0	0	0	1	1	1
Livestock Enclosures 2010	185	35	2.3802083	0	0	0	0	0	0
Livestock Enclosures 2010	185	36	2.0000000	0	0	0	0	0	0
Livestock Enclosures 2010	185	37	1.6666667	0	0	0	0	0	0
Livestock Enclosures 2010	185	38	1.9166667	1	0	0	0	0	1
Livestock Enclosures 2010	185	39	1.1250000	1	0	0	2	2	3
Livestock Enclosures 2010	185	40	1.9166667	6	0	0	4	4	10
Livestock Enclosures 2010	185	41	2.4166667	1	1	0	0	0	2
Livestock Enclosures 2010	185	42	1.3645833	0	0	0	0	0	0
Livestock Enclosures 2010	185	43	0.2291667	0	0	0	0	0	0
Livestock Enclosures 2010	185	44	0.2500000	0	0	0	0	0	0
Livestock Enclosures 2010	185	45	3.5000000	0	0	1	0	1	1
Livestock Enclosures 2010	185	46	2.0000000	2	0	0	0	0	2
Livestock Enclosures 2010	185	47	2.3333333	0	0	0	0	0	0
Livestock Enclosures 2010	185	48	0.8333333	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2010	185	49	1.2343750	0	0	0	0	0	0
Livestock Enclosures 2010	185	50	3.9166667	0	0	0	0	0	0
Livestock Enclosures 2010	185	51	0.7500000	0	0	0	0	0	0
Livestock Enclosures 2010	185	52	1.7291667	0	0	0	0	0	0
Livestock Enclosures 2010	185	53	0.1614583	0	0	0	0	0	0
Livestock Enclosures 2010	185	54	0.1927083	0	0	0	0	0	0
Livestock Enclosures 2010	185	55	2.1666667	0	0	0	0	0	0
Livestock Enclosures 2010	185	56	2.1666667	1	0	0	0	0	1
Livestock Enclosures 2010	185	58	2.5833333	2	0	0	0	0	2
Livestock Enclosures 2010	185	59	0.2187500	0	0	0	0	0	0
Livestock Enclosures 2010	185	60	2.4166667	0	0	0	0	0	0
Livestock Enclosures 2010	185	61	2.4166667	2	0	0	0	0	2
Livestock Enclosures 2010	185	62	2.4166667	3	0	0	0	0	3
Livestock Enclosures 2010	185	63	3.4166667	0	0	0	0	0	0
Livestock Enclosures 2010	185	64	2.5833333	1	1	0	0	0	2
Livestock Enclosures 2010	182	1	1.0000000	0	1	0	2	2	3
Livestock Enclosures 2010	182	2	1.0104167	0	0	0	3	3	3
Livestock Enclosures 2010	182	3	2.2500000	0	1	0	2	2	3
Livestock Enclosures 2010	182	4	2.2500000	0	0	0	5	5	5
Livestock Enclosures 2010	182	5	3.5000000	0	0	0	11	11	11
Livestock Enclosures 2010	182	6	2.0000000	0	0	0	5	5	5
Livestock Enclosures 2010	182	7	2.0833333	1	0	0	5	5	6
Livestock Enclosures 2010	182	8	2.5833333	0	0	0	3	3	3
Livestock Enclosures 2010	182	9	4.3333333	0	0	0	10	10	10

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2010	182	10	2.3333333	1	0	0	9	9	10
Livestock Enclosures 2010	182	11	3.2500000	0	0	0	14	14	14
Livestock Enclosures 2010	182	12	3.0000000	0	0	1	5	6	6
Livestock Enclosures 2010	182	13	2.6666667	0	0	0	15	15	15
Livestock Enclosures 2010	182	14	1.1666667	0	0	0	13	13	13
Livestock Enclosures 2010	182	15	1.5000000	0	0	0	8	8	8
Livestock Enclosures 2010	182	16	2.7500000	0	0	0	10	10	10
Livestock Enclosures 2010	182	17	3.0000000	0	0	0	2	2	2
Livestock Enclosures 2010	182	18	3.0000000	0	0	0	7	7	7
Livestock Enclosures 2010	182	19	2.7500000	0	0	0	16	16	16
Livestock Enclosures 2010	182	20	3.5833333	0	0	0	15	15	15
Livestock Enclosures 2010	182	21	1.5833333	0	0	0	2	2	2
Livestock Enclosures 2010	182	22	1.6666667	0	0	0	12	12	12
Livestock Enclosures 2010	182	23	1.5833333	0	0	0	22	22	22
Livestock Enclosures 2010	182	24	3.9166667	0	0	0	6	6	6
Livestock Enclosures 2010	182	25	2.8333333	0	1	0	5	5	6
Livestock Enclosures 2010	182	26	1.5833333	0	0	0	4	4	4
Livestock Enclosures 2010	182	27	2.5000000	1	0	0	15	15	16
Livestock Enclosures 2010	182	28	2.2500000	0	0	0	8	8	8
Livestock Enclosures 2010	182	29	1.9166667	4	0	0	21	21	25
Livestock Enclosures 2010	182	30	2.0833333	4	0	0	13	13	17
Livestock Enclosures 2010	182	31	2.4166667	0	0	0	11	11	11
Livestock Enclosures 2010	182	32	3.7500000	0	2	0	10	10	12
Livestock Enclosures 2010	182	33	2.5000000	1	0	0	9	9	10

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2010	182	34	2.3333333	1	0	0	12	12	13
Livestock Enclosures 2010	182	35	2.0833333	0	1	0	6	6	7
Livestock Enclosures 2010	215	3	1.1666667	0	0	0	2	2	2
Livestock Enclosures 2010	215	4	1.6666667	0	1	0	2	2	3
Livestock Enclosures 2010	215	5	1.3333333	2	0	2	0	2	4
Livestock Enclosures 2010	215	6	1.5833333	0	1	0	0	0	1
Livestock Enclosures 2010	215	7	1.2500000	1	0	0	2	2	3
Livestock Enclosures 2010	215	8	2.0833333	0	1	0	0	0	1
Livestock Enclosures 2010	215	10	3.0000000	0	0	0	0	0	0
Livestock Enclosures 2010	215	11	1.5833333	0	0	0	2	2	2
Livestock Enclosures 2010	215	12	2.9166667	0	0	0	2	2	2
Livestock Enclosures 2010	215	13	2.2500000	2	0	0	2	2	4
Livestock Enclosures 2010	215	14	1.7500000	0	0	0	5	5	5
Livestock Enclosures 2010	215	15	2.0833333	0	0	0	0	0	0
Livestock Enclosures 2010	215	16	1.6666667	0	0	0	2	2	2
Livestock Enclosures 2010	215	17	2.4166667	0	0	0	6	6	6
Livestock Enclosures 2010	215	18	1.9166667	0	0	1	0	1	1
Livestock Enclosures 2010	215	19	2.6666667	0	0	0	18	18	18
Livestock Enclosures 2010	215	20	1.8333333	0	1	0	6	6	7
Livestock Enclosures 2010	215	21	1.6666667	0	0	0	9	9	9
Livestock Enclosures 2010	215	22	1.7500000	0	0	0	3	3	3
Livestock Enclosures 2010	215	23	2.4166667	1	1	0	2	2	4
Livestock Enclosures 2010	215	24	1.5833333	0	1	0	0	0	1
Livestock Enclosures 2010	215	25	1.7500000	0	0	1	4	5	5

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2010	215	26	1.9166667	0	0	0	2	2	2
Livestock Enclosures 2010	215	27	1.7500000	0	0	0	5	5	5
Livestock Enclosures 2010	215	28	1.5833333	0	0	0	3	3	3
Livestock Enclosures 2010	215	29	2.2500000	1	0	0	2	2	3
Livestock Enclosures 2010	215	30	2.0000000	0	0	1	2	3	3
Livestock Enclosures 2010	215	31	1.7500000	0	0	0	0	0	0
Livestock Enclosures 2010	215	32	1.1666667	0	0	0	0	0	0
Livestock Enclosures 2010	215	33	2.4166667	0	0	1	2	3	3
Livestock Enclosures 2010	215	34	2.5000000	0	1	1	2	3	4
Livestock Enclosures 2010	215	35	1.0833333	0	0	0	8	8	8
Livestock Enclosures 2010	215	36	1.2500000	2	2	1	2	3	7
Livestock Enclosures 2010	215	37	1.0000000	0	1	0	3	3	4
Livestock Enclosures 2010	215	38	1.2500000	0	0	1	10	11	11
Livestock Enclosures 2010	215	39	1.4166667	0	0	0	0	0	0
Livestock Enclosures 2010	215	40	1.7500000	0	0	0	0	0	0
Livestock Enclosures 2010	215	41	2.5833333	2	0	1	5	6	8
Livestock Enclosures 2010	215	42	1.5000000	0	0	0	5	5	5
Livestock Enclosures 2010	215	43	1.1666667	1	0	0	0	0	1
Livestock Enclosures 2010	215	44	1.5833333	0	0	0	11	11	11
Livestock Enclosures 2010	215	45	2.1666667	0	0	3	6	9	9
Livestock Enclosures 2010	215	46	1.9166667	0	0	0	3	3	3
Livestock Enclosures 2010	215	47	1.5833333	1	0	1	7	8	9
Livestock Enclosures 2010	215	48	2.1666667	0	0	0	5	5	5
Livestock Enclosures 2010	215	49	1.5000000	0	1	0	0	0	1

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2010	215	50	3.0833333	0	1	0	7	7	8
Livestock Enclosures 2010	215	51	2.1666667	1	0	1	0	1	2
Livestock Enclosures 2010	215	52	2.0833333	2	0	1	7	8	10
Livestock Enclosures 2010	215	53	1.5000000	0	0	1	4	5	5
Livestock Enclosures 2010	215	54	0.4791667	0	0	0	11	11	11
Livestock Enclosures 2010	215	55	0.6250000	0	0	0	4	4	4
Livestock Enclosures 2010	215	56	2.0833333	1	0	0	6	6	7
Livestock Enclosures 2010	215	57	1.5000000	2	0	1	4	5	7
Livestock Enclosures 2010	215	58	2.2500000	2	0	0	0	0	2
Livestock Enclosures 2010	215	59	1.6666667	2	2	0	0	0	4
Livestock Enclosures 2010	215	60	0.8333333	0	1	0	7	7	8
Livestock Enclosures 2010	215	61	2.8333333	0	0	1	5	6	6
Livestock Enclosures 2010	215	62	3.0000000	0	0	0	6	6	6
Livestock Enclosures 2010	215	63	3.0833333	1	0	0	7	7	8
Livestock Enclosures 2010	215	64	1.4166667	1	0	0	3	3	4
Livestock Enclosures 2010	215	65	0.8125000	2	0	0	4	4	6
Livestock Enclosures 2010	215	66	1.4166667	0	0	0	0	0	0
Livestock Enclosures 2010	215	67	2.0000000	4	0	0	6	6	10
Livestock Enclosures 2010	215	68	2.1666667	1	2	0	2	2	5
Livestock Enclosures 2010	215	69	2.5833333	0	0	0	0	0	0
Livestock Enclosures 2010	215	70	2.3333333	2	3	1	4	5	10
Livestock Enclosures 2010	215	71	2.2500000	1	1	0	4	4	6
Livestock Enclosures 2010	215	72	1.5937500	0	0	0	3	3	3
Livestock Enclosures 2010	215	73	2.4166667	0	0	0	4	4	4

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2010	215	74	3.1666667	0	1	0	4	4	5
Livestock Enclosures 2010	215	75	1.2500000	2	0	1	3	4	6
Livestock Enclosures 2010	215	76	2.3333333	0	0	0	4	4	4
Livestock Enclosures 2010	215	77	2.0833333	0	0	0	0	0	0
Livestock Enclosures 2010	215	78	2.6666667	0	1	1	2	3	4
Livestock Enclosures 2010	215	79	1.5000000	2	4	1	1	2	8
Livestock Enclosures 2010	215	80	3.7500000	0	0	0	2	2	2
Livestock Enclosures 2010	215	81	2.4166667	0	2	0	5	5	7
Livestock Enclosures 2010	215	82	2.1666667	0	0	0	0	0	0
Livestock Enclosures 2010	215	83	2.4166667	0	0	0	1	1	1
Livestock Enclosures 2010	215	84	2.3333333	0	0	1	7	8	8
Livestock Enclosures 2010	215	85	2.4166667	0	0	0	2	2	2
Livestock Enclosures 2010	215	86	2.0000000	1	1	0	2	2	4
Livestock Enclosures 2010	215	87	2.4166667	1	0	0	0	0	1
Livestock Enclosures 2010	215	88	3.1666667	0	0	0	1	1	1
Livestock Enclosures 2010	215	89	3.5833333	1	2	0	2	2	5
Livestock Enclosures 2010	215	90	2.2500000	1	0	0	0	0	1
Livestock Enclosures 2010	215	91	1.3333333	0	1	1	0	1	2
Livestock Enclosures 2010	215	92	2.6666667	0	0	0	1	1	1
Livestock Enclosures 2010	215	93	1.1145833	0	0	0	0	0	0
Livestock Enclosures 2010	180	5	1.8333333	1	0	0	2	2	3
Livestock Enclosures 2010	180	6	0.4843750	1	0	0	0	0	1
Livestock Enclosures 2010	180	7	1.7500000	0	0	0	1	1	1
Livestock Enclosures 2010	180	8	2.3333333	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2010	180	10	1.1666667	0	0	0	0	0	0
Livestock Enclosures 2010	180	11	2.6666667	0	0	0	0	0	0
Livestock Enclosures 2010	180	12	2.1666667	0	0	0	0	0	0
Livestock Enclosures 2010	180	13	1.7500000	1	0	0	0	0	1
Livestock Enclosures 2010	180	14	1.2500000	1	0	0	4	4	5
Livestock Enclosures 2010	180	15	1.5000000	0	0	0	1	1	1
Livestock Enclosures 2010	180	16	1.2500000	0	1	0	6	6	7
Livestock Enclosures 2010	180	20	3.0000000	0	0	1	25	26	26
Livestock Enclosures 2010	180	21	2.7500000	0	0	2	0	2	2
Livestock Enclosures 2010	180	22	2.7500000	2	0	1	0	1	3
Livestock Enclosures 2010	180	23	3.6666667	0	0	0	2	2	2
Livestock Enclosures 2010	180	24	3.2500000	0	0	0	2	2	2
Livestock Enclosures 2010	180	25	2.5000000	0	0	1	0	1	1
Livestock Enclosures 2010	180	26	2.0000000	1	0	0	5	5	6
Livestock Enclosures 2010	180	27	2.1666667	1	0	0	0	0	1
Livestock Enclosures 2010	180	28	1.8333333	2	1	2	4	6	9
Livestock Enclosures 2010	180	29	2.2500000	5	0	0	5	5	10
Livestock Enclosures 2010	180	30	2.0833333	0	0	0	4	4	4
Livestock Enclosures 2010	180	31	2.7500000	1	0	0	1	1	2
Livestock Enclosures 2010	180	32	2.1666667	0	0	0	0	0	0
Livestock Enclosures 2010	180	33	2.4166667	0	0	0	0	0	0
Livestock Enclosures 2010	180	34	2.0833333	0	0	0	6	6	6
Livestock Enclosures 2010	180	35	2.5000000	0	0	0	11	11	11
Livestock Enclosures 2010	180	36	1.9166667	0	0	0	7	7	7

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2010	180	37	0.1510417	1	0	0	1	1	2
Livestock Enclosures 2010	180	38	1.0416667	0	0	0	0	0	0
Livestock Enclosures 2010	180	39	1.5833333	2	0	0	1	1	3
Livestock Enclosures 2010	180	40	1.9166667	0	0	0	0	0	0
Livestock Enclosures 2010	180	41	4.0000000	0	0	0	0	0	0
Livestock Enclosures 2010	180	42	3.5833333	0	0	0	11	11	11
Livestock Enclosures 2010	180	43	2.9166667	0	0	0	2	2	2
Livestock Enclosures 2010	180	44	2.0000000	0	0	0	0	0	0
Livestock Enclosures 2010	180	45	1.0729167	0	0	0	1	1	1
Livestock Enclosures 2010	180	46	0.7083333	0	0	0	3	3	3
Livestock Enclosures 2010	180	47	2.2500000	0	0	0	0	0	0
Livestock Enclosures 2010	180	48	1.9166667	0	0	0	3	3	3
Livestock Enclosures 2010	180	49	1.7500000	0	0	0	0	0	0
Livestock Enclosures 2010	180	50	3.9166667	0	0	0	0	0	0
Livestock Enclosures 2010	180	51	2.0833333	0	0	0	0	0	0
Livestock Enclosures 2010	180	52	2.5000000	0	0	0	0	0	0
Livestock Enclosures 2010	180	53	1.5833333	1	0	1	0	1	2
Livestock Enclosures 2010	180	54	2.0833333	0	0	0	0	0	0
Livestock Enclosures 2010	180	55	0.4114583	0	0	1	0	1	1
Livestock Enclosures 2010	180	56	3.6666667	0	0	0	2	2	2
Livestock Enclosures 2010	180	57	2.6666667	0	0	0	0	0	0
Livestock Enclosures 2010	180	58	2.9166667	0	0	0	0	0	0
Livestock Enclosures 2010	180	59	2.3333333	0	0	0	3	3	3
Livestock Enclosures 2010	180	60	2.5000000	0	0	1	3	4	4

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2010	180	61	2.7500000	0	0	0	5	5	5
Livestock Enclosures 2010	180	62	1.9166667	0	0	0	7	7	7
Livestock Enclosures 2010	180	65	1.6666667	0	0	0	9	9	9
Livestock Enclosures 2010	180	66	1.9166667	0	0	1	17	18	18
Livestock Enclosures 2010	180	67	1.3333333	0	0	0	15	15	15
Livestock Enclosures 2010	180	68	1.0833333	0	0	0	17	17	17
Livestock Enclosures 2010	180	69	3.4166667	0	0	0	0	0	0
Livestock Enclosures 2010	180	70	1.2500000	0	0	0	9	9	9
Livestock Enclosures 2010	180	71	1.4166667	0	0	0	14	14	14
Livestock Enclosures 2010	180	72	1.5000000	0	0	1	8	9	9
Livestock Enclosures 2017	212	4	0.1354167	0	0	0	8	8	8
Livestock Enclosures 2017	212	5	3.8333333	0	0	0	0	0	0
Livestock Enclosures 2017	212	6	2.8333333	0	0	0	0	0	0
Livestock Enclosures 2017	212	7	3.2500000	0	0	0	1	1	1
Livestock Enclosures 2017	212	8	0.1458333	0	0	0	2	2	2
Livestock Enclosures 2017	212	9	4.0000000	0	0	0	0	0	0
Livestock Enclosures 2017	212	10	1.3281250	0	0	0	6	6	6
Livestock Enclosures 2017	212	11	4.3333333	0	0	0	0	0	0
Livestock Enclosures 2017	212	12	3.3333333	0	1	0	1	1	2
Livestock Enclosures 2017	212	13	4.0833333	0	0	0	0	0	0
Livestock Enclosures 2017	212	14	3.3333333	0	0	0	1	1	1
Livestock Enclosures 2017	212	15	1.0208333	0	0	0	3	3	3
Livestock Enclosures 2017	212	17	0.2031250	0	0	0	14	14	14
Livestock Enclosures 2017	212	18	3.5000000	0	0	1	10	11	11

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2017	212	19	3.9166667	0	0	0	5	5	5
Livestock Enclosures 2017	212	20	4.0000000	0	0	0	1	1	1
Livestock Enclosures 2017	212	21	4.3333333	0	1	0	1	1	2
Livestock Enclosures 2017	212	22	3.8333333	0	0	0	0	0	0
Livestock Enclosures 2017	212	23	2.2916667	0	0	0	3	3	3
Livestock Enclosures 2017	212	24	1.2968750	0	0	0	0	0	0
Livestock Enclosures 2017	212	25	3.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	212	26	2.2500000	1	0	0	0	0	1
Livestock Enclosures 2017	212	27	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	212	28	3.4166667	0	0	0	0	0	0
Livestock Enclosures 2017	212	29	1.2604167	0	0	0	2	2	2
Livestock Enclosures 2017	212	30	0.1614583	0	0	0	0	0	0
Livestock Enclosures 2017	212	31	0.1979167	0	0	0	7	7	7
Livestock Enclosures 2017	212	32	0.1562500	0	0	0	5	5	5
Livestock Enclosures 2017	212	33	0.1093750	0	0	0	5	5	5
Livestock Enclosures 2017	212	34	2.7500000	0	0	1	2	3	3
Livestock Enclosures 2017	212	35	1.1614583	0	0	0	0	0	0
Livestock Enclosures 2017	212	36	4.3333333	0	0	0	4	4	4
Livestock Enclosures 2017	212	37	2.6250000	0	0	0	7	7	7
Livestock Enclosures 2017	212	38	2.4270833	0	0	0	7	7	7
Livestock Enclosures 2017	212	39	1.6197917	0	0	0	3	3	3
Livestock Enclosures 2017	212	40	0.1145833	0	0	0	2	2	2
Livestock Enclosures 2017	212	41	1.1354167	0	0	0	3	3	3
Livestock Enclosures 2017	212	42	4.0000000	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2017	212	43	3.7500000	0	0	0	0	0	0
Livestock Enclosures 2017	212	44	3.1666667	0	0	0	1	1	1
Livestock Enclosures 2017	212	45	3.8333333	0	0	0	2	2	2
Livestock Enclosures 2017	212	46	4.1666667	0	0	0	7	7	7
Livestock Enclosures 2017	212	47	1.1614583	0	0	0	24	24	24
Livestock Enclosures 2017	212	48	0.1406250	0	0	0	11	11	11
Livestock Enclosures 2017	212	49	2.2135417	0	0	0	37	37	37
Livestock Enclosures 2017	212	50	2.5833333	0	0	0	12	12	12
Livestock Enclosures 2017	212	51	3.3333333	0	0	0	2	2	2
Livestock Enclosures 2017	212	52	3.0833333	0	0	0	0	0	0
Livestock Enclosures 2017	212	53	1.4270833	0	0	0	0	0	0
Livestock Enclosures 2017	212	54	2.8333333	0	0	0	0	0	0
Livestock Enclosures 2017	212	55	4.2500000	0	0	0	1	1	1
Livestock Enclosures 2017	212	56	2.8802083	0	0	0	12	12	12
Livestock Enclosures 2017	212	59	1.5833333	0	0	0	0	0	0
Livestock Enclosures 2017	212	60	1.9739583	0	0	0	9	9	9
Livestock Enclosures 2017	212	61	0.1666667	0	0	0	1	1	1
Livestock Enclosures 2017	212	62	1.9270833	0	0	0	10	10	10
Livestock Enclosures 2017	212	63	2.5885417	0	0	1	11	12	12
Livestock Enclosures 2017	212	64	0.3281250	0	0	0	20	20	20
Livestock Enclosures 2017	217	1	2.4166667	0	0	0	2	2	2
Livestock Enclosures 2017	217	2	2.3333333	0	0	1	0	1	1
Livestock Enclosures 2017	217	3	3.7500000	0	0	0	2	2	2
Livestock Enclosures 2017	217	4	3.5833333	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2017	217	5	4.2500000	0	0	0	5	5	5
Livestock Enclosures 2017	217	6	3.0833333	2	0	0	0	0	2
Livestock Enclosures 2017	217	7	2.8333333	1	0	0	0	0	1
Livestock Enclosures 2017	217	8	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	217	11	3.9166667	0	0	0	2	2	2
Livestock Enclosures 2017	217	12	3.4166667	1	0	0	1	1	2
Livestock Enclosures 2017	217	13	3.6666667	2	0	0	0	0	2
Livestock Enclosures 2017	217	14	3.0833333	0	2	0	1	1	3
Livestock Enclosures 2017	217	15	3.8333333	0	0	0	0	0	0
Livestock Enclosures 2017	217	16	2.6666667	0	0	0	0	0	0
Livestock Enclosures 2017	217	17	3.5000000	0	0	0	5	5	5
Livestock Enclosures 2017	217	18	1.5000000	0	3	0	4	4	7
Livestock Enclosures 2017	217	19	1.8333333	0	0	0	17	17	17
Livestock Enclosures 2017	217	20	3.6666667	1	0	1	3	4	5
Livestock Enclosures 2017	217	21	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	217	22	4.0833333	0	0	0	0	0	0
Livestock Enclosures 2017	217	23	4.0833333	0	0	0	0	0	0
Livestock Enclosures 2017	217	24	2.8333333	1	0	0	0	0	1
Livestock Enclosures 2017	217	25	3.5833333	0	0	0	0	0	0
Livestock Enclosures 2017	217	26	2.4166667	0	0	0	0	0	0
Livestock Enclosures 2017	217	28	2.0000000	0	0	0	0	0	0
Livestock Enclosures 2017	217	29	3.7500000	0	0	0	0	0	0
Livestock Enclosures 2017	217	30	4.0833333	0	0	0	0	0	0
Livestock Enclosures 2017	217	31	3.0000000	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2017	217	32	3.6666667	1	0	0	0	0	1
Livestock Enclosures 2017	217	33	4.0000000	3	1	0	0	0	4
Livestock Enclosures 2017	217	34	4.2500000	0	0	0	0	0	0
Livestock Enclosures 2017	217	35	1.7500000	0	0	0	13	13	13
Livestock Enclosures 2017	217	36	1.2500000	0	0	0	0	0	0
Livestock Enclosures 2017	217	38	1.7500000	2	0	0	7	7	9
Livestock Enclosures 2017	217	39	4.2500000	0	0	0	0	0	0
Livestock Enclosures 2017	217	40	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	217	41	4.0833333	1	0	0	0	0	1
Livestock Enclosures 2017	217	42	3.9166667	0	1	0	4	4	5
Livestock Enclosures 2017	217	43	3.3333333	0	0	0	0	0	0
Livestock Enclosures 2017	217	44	2.0833333	0	0	0	0	0	0
Livestock Enclosures 2017	217	45	3.4166667	0	0	0	0	0	0
Livestock Enclosures 2017	217	46	2.5833333	0	0	0	0	0	0
Livestock Enclosures 2017	217	47	3.5833333	0	0	0	0	0	0
Livestock Enclosures 2017	217	48	3.7500000	0	0	0	0	0	0
Livestock Enclosures 2017	217	49	3.0000000	0	0	0	0	0	0
Livestock Enclosures 2017	217	50	4.2500000	0	0	0	2	2	2
Livestock Enclosures 2017	217	51	3.4166667	0	0	0	0	0	0
Livestock Enclosures 2017	217	52	2.5000000	0	0	1	0	1	1
Livestock Enclosures 2017	217	53	1.5833333	0	0	0	2	2	2
Livestock Enclosures 2017	217	58	2.2500000	0	0	0	0	0	0
Livestock Enclosures 2017	217	59	1.6666667	1	0	0	0	0	1
Livestock Enclosures 2017	217	60	2.5000000	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2017	217	61	1.4166667	4	1	0	0	0	5
Livestock Enclosures 2017	217	62	3.0833333	1	0	0	0	0	1
Livestock Enclosures 2017	211	2	3.4166667	0	0	0	0	0	0
Livestock Enclosures 2017	211	3	4.1666667	0	0	0	1	1	1
Livestock Enclosures 2017	211	4	4.2500000	0	0	0	4	4	4
Livestock Enclosures 2017	211	5	4.3333333	0	3	1	0	1	4
Livestock Enclosures 2017	211	6	3.8333333	0	0	0	7	7	7
Livestock Enclosures 2017	211	7	4.1666667	0	0	0	2	2	2
Livestock Enclosures 2017	211	8	4.0833333	0	0	0	3	3	3
Livestock Enclosures 2017	211	9	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	211	10	3.9166667	0	0	2	1	3	3
Livestock Enclosures 2017	211	11	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	211	12	4.3333333	1	0	1	1	2	3
Livestock Enclosures 2017	211	13	4.1666667	0	0	0	6	6	6
Livestock Enclosures 2017	211	14	3.7500000	0	0	0	7	7	7
Livestock Enclosures 2017	211	15	4.3333333	0	0	0	3	3	3
Livestock Enclosures 2017	211	16	3.9166667	0	0	0	0	0	0
Livestock Enclosures 2017	211	17	3.2500000	0	0	0	0	0	0
Livestock Enclosures 2017	211	18	1.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	211	19	2.9166667	0	0	0	0	0	0
Livestock Enclosures 2017	211	20	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	211	21	4.3333333	0	0	0	3	3	3
Livestock Enclosures 2017	211	22	4.5000000	0	0	0	11	11	11
Livestock Enclosures 2017	211	23	4.0000000	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2017	211	24	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	211	25	4.0833333	0	0	0	0	0	0
Livestock Enclosures 2017	211	26	4.5000000	0	0	0	2	2	2
Livestock Enclosures 2017	211	27	1.5833333	0	0	0	0	0	0
Livestock Enclosures 2017	211	28	3.9166667	0	0	0	0	0	0
Livestock Enclosures 2017	211	29	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	211	30	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	211	31	4.0000000	0	0	1	2	3	3
Livestock Enclosures 2017	211	32	3.6666667	0	0	0	5	5	5
Livestock Enclosures 2017	211	33	3.9166667	0	0	0	9	9	9
Livestock Enclosures 2017	211	34	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	211	35	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	211	36	2.1666667	0	0	0	0	0	0
Livestock Enclosures 2017	211	37	3.6666667	0	0	0	0	0	0
Livestock Enclosures 2017	211	38	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	211	39	3.8333333	0	0	0	5	5	5
Livestock Enclosures 2017	211	40	3.8333333	0	0	0	0	0	0
Livestock Enclosures 2017	211	41	2.4166667	3	0	0	1	1	4
Livestock Enclosures 2017	211	42	3.8333333	0	0	0	0	0	0
Livestock Enclosures 2017	211	43	3.5833333	0	0	0	0	0	0
Livestock Enclosures 2017	211	44	3.5833333	0	0	0	0	0	0
Livestock Enclosures 2017	211	47	3.2500000	0	0	0	0	0	0
Livestock Enclosures 2017	211	48	1.2500000	0	0	0	3	3	3
Livestock Enclosures 2017	211	49	2.3333333	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2017	211	50	2.5833333	2	1	0	5	5	8
Livestock Enclosures 2017	211	51	4.0000000	0	0	0	3	3	3
Livestock Enclosures 2017	211	52	2.0833333	1	0	0	1	1	2
Livestock Enclosures 2017	211	53	2.4166667	0	0	0	0	0	0
Livestock Enclosures 2017	211	54	2.7500000	0	0	0	0	0	0
Livestock Enclosures 2017	220	3	3.0833333	0	0	0	0	0	0
Livestock Enclosures 2017	220	4	2.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	220	5	3.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	220	6	3.6666667	0	0	0	0	0	0
Livestock Enclosures 2017	220	13	0.1406250	0	0	0	0	0	0
Livestock Enclosures 2017	220	14	0.1979167	0	0	0	0	0	0
Livestock Enclosures 2017	220	15	0.2031250	0	0	0	0	0	0
Livestock Enclosures 2017	220	16	0.2187500	3	0	0	0	0	3
Livestock Enclosures 2017	220	17	3.0468750	0	0	1	6	7	7
Livestock Enclosures 2017	220	18	3.3333333	0	2	0	1	1	3
Livestock Enclosures 2017	220	19	3.6666667	0	0	0	0	0	0
Livestock Enclosures 2017	220	21	0.2447917	0	0	0	1	1	1
Livestock Enclosures 2017	220	22	2.1770833	5	0	0	0	0	5
Livestock Enclosures 2017	220	23	2.9062500	0	0	0	2	2	2
Livestock Enclosures 2017	220	24	2.7604167	0	0	0	4	4	4
Livestock Enclosures 2017	220	25	2.9010417	0	0	0	5	5	5
Livestock Enclosures 2017	220	26	4.5000000	0	0	0	3	3	3
Livestock Enclosures 2017	220	27	4.0000000	0	0	0	1	1	1
Livestock Enclosures 2017	220	28	3.0572917	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2017	220	29	4.0833333	0	0	0	0	0	0
Livestock Enclosures 2017	220	31	1.4479167	2	0	0	0	0	2
Livestock Enclosures 2017	220	32	1.6197917	1	1	0	0	0	2
Livestock Enclosures 2017	220	33	3.4166667	0	0	0	0	0	0
Livestock Enclosures 2017	220	34	2.3177083	0	1	0	1	1	2
Livestock Enclosures 2017	220	35	3.9166667	0	0	0	1	1	1
Livestock Enclosures 2017	220	36	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	220	37	3.9166667	0	0	0	0	0	0
Livestock Enclosures 2017	220	38	0.1458333	0	0	0	0	0	0
Livestock Enclosures 2017	220	39	0.2031250	5	1	0	4	4	10
Livestock Enclosures 2017	220	40	0.1822917	0	0	0	0	0	0
Livestock Enclosures 2017	220	41	0.1770833	10	1	0	3	3	14
Livestock Enclosures 2017	220	42	0.2500000	0	0	0	4	4	4
Livestock Enclosures 2017	220	43	1.4270833	0	0	0	2	2	2
Livestock Enclosures 2017	220	44	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	220	45	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	220	46	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	220	47	3.5000000	0	1	0	0	0	1
Livestock Enclosures 2017	220	48	3.4166667	0	1	0	0	0	1
Livestock Enclosures 2017	220	49	3.1666667	2	0	0	0	0	2
Livestock Enclosures 2017	220	50	3.9166667	0	0	0	0	0	0
Livestock Enclosures 2017	220	51	0.1875000	0	1	0	0	0	1
Livestock Enclosures 2017	220	52	0.2812500	0	0	0	0	0	0
Livestock Enclosures 2017	220	53	4.3333333	0	1	0	0	0	1

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2017	220	54	3.7500000	0	0	0	0	0	0
Livestock Enclosures 2017	220	55	1.6666667	1	0	0	2	2	3
Livestock Enclosures 2017	220	56	4.2500000	0	0	0	0	0	0
Livestock Enclosures 2017	220	57	3.1666667	0	0	0	0	0	0
Livestock Enclosures 2017	220	58	2.4114583	0	0	0	0	0	0
Livestock Enclosures 2017	220	59	0.1979167	0	0	0	7	7	7
Livestock Enclosures 2017	220	60	1.1302083	1	0	0	0	0	1
Livestock Enclosures 2017	220	61	0.1770833	0	0	0	0	0	0
Livestock Enclosures 2017	220	62	3.0000000	0	1	0	0	0	1
Livestock Enclosures 2017	220	63	3.4166667	0	0	0	0	0	0
Livestock Enclosures 2017	220	64	3.3333333	0	1	1	0	1	2
Livestock Enclosures 2017	220	65	2.4947917	0	0	0	0	0	0
Livestock Enclosures 2017	220	66	0.8281250	2	0	0	0	0	2
Livestock Enclosures 2017	220	67	1.6770833	1	0	0	1	1	2
Livestock Enclosures 2017	220	68	3.0000000	0	0	0	0	0	0
Livestock Enclosures 2017	220	69	0.4791667	33	0	0	0	0	33
Livestock Enclosures 2017	220	70	0.1927083	0	0	0	0	0	0
Livestock Enclosures 2017	226	1	3.9166667	0	0	0	0	0	0
Livestock Enclosures 2017	226	2	2.0000000	0	0	1	0	1	1
Livestock Enclosures 2017	226	3	2.2500000	0	0	0	0	0	0
Livestock Enclosures 2017	226	4	4.5000000	1	0	0	0	0	1
Livestock Enclosures 2017	226	5	2.4166667	0	0	0	0	0	0
Livestock Enclosures 2017	226	13	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	226	14	1.0104167	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	S M	S R	A	T	IN V	Tota l
Livestock Enclosures 2017	226	15	2.6666667	0	0	1	0	1	1
Livestock Enclosures 2017	226	16	1.8333333	0	0	0	0	0	0
Livestock Enclosures 2017	226	17	3.0000000	0	0	1	0	1	1
Livestock Enclosures 2017	226	18	4.0833333	0	0	0	0	0	0
Livestock Enclosures 2017	226	19	1.8333333	0	5	0	0	0	5
Livestock Enclosures 2017	226	20	4.3333333	0	0	0	0	0	0
Livestock Enclosures 2017	226	21	3.3333333	0	0	0	0	0	0
Livestock Enclosures 2017	226	22	1.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	226	23	2.3333333	0	0	0	0	0	0
Livestock Enclosures 2017	226	24	3.7500000	0	0	0	0	0	0
Livestock Enclosures 2017	226	25	2.6666667	0	0	0	0	0	0
Livestock Enclosures 2017	226	26	2.0000000	0	0	0	0	0	0
Livestock Enclosures 2017	226	27	1.4166667	0	0	0	0	0	0
Livestock Enclosures 2017	226	28	1.1666667	0	0	0	0	0	0
Livestock Enclosures 2017	226	29	1.9166667	0	0	0	0	0	0
Livestock Enclosures 2017	226	30	0.6041667	0	0	0	0	0	0
Livestock Enclosures 2017	226	31	1.8281250	0	0	0	0	0	0
Livestock Enclosures 2017	226	32	3.0000000	0	0	0	0	0	0
Livestock Enclosures 2017	226	35	2.0000000	0	2	0	0	0	2
Livestock Enclosures 2017	226	36	2.5833333	2	0	0	0	0	2
Livestock Enclosures 2017	226	37	3.2500000	3	0	0	0	0	3
Livestock Enclosures 2017	226	38	3.7500000	0	2	0	0	0	2
Livestock Enclosures 2017	226	39	4.0000000	0	0	0	0	0	0
Livestock Enclosures 2017	226	40	2.4166667	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2017	226	41	2.9166667	0	0	0	0	0	0
Livestock Enclosures 2017	226	42	1.4687500	1	0	0	0	0	1
Livestock Enclosures 2017	226	43	3.0000000	0	0	0	0	0	0
Livestock Enclosures 2017	226	44	3.1666667	0	0	0	0	0	0
Livestock Enclosures 2017	226	45	2.7500000	0	0	0	0	0	0
Livestock Enclosures 2017	226	46	2.8333333	0	0	0	0	0	0
Livestock Enclosures 2017	226	47	4.4166667	0	0	0	0	0	0
Livestock Enclosures 2017	226	48	1.9166667	0	0	0	0	0	0
Livestock Enclosures 2017	226	49	1.1666667	0	0	0	0	0	0
Livestock Enclosures 2017	226	50	1.9166667	0	0	0	0	0	0
Livestock Enclosures 2017	226	51	1.9166667	0	0	0	0	0	0
Livestock Enclosures 2017	226	52	2.7500000	5	0	0	0	0	5
Livestock Enclosures 2017	226	53	3.0833333	0	0	0	0	0	0
Livestock Enclosures 2017	226	54	1.5000000	0	0	0	2	2	2
Livestock Enclosures 2017	226	57	3.9166667	0	0	0	0	0	0
Livestock Enclosures 2017	226	58	3.0000000	0	0	0	11	11	11
Livestock Enclosures 2017	226	59	3.7500000	0	0	0	1	1	1
Livestock Enclosures 2017	226	60	3.3333333	0	1	0	6	6	7
Livestock Enclosures 2017	226	61	3.9166667	0	0	0	0	0	0
Livestock Enclosures 2017	226	62	2.0000000	0	1	0	0	0	1
Livestock Enclosures 2017	226	63	2.5833333	0	0	0	0	0	0
Livestock Enclosures 2017	226	64	2.1666667	0	0	0	0	0	0
Livestock Enclosures 2017	226	65	2.921875	0	0	0	0	0	0
Livestock Enclosures 2017	226	66	0.6770833	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2017	226	67	0.2552083	0	0	0	0	0	0
Livestock Enclosures 2017	226	68	3.8333333	0	0	0	0	0	0
Livestock Enclosures 2017	226	69	1.5937500	0	0	0	0	0	0
Livestock Enclosures 2017	226	70	2.7500000	1	0	0	0	0	1
Livestock Enclosures 2017	226	71	2.0000000	0	0	0	0	0	0
Livestock Enclosures 2017	226	72	3.1666667	0	0	0	0	0	0
Livestock Enclosures 2017	226	73	3.2500000	0	0	0	1	1	1
Livestock Enclosures 2017	226	74	3.0000000	0	1	0	0	0	1
Livestock Enclosures 2017	226	75	2.7500000	2	0	0	0	0	2
Livestock Enclosures 2017	226	76	2.5000000	3	0	0	0	0	3
Livestock Enclosures 2017	226	77	3.0833333	0	1	0	3	3	4
Livestock Enclosures 2017	226	78	2.7500000	0	0	0	0	0	0
Livestock Enclosures 2017	226	79	2.0000000	0	1	0	0	0	1
Livestock Enclosures 2017	226	80	2.5833333	0	0	0	0	0	0
Livestock Enclosures 2017	226	81	1.9166667	1	0	0	0	0	1
Livestock Enclosures 2017	226	82	1.8333333	0	0	0	0	0	0
Livestock Enclosures 2017	226	83	4.3333333	0	0	0	0	0	0
Livestock Enclosures 2017	226	84	2.1666667	0	0	0	0	0	0
Livestock Enclosures 2017	226	85	2.6666667	0	0	0	0	0	0
Livestock Enclosures 2017	226	86	4.3333333	0	0	0	0	0	0
Livestock Enclosures 2017	226	87	4.2500000	0	0	0	0	0	0
Livestock Enclosures 2017	226	88	2.3437500	0	1	0	0	0	1
Livestock Enclosures 2017	226	90	2.0833333	0	0	0	0	0	0
Livestock Enclosures 2017	226	91	3.5000000	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2017	226	92	3.0833333	0	0	0	0	0	0
Livestock Enclosures 2017	226	93	2.6666667	0	1	0	0	0	1
Livestock Enclosures 2017	226	94	4.1666667	0	0	0	0	0	0
Livestock Enclosures 2017	226	95	4.0000000	0	0	0	0	0	0
Livestock Enclosures 2017	226	96	3.1666667	0	1	0	0	0	1
Livestock Enclosures 2017	226	97	2.2500000	0	0	0	0	0	0
Livestock Enclosures 2017	226	98	2.6666667	1	2	0	1	1	4
Livestock Enclosures 2017	226	99	3.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	226	100	2.7500000	0	0	0	0	0	0
Livestock Enclosures 2017	226	101	2.5833333	0	0	0	0	0	0
Livestock Enclosures 2017	226	102	2.3333333	0	0	0	0	0	0
Livestock Enclosures 2017	226	103	3.2500000	0	0	0	0	0	0
Livestock Enclosures 2017	226	104	3.7500000	0	0	0	0	0	0
Livestock Enclosures 2017	226	105	3.1666667	0	0	0	0	0	0
Livestock Enclosures 2017	214	2	2.4166667	0	0	0	6	6	6
Livestock Enclosures 2017	214	3	3.4166667	0	0	0	5	5	5
Livestock Enclosures 2017	214	6	1.7500000	0	0	0	2	2	2
Livestock Enclosures 2017	214	7	4.3333333	0	0	0	1	1	1
Livestock Enclosures 2017	214	8	3.2500000	0	0	0	0	0	0
Livestock Enclosures 2017	214	9	3.8333333	0	0	7	0	7	7
Livestock Enclosures 2017	214	10	4.4166667	0	0	1	0	1	1
Livestock Enclosures 2017	214	11	3.5000000	0	0	0	9	9	9
Livestock Enclosures 2017	214	12	3.2500000	0	0	0	8	8	8
Livestock Enclosures 2017	214	13	3.2500000	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2017	214	14	3.1666667	0	0	1	5	6	6
Livestock Enclosures 2017	214	15	4.2500000	0	0	0	1	1	1
Livestock Enclosures 2017	214	16	4.2500000	0	0	0	5	5	5
Livestock Enclosures 2017	214	17	3.0000000	0	0	0	2	2	2
Livestock Enclosures 2017	199	11	2.0833333	0	0	0	0	0	0
Livestock Enclosures 2017	199	14	2.6666667	1	0	0	0	0	1
Livestock Enclosures 2017	199	15	4.3333333	0	0	0	1	1	1
Livestock Enclosures 2017	199	16	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	199	17	2.3333333	0	0	0	6	6	6
Livestock Enclosures 2017	199	18	2.8333333	0	0	0	2	2	2
Livestock Enclosures 2017	199	19	3.5000000	0	0	1	1	2	2
Livestock Enclosures 2017	199	20	3.1666667	0	0	1	0	1	1
Livestock Enclosures 2017	199	26	0.1927083	0	0	0	0	0	0
Livestock Enclosures 2017	199	27	0.1822917	0	0	0	0	0	0
Livestock Enclosures 2017	199	28	1.4270833	0	0	0	0	0	0
Livestock Enclosures 2017	199	29	4.1666667	0	0	1	2	3	3
Livestock Enclosures 2017	199	30	3.4166667	0	0	0	3	3	3
Livestock Enclosures 2017	199	31	3.1666667	0	0	0	1	1	1
Livestock Enclosures 2017	199	32	4.0833333	0	0	0	0	0	0
Livestock Enclosures 2017	199	33	3.3333333	0	0	0	0	0	0
Livestock Enclosures 2017	199	34	3.3333333	0	0	0	0	0	0
Livestock Enclosures 2017	199	35	4.0833333	0	0	0	0	0	0
Livestock Enclosures 2017	199	38	0.2239583	0	0	0	0	0	0
Livestock Enclosures 2017	199	39	3.5000000	0	0	0	6	6	6

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2017	199	40	3.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	199	41	3.5833333	0	0	0	0	0	0
Livestock Enclosures 2017	199	42	3.0833333	0	1	0	1	1	2
Livestock Enclosures 2017	199	43	3.7500000	0	0	0	0	0	0
Livestock Enclosures 2017	199	44	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	199	45	3.9166667	0	0	0	0	0	0
Livestock Enclosures 2017	199	46	4.5000000	0	0	0	1	1	1
Livestock Enclosures 2017	199	47	0.1875000	0	1	0	0	0	1
Livestock Enclosures 2017	199	49	0.1458333	0	0	0	0	0	0
Livestock Enclosures 2017	199	50	3.1666667	0	0	0	0	0	0
Livestock Enclosures 2017	199	51	3.6666667	0	1	0	0	0	1
Livestock Enclosures 2017	199	52	3.5000000	1	0	0	0	0	1
Livestock Enclosures 2017	199	53	3.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	199	54	4.0000000	0	0	0	0	0	0
Livestock Enclosures 2017	199	55	3.7500000	0	0	0	0	0	0
Livestock Enclosures 2017	199	56	3.0833333	0	0	0	0	0	0
Livestock Enclosures 2017	199	57	4.5000000	0	0	0	0	0	0
Livestock Enclosures 2017	199	58	3.2500000	2	0	0	0	0	2
Livestock Enclosures 2017	199	59	3.3333333	0	0	0	2	2	2
Livestock Enclosures 2017	199	60	0.1250000	0	0	0	0	0	0
Livestock Enclosures 2017	199	61	1.6875000	0	0	0	1	1	1
Livestock Enclosures 2017	199	62	2.1562500	1	0	0	2	2	3
Livestock Enclosures 2017	199	63	3.7500000	0	0	0	5	5	5
Livestock Enclosures 2017	199	64	3.2500000	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2017	199	65	4.0000000	0	1	0	5	5	6
Livestock Enclosures 2017	199	66	3.4166667	0	0	0	2	2	2
Livestock Enclosures 2017	199	67	3.3333333	0	0	0	0	0	0
Livestock Enclosures 2017	199	68	2.9166667	2	1	1	0	1	4
Livestock Enclosures 2017	199	69	2.5833333	0	0	1	12	13	13
Livestock Enclosures 2017	199	70	3.5833333	0	0	0	0	0	0
Livestock Enclosures 2017	199	71	3.8333333	0	0	0	3	3	3
Livestock Enclosures 2017	199	72	1.8333333	0	0	0	0	0	0
Livestock Enclosures 2017	199	73	2.0000000	0	0	0	0	0	0
Livestock Enclosures 2017	199	74	2.0000000	1	0	0	0	0	1
Livestock Enclosures 2017	199	75	3.5833333	1	2	0	0	0	3
Livestock Enclosures 2017	199	76	3.6666667	0	0	0	0	0	0
Livestock Enclosures 2017	199	77	3.5833333	0	0	0	0	0	0
Livestock Enclosures 2017	199	78	3.0833333	0	1	0	2	2	3
Livestock Enclosures 2017	199	79	4.0833333	0	0	0	0	0	0
Livestock Enclosures 2017	199	80	2.6666667	1	0	0	0	0	1
Livestock Enclosures 2017	199	81	4.1666667	0	0	0	0	0	0
Livestock Enclosures 2017	199	82	4.3333333	0	0	0	0	0	0
Livestock Enclosures 2017	199	83	2.9270833	0	0	0	0	0	0
Livestock Enclosures 2017	199	84	0.2291667	0	0	0	0	0	0
Livestock Enclosures 2017	199	85	0.2447917	0	0	0	0	0	0
Livestock Enclosures 2017	199	86	3.4166667	0	0	0	0	0	0
Livestock Enclosures 2017	199	87	3.9166667	0	0	0	0	0	0
Livestock Enclosures 2017	199	88	3.7500000	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2017	199	89	2.3333333	0	0	0	0	0	0
Livestock Enclosures 2017	199	90	2.9166667	0	0	0	2	2	2
Livestock Enclosures 2017	199	91	3.4166667	0	0	0	0	0	0
Livestock Enclosures 2017	199	92	3.5833333	0	0	0	0	0	0
Livestock Enclosures 2017	199	93	3.7500000	0	1	0	0	0	1
Livestock Enclosures 2017	199	94	2.8333333	0	0	0	2	2	2
Livestock Enclosures 2017	199	95	3.3333333	0	2	0	2	2	4
Livestock Enclosures 2017	199	96	3.0833333	0	0	1	0	1	1
Livestock Enclosures 2017	199	97	2.3333333	0	0	0	0	0	0
Livestock Enclosures 2017	199	98	3.0000000	0	2	0	0	0	2
Livestock Enclosures 2017	199	99	4.3333333	0	0	0	0	0	0
Livestock Enclosures 2017	199	100	4.3333333	0	0	0	0	0	0
Livestock Enclosures 2017	199	101	3.5833333	0	0	0	2	2	2
Livestock Enclosures 2017	199	102	3.1666667	0	0	0	0	0	0
Livestock Enclosures 2017	199	103	3.4166667	0	0	0	0	0	0
Livestock Enclosures 2017	199	104	3.5833333	0	1	1	0	1	2
Livestock Enclosures 2017	199	105	3.0833333	0	0	0	0	0	0
Livestock Enclosures 2017	199	106	3.6666667	0	0	0	0	0	0
Livestock Enclosures 2017	199	107	2.9166667	0	0	0	0	0	0
Livestock Enclosures 2017	199	108	1.6875000	0	1	0	0	0	1
Livestock Enclosures 2017	199	110	0.5833333	0	0	0	0	0	0
Livestock Enclosures 2017	199	111	2.5000000	3	0	0	0	0	3
Livestock Enclosures 2017	199	112	3.5000000	0	0	0	2	2	2
Livestock Enclosures 2017	199	113	3.7500000	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2017	199	114	2.4166667	0	0	0	0	0	0
Livestock Enclosures 2017	199	115	3.2500000	0	0	0	0	0	0
Livestock Enclosures 2017	199	116	3.1666667	0	0	0	0	0	0
Livestock Enclosures 2017	199	117	3.4166667	0	0	0	0	0	0
Livestock Enclosures 2017	199	118	1.6666667	0	0	0	0	0	0
Livestock Enclosures 2017	199	119	1.8333333	1	0	0	0	0	1
Livestock Enclosures 2017	199	120	0.1614583	0	0	0	0	0	0
Livestock Enclosures 2017	199	121	1.0364583	0	0	0	6	6	6
Livestock Enclosures 2017	199	122	2.5833333	4	0	0	0	0	4
Livestock Enclosures 2017	199	123	3.4166667	0	0	0	0	0	0
Livestock Enclosures 2017	199	124	3.0000000	0	0	0	0	0	0
Livestock Enclosures 2017	199	125	2.9166667	0	0	0	0	0	0
Livestock Enclosures 2017	199	126	3.9166667	0	0	0	0	0	0
Livestock Enclosures 2017	199	127	2.5833333	0	0	0	0	0	0
Livestock Enclosures 2017	199	128	2.9166667	0	0	0	1	1	1
Livestock Enclosures 2017	199	129	2.9166667	1	0	0	0	0	1
Livestock Enclosures 2017	199	130	2.1666667	1	0	0	0	0	1
Livestock Enclosures 2017	199	137	3.2500000	1	1	0	1	1	3
Livestock Enclosures 2017	199	138	2.0833333	0	0	0	0	0	0
Livestock Enclosures 2017	199	139	3.0000000	0	0	1	0	1	1
Livestock Enclosures 2017	199	140	3.4166667	0	0	2	0	2	2
Livestock Enclosures 2017	199	141	3.3333333	0	0	1	0	1	1
Livestock Enclosures 2017	199	142	1.9166667	0	1	0	1	1	2
Livestock Enclosures 2017	199	143	1.5000000	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Livestock Enclosures 2017	199	144	2.4062500	0	0	1	0	1	1
Livestock Enclosures 2017	199	147	1.3333333	0	0	0	0	0	0
Livestock Enclosures 2017	199	148	2.6666667	0	1	0	0	0	1
Livestock Enclosures 2017	199	149	3.4166667	0	0	0	0	0	0
Non-disturbed Sites	Reference 1	1	1.7500000	0	0	0	0	0	0
Non-disturbed Sites	Reference 1	2	1.8333333	0	0	0	1	1	1
Non-disturbed Sites	Reference 1	3	2.1666667	0	1	1	0	1	2
Non-disturbed Sites	Reference 1	4	1.6666667	0	0	0	2	2	2
Non-disturbed Sites	Reference 1	5	2.0000000	0	0	0	12	12	12
Non-disturbed Sites	Reference 1	6	0.9166667	0	1	1	0	1	2
Non-disturbed Sites	Reference 1	7	1.4166667	0	0	0	4	4	4
Non-disturbed Sites	Reference 1	8	2.0833333	0	0	0	16	16	16
Non-disturbed Sites	Reference 1	9	3.0000000	0	0	0	0	0	0
Non-disturbed Sites	Reference 1	10	2.5833333	0	0	0	5	5	5
Non-disturbed Sites	Reference 1	11	2.3333333	0	0	1	13	14	14
Non-disturbed Sites	Reference 1	12	3.1666667	0	0	0	14	14	14
Non-disturbed Sites	Reference 1	13	0.1875000	0	0	0	4	4	4
Non-disturbed Sites	Reference 1	14	2.2500000	0	0	0	1	1	1
Non-disturbed Sites	Reference 1	15	2.3333333	0	0	0	9	9	9
Non-disturbed Sites	Reference 1	16	2.9166667	0	0	0	0	0	0
Non-disturbed Sites	Reference 1	17	2.1666667	0	0	0	1	1	1
Non-disturbed Sites	Reference 1	18	0.2291667	2	0	0	0	0	2
Non-disturbed Sites	Reference 1	19	0.1822917	0	0	0	0	0	0
Non-disturbed Sites	Reference 1	20	0.8229167	0	1	0	8	8	9

TYPE	CAMP	QUADRAT	AC	S M	S R	A	T	IN V	Tota l
Non-disturbed Sites	Reference 1	21	0.390625	0	0	0	4	4	4
Non-disturbed Sites	Reference 1	22	0.6354167	0	1	0	2	2	3
Non-disturbed Sites	Reference 1	23	0.1875000	0	0	0	2	2	2
Non-disturbed Sites	Reference 1	24	0.1875000	0	0	0	1 5	15	15
Non-disturbed Sites	Reference 1	25	0.2031250	0	0	0	7	7	7
Non-disturbed Sites	Reference 1	26	0.2083333	0	0	0	1 2	12	12
Non-disturbed Sites	Reference 1	27	2.2500000	1	1	1	0	1	3
Non-disturbed Sites	Reference 1	28	1.0729167	0	0	0	5	5	5
Non-disturbed Sites	Reference 1	29	1.1666667	0	0	0	1 2	12	12
Non-disturbed Sites	Reference 1	30	0.4062500	0	0	0	0	0	0
Non-disturbed Sites	Reference 1	31	0.4062500	0	1	0	3	3	4
Non-disturbed Sites	Reference 1	32	0.1354167	0	0	0	7	7	7
Non-disturbed Sites	Reference 1	33	0.1250000	0	0	0	0	0	0
Non-disturbed Sites	Reference 1	34	0.1510417	0	1	0	0	0	1
Non-disturbed Sites	Reference 1	35	0.1614583	0	2	0	6	6	8
Non-disturbed Sites	Reference 1	36	0.2343750	0	0	0	0	0	0
Non-disturbed Sites	Reference 1	37	0.2500000	0	0	0	0	0	0
Non-disturbed Sites	Reference 1	38	0.1927083	0	0	0	0	0	0
Non-disturbed Sites	Reference 1	39	0.1458333	0	0	0	3	3	3
Non-disturbed Sites	Reference 1	40	0.2708333	0	0	0	1	1	1
Non-disturbed Sites	Reference 1	41	0.2343750	1	3	0	1	1	5
Non-disturbed Sites	Reference 1	42	0.2447917	0	0	0	5	5	5
Non-disturbed Sites	Reference 1	43	0.2708333	0	0	0	0	0	0
Non-disturbed Sites	Reference 1	44	0.2500000	0	0	0	1	1	1

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Non-disturbed Sites	Reference 1	45	0.1979167	0	1	0	0	0	1
Non-disturbed Sites	Reference 1	46	0.1458333	0	0	0	6	6	6
Non-disturbed Sites	Reference 1	47	0.1718750	0	1	0	3	3	4
Non-disturbed Sites	Reference 1	48	0.1302083	0	0	0	13	13	13
Non-disturbed Sites	Reference 1	49	0.2187500	0	0	0	3	3	3
Non-disturbed Sites	Reference 1	50	0.6250000	0	0	0	3	3	3
Non-disturbed Sites	Reference 1	51	2.0833333	0	0	0	2	2	2
Non-disturbed Sites	Reference 1	52	0.4062500	0	0	0	2	2	2
Non-disturbed Sites	Reference 1	53	0.1718750	0	0	0	1	1	1
Non-disturbed Sites	Reference 1	54	0.1875000	0	0	0	2	2	2
Non-disturbed Sites	Reference 1	55	0.2604167	0	1	0	3	3	4
Non-disturbed Sites	Reference 1	56	0.4791667	0	1	1	0	1	2
Non-disturbed Sites	Reference 1	57	0.3437500	1	0	0	0	0	1
Non-disturbed Sites	Reference 1	58	0.1250000	0	0	0	3	3	3
Non-disturbed Sites	Reference 1	59	0.5416667	1	0	0	2	2	3
Non-disturbed Sites	Reference 1	60	0.2187500	0	0	0	1	1	1
Non-disturbed Sites	Reference 1	61	0.1979167	0	0	0	0	0	0
Non-disturbed Sites	Reference 1	62	0.1302083	0	0	0	0	0	0
Non-disturbed Sites	Reference 1	63	1.0208333	0	0	1	4	5	5
Non-disturbed Sites	Reference 1	64	0.2031250	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	1	1.2500000	1	0	0	0	0	1
Non-disturbed Sites	Reference 2	2	0.6562500	0	0	0	1	1	1
Non-disturbed Sites	Reference 2	3	1.8333333	2	0	0	1	1	3
Non-disturbed Sites	Reference 2	4	0.8125000	2	0	0	4	4	6

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Non-disturbed Sites	Reference 2	5	0.3854167	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	6	0.1458333	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	7	0.1927083	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	8	0.5000000	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	9	0.5312500	0	1	0	0	0	1
Non-disturbed Sites	Reference 2	10	0.3437500	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	11	0.1354167	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	12	1.0520833	0	0	1	0	1	1
Non-disturbed Sites	Reference 2	13	0.1302083	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	14	0.1666667	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	15	0.2135417	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	16	0.9375000	0	0	0	4	4	4
Non-disturbed Sites	Reference 2	17	0.1979167	0	0	0	4	4	4
Non-disturbed Sites	Reference 2	18	0.1614583	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	19	0.1406250	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	20	0.7135417	1	0	0	0	0	1
Non-disturbed Sites	Reference 2	21	0.1666667	0	0	0	2	2	2
Non-disturbed Sites	Reference 2	22	0.7812500	0	1	0	3	3	4
Non-disturbed Sites	Reference 2	23	0.1562500	0	0	0	9	9	9
Non-disturbed Sites	Reference 2	24	0.1302083	0	0	0	2	2	2
Non-disturbed Sites	Reference 2	25	0.1354167	0	0	0	3	3	3
Non-disturbed Sites	Reference 2	26	0.5520833	0	1	0	3	3	4
Non-disturbed Sites	Reference 2	27	0.5000000	0	0	0	2	2	2
Non-disturbed Sites	Reference 2	28	0.1770833	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Non-disturbed Sites	Reference 2	29	0.1250000	0	0	0	3	3	3
Non-disturbed Sites	Reference 2	30	0.1614583	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	31	0.1718750	0	0	0	1	1	1
Non-disturbed Sites	Reference 2	32	0.7916667	0	1	0	0	0	1
Non-disturbed Sites	Reference 2	33	0.4895833	0	1	0	0	0	1
Non-disturbed Sites	Reference 2	34	0.0989583	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	35	0.1093750	0	0	0	2	2	2
Non-disturbed Sites	Reference 2	36	0.0781250	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	37	0.1302083	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	38	0.9583333	1	0	0	0	0	1
Non-disturbed Sites	Reference 2	39	0.1354167	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	40	0.1145833	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	41	0.9947917	1	1	0	0	0	2
Non-disturbed Sites	Reference 2	42	0.7291667	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	43	0.2031250	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	44	0.1093750	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	45	0.1302083	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	46	0.1145833	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	47	0.5677083	1	0	0	0	0	1
Non-disturbed Sites	Reference 2	48	0.1822917	1	0	0	0	0	1
Non-disturbed Sites	Reference 2	49	1.3333333	1	0	0	1	1	2
Non-disturbed Sites	Reference 2	50	0.7968750	1	1	0	0	0	2
Non-disturbed Sites	Reference 2	51	1.1406250	0	2	1	5	6	8
Non-disturbed Sites	Reference 2	52	1.7187500	0	0	0	0	0	0

TYPE	CAMP	QUADRAT	AC	S M	S R	A	T	IN V	Tota l
Non-disturbed Sites	Reference 2	53	0.2708333	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	54	0.1979167	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	55	0.1562500	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	56	0.1302083	0	1	0	0	0	1
Non-disturbed Sites	Reference 2	57	0.1406250	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	58	1.1406250	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	59	0.2708333	0	0	0	0	0	0
Non-disturbed Sites	Reference 2	60	2.0000000	2	1	0	0	0	3
Non-disturbed Sites	Reference 2	61	2.1666667	0	1	0	0	0	1
Non-disturbed Sites	Reference 2	62	1.5833333	0	1	0	3	3	4
Non-disturbed Sites	Reference 2	63	1.5000000	1	1	0	0	0	2
Non-disturbed Sites	Reference 2	64	1.7500000	0	0	0	0	0	0
Non-disturbed Sites	Reference 3	1	0.1718750	1	1	0	0	0	2
Non-disturbed Sites	Reference 3	2	0.1822917	0	0	0	0	0	0
Non-disturbed Sites	Reference 3	3	1.7500000	0	2	0	0	0	2
Non-disturbed Sites	Reference 3	4	2.4166667	0	2	0	0	0	2
Non-disturbed Sites	Reference 3	5	2.5000000	0	0	0	0	0	0
Non-disturbed Sites	Reference 3	6	0.1562500	0	0	0	0	0	0
Non-disturbed Sites	Reference 3	7	0.1510417	1	0	0	0	0	1
Non-disturbed Sites	Reference 3	8	2.1666667	0	0	0	0	0	0
Non-disturbed Sites	Reference 3	9	2.7500000	0	0	0	0	0	0
Non-disturbed Sites	Reference 3	10	2.0833333	0	1	0	0	0	1
Non-disturbed Sites	Reference 3	11	1.7500000	0	0	0	0	0	0
Non-disturbed Sites	Reference 3	12	1.0833333	0	0	0	2	2	2

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Non-disturbed Sites	Reference 3	13	0.2291667	0	1	0	0	0	1
Non-disturbed Sites	Reference 3	14	0.4270833	2	2	0	0	0	4
Non-disturbed Sites	Reference 3	15	0.5937500	0	0	0	4	4	4
Non-disturbed Sites	Reference 3	16	1.7500000	0	0	0	0	0	0
Non-disturbed Sites	Reference 3	17	1.5833333	0	0	0	0	0	0
Non-disturbed Sites	Reference 3	18	1.0625000	0	1	0	0	0	1
Non-disturbed Sites	Reference 3	19	1.1770833	0	1	0	2	2	3
Non-disturbed Sites	Reference 3	20	0.4375000	0	2	0	0	0	2
Non-disturbed Sites	Reference 3	21	0.7500000	1	0	0	0	0	1
Non-disturbed Sites	Reference 3	22	2.0000000	0	0	0	1	1	1
Non-disturbed Sites	Reference 3	23	2.0833333	0	0	0	0	0	0
Non-disturbed Sites	Reference 3	24	0.8958333	0	0	0	0	0	0
Non-disturbed Sites	Reference 3	25	1.6666667	1	0	0	0	0	1
Non-disturbed Sites	Reference 3	26	2.1666667	0	1	1	4	5	6
Non-disturbed Sites	Reference 3	27	0.1458333	0	0	0	4	4	4
Non-disturbed Sites	Reference 3	28	2.0833333	0	0	0	0	0	0
Non-disturbed Sites	Reference 3	29	0.3125000	2	0	0	3	3	5
Non-disturbed Sites	Reference 3	30	1.7500000	1	3	0	3	3	7
Non-disturbed Sites	Reference 3	31	0.1510417	0	0	0	4	4	4
Non-disturbed Sites	Reference 3	32	0.1458333	1	0	0	3	3	4
Non-disturbed Sites	Reference 3	33	0.2239583	4	0	0	5	5	9
Non-disturbed Sites	Reference 3	34	0.5989583	1	0	0	0	0	1
Non-disturbed Sites	Reference 3	35	0.1510417	0	0	0	2	2	2
Non-disturbed Sites	Reference 3	36	3.1666667	1	2	0	17	17	20

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Non-disturbed Sites	Reference 3	37	1.1145833	0	0	0	5	5	5
Non-disturbed Sites	Reference 3	38	0.1458333	0	0	0	4	4	4
Non-disturbed Sites	Reference 3	39	3.0833333	0	1	0	3	3	4
Non-disturbed Sites	Reference 3	40	2.5000000	0	0	0	2	2	2
Non-disturbed Sites	Reference 3	41	2.5000000	0	0	0	5	5	5
Non-disturbed Sites	Reference 3	42	2.5000000	0	0	0	3	3	3
Non-disturbed Sites	Reference 3	43	1.8333333	0	0	0	1	1	1
Non-disturbed Sites	Reference 3	44	0.1614583	0	0	0	8	8	8
Non-disturbed Sites	Reference 3	45	1.0833333	3	0	0	3	3	6
Non-disturbed Sites	Reference 3	46	0.8333333	1	0	0	0	0	1
Non-disturbed Sites	Reference 3	47	1.0833333	2	1	0	8	8	11
Non-disturbed Sites	Reference 3	48	1.2395833	0	0	0	23	23	23
Non-disturbed Sites	Reference 3	49	0.6354167	4	2	0	3	3	9
Non-disturbed Sites	Reference 3	50	0.4166667	3	0	0	1	1	4
Non-disturbed Sites	Reference 3	51	0.8229167	1	0	0	1	1	2
Non-disturbed Sites	Reference 3	52	0.5104167	2	0	0	3	3	5
Non-disturbed Sites	Reference 3	53	1.8333333	0	0	0	5	5	5
Non-disturbed Sites	Reference 3	54	2.0833333	1	2	0	0	0	3
Non-disturbed Sites	Reference 3	55	2.8333333	0	0	0	2	2	2
Non-disturbed Sites	Reference 3	56	1.6666667	0	0	0	0	0	0
Non-disturbed Sites	Reference 3	57	2.8333333	0	2	0	0	0	2
Non-disturbed Sites	Reference 3	58	1.9166667	1	0	0	2	2	3
Non-disturbed Sites	Reference 3	59	0.8020833	0	1	0	5	5	6
Non-disturbed Sites	Reference 3	60	1.5729167	0	0	0	5	5	5

TYPE	CAMP	QUADRAT	AC	SM	SR	A	T	INV	Total
Non-disturbed Sites	Reference 3	61	1.0104167	0	1	0	6	6	7
Non-disturbed Sites	Reference 3	62	1.3177083	2	0	0	0	0	2
Non-disturbed Sites	Reference 3	63	0.9062500	1	0	0	0	0	1
Non-disturbed Sites	Reference 3	64	0.9791667	0	0	0	0	0	0

Figure A-1. DigitalGlobe Image (Date: 11/3/2016). The source of the satellite image is located at the center bottom of the image. The location of the study area is 29.14°, 29.19° N and 47.85°, 47.91° E.

Figure A-2. CNES/Airbus Image (Date: 1/7/2017). The source of the satellite image is located at the center bottom of the image.

REFERENCES

Abensperg-Traun, M. 1994. The influence of climate on patterns of termite eating in Australian mammals and lizards. *Australian Journal of Ecology* 19 (1): 65–71.

Abushaman F. T., W. A. Al-Houty. 1988. The foraging activity of subterranean termites in the Kuwait desert. *Journal of Arid Environments* 14 (1):75–82.

Al-Helal, A. B., and J. M. Al-Awadhi. 2006. Assessment of sand encroachment in Kuwait using GIS. *Environmental Geology* 49 (7):960–967.

Al-Hurban, A. E. 2014. Effects of recent anthropogenic activities on the surface deposits of Kuwait. *Arabian Journal of Geosciences* 7 (2):665–91.

Almedeij, J. 2014. Drought analysis for Kuwait using standardized precipitation index. *The Scientific World Journal* 1–9.

Al-Sayegh, M. 2017. *Eco-physiological Implications of Conservation of Dhubs (Uromastyx Aegyptius) in Kuwait.* Doctoral dissertation., Arizona State University.

Al-Yamani, F. Y., J. Bishop, E. Ramadan, M. Al-Husaini, and A. N. Al-Ghadban. 2004. *Oceanographic atlas of Kuwaiti waters*: Kuwait Instiute for Scientific Research.

Anzah, F. A., D. R. Butler, and R. W. Dixon. 2017. The Effects of physical landscape variables on burrow-site selection in the Kuwaiti desert by lesser egyptian jerboa (*Jaculus jaculus*). *Papers in Applied Geography* 3 (1): 44–51.

Bates, R. L., J. A. Jackson. 1984. *Dictionary of geological terms*. New York: Doubleday.

Bauer, A. M., and A. P. Russell. 1991. Pedal specializations in dune-dwelling geckos. *Journal of Arid Environments* 20:43–62.

Bennet, H. H. 1938. *Soil conservation*. New York: McGraw-Hill.

Beylich, A., H. R. Oberholzer, S. Schrader, H. Höper, and B. M. Wilke. 2010. Evaluation of soil compaction effects on soil biota and soil biological processes in soils. *Soil and Tillage Research* 109 (2):133–43.

Boeken, B., M. Shachak, Y. Gutterman, and S. Brand. 1995. Patchiness and disturbance: plant community responses to porcupine diggings in the central Negev. *Ecography* 18 (4):410–21.

Boelhouwers, J., and T. Scheepers. 2004. The role of antelope trampling on scarp erosion in a hyper-arid environment, Skeleton Coast, Namibia. *Journal of Arid Environments* 58 (4):545–57.

Boussingault, J. B. 1845, *Rural economy* (2nd Ed). London: Baillière.

Brussaard, L., H. G. Van Faassen. 1994. Effects of compaction on soil biota and soil biological processes. In *Soil Compaction in Crop Production*, ed. by B. D. Soane., and C. Van Ouwerkerk. Elsevier: New York.

Burns, S. 1979. The northern pocket gopher (*Thomomys talpoides*): a major geomorphic agent on the alpine tundra. *Journal of the Colorado-Wyoming Academy of Sciences* 2:86.

Butler, D. R. 1992. The grizzly bear as an erosional agent in mountainous terrain. *Zeitschrift für Geomorphologie* 36 (2):179–89.

Butler D. R. 1995. *Zoogeomorphology: animals as geomorphic agents*. New York: Cambridge University Press.

Butler, D. R., and C. F. Sawyer. 2012. Introduction to the special issue—zoogeomorphology and ecosystem engineering. *Geomorphology* 157:1–5.

Butler, D. R., C. J. Whitesides, J. M. Wamsley, and S. G. Tsikalas. 2013. The Geomorphic Impacts of Animal Burrowing and Denning. In *Treatise of Geomorphology* Vol. 12, "Ecogeomorphology" ed. by D.R. Butler and C. Hupp. Elsevier: The Netherlands.

Butler, D. R., C. J. Whitesides, and S. G. Tsikalas. 2013. The Faunal Influence – Geomorphic Form and Process. In *Treatise of Geomorphology* Vol. 12, "Ecogeomorphology" ed. by D.R. Butler and C. Hupp. Elsevier: The Netherlands.

Butler, D. R., and R. M. Cavin. 2014. *Oxford bibliographies in geography "Biopedoturbation"*. New York: Oxford University Press.

Carlson, J. M., and T. O. Crist. 1999. Plant responses to pocket-gopher disturbances across pastures and topography. *Journal of Range Management* 52 (6):637–45.

Costa, J. E., 1975. Effects of agriculture on erosion and sedimentation in the Piedmont Province, Maryland. *Geological Society of America Bulletin* 86 (9):1281–86.

Cushman, G. T. 2011. Humboldtian science, Creole meteorology, and the discovery of human-caused climate change in South America. *Osiris* 26 (1):16–44.

Dale, T., and V. G. Carter. 1955. *Topsoil and civilization*. Norman, Oklahoma: University of Oklahoma Press.

Darwin, C. 1881. *The formation of vegetable mould, through the action of worms, with observations on their habits*. London: John Murray.

Davidson, A. D., and D. C. Lightfoot. 2008. Burrowing rodents increase landscape heterogeneity in a desert grassland. *Journal of Arid Environments* 72 (7):1133–45.

Davidson, T. M., A. H. Altieri, G. M. Ruiz, and M. E. Torchin. 2018. Bioerosion in a changing world: a conceptual framework. *Ecology letters* 21 (3): 422–438.

de Saussure, H. B. 1796. *Voyages dans les Alpes*. Paris: Fauche.

Desmet, P. G., and R. M Cowling. 1999. Patch creation by fossorial rodents: a key process in the revegetation of phytotoxic arid soils. *Journal of Arid Environments* 43 (1):35–45.

El-Baz, F., and M. Al-Sarawi. 2000. *Atlas of Kuwait*. Kuwait Foundation Advancement Science Press: Kuwait.

Eldridge, D. J. 2004. Mounds of the American badger (Taxidea taxus): significant geomorphic features of North American shrub–steppe ecosystems. *Journal of Mammalogy* 85 (6):1060–67.

Eldridge, D. J., and D. Rath. 2002. Hip holes: kangaroo (Macropus spp.) resting sites modify the physical and chemical environment of woodland soils. *Austral Ecology* 27 (5):527–36.

Ellison, L. 1946. The pocket gopher in relation to soil erosion on moutain range. *Ecology* 27 (2):101–14.

Fekete, R., T. Nagy, J. Bódis, É. Biró, V. Löki, K. Süveges, A. Takács, J. Tökölyi, and A. Molnár. 2017. Roadside verges as habitats for endangered lizard-orchids (Himantoglossum spp.): Ecological traps or refuges? *Science of the Total Environment* 607: 1001–1008.

García-Ruiz, J.M. and Lana-Renault, N., 2011. Hydrological and erosive consequences of farmland abandonment in Europe, with special reference to the Mediterranean region–a review. *Agriculture, Ecosystems & Environment* 140 (3):317–38.

Garkaklis, M. J., J. S. Bradley, and R. D. Wooller. 2004. Digging and soil turnover by a mycophagous marsupial. *Journal of Arid Environments* 56 (3):569–78.

Ghasemi, A., and Zahediasl, S. 2012. Normality tests for statistical analysis: a guide for non-statisticians. *International journal of endocrinology and metabolism 10* (2): 486–489.

Godó, L., B. Tóthmérész, O. Valkó, K. Tóth, R. Kiss, A. Radócz, A. Kelemen, P. Török, E. Švamberková, and B. Deák. 2018. Ecosystem engineering by foxes is mediated by the landscape context—A case study from steppic burial mounds. *Ecology and Evolution* 1–11.

Golomb, V. N., and H. M. Eder. 1964. Landforms made by man. *Landscape* 14:4–7.

Gottschalk, L. C., 1945. Effects of soil erosion on navigation in upper Chesapeake Bay. *Geographical Review* 35 (2):219–38.

Goudie, A. S. 2013. *The human impact on the natural environment* (7th Ed). Oxford.

Goudie, A. S., and H. A. Viles. 2016. *Geomorphology in the Anthropocene*. Cambridge: Cambridge University Press.

Grable, A. R., and E. Siemer. 1968. Effects of bulk density, aggregate size, and soil water suction on oxygen diffusion, redox potentials, and elongation of corn roots. *Soil Science Society of America Journal* 32 (2):180–86.

Grant, G. E., and A. L. Wolff. 1991. Long-term patterns of sediment transport after timber harvest, western Cascade Mountains, Oregon, USA. In *Sediment and stream water quality in a changing environment: Trends and explanation.* Proceedings of the symposium; 1991 August 11-24; Vienna, Austria. IAHS Publication 203:31–40.

Grant, W. E., N. R. French, and L. T. Folse, Jr. 1980. Effects of pocket gopher mounds on plant production in shortgrass prairie ecosystems. *The Southwestern Naturalist* 25 (2):215–24.

Gruver, J.B., 2013. Prediction, Prevention and Remediation of Soil Degradation by Water Erosion. *Nature Education Knowledge* 4 (12):2.

Halwagy, R., A. Moustafa., and S. M. Kamel. 1982. On the ecology of the desert vegetation in Kuwait. *Journal of Arid Environments* 5:95–107.

Happ, S. C., G. Rittenhouse, and G. C. Dobson. 1940. *Some principles of accelerated stream and valley sedimentation* (No. 695). US Department of Agriculture.

Hupy, J. P., and R. J. Schaetzl. 2006. Introducing" bombturbation," a singular type of soil disturbance and mixing. *Soil Science* 171 (11):823–36.

Hupy, J. P., and T. Koehler. 2012. Modern warfare as a significant form of zoogeomorphic disturbance upon the landscape. *Geomorphology* 157:169–82.

Jaman, S. K., and R. H. Meakins. 1998. *Biodiversity of animals in Kuwait*. Kuwait: Center for Research and Studies on Kuwait.

James, A. I., and D. J. Eldridge. 2007. Reintroduction of fossorial native mammals and potential impacts on ecosystem processes in an Australian desert landscape. *Biological Conservation* 138 (3):351–59.

James, C.D. 2003. Response of vertebrates to fenceline contrasts in grazing intensity in semi-arid woodlands of eastern Australia. *Austral Ecology* 28 (2): 137–151.

James, T., D. Smith, E. Mackintosh, M. Hoffman, and P. Monti. 1979. Effects of camping recreation on soil, jack pine, and understory vegetation in a northwestern Ontario park. *Forest Science* 25 (2):333–49.

Jumeau, J., D. Wolf, L. Guthmann, N. Gorlero, F. Burel, and Y. Handrich. 2018. The use of military bunkers by the European badger and red fox in Western Europe. *Urban Ecosystems* 21 (2): 395–403.

Kemper, W. D., B. A. Stewart, and L. K. Porter. 1971. Effects of compaction on soil nutrient status. In *Compaction of agricultural soils, ed. by* K. K. Barnes, W. M. Carleton, H. M. Taylor, R. I. Throckmorton, and G. E. Vanden Berg. American Society of Agricultural Engineers: Michigan.

Khalaf, F. I., and D. Al-Ajmi. 1993. Aeolian processes and sand encroachment problems in Kuwait. *Geomorphology* 6 (2): 111–134.

Kim, H.Y. 2013. Statistical notes for clinical researchers: assessing normal distribution (2) using skewness and kurtosis. *Restorative dentistry & endodontics 38* (1): 52–54.

Kusky, T. M., and K. E. Cullen. 2010. *Encyclopedia of earth and space science* (2 vols). New York: Facts on file.

Lipiec, J., and R. Hatano. 2003. Quantification of compaction effects on soil physical properties and crop growth. *Geoderma* 116 (1):107–36.

Lock, J. M. 1972. The effects of hippopotamus grazing on grasslands. *The Journal of Ecology* 60 (2):445–67.

Lore, R., and K. J. Flannelly. 1978. Habitat selection and burrow construction by wild Rattus norvegicus in a landfill. *Journal of Comparative and Physiological Psychology* 92 (5):888–96.

Loreau, M., and de Mazancourt, C. (2013). Biodiversity and ecosystem stability: a synthesis of underlying mechanisms. *Ecology letters* 16: 106–115.

Lowdermilk, W. C. 1934. Acceleration of erosion above geologic norms. *Eos, Transactions American Geophysical Union* 15 (2):505–9.

Lowdermilk, W. C. 1935. Man-made deserts. *Pacific Affairs* 8 (4):409–19.

Marsh, G. P. 1864. *Man and nature*. New York: Scribner.

Martin, B. G. 2003. The role of small ground-foraging mammals in topsoil health and biodiversity: Implications to management and restoration. *Ecological Management & Restoration* 4 (2):114–19.

Massa, C., Bichet, V., Gauthier, É., Perren, B.B., Mathieu, O., Petit, C., Monna, F., Giraudeau, J., Losno, R. and Richard, H., 2012. A 2500 year record of natural and anthropogenic soil erosion in South Greenland. *Quaternary Science Reviews* 32 119–30.

May, R. M. 1973. *Stability and complexity in model ecosystems*. Number 6 in Monographs in population biology. Princeton, NJ: Princeton University Press.

McDonald, J. H. 2009. *Handbook of biological statistics* (2nd ed.). Baltimore: Sparky House Publishing.

McEwen, D., D. N. Cole. 1997. Campsite impact in wilderness areas. *Parks and Recreation* 32: 24–32.

Monsef, H. A., and A. Abahussain. 2013. The impact of camping activities on soil degradation in Kuwait. *Journal of Environmental Informatics* 22 (2):102–11.

Nemtzov, S. C. 2005. Uromastyx lizards in Israel. *NDF workshop case studies WG7* 5:22.

Neubert, M. G., and H. Caswell 1997. Alternatives to resilience for measuring the responses of ecological systems to perturbations. *Ecology* 78: 653–665.

Oakley, J. P. 2012. Habitat assessment of an inland population of the Gulf Coast kangaroo rat (Dipodomys compactus). Doctoral dissertation., Texas State University.

Pickering, C. M., W. Hill, D. Newsome, and Y. F. Leung. 2010. Comparing hiking, mountain biking and horse riding impacts on vegetation and soils in Australia and the United States of America. *Journal of Environmental Management* 91 (3):551–562.

Qumsiyeh, M. B. 1996. *Mammals of the holy land*. Lubbock: Texas Tech University Press.

Reichman, O. J., and S. C. Smith. 1985. Impact of pocket gopher burrows on overlying vegetation. *Journal of Mammalogy* 66 (4):720–25.

Rogers, W. E., D. C. Hartnett, and B. Elder. 2001. Effects of plains pocket gopher (Geomys bursarius) disturbances on tallgrass-prairie plant community structure. *American Midland Naturalist* 145 (2):344–57.

Rutin, J., 1992. Geomorphic activity of rabbits on a coastal sand dune, De Blink dunes, the Netherlands. *Earth Surface Processes and Landforms* 17 (1):85–94.

Sherrod, S.K., and T. R. Seastedt. 2001. Effects of the northern pocket gopher (Thomomys talpoides) on alpine soil characteristics, Niwot Ridge, CO. *Biogeochemistry* 55 (2):195–18.

Smallwood, K. S., and M. L. Morrison. 1997. Animal burrowing in the waste management zone of Hanford Nuclear Reservation. *Transactions of the Western Section of the Wildlife Society* 33:88–97.

Smallwood, K. S., M. L. Morrison, and J. Beyea. 1998. Animal burrowing attributes affecting hazardous waste management. *Environmental Management* 22 (6):831–47.

Stohlgren, T., and D. Parsons. 1986. Vegetation and soil recovery in wilderness campsites closed to visitor use. *Environmental Management* 10 (3):375–80.

Street, G.M., J. Fieberg, A. R. Rodgers, M. Carstensen, R. Moen, S. A. Moore, S. K. Windels, and J. D. Forester. 2016. Habitat functional response mitigates reduced foraging opportunity: implications for animal fitness and space use. *Landscape Ecology* 31 (9): 1939–1953.

Surell, A. 1841. *Étude sur les torrents des Hautes-Alpes par Alexandre Surell*. Paris: Carilian- Goeury et Dalmont.

Viles, H.A. (Ed.). 1988. *Biogeomorphology*. New York: Basil Blackwell.

Voorhies, M. R. 1975. Vertebrate burrows. In *The study of trace fossils,* ed. R. W. Frey, 325-50. Springer: Berlin Heidelberg.

Voslamber, B., and A. W. L. Veen. 1985. Digging by badgers and rabbits on some wooded slopes in Belgium. Earth Surface Processes and Landforms 10 (1):782–99.

Whisler, F. D., Engle, C. F. and Baughman, N. M. 1965. The effect of soil compaction in nitrogen transformations in the soil. Bull IV. Va Univ. agric. Exp. Stn, 516T.

Whitford, W. G., and D. J. Eldridge. 2013. Effects of Ants and Termites on Soil and Geomorphological Processes. *Treatise on Geomorphology* 12: 281–292.

Whitford, W. G., and F. R. Kay. 1999. Biopedturbation by mammals in deserts: a review. *Journal of Arid Environments* 41:203–30.

Williams, M., and E. C. Brevik. 2010. Effect of traffic rate and type on soil compaction in sandy South Georgia soils. *Soil Survey Horizons* 51 (3):88.

Wolkowski, R. and Lowery, B., 2008. Soil compaction: Causes, concerns and cures. http://www.soils.wisc.edu/extension/pubs/A3367.pdf (last accessed December 2, 2017).

Yoshihara, Y., T. Okuro, J. Undarmaa, T. Sasaki, and K. Takeuchi. 2009. Are small rodents key promoters of ecosystem restoration in harsh environments? A case study of abandoned croplands on Mongolian grasslands. *Journal of Arid Environments* 73 (3):364–68.

Zaitlin, B., and M. Hayashi. 2012. Interactions between soil biota and the effects on geomorphological features. *Geomorphology* 157:142–52.

Zalasiewicz, J., C. N. Waters, and M. Williams. 2014. Human bioturbation, and the subterranean landscape of the Anthropocene. *Anthropocene* 6:3–9.

ARABIC REFERENCES

Al-Houty, W. *Almawsoaa Almoyasarah lehasharat dawlat Alkuwait (alerdah walqamel walbarageth.* 2015. The Kuwait Foundation for the Advancement of Science (KFAS): Kuwait.