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Ecological Impact and Carrying Capacity of Ponies

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SUMMARY

The primary objectives of the study were to determine (1) the grazing patterns of the ponies living within the Chincoteague National Wildlife Refuge, (2) the effects of pony grazing on the island's vegetation, and (3) the carrying capacity of the area.

Information on the grazing patterns of the ponies was obtained by observing the ponies in the field during over 600 hours of observation over the course of one year. By recording the type of plant being consumed and the habitat in which the ponies were feeding, it was determined that on a yearly basis the animals spend over 60% of the time in the salt marsh. Grass areas, vegetated primarily with American Beach grass, were utilized about 20% of the time, while other habitats such as forest, brush, and sand areas were little utilized.

The effects of pony grazing were studied by marking areas grazed by ponies then re-examining these areas at a later time. Although the grazed plants displayed shorter stems than ungrazed plants, they showed a slightly larger number of stems per plant. Likewise the grazed plants grew more in the period between grazing and re-examination than did ungrazed plants. These results suggest that light grazing activity may actually stimulate additional plant growth and lead to a shorter but more dense vegetation.

Information on the density of the vegetation in the study area was obtained by running transects at 0.5 mile intervals along the island. Results showed that salt marshes contained 9 times the amount of vegetation as an area of comparable size in the dune and inner-dune grassy areas. Since the number of grazed plants and stems were recorded, it was determined that only about 1.5% of all plants and 1% of all stems were grazed in grassy areas while 9.5% of the plants and 3.2% of the stems were grazed in salt marshes. This data suggested that about 11% of the available vegetation had been grazed.

INTRODUCTION

One of the most common uses of salt marshes has been to provide forage for domestic animals. Many of the older Spartina marshes in Europe have been extensively grazed by cattle, sheep, ponies, pigs or rabbits for over fifty years (Hubbard and Ranwell, 1966). Similarly cattle graze in the extensive Spartina marshes along the coast of Georgia during spring and early summer, and salt marsh cordgrass has been harvested for winter cattle feeding (Burkholder, 1956). Likewise cattle grazing is common in marshes along the Gulf Coast in Louisiana (Chabreck, 1968).

Despite the extensive use of salt marshes for grazing by large mammalian herbivores, few studies have examined the ecological effects of this practice. Ranwell (1961), studying the effects of sheep grazing by building exclusion cages, found that light grazing resulted in an increase in the cover of Spartina. Chabreck (1968), using exclusion cages as well, found that light grazing encouraged the growth of certain valuable wildlife food plants, but these were destroyed by heavy grazing. On areas where cattle grazed, the vegetation was shorter and sparser compared to the vegetation within the enclosures.

Sheep, cattle, and ponies have also been grazed on sand dunes in Britain, Scotland, and the Netherlands (Barnes, 1977). However, there is little information about the effects of stock grazing on dunes, and this has apparently never received experimental study.

The objective of the proposed research then is to study the ecological impact of grazing by ponies on the vegetation within the Chincoteague National Wildlife Refuge on the Virginia portion of Assateague Island.

Three main areas of research will be emphasized:

1. Determination of the grazing patterns of the ponies.
2. Determination of the effects of this grazing on the vegetation.
3. Determination of the carrying capacity of the Chincoteague National Wildlife Refuge with respect to ponies.

By directly observing ponies as they grazed, data were gathered on feeding rates and on the quantity of vegetation consumed in a given time period. This information was then used to calculate yearly consumption rates which in turn could be used to calculate theoretical carrying capacity. Based on the more realistic yearly percent of utilization rather than on the theoretical carrying capacity, it was recommended that a population of no more than 141 ponies should be allowed to graze on the study area.

METHODS

Herd Descriptions

The study was conducted on the Virginia portion of Assateague Island. This portion encompasses approximately 9,439 acres that are included within the Chincoteague National Wildlife Refuge. A population of approximately 90 ponies occupy this area.

During the course of the study the ponies were distributed among about 9 bands, each consisting of one adult male and 2-12 adult females. A few immature animals (less than 3 years old) were present in some of the herds. In addition to the harem bands a few solitary animals were present on the study area.

Data Collection

Using two different methods a total of over 600 hours of direct observation were made on the ponies during the year of study. The first method of observation involved visually locating a herd and recording its location on a map as well as the plant types being grazed.

The observer then moved on to another band until all the herds in an area had been located. This process was then repeated throughout the day providing information on movement patterns as well as on habitat utilization.

The second method involved locating a herd and staying with it for several hours as it grazed. In addition to location, data were collected on the rate of movement, amount and type of vegetation being consumed and climatic conditions. Because the ponies were acclimated to man, the observer could get close enough to the feeding animals to record the number of bites of vegetation and to observe the number of stems of a plant consumed with each bite. Examination of a grazed plant revealed how much of a plant was consumed during feeding.

Study of naturally grazed areas

During the observation periods in May and June plastic flags were used to

mark locations where ponies had been observed to graze. In late August about 5% of these areas were re-examined to determine if grazing had any effect on the vegetation.

At each location, 10 grazed plants immediately around the flag were randomly selected. The number of stems on each plant were counted and their heights were measured. Similar data were collected from 10 ungrazed plants randomly selected from the immediate area.

Determination of vegetation density

Information on the density of vegetation on Assateague Island was collected utilizing 24 transects that were established at 0.5 mile intervals along most of the length of the Virginia portion of Assateague.

At each transect location, three different transects were run. For the Dune Transect, the highest point on the primary dune was determined. Starting at this point, a 100-foot tape was laid in an east-west direction, with 50 feet lying east of the starting point (toward the beach) and 50 feet lying west of the starting location. The Inner-Dune Transect began at the edge of the road or edge of the appropriate telephone pole and ran 100 feet to the east. The Marsh Transect began along the east-west transect line at the point where the low salt marsh began and ran 50 feet to the west (the length of the transect was reduced due to the uniform nature of the salt marsh).

For each transect, sampling was done at each ten foot interval along the tape. At that point a 2 foot by 2 foot wooden frame (1 foot by 1 foot for the marsh) was centered over the tape. All the plants within this sampling area were identified and recorded. A separate record was kept for ungrazed and for grazed plants. The number of grazed and ungrazed stems were recorded.

RESULTS AND DISCUSSION

Habitat Utilization

There were 6 major terrestrial habitats within the study area: 1. salt marsh, composed largely of salt marsh cordgrass (Spartina alterniflora) and comprising just over 1,700 acres, 2. forest stands, making up approximately 1,850 acres, 3. grassy areas on the sand dunes and in the inner-dune area just west of the dunes, an area of almost 1,100 acres, composed primarily of American Beachgrass (Ammophila brevilingulata), 4. salt meadows, containing large amounts of salt meadow hay (Spartina patens) and comprising 680 acres, 5. brushy areas, consisting of growth of Bayberry (Myrica pennsylvanica) and marsh elder (Iva fruscens), and making up about 460 acres and 6. sand beach, generally devoid of vegetation and comprising about 380 acres. However, only three of these habitats, the salt marsh, the salt meadows, and the grassy zones, were utilized to any great degree by the ponies (Table 1). Throughout the year the animals obtained most of their food from these areas. The other habitats were used primarily for travel, for grooming activities, or for resting. This was especially true for the extensive wash flats area which was largely dry during the summer of 1980. The area was utilized extensively for resting during the daylight hours, apparently because the lack of vegetation and the higher wind velocities associated with the open area served to decrease the abundance of biting flies. Although the ponies grazed to some extent on the largely exotic vegetation that had developed on the dry lake bed between resting bouts, the animals obtained little of their daily food from this source. In the fall the area was gradually flooded with water and was no longer utilized by the ponies.

The southern part of the population (herds 1-3) spent almost all their time feeding in the extensive salt marsh and salt meadow areas south of the beach

road. This was no doubt partly due to the fact that fencing served to restrict the animals movement. On occasion, however, one or more of the herds would move out onto Beach Road and utilize other habitats along the wildife drive and the beach parking area.

Herd 4 was a small band of ponies that lived on the hook of Assateagae. These animals were not restricted by fencing and consequently displayed increased utilization of dunes. This dune utilization might also have resulted because of the smaller amounts of salt marsh present on the hook.

The remaining 5 herds lived primarily within the former quarantine area surrounding the wash flats. Although these herds were prevented from grazing on the dunes by fences, they utilized grassy areas to the west of the fences and along the edges of the dried lake bed. Similarly these herds all spent considerable time resting on the lake bed.

There was considerable variation in habitat utilization between summer and winter (see Table 1). Utilization of salt meadows and salt marsh habitats increased in winter while utilization of grassy areas and other habitats decreased. Much of this shift resulted from the movement of wash flats herds away from the lake bed area. Two of the herds moved 2-4 miles north of the wash flats area and spent the winter grazing in the salt marshes and grassy fields. Such behavior apparently was largely restricted during the summer because of abundant biting flies. Two other herds moved into the extensive salt marsh areas near Cherrytree Hill and spent almost all their time there.

Throughout the study several solitary ponies or pairs of adult females were observed. These were located along the northern part of the hook (north of the Coast Guard Station), along the road in the "buffer zone" between the Wildlife Drive and the quarantine area, and along the Wildlife Drive. The movement patterns and habitat utilization of these animals was irregular and atypical

compared to the harem herds and because of their small numbers, the effect of these animals was considered minimal.

Compared to the ponies living on the northern (Maryland) portion of Assateague, these southern herds showed higher utilization of marsh and meadow areas and lower utilization of dune and inner-dune areas (Keiper and Zervanos, 1979). This was especially true for the winter, for marsh utilization in northern herds is lower in winter because the animals make increased use of inner-dune grasses. Northern herds, which are not restricted by fencing also utilize a greater variety of habitats such as beaches, Chincoteague Bay, mud flat regions, and camp grounds. The first two areas are especially important as refuge sites from biting flies and receive a significant amount of use. The northern ponies also have complete access to dunes and utilize the American Beachgrass on the dunes as a major food source.

Grazing Effects

In addition to collecting data on the habitat utilization of the ponies (where the ponies graze), information was also gathered on the effects of their grazing. Grazed areas were marked then re-examined later in the summer to see what effect pony grazing may have had on the vegetation. The results of this re-examination are presented in Table 2. Grazing had no apparent negative effect on the number of stems produced by a plant; in fact for both Spartina and Ammophila the number of stems per plant were actually increased. These results are similar to those obtained for grazed vegetation on the nothern end of Assateague (Keiper and Zervanos, 1979), at least in the case of Spartina and probably result because grazing causes increased tillering (the growth of new shoots from the root or base of the stem (Ranwell, 1961).

Grazing did cause stems to be shorter in height than ungrazed stems (Table 2). However, comparison of the heights of grazed plants in August with heights of grazed plants in June revealed that the height of Spartina stems increased

an average of 9.8 cm. despite having been grazed. This is actually more growth during that period than that displayed for ungrazed stems, for these grew only an average of 3.5 cm.

Similarly Ammophila stems grazed in June grew an average of 4.5 cm. by late August while ungrazed stems grew only 0.8 cm. during the same period.

Light grazing (once per growing season) may, therefore, actually have a stimulatory effect on vegetation, producing growth of a denser vegetation. Observation revealed, however, that repeated grazing on the same vegetation over the course of the year results in negative effects characterized by very short vegetation that fails to flower and seed.

Determination of Vegetation Density

Table 3 presents the results obtained from 24 different transects along the length of the island. The results show that while the density of vegetation was similar in dune and inner-dune regions, the density was 9 times greater in the salt marsh with respect to both the number of plants and the number of stems. This higher density may explain why the ponies spend so much time feeding in the salt marsh. The greater density of forage vegetation would make the marsh habitat a more efficient grazing area for the ponies, especially during the winter when more energy must be consumed, and would therefore justify the greater utilization of the marsh.

The transect data revealed that the density of the vegetation varied along the length of the island. For example, in the salt marsh the density ranged from 106 plants and 338 stems per square foot to only 17.8 plants and 59.4 stems. This variation was apparently due to physical conditions in the marsh and not to the effects of the ponies. Thus plant density was only about 20 plants and 100 stems per square foot on "new" salt marsh near the southern tip of the island and along Tom's Cove but 88 plants and 300 stems in the "older", well established salt marshes in the Black Duck Drain area.

Vegetative density also varied for dune and inner-dune transects. Dunes on the hook of Assateague averaged only 2-3 plants, and around 8 stems per square foot, while better vegetated dunes showed up to 10 plants and 30-40 stems in the same area. Inner-dune areas displayed the lowest plant densities ranging from only 1 plant and 2.5 stems per square foot in some areas to 8 plants and 25 stems in the best areas.

Since a distinction was made between ungrazed and grazed plants and stems during the recording of transect information, transect data also provided information on the degree of utilization of the forage vegetation. Although one-third of the marsh transects contained some grazed plants, the degree of utilization was rather low; only 9.5% of all plants were grazed. Similarly, only 3.2% of all Spartina stems were grazed, suggesting that in most cases grazing affects only a few rather than all the stems present on a plant.

Grazing in the marsh occurred most heavily for marsh areas on the hook of Assateague, in the Black Duck Drain area, in the marshes along Assateague Bay south of the dike and west of the wash flats area, and for marshes in the Smith Bay Tumps area.

Utilization was lower for inner-dune transects, for only 2.7% of the plants recorded were grazed. Similarly only 1.6% of all stems were grazed. Inner-dune grazing was greatest on the hook area and in the Beach Road-Wildlife Drive area and almost non-existant elsewhere. Some of the low degree of utilization results because the ponies were kept from 4-5 miles of the inner-dune area by fencing.

Dune transects showed the lowest amount of utilization with only 0.4% of all plants and 0.2% of all stems being grazed. Dune grazing was only recorded for transects on the hook. Fences prevented ponies from grazing on the dunes from the Maryland line to the southern end of the quarantine zone. South of that point, there were no fences to keep ponies off the dunes but the animals

were kept out of this buffer area by fences running across the island.

Estimation of Carrying Capacity

To determine the carrying capacity of the southern portion of Assateague Island, two different kinds of data are required. First information must be available on the amount of vegetation available to the ponies on the study area. Such information can be determined by multiplying the vegetation density for each vegetation type by the amount of acreage of each vegetation type.

The other kind of data needed are consumption data -- how much vegetation is consumed by a pony during the course of the year. Dividing how much vegetation is available by how much vegetation is consumed by one animal will provide information as to how many animals can be supported.....the carrying capacity.

Since grazing is limited primarily to only two habitats, salt marshes and grassy flats, only the acreage from these areas will be used in determining the theoretical carrying capacity. Using the vegetative density data obtained from the transects, it can be calculated that in an average acre of salt marsh, there would be 1.96×10^6 plants of Spartina. Using 1,720 acres as the total acreage of salt marsh present on the island, the total number of plants available in the salt marsh acreage would be 3.37×10^9 plants. Instead of considering number of plants however, the biomass should be determined and this can be calculated by multiplying the total number of plants (3.37×10^9) by the mass of an average Spartina plant (.0015 Kg). This yields a figure of 5.06×10^6 for the total biomass available in the salt marsh acreage.

With respect to the grassy areas covered primarily with Ammophila, an acre would contain approximately 2.05×10^5 plants. With about 1,073 acres, the total number of plants would be 2.19×10^8. When multiplied by the mass of an average Ammophila plant (.002 Kg), a biomass of 4.38×10^5 Kg is obtained.

Combining the total biomass contained in all the salt marsh acreage with the biomass found in the total grass acreage provides a total available biomass figure of 5.49×10^6 Kg.

To calculate the amount of vegetation consumed by an adult Assateague pony, information is needed on consumption rates, and the data are presented in Table 4. These data were obtained by counting the number of bites of vegetation taken by randomly selected animals during one minute periods of grazing. By comparing grazed and ungrazed stems, the amount of vegetation consumed per bite can be determined and these figures can be combined to provide an hourly consumption rate in terms of Kg. of dry weight.

Table 5 provides data on the average time spent each day on grazing by an Assateague pony. Since about 65% of this time is spent in the salt marsh (or 7.98 hours) and about 4.30 hours (or 35% of the total grazing time) is spent grazing on Ammophila, the total amount of forage consumed per day per pony can be determined (7.98 hours x 1.12 Kg/hr + 4.30 hours x 0.83 Kg/hr) as 12.51 Kg. of forage. Multiplying daily consumption by 365 days yields the total amount of forage consumed in the year by each pony. Yearly consumption would be approximately 4.57×10^3 Kg. per horse.

By dividing the total amount of vegetation available for consumption (5.49×10^6 Kg) by the yearly consumption per pony (4.57×10^3 Kg), the theoretical carrying capacity can be determined to be about 1,200 ponies. To attain this figure, a number of assumptions would have to be met. They include (a) total consumption of all the salt marsh and grass area forage, (b) no competition for or consumption of the forage, (c) equal distribution of the ponies on the entire acreage, and (d) that the productivity figures used in this study be the same year after year. None of these assumptions are realistic or valid.

Perhaps a more realistic way of looking at how many animals can be supported by the island is to calculate the yearly percent utilization. If production on the salt marsh and grassland acreage was 5.49×10^6 Kg. and if 100 ponies were present, each consuming 4.57×10^3 Kg. of forage, then percent utilization would be about 12%. That is, a population of 100 ponies would consume 12% of the biomass produced in a given year. Once again this calculation assumes no forage being consumed by other animals and equal distribution of ponies over the included area, both incorrect assumptions on Assateague.

Since the island supports populations of two other large herbivores (White-tailed and Sika deer) and since the ponies are prevented from reaching some of the acreage included in the calculations by fencing, a more realistic figure would be 144 animals, attained by multiplying the theoretical carrying capacity (1,200) by the current percent utilization (12%).

DISCUSSION AND RECOMMENDATIONS

The data gathered in this study suggested that the ponies, through their grazing, are affecting about 10% of the annual biomass produced in the salt marsh and grassy areas of Assateague. Since the pony population is managed so that it will essentially not exceed the estimated carrying capacity of 144 ponies, increased grazing pressure by an increased number of ponies should never be a problem. Similarly, since the populations of White-tailed and Sika deer, other large herbivores that may have some impact on the salt marsh and grassland vegetation, are also monitored and controlled by hunting, increased grazing pressure from these species should not be a factor. Questions still arise, however, as to the long term effects of repeated grazing by ponies over the same acreage and as to whether an 12% utilization rate is too high.

Controlled, light grazing pressure has occurred on Spartina marshes in England for more than 50 years without a significant decrease in marsh productivity (Hubbard, 1966), and these herbivores are less selective in their grazing than horses. Similarly grazing of salt marshes along the Atlantic and Gulf Coasts of the Southern United States is both widespread and of long standing (Lynch et. al. 1974, Chabreck, 1968, Burkholder, 1956). Experimental studies have been conducted in both locations to determine the effects of grazing (Ranwell, 1961; Chabreck, 1968). The results suggest that light grazing increases the growth of some species and helps maintain species diversity. Light grazing by sheep on salt marshes in Southern England resulted in an increase in the cover of Spartina, apparently as the result of tillering (Ranwell, 1961).

Apparently Spartina has great regenerative ability to respond not only to grazing but also to other factors as well. Lynch et. al. (1947) reported that burning had been used on marshes along the Gulf Coast in late summer to stimulate growth of Spartina to permit fall grazing of cattle. Similar results have been obtained by Hubbard (1970) working on salt marshes in England. Marshes that were cut repeatedly for feeding to stock showed growth in the year following the cutting that was more uniform in height and more dense than uncut areas.

Carrying capacity figures have even been suggested for dune and marsh areas. Ranwell (1974) reports that European salt marshes support 2-3 sheep an acre (0.4 hectare) for most of the year, while Barnes (1977) reports that an area of 1963 hectares provides 100 cows and 10 horses with summer grazing.

It appears from the results of the studies discussed above that long term grazing by horses could be continued on Assateague without any apparent effects so long as the grazing was limited. Because of the fencing already in place and the past history of management, the number of animals grazing on a certain parcel of acreage could be controlled and the effects of grazing could be spread over a larger number of acres. Similarly rotation of grazed areas could be

practiced to allow grazed areas time for recovery. Since observation during this study has shown that horses will choose to re-graze a previously grazed area, thus feeding on younger, more tender shoots, rather than graze on older tougher plants, management practices such as controlled burning or cutting of some marshes could be used to stimulate growth of younger shoots. Such practices could also be used to reverse plant succession in marshes, eliminating stands of little-utilized Spartina patens and allowing re-colonization by stands of Spartina alterniflora.

Many of these practices are already being used on the refuge and their use should be continued and more closely monitored. Practices such as controlled burning, which has been used to halt succession and prevent invasion of shrubs into grass areas could be used as described above.

Another consideration is the level of utilization. If the population is kept reasonably constant, then the percent utilization of an area could increase if productivity varied greatly from one year to the next. Lowered productivity of Spartina, for example, could result in increased utilization. A similar result might occur if the acreage of Spartina was reduced, for example, through succession. A third way to increase the utilization of an area, of course, is by concentrating more of the population in that area.

All three of these factors could be affected by management practices. Productivity of an area might be increased by controlled burning or cutting. Succession could be slowed or altered by similar actions. Finally the number of ponies grazing an area could be regulated.

It is important to remember that, although present percent utilization is 11%, grazing pressure is actually greater in some areas, 11% is the average value for all acres of salt marsh and grassland. Not all the salt marsh or grassland acreage is presently affected by pony grazing. On acres where ponies do graze, therefore, utilization may be somewhat greater. Thus the percent of

utilization for salt marshes between Bow Beach and Smiths Hammocks was 26% of all plants and 16% of all Spartina stems. For marshes on the Hook, up to 35% of all plants and 21% of all stems were affected by grazing.

While these values may seem high, common range management practices suggest that less than 45% of annual production be utilized in order to obtain improved or stable production (Cook, 1963). Earlier papers considered it acceptable to have an 80% utilization by cattle, allowing only 20% of the grass stems to remain for reproduction and possible early feed before next year's growth (Stoddard, 1935).

It appears that a 10-15% level of utilization overall on the island, and a 20-25% level of utilization in the most heavily grazed areas is acceptable and will result in a stable annual production. The overall percent utilization as well as the utilization in the most heavily grazed areas could be reduced by allowing the animals to have access to increased acreage.

In addition to their grazing, however, large herbivores like the ponies may also produce some effect by trampling. Chabreck (1968) found that the effect of trampling by cattle on the vegetation of salt marshes in Louisiana often exceeded the effects of grazing. This effect occurred, however, in soft marshes where the cattle sank to depths of 2 to 8 inches and at high population levels, where as many as four hoof prints could be counted per square foot of marsh surface.

On Assateague it was difficult to assess the effects of trampling. Although visible paths could be observed in salt marshes and in some grassy and shrub areas, these paths were characterized by reduced vegetation rather than bare soil. Also, based on the kinds of prints observed along the paths, the paths resulted from the continued utilization of both ponies and deer over certain routes.

In grassy areas where the density of vegetation is reduced, paths due to trampling are less evident when the soil is moist, hoof prints can be observed.

As the soil dries, however, the prints are obliterated. In sandy areas hoof prints are much more temporary, lasting only a few hours before being destroyed by the wind. Studying trampling effects on a long-term basis is virtually impossible. Barnes (1977) notes that trampling may damage dune vegetation, but also concludes that it may sometimes aid plant growth by helping compact soil and conserve moisture. On Assateague, ponies are largely excluded from the dunes by fencing, so that their trampling has little effect on this vulnerable habitat.

The final area of concern with respect to the ecological effects of the ponies is their effect on waterfowl. Spartina marshes apparently are preferred nesting habitat for Black Ducks (Reed and Moisan, 1971), with both adult and young birds also feeding primarily in these tidal marshes. On Assateague salt marshes may also be used for nesting by Mallards and Gadwalls.

Salt marshes may also be used by geese during the fall and winter, but these birds spend more of their time in the grassy areas bordering the freshwater impoundments and the wash flats.

Chabreck (1968) was one of the few scientists to study the relationship between grazing by a large mammalian herbivore (cattle) and marsh wildlife. He found that while some valuable wildlife food plants were lost as the result of grazing, other species benefited. Under moderate grazing in tidal marshes, grazing effects on plant species composition balanced out with no serious effects on wildlife.

Cattle grazing reduced plants with high forage value for cattle, such as Spartina patens and Distichlis spicata, but these are of practically no value to ducks (Chabreck, 1968). On the other hand, light or moderate grazing encouraged the growth of some valuable wildlife food plants. Three-cornered grass (Scirpus olneyi), which is similar to American Three Square (Scirpus americanus) increased under moderate grazing but was destroyed by heavy grazing, and this

plant is consumed by waterfowl (Chabreck, 1968).

Chabreck (1968) concluded that geese benefited by moderate cattle grazing on marshes. Geese feed primarily on the tender new growth of marsh grasses plus roots and rhizones they dig from the soil. Grazing stimulates the growth of new shoots and also reduces stands of dense mature vegetation, allowing better access to roots.

Ducks, however, unlike geese, have different feeding habits and habitat requirements than cattle. Whereas cattle depend mainly on the foliage of marsh grasses, ducks feed on seeds and aquatic vegetation. Grazing by cattle may reduce seed production (Chabreck, 1968).

The Assateague ponies and the waterfowl of the island appear to be compatible. Because the ponies spend most of their time in the salt marsh, they do not reduce greatly the grasses surrounding the wash flats impoundments used as food by waterfowl. These grasses make up only a small part of the ponies diets. Pony effects on vegetation in the area of the fresh-water ponds along Beach Road and the Wildlife Drive are essentially nonexistent.

In salt marshes, trampling and grazing affect only a small part of the marsh vegetation. Even grazed stems average over 16 cm. in height, allowing adequate nesting cover.

In conclusion, it presently appears that as long as pony populations are maintained at levels of less than 150 animals, then no long-term effects of grazing on the island vegetation should occur. Grazing effects could be reduced below present levels by management practices such as alternating, on a yearly basis, acreage that is grazed. Grazing effects could also be reduced by spreading out the ponies thus spreading their grazing over more acreage. Finally controlled burning or cutting could be used to increase the salt marsh vegetation.

The ponies do not presently seem to be having a negative effect on waterfowl. There is little competition for food plants due to little dietary overlap. Ponies also spend less than 20% of their time in prime waterfowl feeding areas. In the salt marsh, where waterfowl may nest in the marsh vegetation, pony grazing does not seriously reduce the thickness or height of the nesting cover.

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Table 1. Habitat utilization in percent of total observation time.

		Habitat							
		Salt Marsh		Salt Meadow		Grassy Areas		Other	
Herd	Location	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer
1	BDD	86	73	13	11	0	15	1	1
2	BDD	66	65	9	5	15	19	10	11
3	BDD	83	71	15	19	2	7	0	3
4	AH	64	55	0	0	34	40	2	5
5	WF	61	40	8	3	22	30	9	27
6	WF	69	42	9	2	19	28	3	28
7	WF	70	59	5	2	20	9	5	30
8	WF	79	45	6	1	14	21	1	33
9	WF	73	55	5	4	13	19	9	22
	Ave.	72.3	56.1	7.8	5.2	15.5	20.9	4.4	17.8

BDD = Black Duck Drain

AH = Assateague Hook

WF = Wash Flats

Table 2. Comparison of ungrazed vegetation with vegetation grazed by ponies.

Type of Vegetation	# Ungrazed Stems/Plant	Ave. Ht. of Ungrazed Stems (cm.)	# Grazed Stems/Plant	Ave. Ht. of Grazed Stems (cm.)
Ammophila (n=20)	3.10 stems	35.6 cm.	3.4 stems	20.7 cm.
Spartina (n=20)	3.4 stems	32.3 cm.	4.1 stems	16.7 cm.

Table 3. Vegetative density of forage plants and the effect of pony grazing. Transect results expressed as the average of 24 one foot square samples.

Type of transect	# Plants	# Stems	% Plants Grazed	% Stems Grazed	Ht. Ungrazed Stems (cm.)	Ht. Grazed Stems (cm.)
Dune	5.3	18.3	0.4%	0.2%	51.6	17.1 ~~71.1~~
Inner Dune	4.1	12.5	2.7%	1.6%	49.1	17.0
Marsh	45.4	171.2	9.5%	3.2%	27.4	16.6

Table 4. Consumption rates of ponies using direct field observation during all seasons of the year.

Vegetation Type	Forage Bites/Hr.	Gr. Dry Wt. of Forage per Bite	Amt. Consumed per Hr. (Kg. Dry Wt.)
Ammophila (n=100)	1013	0.82	0.83
Spartina (n=200)	1490	0.75	1.12

Table 5. Average grazing times for adult ponies in Summer and in Winter.

	Grazing Time (hrs./day/pony)	
Herd	Summer	Winter
1	11.61	11.21
2	12.47	12.07
3	10.80	11.58
5	12.59	16.11
6	10.11	11.66
7	12.70	14.41
Ave.	11.71 hrs.	12.84 hrs.

Yearly Ave. 12.28 hrs.