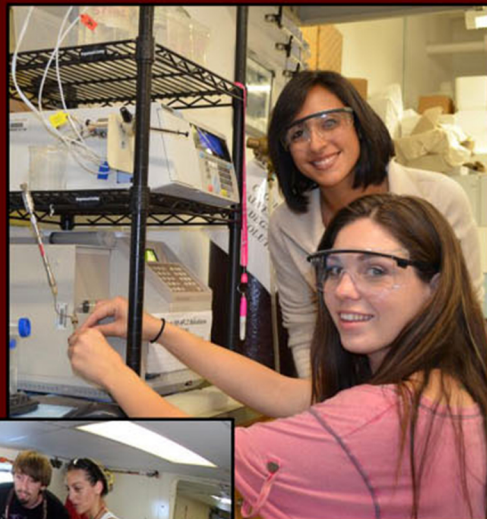


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Monoculture & Mono-woman: An Ecofeminist Critique

DANIELLA ORIAS¹ & JANE CAPUTI²

¹Department of Anthropology,
Florida Atlantic University, Boca Raton, Florida 33431; ²Center for Women, Gender and Sexual-
ity Studies, Florida Atlantic University, Boca Raton, Florida 33431

Abstract

I explore and compare the consumerist view of women with the consumerist view of food, specifically seeds, in Western culture. Western propaganda conceptualizes women as domesticated and dominated and views nature in the same light. As a result of media manipulations, a monoculture and a *mono-woman* have arisen. Through the alteration of seeds, we have created a standard for fruits and vegetables sculpted around the ideal of perfection imposed by science and man. Similarly, the advertisement industry has shaped a new paradigm of women's beauty (*mono-woman*).

This paper will explore beauty and the industrial ideal of women's beauty, which has been shaped by the advertisement industry, leading to an ideal of what I am calling the *mono-woman*. This *mono-woman* ideal is the result of consumerism. Women are now being exploited, transformed, and morphed into look-alike commodities in the projections of much of the advertising for beauty products; women's faces are being manipulated, wrinkles are being removed, and waists are being trimmed down to size 00 or smaller through Photoshop and other techniques. Advertising agencies are dismembering and artificializing women in order to sell specific goods, and, with this mentality, women become objects rather than humans. Similarly, through the alteration of seeds, we have created a standard for fruits and vegetables sculpted around the ideal of perfection imposed by science and man.

Ecofeminist Viewpoint

Ecofeminism is the branch of feminist philosophy and activism that suggests that there are complex parallels between the ways women and other subjugated human groups are defined and treated and the ways

non-human nature is defined and treated (Ruether 13). Taking this direction from ecofeminism, I will parallel the rise of the *mono-woman* with the rise of the monoculture in food production that is taken over by global agribusiness corporations. In like manner, I will explore the consumerist view of women with the consumerist view of food, and specifically seeds, in Western culture. Our food sources have been genetically altered and turned into an industry, but we have been unable to see the potential and the real harms.

Symbolic Meaning of the Terms Seed and Woman

According to the *Merriam-Webster Dictionary*, "[monoculture is] a culture dominated by a single element, a prevailing culture marked by homogeneity" (Merriam-Webster). To understand the terms *monoculture* and *mono-woman* and the connections between the exploitation of women and the exploitation and manipulation of food, we can begin by looking at the symbolism behind the concepts of *seed* and *woman*. Both terms represent fertility and continuance. *Mother* stems from the Latin word for mother,

mater, as does the English word *matter*, which is the most basic component of life. Matter connects all beings together. It is this link with nature that we must revere and respect. The seed is also a symbol for matter and fertility. A seed is the ultimate representation of creation and has much in common with the womb. It represents the beginning of life, the birth of fruit, grain, and vegetables. Vandana Shiva states, "In Sanskrit, *bija*, the seed, means the source of life" (Shiva 94). The terms *seed* and *woman* both stand for reproduction and sustainability.

Media Manipulation of Women's Image

Through media and advertisements, women are being classified and designed to appear in certain ways very similar to the way food is meant to look: "perfect, predictable, and marketable." The concept of women is also being reshaped and morphed through daily advertisements and constant consumer propaganda. Women are shown in ads decapitated, dismembered, and oftentimes even appear to be dead. Jane Caputi writes in *The Pornography of Everyday Life*,

Numerous images [in the advertisement industry] support this kind of dehumanization by making it seem as if women are literal objects—vehicles, blow-up dolls furniture, collectibles, and so on. As objects women are denied autonomy and presented as perpetually accessible, something to toy with, something to possess, something to be consumed (Caputi 34).

Beauty is perceived through advertisements as white, thin, young, blonde, northern European, hairless, and tanned. New generations are constantly bombarded by an advertising industry that is totally profit oriented and promotes an impossible ideal woman. Believing this, women must spend untold amounts of money purchasing products to conform to this generic model. The ensuing distortion of the female body strips women of their natural beauty and hence their relationship to Mother Earth. Humans

are taught that beauty is only skin deep and that perfection can be achieved through consumer products. As a result of this manipulation, a monoculture and a mono-woman have arisen. Vandana Shiva states in *Ecofeminism*, "The marginalization of women and the destruction of biodiversity go hand in hand. Loss of diversity is the price paid in the patriarchal model of progress which pushes inexorably towards monoculture, uniformity and homogeneity" (Mies, Shiva 164).

Differing Views of "Mother" and "Seed" Through Time and Across Cultures

While mother and seed were once viewed with respect and reverence, our contemporary culture is dramatically shifting the meaning behind these terms. In *The Good Mother*, Ellen Rose states, "whatever 'mother' means to a given culture will metaphorically infect the meanings it attaches to Mother Earth" (Rose 151). Western propaganda conceptualizes women as domesticated and dominated, and views nature in the same light. Rose states,

In Western civilization the association [with women and nature] has led to and in many instances justified men's exploration of both nature's and women's productive and reproductive capacities, since both women and nature are seen in patriarchal thought as 'other' than and inferior to men and culture (Rose 150).

We have been programmed to see nature and women as separate from men, and "understand power not as capacity or potential but as power over or domination" (Caputi 1).

Conquest of Women and Food by Modern Media's Concept of Beauty

Women have been turned into objects of conquest, and, to reiterate, this pattern can be seen through mainstream advertisements in television, magazines, billboards, and even movies. The correlation between conquering the seed by altering it genetically and

conquering a woman by altering her physically and digitally in a monotonous ideal forms a striking parallel. Industry has distracted us from the beauty and nature of diversity and instead shifted our minds to focus on external beauties. Social psychologist Britain Scott states in *Babes and the Woods*, “The notion that feminine beauty is epitomized by an artificial and rigorously maintained appearance is, to some extent, a product of industrialization” (Scott 148).

The advertising industry, reflecting the ideals of this complex, has shaped our new paradigm of beauty, which, as Jean Kilbourne points out in her video *Killing us Softly*, is an image of beauty in which failure is inevitable. The images directed to women are impossible to uphold and, in response, women begin to separate from their bodies and blame them. According to Kilbourne’s video, we view over 3,000 advertisements per day, and our brains are constantly being bombarded by images of “perfection.” Scott states,

The culture’s feminine beauty ideal puts women in an antagonistic relationship with their natural bodies, and this is currently exacerbated by the fact that contemporary media images promoting the ideal are completely unrealistic (Scott 148).

This quote explains the contemporary monoculture’s beauty ideal and relates to Kilbourne’s message of beauty ads being unrealistic and impossible to attain.

Media’s Image of Beauty is Pervasive

Advertisements are everywhere in our life; they influence us on emotional and psychological levels. They are not simply on television; they are on clothing, signs, even benches and sidewalks. It is important to take a critical look at the pervasive false and mono-cultural messages the advertisement industry is sending us and which have become integrated into our lives. The concept has been planted in our minds that beauty is a single look (mono-woman), that diversity is feared, and that beauty can only be attained through endless consumer products. We have sep-

arated ourselves from true beauty and decided that diversity is not a suitable basis for an aesthetic ideal. Yet, all life is sustained through diversity and change.

To Achieve Beauty We Disguise Our Natural Bodies and Natural Foods

Our society has been completely brainwashed to believe that beauty should be our greatest goal in life. A potato with a bruise and dirt on it is thrown away. A woman who is aging is depicted as used up. Our fear of losing beauty through aging has been promoted by a constant onslaught of products that claim to slow down the aging process. We have separated ourselves from our natural bodies.

If we continue to separate from our bodies and alter them to conform to what we are told is perfect, we are only separating ourselves further from the earth and our connection to nature. Caputi states the paradox of our culture,

The cumulative cultural opprobrium causes us to hide, isolate, and repress those aspects of our being that are pejoratively understood as our ‘natural’ selves (Caputi 5).

We have been taught to hide and suppress our natural bodies, and therefore we have become detached from the true simplicity of beauty. The chemical and digital altering of beauty through botox, airbrushing, and photo-shopping can be paralleled to the production of aesthetically appealing, low-nutrient, high-output crops of the corporate agriculture industry.

Society also tends to reject natural foods in favor of artificial replacements that are easier and quicker to prepare, have a longer shelf life, and taste good because of their chemical flavorings. We are encouraged to seek artificial replacements rather than natural foods. This is how corporations thrive: by replacing sustainable and natural ideals with consumer-friendly and perishable but profitable items.

Patenting Seeds and The Ideal Woman

The ideology of the mono-woman has led women

to disconnect with their bodies and the earth. The alienation of women's bodies with nature can be seen through ads, many of which place women under men so they appear both subordinate and animalistic. This need to conquer women comes parallel with patenting life. Patenting life is a process corporations are using to monopolize seeds and narrow the diversity of available seeds. This theory of patenting life stems from the ideology that if you can control the source of life, then you can control mass production. Green Consciousness theory (Ecofeminism) shows that the way a society defines and treats nature reflects the way a society will treat women. There is a striking correlation between the need to control and monopolize seeds and the need to alienate women from their bodies. Both forms of manipulation stem from the ego-driven and often male-identified or patriarchal need for power over others and power over nature.

Rose states, "Both women and nature are seen in patriarchal thought as 'other' than and inferior to men and culture" (Rose 150). This is the basis to justify man's exploitation of nature and women, since women are viewed as below men. This statement is also, one would imagine, corporations' justification for altering seeds. Since seeds are seen as "other" and separated from man, man feels the need to dominate and alter the seed through means of science. Through the alteration of seeds, we have created an ideal for fruits and vegetables that has been sculpted around the idea of perfection in appearance imposed by science and man. We have created a monoculture of the mind in which perfection is strived for, yet impossible to achieve.

Nature is not perfect. Its beauty lies in its imperfection and diversity. Delores Williams states,

Violation and exploration of the land and of women's bodies is, in part, caused by widespread human disrespect for the unity of nature's placements. This disrespect has led to the destruction of the natural process of nature (Williams 26).

The natural processes are also diverse and in a con-

stant process of flux or change. By creating an image of supposed perfection, stasis, we have separated ourselves, conceptually and materially, from our natural life source, the earth. This separation is ritually enacted with the artificialization of the female body.

Food as Basis for Life

Our world has become a fast-paced global market for selling and trading goods, and with the rise of globalization, food quality in terms of diversity and nourishing capacities has declined. But so, too, has our spiritual understanding of food. Food was once regarded as a basic unit of life created from the ground, a gift of the Earth. Shiva illustrates the importance of food in the *Taitreya Upanishad* text,

"From food, all creatures are produced...all beings are born from food, when born they live on food, on being deceased they enter into food" (Shiva 164).

This ancient script illustrates the connection each organism shares with food and the seed of life. Seeds are the building block for all organisms; they perpetuate growth and diversity on our biosphere. Unfortunately, today seeds are being manipulated and designed in a lab to produce ideal-looking vegetables, stripped of their fertility and naturally occurring genetic variances.

Consumerist View of Food

In *Earth Democracy* global environmental activist and theorist Dr. Vandana Shiva notes that in its basic meaning, "to consume means to destroy." Extrapolating from this, she and other environmentalist and ecofeminist theorists and activists show the ways that a consumerist view of food leads to destruction of the food source. The consumerist view of food furthered by global capitalism and agribusiness, according to Shiva, "has been an experiment with non-sustainable, chemical intensive, water intensive, and capital intensive industrial agriculture" (Shiva 152). Food is seen as a commodity, not a form of living energy or being. Companies such as Monsanto, who patent and commodify

seeds, now maintain historically unprecedented power over food production, and consequently have devalued the intrinsic beauty of creation. Shiva states,

Patents on life and the rhetoric of the ‘ownership society’ in which everything—water, biodiversity, cells, genes, animals, plants—is property express a worldview in which life forms have no intrinsic worth, no integrity, and no subjecthood (Shiva 3).

The ownership society refers to the capitalist, ego-centric, and money-dominated agricultural industry that has arisen due to major corporations owning seed rights. Shiva defines the capitalist view of nature as “raw material, and acts of domination, destruction, and exploration as acts of creation” (Shiva 138). The capitalist view of nature does not value land. It values monetary worth,

Everything is a commodity, everything is for sale, and the only value a thing has is the price it can bring to the global marketplace (Shiva 141).

In *The Manifesto On The Future Of Seeds*, Shiva and her co-author Claudia Martini define a monoculture as, “The erosion of diversity [that] has been propelled by the drive for homogenization” (Martini, Shiva 6). Homogenization leads to the destruction of the diversity of foods, and particularly of seeds. Homogenizing or monoculturing food, moreover, is directly related to globalization. Concomitantly Vandana Shiva contends, “Globalization is a project of capitalist patriarchy that has accelerated and deepened the violence against women” (Shiva 130).

In our monoculture, large corporations have replaced small family farms. Genetically Modified Organisms (GMO’s) and agribusinesses are diminishing the local food industry while polluting and damaging the delicate biosphere of the earth. It is not natural to have a tomato that is chemically forced to ripen using ethylene gas, a carrot that is perfectly cone shaped, or an apple glistening with wax, yet these

fruits and vegetables are a main part of our diet. The food industry has turned the beauty of eating into a profit machine, while losing sight of the importance of quality food. Food is essential for life; it binds humanity together. If we continue to detach ourselves from the farm and the art of growing and consuming food, we will lose sight of our health and our relationship with the rest of humanity.

Detached from the Earth

The reason many individuals lack respect for the earth is because in our monoculture today they are completely detached from the beauty of raising food from the earth. Buddhist teacher Thich Nhat Hanh states, “because we are so distant from our Mother Earth, we become sick” (Hanh 106). We are becoming a numb society, attempting to survive off of government-subsidized junk food and genetically altered vegetables. We cannot survive with these subsidized foods. Our bodies will become sicker and our minds will become more polluted. As the movie *Food Inc.* points out, companies have placed an iron veil separating us from our food source, and because of this separation, we have lost sight of the true meaning of existing on this planet, which, I contend, is to connect with our Mother, the Earth. We cannot continue to remain ignorant about our food source, as Shiva states,

We are not living in a knowledge society if we don’t have the very basic choices that allow us to lead a human life, a life of dignity, [which] allows us to know how our food is produced [...] and what’s in our food (Shiva 38).

A distancing or alienation now marks the relationship of modern humans to our food source. Humans have become detached and further disconnected from the elemental or natural world we live in and from each other.

Conclusion: Closing Thoughts on Monoculture and Mono-woman

In sum: Our biosphere thrives on diversity and individuality that is embodied in genetic uniqueness. If

this diversity is ruined and replaced by profit-driven monocultural products and ideals, it will only lead to our diminishment, if not extinction. Seeds should not be manipulated and transformed for the needs of corporate profits, and neither should women. We are at the tipping point. It is the “twelfth hour” and time for us to take a stand. We are at an age where “globalization is redefining the very status and understanding of creation” (Shiva 138). We must break the corporatization of life and begin to realize the beauty and prosperity of Mother Nature. As I have demonstrated in this paper, monoculture and mono-woman are viral ideas that have spread throughout the world due to consumerism and corporate propaganda. As members of this earth, we must respect biological diversity with women and with food. We must realize the innate nature of diversity and allow it to thrive in our environment rather than morphing it for our own aesthetic or economic desires. The biosphere of life requires diversity in order to survive. We cannot alter and control life and beauty without destroying the very things we try to possess. As beings on this earth, we must respect the intrinsic order of nature.

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An Analysis of the Vegetation within the FAU Preserve as a Basis for Management of Scrub Habitat for *Gopherus polyphemus*

MARINA LAUCK^{1,2}, JOSHUA SCHOLL^{1,2}, DIANNE OWEN³,
EVELYN FRAZIER²

¹NSF-Undergraduate Research and Mentoring Program; ²Department of Biological Sciences, Florida Atlantic University, Boca Raton, Florida 33431; ³Environmental Sciences Program, Florida Atlantic University, Boca Raton, Florida 33431

Abstract

In Florida, urbanization has caused habitat fragmentation coupled with a major decline in the available habitat for native species. Native scrublands are of particular concern as they are deemed priority habitat by the Florida Fish and Wildlife Conservation Commission (FWC). Florida Atlantic University's Ecological Preserve—home to a keystone species, the gopher tortoise (*Gopherus polyphemus*)— is a prime example of such a fragmented, degraded scrub habitat. Our research focused on how fragmentation affected habitat suitability, as determined by the distribution of tortoise burrows in the preserve. We found significant correlations between higher burrow densities and minimal (< 50 %) shrub and canopy cover. Burrow densities were also higher in areas of greater herbaceous cover and organic soil content. These correlations were in agreement with previous findings reported in the literature. However, 23% of the preserve area was covered with invasive vines that, unless controlled, could further degrade the habitat. Our data suggest how a plan could be developed and implemented for the better management of gopher tortoises in the FAU Preserve.

Introduction

Our native scrub habitats are of particular concern for Florida as they are disappearing at an alarming rate (Myers 1990). Scrub is listed by FWC as a *priority habitat*, that is, one of special significance and/or purpose for one or more native species. Particularly, scrub habitats are home to a number of endemic species like the Florida scrub jay. Maintenance of

biodiversity has been correlated to overall ecosystem health and function (Sodhi 2010), hence the importance of conservation of these unique habitats and their inhabitants. As a consequence of development, populations of these species have steadily declined. Urban development, such as in the highly urbanized Tri-county area of Southeastern Florida, has superseded preservation of these unique and diverse areas resulting in habitat loss for its numer-

ous, and often endemic, inhabitants (Hall 2003).

Habitat fragmentation and close proximity to urbanized areas have resulted in a decline in natural fires and increased the necessity for anthropogenic methods of management. Scrub-type habitat, like that found on the FAU Preserve, is ideally maintained via prescribed burns (Myers 1990). Under the classical theory of succession, these regimented burns control the composition of the habitat by eradicating invasive species and reducing shrub and canopy cover (Krebs 2009). This reduction promotes the growth of grasses and other vegetation characteristics of scrub habitat that would otherwise be reduced due to shading by the canopy. Gopher tortoises prefer habitats containing a high proportion of herbaceous ground cover as forage. They also favor a reduced canopy for basking (thermo-regulation; MacDonald 1988).

The Florida Atlantic University (FAU) Ecological Preserve (Fig. 1) is an example of secondary succession in a fragmented habitat. This preserve was a regularly mowed lawn before 1970. At this time it was deemed a natural area and regular mowing ceased, allowing the land to begin successional development (Austin 1990). Presently, it stands as one of the limited and fragmented local conservation areas in South Florida featuring a variety of habitats, including primarily scrub and a growing population of oak hammocks (Austin 1990). A variety of species have since taken refuge in the preserve. The gopher tortoise (*Gopherus polyphemus*) and FAU's mascot, the burrowing owl (*Athene cunicularia*), are examples of two such species. Gopher tortoises and burrowing owls are native to scrub habitats and each is listed on the International Union for Conservation of Nature's Red List for Threatened Species (IUCN). Gopher tortoises in particular are of special significance as they are a threatened keystone species with declining populations. Their keystone designation is with regards to the 360 known species of animals that utilize and inhabit the burrows created by the gopher tortoise (McCoy 2005).

Although prescribed burns are commonly used to manage scrub habitat, this technique cannot be used in the FAU Preserve because of its close prox-

imity to a local executive airport, university buildings, and a major highway (King 2005). As a result, invasive plant species such as earleaf acacia (*Acacia auriculiformis*), rosary pea (*Abrus precatorius*), brazilian pepper (*Schinus terebinthifolia*) and umbrella trees (*Schefflera actinophylla*) have become a source of concern for preserve managers, and are seriously affecting the local gopher tortoise population (Myers 1990; Hicklin 1994). The absence of fire or any other natural disturbances have resulted in an increase in the abundance of trees and canopy cover, as well as a decline in herbaceous ground cover as the two are negatively correlated (Menges 1993). This decrease in herbaceous ground cover negatively affects gopher tortoises by limiting the suitability of the area due, in part, to a decreased abundance of their food supply. Since the preserve is also surrounded by development on all sides, the tortoises cannot emigrate to a more suitable habitat (Steward 1991).

The purpose of this study was to determine where gopher tortoises preferred to place their burrows, and then use these data to determine correlations between these behavioral (habitat) preferences and the distribution of soil organic matter and vegetation in the preserve. These correlations enabled us to identify the quantity and quality of scrub habitat available, and thus the overall "condition" of the preserve as a scrub habitat. These findings were used to suggest a management and restoration plan for the FAU Preserve, as well as similarly distressed and fragmented scrub habitat communities in Florida.

Research Methods

Study Site

Our study was conducted on a 90-acre conservation area in southeastern Florida (Fig. 1). The site was located on the northwestern corner of Florida Atlantic University's Boca Raton campus. The conservation area is barricaded and fragmented by the university, as well as Palm Beach State College, and the Boca Raton Airport. The site houses a variety of wildlife, including a gopher tortoise population of



Figure 1. Study site location. Our study was conducted on the Florida Atlantic University (FAU) Boca Raton campus Conservation Area, know locally as the Preserve. The Preserve is a fragmented, island habitat sandwiched between FAU, Palm Beach State College, the Boca Raton Airport and I-95.

approximately 100 individuals for which burrow locations are known (Scholl et al. 2012). Habitats within the conservation area include palmetto scrub, oak hammock and a couple of stands of pine flatwoods.

Vegetation Surveys

Vegetation surveys were conducted from May to October 2012 using an existing, PVC-marked grid of 50 x 50 m points (Fig. 2). We performed 25 m belt transects, approximately six feet wide due north and south from each PVC marker using transect tape. Each northern 25 m transect should meet with the proceeding point's southern transect, and vice versa, to create continuous transects north and south. Collected data was species specific concerning shrub and canopy cover on a presence/absence basis at each meter. Any vegetation at or exceeding approximately 1.5 m in height was classified as a shrub. Any vegetation which could be measured via a Geographic Resource Solutions (GRS) densitometer (a tool used to measure overhead canopy) was classified as canopy.

At each point, ground cover was sampled using a

1 m² quadrat, which was centered using a compass and faced just east of the PVC marked point for consistency from sample to sample. The length of each quadrat was directed due north, south, east and west, respectively, using a compass. Within each quadrat, percent cover of bare ground, leaf litter and debris, saw palmetto, woody vegetation, grasses and other herbaceous cover were recorded using standard cover classes with a range of 0-6. Ground cover was measured as any vegetation less than a meter and a half in height within the quadrat, excluding any vegetation rooted outside of the boundaries of the quadrat. All methods for vegetation surveys were modified from the methods presented by the FWC (FWC 2010).

Using ArcGIS 9.3, we developed square buffer zones around each of the grid points to create 50 m quadrats around each point. After extrapolating the vegetation data collected within each quadrat, we overlaid the existing gopher tortoise burrow data from the previous year and were able to relate the placement of burrows to the vegetation within each of the quadrats in which they were found.

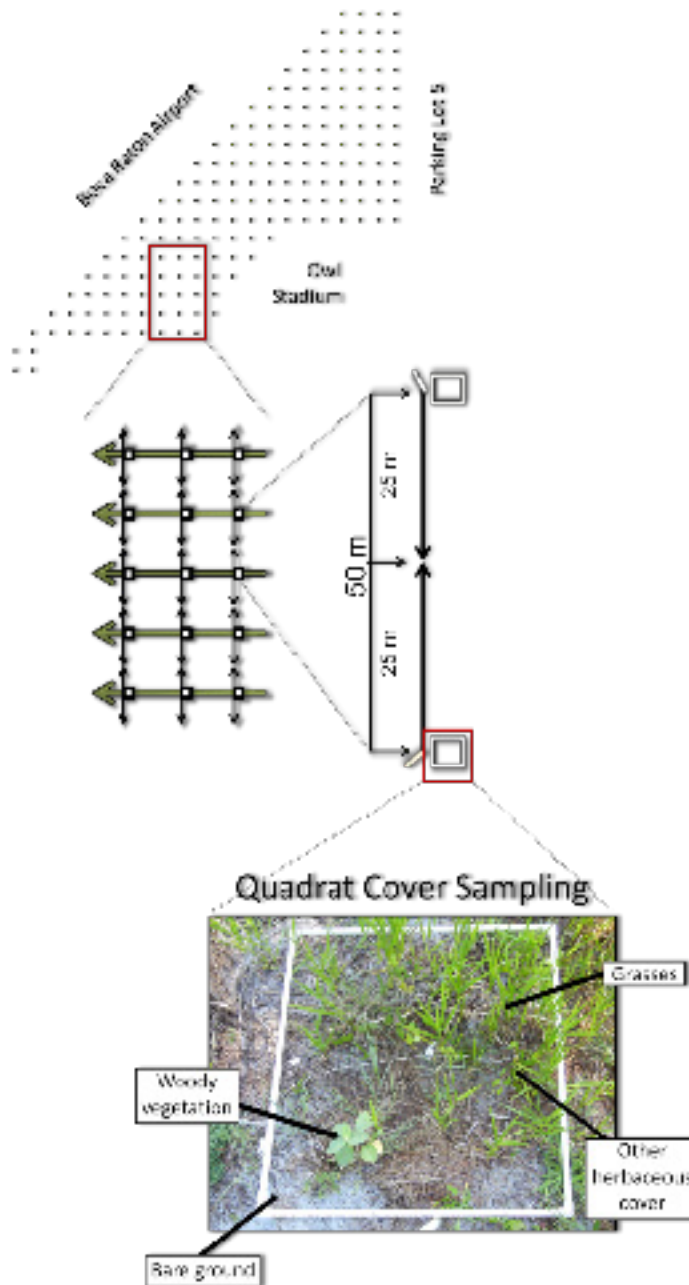


Figure 2. Vegetation Methods. We created a 50 m x 50 m grid of points over the FAU Preserve. At each point we conducted transects north and south to measure for shrub and canopy cover. We also conducted quadrat cover sampling using a 1m² quadrat to measure ground cover.

Soil Surveys

We conducted soil surveys in August 2012 using stratified random sampling. Each of the strata was randomly sampled individually in order to proportionally represent the different vegetation types: xeric oak, grassland, live oak, upland shrub, brushland, and areas where acacia had been recently removed. Strata were defined using the Florida Land Use, Cover and Forms Classification System (FLUCCS). Each sample was collected using a 0.33 m³ core sampler. Moisture content in each sample was obtained by comparing the weights of the sample before and after drying in an oven. Samples were then sifted using Kreck Sand Shaker soil sieve, which separated soil by particle size. The Wentworth grain size chart was used to determine the sieve sizes. The soil collected from each compartment in the sieve was weighted for each individual soil sample to determine the percent composition of each particle size in each sample by mass. Using a ball grinder, samples were grinded until homogenous. A muffle furnace was used to incinerate the biomass content in the soil. The weight of the sample before processing by the muffle furnace was compared to the weight after incineration to calculate the percent biomass in each sample.

Statistical Analysis

A test for simple, two-dimensional linear regression was performed on all of the collected data and burrow locations to analyze the significance of the burrow correlations. Linear regression was used to identify simple linear relationships between burrow placement and specific vegetation features. These tests were performed using the statistical software R. We used these correlation analyses to determine whether differences in burrow density were positively or negatively correlated with specific plant species, ground cover, and soil properties. We also checked for multi-collinearity using a variance inflation factor to test for multidimensional relationships between different vegetation features and burrow placement.

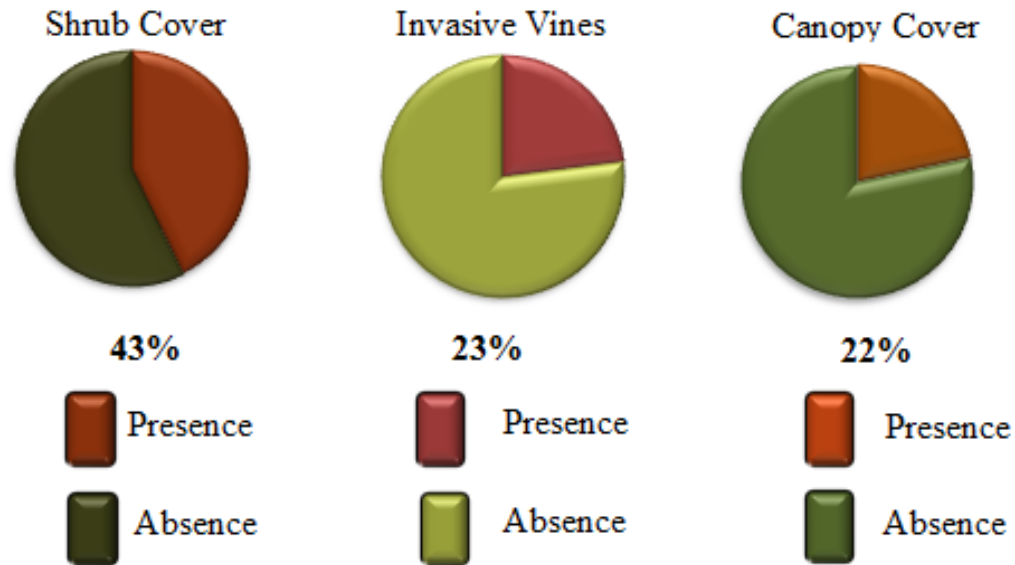


Figure 3. Total shrub and canopy cover. Of the sampled habitat, 43% consisted of shrub cover – 23% of the shrub cover was covered in invasive vines. The habitat consisted of 22% canopy cover which partially overlapped shrub cover. Total cover was just within the literature value of <50% total cover threshold for suitable gopher tortoise. The high proportion of shrub and canopy cover related to the literature range suggests that without proper, effective habitat management, the area may degrade to unsuitable habitat for gopher tortoise.

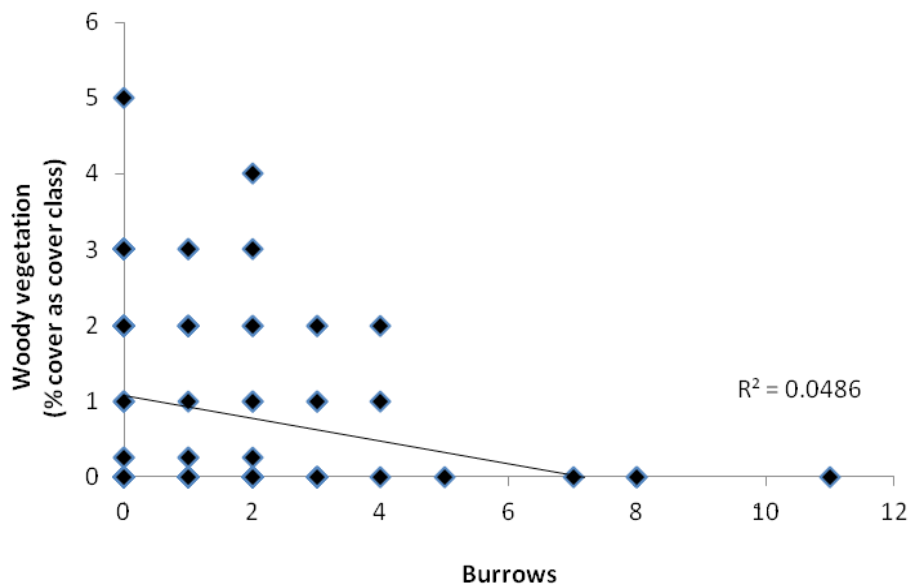


Figure 4. Woody Vegetation vs. Burrow Placement. The distribution of gopher tortoise burrows was negatively correlated with woody vegetation found within the 1m² quadrats sampled at each point with P = 0.014. Ground cover of woody vegetation was measured using standard cover classes to reduce sampling error. This negative correlation suggests gopher tortoises are selecting against areas with greater woody ground cover.

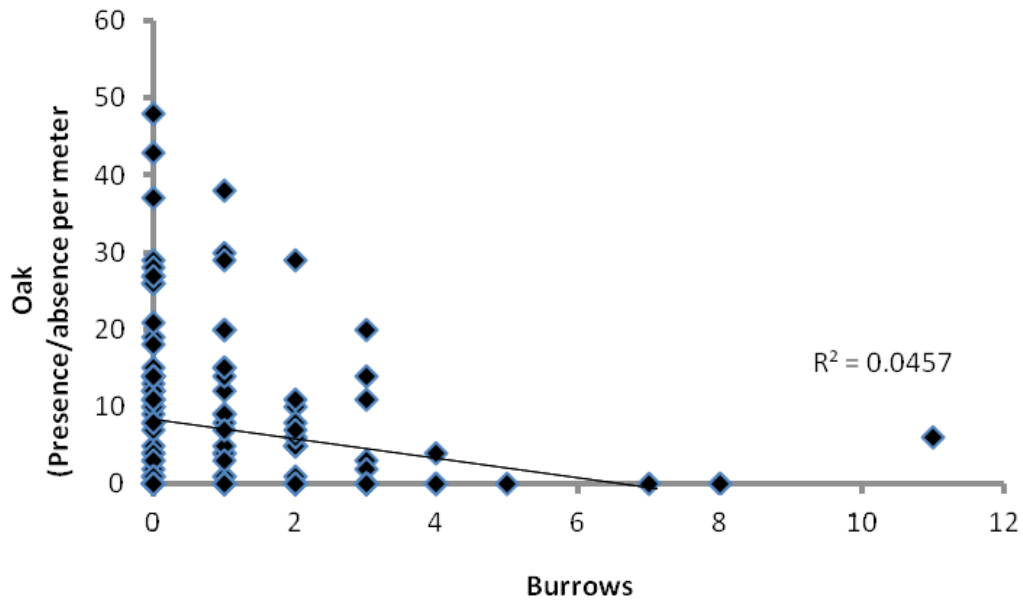


Figure 5. Oak Canopy vs. Burrow Placement. The distribution of gopher tortoise burrows was negatively correlated with oak canopy found in transects on a presence/absence basis at each meter with $p = 0.0347$. The negative correlation between oak canopy and the presence of gopher tortoise burrows suggests that the tortoises are selecting for areas with less oak canopy cover.

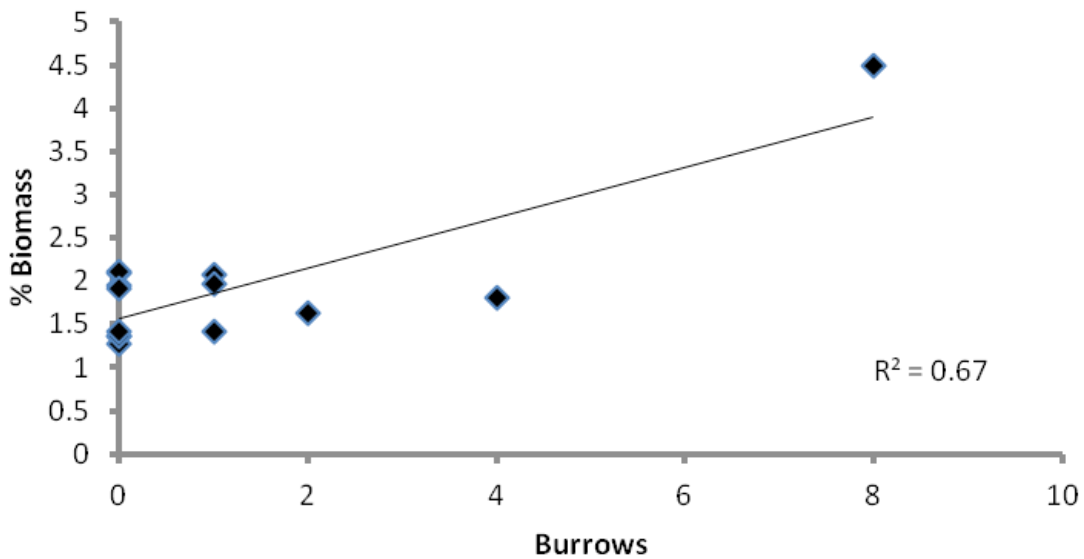


Figure 6. Biomass content versus burrow placement. Percent biomass measured in soil samples from 15 points compared to the quantity of gopher tortoise burrows in that 50m² quadrat with $p = 0.00376$. This was a significant, positive correlation suggesting that tortoises prefer areas of high biomass content. However, this result is driven primarily by a single outlier. Additional sampling should be performed in order to confirm this correlation.

Results

In general, 43% of the area surveyed contained shrub cover. An independent 23% of the 43% shrub was covered in invasive vines including *Smilax*, *Vitis* and *Cassytha* species. Another 22% canopy cover was measured within the sampled area. Canopy and shrub cover often overlapped and hence are not additive (Fig. 3). The total cover was just within the range of the < 50% literature value associated with suitable gopher tortoise habitat.

We related the placement of burrows to various ground cover categories, including herbaceous, leaf litter, debris, bare ground and woody vegetation. We found a significant negative correlation between the placement of burrows and woody vegetation (Fig. 4).

A significant negative correlation was found between oak canopy and the distribution of gopher tortoise burrows. The negative relationship between the distribution of burrows and oak canopy cover suggests that gopher tortoises prefer areas with less oak canopy (Fig. 5).

We also tested for correlations between the placement of gopher tortoise burrows and soil features. We found a positive correlation between the placement of burrows and biomass content.

Multicollinearity in all of the data collected in the vegetation and soil surveys was tested using a variance inflation factor (VIF). The VIF test returned values under 5 for each of the variables indicating no multicollinearity.

Discussion

The primary objective of this research was to investigate the composition of the vegetation related to habitat suitability for gopher tortoises, as well as identify the areas in need of greater management to increase the level and abundance of suitable scrub habitat for the species. As a keystone species, management of gopher tortoise habitat will affect the scrub habitat ecosystem as a whole.

The data illustrate the influx in the environment of oaks and sable palm causing an increase in canopy

as well as a high density of shrubs. By the standards for shrub and canopy cover outlined in the literature, the FAU Preserve may be deemed suitable for gopher tortoise habitat. However, the now greater abundance of oaks both in canopy and shrub cover serve as evidence of succession of the scrub into an oak-dominated habitat unsuitable for gopher tortoises.

Gopher tortoise burrow distribution illustrated a significant negative correlation with areas consisting of high percentage of oak canopy cover. Herbaceous ground cover is generally negatively correlated with canopy cover. Although not clearly evident from this study, it can be deduced that herbaceous cover is positively correlated with the distribution of gopher tortoise burrows. We believe this correlation may not have been measured due to the degradation of the habitat. Herbaceous ground cover is relatively sparse throughout the FAU Preserve.

Our data suggests a positive correlation between burrow placement and greater biomass in the soil. This relationship suggests that gopher tortoises prefer soils with greater biomass content. However, this result is based on a small subsample and is driven by a single outlier (Fig. 6). Additional samples should be collected and analyzed for more definitive evidence.

Due to the relatively low percentage of canopy cover in this area, management might best be achieved by concentrating on the population of shrubs. The current management regime of the Preserve is based on mechanical removal of invasive vegetation and pesticides (Team 4 2005). We have observed that in areas managed through mechanical removal invasive species, such as *Phytolacca americana* and *Eupatorium capillifolium*, have increased. Based on the collected vegetation data, we suggest that a prescribed fire regime be put into place as this is the most effective, natural and cost effective way to manage scrub habitat (Myers 1990). Due to the high degree of fragmentation and proximity to the Boca Raton Airport, Florida Atlantic University and Interstate 95, smaller, highly regulated burns are suggested. By manually removing excess fuels we would be able to conduct

small fires with a minimal amount of resulting smoke using the pre-existing Tortuga Trail as a basis for a fire line. Similar preserves in the Palm Beach county area use fire to maintain the habitat, such as Blazing Star Preserve – which is also in close proximity to I-95.

We speculate that the use of fire as a tool for habitat management will increase and maintain the habitat suitability for gopher tortoises, and in turn will provide viable scrub habitat for numerous native species. Fire regimes would also be of benefit for the university and surrounding facilities, both as a preventative measure and as an effective use of land. If a wild fire was to occur on the FAU Preserve, the build-up of excess fuels would result in a larger, less manageable fire. Also, an increase in suitable habitat would increase the carrying capacity of the area. This would allow for the transfer of animals from areas where their presence is less desirable. However, this undertaking would require the assistance of trained wild-fire fighters. It is suggested that FAU faculty contact local state parks, for example Jonathan Dickinson State Park, and consult with their park rangers to discuss this possibility.

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