GOPHER TORTOISE MANAGEMENT IN YARDS, SMALL RANCHES, FARMS AND MITIGATION PARKS

Ray E. & Patricia S. Ashton
Gopher Tortoise Conservation Initiative
Ashton Biodiversity Research and Preservation Institute, Inc.
14260 W. Newberry Rd, Newberry, Fl 32669
Phone: 352-495-7449
Tortfarm2@aol.com

1. Introduction – There's a Tortoise on My Property! What do I do?

Many people who live in communities which have just been developed or in rural communities where there are gopher tortoises, frequently have tortoises take up housekeeping in their yards, pastures and gardens. When humans discover the presence of these tortoises, they usually either want to protect the tortoises or find out how to get rid of the problem. Those who wish to get rid of the tortoise need to contact the FFWCC to obtain a permit to move the tortoise away from areas where it may not be wanted or to obtain a relocation permit to move it off of their property.

The remainder of this unit is designed to provide information on how to co-exist with one or more gopher tortoises on your property or in your yard or surrounding areas.

2. The Rules Pertaining to Tortoises

Current state regulations clearly indicate that it is illegal to handle or disturb gopher tortoises or to bother their burrows. Contact the local game officials regarding how this rule is being interpreted in your area and how you can proceed with making your yard tortoise or tortoises on your ranch or farm more welcome.

Florida Fish and Wildlife Conservation Commission
Bureau of Wildlife Diversity Conservation
620 South Meridian St.
Tallahassee, Fl 32399-1600

3. Adopting a Tortoise

There are many tortoises that have been confiscated in other states or have been taken in after being injured and repaired and are being held by animal rehabilitators around the state. It is possible to obtain a permit to take one or more of these tortoises in situations where they cannot escape or are not in contact with other wild tortoises. Contact your local FFWCC office for details.

Something to Consider

Gopher tortoises live a long time, 80 years or more. If you are considering adopting a tortoise as a pet in your yard, one should consider it a permanent resident. If you are going to apply to obtain a tortoise needing rescue, the question may be asked about your long term plans and how they may affect the tortoise on your property. This is true if you are getting a tortoise that will not be free ranging. Should you need to move or should the tortoise out live you it will require care or transfer to another property of someone who would take care of it.

4. What is a Gopher Tortoise?

A gopher tortoise is a reptile. Its relatives are snakes, lizards, turtles, alligators, and crocodiles. It is not an amphibian (frogs and salamanders are amphibians). It has a leathery feeling skin with scales. The backbone of a tortoise is actually part of the shell. The shell is a part of the tortoise's body. Its feet are elephant-like with toenails. These feet are well-designed for digging and they can move quite rapidly when their body temperature is not too cold. They are "cold-blooded" meaning that they need an external source of heat to maintain their internal body temperature. For this reason they are often seen sitting at the mouth of their burrow basking in the sun.

Tortoises live on land, not in the water. They may be seen at a puddle or pond drinking or soaking occasionally. Tortoises are like "cows with shells", they are herbivores, primarily feeding on plants. A gopher tortoise gets its name from its habit of making a burrow. There is a totally different animal, a mammal called a pocket gopher which burrows throughout the sandy areas of the southeast. The pocket gopher digs tunnels, eats the roots of plants and throws up conical shaped piles of sand which often dot a pasture or roadside like giant anthills. These dirt piles are often mistaken for gopher tortoise burrows. The furry little pocket gopher and the gopher tortoise may both live in the same habitat, but never in the same burrows.

5. The Burrow

Tortoises usually dig their burrows in areas that get good sun (20-40% canopy cover) during a good part of the day. They normally are right in the open or dug at the base of a root, log, fencerow, even the edge of a foundation. You will see the burrow probably before you see the tortoise.

The tortoise digs the burrow down as deep as necessary to get to the ground water table. Along the coast, the burrow may be only a few feet long since the water table is close to the surface. In the case of sandhills, it may be long and deep. The deepest we have dug out were 60 feet long and 23 feet deep but these curved back and forth like a spiral down to the water table. The average burrow is generally 30 feet long and 6 to 15 feet deep. In typical sandy soils, a tortoise can dig 9 feet in a day. The sand is pushed out in front of the burrow to form a semi-circular "palate". This sand brought up from the water table is often rich in minerals and acts to encourage new plant growth that serves as tasty treats for the tortoise. Many other species share the burrow with the tortoise. The burrow is like an "apartment building" for many important vertebrate and invertebrate animals.

The burrow must be protected from being collapsed and care needs to be taken that people and vehicles do not fall into or collapse the burrow. The best way to avoid this is by putting fence posts or stakes on either side of the mouth of the burrow. A stake about 15 feet behind the burrow (if the burrow is deep enough) may help keep people from vehicles collapsing the burrow. If it is collapsed, the tortoise can usually dig out, especially if the collapse is near the burrow mouth. If more than 4 or 5 feet of burrow is collapsed, then it would be wise, with a proper permit, to try and dig out some of the burrow. Tortoises may take weeks or even months to dig out, depending on the time of year and other factors.

The pallet or the spoil in front of the burrow is important and is used for sunning,

socializing and egg laying (see reproduction). The tortoise can, where the pallet is large enough, drink from the sheet flow during heavy rains. The rain flowing off the top of the palate and burrow will run down and collect at the corner of the burrow in a narrower stream. The tortoise using one foot to dam up the flow can lower its head and drinks its fill in only 20 seconds.

Remember that there is usually more than one burrow per tortoise. Tortoises may also share a burrow with each other particularly in the spring mating season and occasionally in the fall. On the other hand, tortoises may have from one to seven burrows that they use off and on. If you have one burrow in your yard, the tortoise likely has another somewhere else, perhaps on the other side of the fence.

6. Foraging

Gopher tortoises carry out two types of feeding behavior; gorging themselves on grass or selectively eating herbaceous plants. Tortoises use both their sense of smell and their vision to locate food species. Tortoises do not have teeth but use their scissor-like beak to nip off leaves or rip up small seedlings completely out of the ground. They slightly extend their tongue in bringing food into the mouth. This may be the only time you see that they have a tongue. When testing whether they want to take a bite, they often first bend their head down so the nostrils are directly over the plant part and take a deep sniff. Sometimes they may even smell several times or actually seem to crush the plant against the ground (perhaps better to release aromatic compounds) and sniff carefully before deciding to take a bite.

Tortoises in yards or pastures will seek out and forage on Bahia, St. Augustine, and other non-native grasses. They will in fact feed on these in the same areas time and time again. These areas are called foraging areas and may be defended by the tortoise using it. They may have it eaten the grass down to near the top of the soil. Once they get the grasses down this low, they keep foraging on the young grass shoots. They do this because it is the most nutritious and digestible part of the grass plant.

They also eat a wide variety of primarily broad-leafed native grasses. We have observed them feeding on 19 species in sandhill habitat. Again the tortoises often pick the tender blades and then usually just the tender tip ends. Several people in the past have stated that wiregrass is necessary for tortoises to use for healthy forage and that the more wiregrass the better. This was indicated because they were studying fecal pellets and not what was actually being eaten by the tortoises. There are no studies we know of that validate this belief. The presence of wiregrass does often indicate a healthy sandhills community where there will be plants that tortoises like to forage on but areas where the wiregrass is too thick (more than 40% ground cover) actually have less forage available for gopher tortoises. Tortoises seem to only eat the more tender shoots of wiregrass and the drier wiregrass stalks when other more desirable foods are not available.

Feeding on herbaceous plants is an entirely different way of foraging from the cow-like gorging on grasses. The tortoise walks around looking and smelling different plants and even parts of plants. Once they find the plant they want, they may eat all of it, or pick out leaves, or flowers, buds, or fruits. They may only eat that species of plant

once and perhaps never again during the year. Their feeding habits are very complicated. We have now observed foraging on more than 400 species of plants.

Tortoises on the average feed once every three days. They may not drink for up to 10 days. Foraging trips usually last about 40 minutes and usually occur once a day, when the weather is appropriate, during the spring, winter and fall. This is usually either before or after the heat of the day in spring and fall and when sufficiently warm in winter. During summer, they generally eat at late morning and before sunset. Rarely gopher tortoises have been seen feeding at night. In preserves, parks and more limited island environments feeding has been observed to occur several times throughout the day for 20 minutes to up to 2 hours as the tortoise moves in and out of the sun to keep its body temperature from elevating too much.

Tortoise feeding studies have revealed some basic information about how tortoises locate their food and about which plant families and species they prefer. Some of the earliest studies we did in the early 1970s looked at readily available tortoise feces (solid waste). This provided information on some plant species that were being ingested and revealed at least some parts of which were passing through the digestive system. Tortoise feces are generally made up of non-digestible bulk like pine needles, seeds, leaf stems, and parts of grasses. Fecal studies do not however tell us which parts the tortoise actually digested and used for food though in combination with observation of what was taken in, the analysis of what then came out can be very enlightening.

We did spend time observing tortoises feeding in a variety of habitats and recorded what they ate. Some studies done over the last two decades actually counted the number of bites tortoises took out of each species of plant. In the 1980s we photographed and video taped hundreds of hours of tortoises feeding. Individual tortoises were identified and followed about from sunrise to sunset to determine their eating habits and food preferences. We also identified tortoise foraging areas, used GPS to map forage areas and were able to recognize signs of tortoise foraging on specific plants.

We carried out a series of plant transect studies in tortoise feeding areas and used exclusion plots to determine which species the tortoises were pulling up by the roots and consuming totally. Tortoise selection of plant parts often depends upon the maturity of the individual plant, the season, the level of moisture or nutrients available to plants in that location and on the general health and robustness of the individual plant. Through these methods we have compiled a list of families (Table 6A) and species (Table 6B) that are used selectively by tortoises over the seasons. Some of these are more common or limited to certain parts of Florida but most are found throughout the state. See table 6C for a listing of references that can be used to identify plant species on which tortoises may forage.

TABLE 6A: Some Common Plant Families that are used by Tortoises for Forage

(Sample members of families in parentheses are for reference and do not necessarily tortoises eat those)

Acanthus Family – Acanthaceae (twin flower, wild petunia)
Amaranth Family – Amaranthaceae (alligator weed, chaff flower, samphire, pigweed)
Aster Family – Compositae or Asteraceae (dandelions, daises, hawkweed, ragweed)
Borage Family – Boraginaceae (wild heliotrope, scorpiontail, puccoon, false gromwell)
Buckwheat Family – Polygonaceae (pigeon plum, sea grape, buckwheat, jointweed, wireweed, smartweed, sheep sorrel, dock)
Cactus Family – Cactaceae (prickly pear, coastal opuntia)
Carpet Weed Family – Aizoaceae (carpet weed, sea purslane)
Coco Plum Family – Chrysobalanaceae (gopher apple, coco plum)
Goosefoot Family – Chenopodiaceae (lamb's quarters, glasswort, Mexican tea)
Gourd Family – Cucurbitaceae (creeping cucumber, balsam apple)
Grape Family – Vitaceae (grapes, pepper vine, Virginia creeper)
Grass Family – Gramineae or Poaceae (woods grass, Bahia, Bermuda, orchardgrass)
Ebony Family – Ebenaceae (persimmon)
Evening Primrose Family – Onagraceae (gaura, water-primrose, seedbox, evening primrose)
Figwort Family – Scrophulariaceae (hedge-hyssop, blue hearts, toadflax, beard tongue, seymeria, mullein, speedwell, aureolaria)
Heath Family – Ericaceae (huckleberry, blueberry, sparkleberry, fetterbush, tar flower)
Holly Family – Aquifoliaceae (gallberry)
Iris Family – Iridaceae (blue-eyed grass, ixia,
Logania Family – Loganiaceae (miterwort, rust weed)
Madder Family – Rubiaceae (buttonbush, snowberry, poor joe, buttonweed, beach creeper, bedstraw, innocence, partridge berry, wild coffee, pusley, Mexican clover)
Mallow Family – Malvaceae (hibiscus, Indian mallow, sida)
Meadow Beauty Family – Melastomataceae (meadow beauty)
Milkweed Family – Asclepiadaceae (milkweeds)
Mint Family – Lamiaceae or Labiatae (dicerandra, mint, henbit, sage, pennyroyal, skullcap)
Morning Glory Family – Convolvulaceae (morning glories, bindweed, dichondra, stylisma)
Mustard Family – Cruciferae or Brassicaceae (cress, mustard, pepper grass, sea rocket, wild radish, warea)
Nightshade Family – Solanaceae (peppers, tomatoes, Christmas berry, ground cherry, nightshade, angel's trumpet, potato, horse nettle)
Palm Family – Arecaceae (palmetto, scrub palmetto, saw palmetto)
Pea or Bean Family – Leguminosae or Fabaceae (indigo, ground nut, peanut, vetch, senna)
Pink Family – Caryophyllaceae (corn cockle, sandwort, chickweed, whitlow-wort, Drymaria)
Pineapple Family – Bromeliaceae (Spanish moss, airplant)
Pinweed Family – Cistaceae (rock rose, pinweed)
Plantain Family – Plantaginaceae (English plantain, common plantain)
Purslane Family – Portulacaceae (purslane, rose moss, portulaca)
Rose Family – Rosaceae (rose, chokeberry, plum, peach haw, blackberry, dewberry, strawberry, cinquefoil, cherry, apple)
Saltwort Family – Bataceae (saltwort)
Sedge Family – Cyperaceae (sedges, spikerush, fimbry, spikesedge, umbrella sedge)
Smilax Family – Smilacaceae (greenbrier, sarsaparilla
Spurge Family – Euphorbiaceae (3-seeded mercury, spurge, tread softly, croton, phyllanthus)
Sumac Family – Anacardiaceae (sumac, poison ivy, mango, Brazilian pepper)
Vervain Family – Verbenaceae (French mulberry, lantana, match-heads, verbena, porterweed)
Violet Family – Violaceae (violets)
Wood Sorrel Family – Oxalidaceae (wood sorrel)

Of all the studies done on gopher tortoise forage, the families of plants most consumed included members of the: grass family, the pea or bean family, the aster family, the spurge family, the goosefoot family, the vervain family, the amaranth family, the mustard family, the rose family, the grape family, the nightshade family, the heath family, and the sumac family.

The relative quantities consumed of various plants from different families of course vary with habitat and part of the state. You may notice that with the exceptions of the spurge and vervain families, most of these families also include many members that are eaten by humans (grains/cereals, peas, beans, cabbage, mustard greens, coco plums, spinach, lettuce, radish, blackberry, plum, mango, potato, tomato, blueberry, etc.). The relative importance of different species to quality of the forage for the gopher tortoise is difficult to quantify. For example, the tortoise by amount (biomass) may primarily forage on grasses but in terms of overall health, when producing eggs or when trying to fight off disease or during the maturation process, tortoises may require specific nutrients or combinations of chemicals provided in small amounts by very specific herbaceous species which they seek out. The feeding on these species may not be observed except during the very specific times mentioned above. In addition, they feed on many sprouting species, ripping them up roots and all so that the identification or even observation of the feeding on these species is very difficult and estimating the biomass consumed of these non-grass species is even more difficult. Yet when planning a preserve or preparing a management plan for a yard or natural area, the presence of these species is very important for the health of the tortoises.

Our knowledge of the nutrient or chemical composition of various plant species is very limited. Except for species eaten by humans or used for pharmacological or industrial extraction, the only other data available is on species used as forage for cattle, sheep, or goats. Studies have been done on the specific nutrient composition of some plants foraged by the western gopher tortoise but no funding has been available to do these studies on our gopher tortoise forage plants.

At different times tortoises may select the fruits, leaves, stems, flowers or the entire plant roots and all to consume. Generally fruits are taken from the ground or off low plants. Low leaves or sprouts of shrubs or trees may be eaten when the plant is young. Tortoises may simply walk-over weak plants knocking them down to get the desired parts such as flowers, fruits, shoots or seed heads. Favorite parts of plants consumed by tortoises include the young tender shoots, new leaves, ripe fruits and nectar filled flowers. Gopher tortoises have been observed to come several 100 meters (in line of sight) to bright yellow or deep red colors. They have also been observed eating limestone, shell, and bone as well as consuming whole the entire seed pods of Australian Pine (*Casuarina*), nibbling cattail seed heads, and munching red hibiscus flowers. They rarely distinguish between edibles in the wild and in your garden so they go whole heartedly after the flowers and leaves of many species planted in “butterfly gardens” or “flower gardens” as well as most species in your vegetable garden.

Sometimes following individual tortoises about can leave you wondering why they appear to pass up really edible “goodies” on one day and select the leaves of a particular plant to consume and then on another day gorge themselves on the very species they passed up for weeks at a time. We believe that this behavior is explained by the need for certain nutrients by the tortoise and also by the seasonal variation of

chemicals in the various parts of plants. As plants mature and move from a growth phase to reproduction, the relative amounts of various chemicals in the various plant parts changes. Tortoises appear to be able to detect these changes and select specific parts at specific times. Also, some plants that are repeatedly grazed have been shown to send distasteful or toxic chemicals along with fungicides and bacteriacides to the injured portions to prevent infection and discourage further grazing by herbivores. Some of the most common species you might see eaten by gopher tortoises or you might encourage to provide good gopher tortoise forage include:

TABLE 6B Species from the most common to the less commonly foraged families:

1. Grass Family
Almost all species of low, broad leafed grasses (native and introduced)

2. Aster Family
Asters (*Aster* spp.)
Spanish needles (*Bidens pilosa*)
Wild lettuce (*Lactuca graminifolia*)
Dandelion (*Taraxacum officinale*)
Florida dandelion or Green eyes (*Berlandiera subacaulis*)
Catsear dandelion (*Hypochoeris radicata*)
Beach Elder (*Iva imbricata*)
Marsh Elder (*Iva frutescens*)
Goldenrods (*Solidago* spp.)
Horseweed (*Conyza canadensis*)
Eupatorium (*Eupatorium* spp.)
Cudweed (*Gnaphalium* spp.)
Coastal Ragweed (*Ambrosia hispida*)
Ragweed (*Ambrosia artemisiifolia*)
Beach wormwood (*Artemisia stelleriana*)
Dwarf dandelion (*Krigia virginica*)
Hawkweed (*Hieracium* spp.)

3. Pea or Bean Family
Elliot's Milk pea (*Galactia elliottii*) white flower
Milk pea (*Galactia regularis*) pink flower
Cowpea (*Vigna luteola*)
White Clover (*Trifolium repens*)
Marsilea Sandweed (*Zornia bracteata*)
Joint-vetch (*Aeschynomene viscidula*)
Milk vetch (*Astragalus villosus*)
Gopher weed (*Baptisia perfoliata*)
Butterfly pea (*Centrosema virginianum*)
Buckroot or wild pea (*Psoralea canescens*)

4. Spurge Family
Three-seeded mercury (*Acalypha gracilens*)
Beach spurge (*Chamaesyce mesembrianthemifolium*)
Beach croton (*Croton punctatus*)
Stinging nettle (*Cnidoscolus stimulosus*)
Phyllanthus (*Phyllanthus* spp.)

5. Goosefoot Family
Seabeach Orach (*Atriplex pentandra*)
Sea Blite (*Suaeda linearis*)
Lamb's quarters (*Chenopodium* spp.)

6. Vervain Family
Wild sage or white lantana (*Lantana involucrata*)
Blue or Nettleleaf Porterweed (*Stachytarpheta urticifolia*)
Pink Porterweed (*Stachytarpheta mutabilis)*
Match heads or creeping Charlie (*Phyla notoflora)*

7. Amaranth Family
Chaff flower (*Alternanthera flavescens*)
Beach alternanthera (*Alternanthera maritime*)
Samphire (*Philoxerus vermicularis)*

8. Mustard Family
Peppergrass (*Lepidium virginicum*)
Wild radish (*Raphanus raphanistrum)*
Shepard's purse (*Capsella bursa-pastoris*)
Sea rocket (*Cakile edentula*)

9. Rose Family
Blackberry (*Rubus* spp.)
Loquat (*Eriobotrya japonica*)

10. Grape Family
Virginia creeper (*Parthenocissus quinquefolia*)
Wild grape (*Vitis* spp.)

11. Nightshade Family
Ground Cherry (*Physalis* spp.)

12. Heath Family
Huckleberry (*Gaylussacia* spp.)
Blueberry (*Vaccinium* spp.)

13. Sumac Family
Poison Ivy (*Toxicodendron radicans*)
Brazilian pepper (*Schinus terebinthifolius*)

14. Madder Family
Mexican clover (*Richardia brasiliensis*)
Poor Joe (*Diodia teres*)
Diodia or Buttonweed (*Diodia virginiana*)

15. Borage Family
Scorpion tail (*Heliotropium angiospermum*)

16. Coco Plum Family
Gopher apple (*Licania michauxii*)

17. Mint Family
Heal-all (*Prunella vulgaris*)
Henbit (*Lamium amplexicaule*)
Betony (*Stachys floridana*)

18. Smilax Family
Greenbrier (*Smilax* spp.)

19. Plantain Family
Common plantain (*Plantago major*)
English plantain (*Plantago lanceolata*)

20. Cactus Family
Prickly pear cactus (*Opuntia* spp.)

21. Acanthus Family
Blue Twinflower (*Dyschoriste oblongifolia*)

22. Pink Family
Chickweed (*Stellaria media*)

Ferns, Mosses, Clubmosses, Fungi and Lichens

Tortoises are also known to feed on a variety of ferns. All known fern species are considered edible for humans and so are suitable for tortoise forage as well. Tortoises select the more succulent fern fronds and the tender shoots or crosiers are grazed as well. The most commonly foraged species are those normally found in the upland habitats or along wetland interfaces with upland habitats including the bracken fern (shoots), the resurrection fern, and the cinnamon fern. In developed areas tortoises have been observed feeding on Boston ferns. In addition to ferns, tortoises are known to ingest a variety of lichens, Clubmosses, mosses and fungi. It is sometimes difficult to tell whether they purposely took in certain mosses, clubmosses or lichens for whether they were accidentally ingested with other forage which they tend to grow among. Tortoises have been observed purposely taking bites out of mushrooms including species toxic to humans.

Identification of plants being foraged by your tortoises can be made using a variety of plant books. For those who know how to do botanical keying the best recommended resource *is Guide to the Vascular Plants of Florida* by Richard P. Wunderlin, 1998, University Press of Florida. Some of the books that are easy to use for non-botanists are listed in Table 6C below.

TABLE 6C References for Identification of Tortoise Forage Species

1. Austin, Daniel and Penelope Honychurch, 1993. *Scrub Plant Guide: A Pocket Guide to the Common Plants of Southern Florida's Scrub Community*, Gumbo Limbo Nature Center of South Palm Beach
2. Austin, Daniel, Penelopy Honychurch, and Steve Bass, 1991. *Coastal Dune Plants*, Gumbo Limbo Nature Center of South Palm Beach County
3. Bell, C. Richie and Bryan J. Taylor 1982. *Florida Wild Flowers and Roadside Plants*. Laurel Hill Press, Chapel Hill, North Carolina
4. Duncan, Wilbur H. and Leonard E. Foote 1975. *Wildflowers of the Southeastern United States*. The University of Georgia Press, Athens
5. Duncan, Wilbur E. and Marion B. Duncan, 1987. Smithsonian Guide to Seaside Plants of the Gulf and Atlantic Coasts. Smithsonian, Washington, D.C.
6. Godfrey, Robert K. 1988. *Trees, Shrubs, and Woody Vines of Northern Florida and Adjacent Georgia and Alabama.* University of Georgia Press. Athens, Ga.
7. Hall, David W.1993*. Illustrated Plants of Florida and the Coastal Plain*. Maupin House, Gainesville, FL
8. IFAS, University of Florida, *Weeds of Southern Turfgrasses*
9. Mino, Marc C. and Maria Minno, *Florida Butterfly Gardening*, 1999, University Press of Florida
10. Nellis, David W., 1994, *Seashore Plants of South Florida and the Caribbean,* Pineapple Press, Sarasota, Florida
11. Nelson, Gil 1996. *The Shrubs and Woody Vines of Florida.* Pineapple Press, Sarasota, Fl.
12. Scurlock, J. Paul, 1987, *Native Trees and Shrubs of the Florida Keys,* Laurel Press, Inc.
13. Taylor, Walter Kingsley 1992. *The Guide to Florida Wildflowers.* Taylor Publishing Co, Dallas Tx.
14. Taylor, Walter Kingsley 1998. *Florida Wildflowers in the Their Natural Communities*. University Press of Florida
15. Turner, R.G. Junior, 1997, Botanica, Barnes and Noble, Inc.
16. Yarlett, Lewis L., 1996, *Common Grasses of Florida and the Southeast*, Florida Native Plant Society, Spring Hill Florida

7. Managing Forage for Gopher Tortoises

The presence of a diversity of plant species to be available for tortoise forage is vital. The selection of native species is always preferable but tortoises appear to remain healthy when feeding on some non-native species, particularly grasses and those classified as "weeds" or "butterfly plants". Cultivated garden plants in the same families as those mentioned above are also usable forage. When working to develop a

practical management plan for your yard, ranch or other properties, always check on the following:

1) What is the current plant diversity?
2) What is the desired plant diversity for this habitat and area?
3) What seed source is available from surrounding properties for enhancing the current biodiversity? What species are available to purchase?
4) What kind of management will be available for the property? burning? mowing? cattle grazing? shallow plowing? hand clearing?
5) What physical factors may limit the availability of the forage to the tortoises? roads? railroads? ditches? heavy use areas?

Gardens

Tortoises love vegetable and flower gardens and deer feeding plots. They love just about every species of plant that humans eat. They also like many of the flower garden plants we grow as well. Once a tortoise has located a garden chances are real good, it will be back again and again. The only way to keep a tortoise out of your garden is put up a fence. It has to be tight against ground so it cannot be lifted up by one of the tortoise's front feet. Gophers cannot climb fences too well so it does not have to be very high.

Providing Supplemental Food

Providing additional food usually is not necessary and is not recommended. It is usually done because people like to watch the tortoise feeding. If food is to be made available to the tortoises in the yard then the best choice is a well planned planting of native food species. The next best choice would be a garden of lettuce and other greens and vegetables that tortoises like. It is important to follow some simple rules.

1. Do not interfere with the burrow or with the tortoise while it is out foraging.
2. Place vegetable material, such as salad greens, apple peelings, or other material that you might also place in a compost heap in a safe location where it will decompose and make compost if not grazed upon by tortoises or sampled by birds. Do not place food in or on or near the burrow. You may find well established feeding trails for the tortoise and place the food near one of those.
3. Do not put out iceberg lettuce. When this is available for a tortoise, it seems to want to eat it at the expense of eating more nutritious foods.

It is best however, to leave the tortoise to feed on its own. They appear to be very careful to select certain foods probably based on its body telling it that it needs certain nutrients or plant chemicals to remain healthy. Providing attractive foods but not necessarily the ones the tortoise needs could give it a full belly that may make it lazy and keep it from going out to forage properly, thus missing the needed nutrients.

Planting Forage

Planting food plants other than grasses may be as simple as tilling up an open space and letting weeds start to grow. Many of the foods tortoises like are weeds that frequently get into gardens and open space.

Planned Forage Planting

Mitigation Parks and preserves, especially those that have had exotic plant removal may require some supplemental planting or seeding to increase diverse plant forage. The following are some simple points to keep in mind:

1. Survey the current forage and forage seasonally to determine if there are groups or key species lacking.
2. It is important to be sure that there is a wide variety of native grasses available first. These make up 80% of the food intake of tortoises. In areas that are not being managed for natural vegetation, Bahia and/or St. Augustine or Centipede grasses are highly perfered by gopher tortoises.
3. It may be much more economically sound to obtain seeds for both grasses and broadleaves in lieu of spending money on potted plants. Note that it is important to survey to find out what is in the habitat before buying plants or seed.
4. When surveying look for potential seed sources that may naturally re-seed the property. If these exist, you probably should spend your time and money on other species.
5. Be sure to plant in an area which is located in and around tortoise pods (groups of burrows). This will increase use.
6. Have a well planned out monitoring program to determine if there are changes in plant diversity.

Pesticides and Herbicides

There have been some reports of tortoises dying right after eating where grass has been sprayed with herbicides or insecticides. There is very little information about the impacts on tortoises of pesticides and herbicides. The best thing to do is not to use pesticides within 50 feet of the burrow if at all possible. If pesticides are being used, try to apply them at a time when the tortoise is not active. Long-term effects of some pesticides seem to be causing some species of animals problems with reproduction and creating other abnormalities. We however, just do not have the information on tortoises and we just don't know which chemicals will affect them. Nor do we know how these chemicals will affect tortoises in the long term. Some chemicals are stored in body fat for long periods of time before building up to dangerous levels. PLAY IT SAFE.

Water

Gopher tortoises drink only once a week or so. They will go to a pond or puddle after a rain to drink and they drink from the edges of their burrows as previously described. They normally do not need to be provided a source of freshwater except possibly during severe drought. Then a shallow dish of water near the active burrow would suffice.

8. Tortoises, Pets and Kids

There are three great dangers for adult tortoises in neighborhoods, dogs, cats and kids. The greatest danger for most are dogs. Large dogs seem to consider tortoises a walking chew bone. Once the dog frightens the tortoise into closing up, they will continue to chew the shell until it is nearly destroyed. Tortoises are tough and can

frequently bounce back from a good chewing but if the dog breaks into the body cavity or gets hold of a foot or head, the tortoises chances of surviving go way down.

Solution: Train the Dog

Dog trainers can teach a dog to leave a tortoise alone and so can you. If you have a dog that is basically trained, teaching him to stay away from the tortoise is very possible. However, unless the dog is very well trained, never leave the dog in the yard with the tortoise without supervision. Some ways of handling the dog and tortoise problem are:

- Get a professional trainer.
- Use your own methods of training the dog. Shock collars are recommended by many trainers.
- Fence the dog away from the tortoise without restricting the movements of the tortoise in a way that they cannot get to proper feeding areas.

Cats

We use to tell people that cats were dangerous to baby young tortoises up to about 5 inches in length. That was until we found a cat from a feral cat colony chewing the back legs off what appeared to be a healthy adult tortoise. This tortoise was apparently caught out from its burrow and was an unusual situation. Cats and most wildlife simply do not mix so if you want a tortoise in your yard, especially a young one, keep the cat indoors at all times.

Children

Free-living gopher tortoises are excellent pets. They come and go on their own. They eat and drink on their own so no one has to be scolded about taking care of it. Meanwhile they are great to watch and will be very tolerant if not harassed. On the other hand, children must be taught to respect and not bother the tortoise. The burrow is not a place to drop firecrackers into or role stones down. The tortoise is not a target for BB guns or bows and arrows. Tortoises are great animals to use to learn how to observe and do science projects (hands off) for school.

9. Dealing with Tortoises and Roadways

Most large tortoises that live near highways eventually wander out on them and get killed. One problem with roads besides breaking up the tortoise's natural movements through its habitat is that they usually are lined with bahia or other great tasting mowed grasses and many plant species that are in the top 25% of the plants tortoises like to eat. In this case, the "grass is always greener" concept gets a large number of tortoises killed every year.

Fencing

The best way to keep tortoises from getting onto busy roads from your yard is simply to put a fence or barrier up between the area where the tortoises are and the road. Tortoises will not burrow under fences but will use other spaces dug by other animals. If there is a space under a fence that a tortoise can get a front leg under, then the tortoise can get out. The fence has to be in the ground several inches (12 inches is recommended to avoid most animals from digging) to avoid exposure of the bottom by erosion or other animals digging. Tortoises will frequently put a burrow at a fence line and the burrow may extend under the fence to the other side. The tortoise burrow will

not resurface on the other side however the front of the burrow may collapse and open a crawl space under the fence. If fencing is used, be sure the sizes of the openings are such that the tortoise cannot simply go through the fence.

Of course the tortoise may follow a driveway out of the yard. This then requires a gate that keeps tortoises from crawling under or through it. Simply putting a 4 X 4 lawn timber under the gate which is hung low enough to keep a tortoise inside will be the most effective method of doing this.

Tortoise Enclosures

One of the best ways to avoid having all the problems mentioned above is to give the tortoise its own yard by enclosing part of the yard. There are several key elements that should be taken into account when doing this. First, the area should be covered in at least one species of grass such as Bahia or St Augustine. Most of the area needs to be in the sun although some shade is good. We recommend that the tortoise enclosure be no less than one-quarter acre in size. Up to three adult tortoises could be maintained in an area of this size if they were two females and a male. Tortoises can be kept in smaller enclosures, especially those that need to have special treatment like rehab tortoises. The key to keeping healthy gopher tortoises is that each has its own burrow. Remember that gopher tortoises are somewhat anti-social in part because they defend the burrows they occupy. Too many tortoises will increase stress which may lead to sick tortoises.

If you are introducing a tortoise to an enclosure, a starter burrow may help get them started, especially if the tortoise has been in captivity for some time. Also, when introducing a new tortoise, be sure to provide shade and a place to hide (hide box) or dense cover until it gets into the digging mode. Keep a diversity of plant species in the yard for additional forage and do not use pesticides or herbicides on areas where the tortoise lives, walks or feeds.

Other tips on managing an enclosure or a yard with tortoises:

- Do not let the grass get too high. Design it so you can cut the grass with a lawn mower.
- Provide a water dish and maintain fresh water, usually in a shaded area. If you have juvenile tortoises make sure they are low enough that the tortoise can get into them and get out of them.
- Maintain an area that allows weeds or planted foods to grow on a regular basis. Usually till the soil in winter, mid summer, and at the end of fall. This allows new plants to grow.
- Weigh your tortoises every two months to see if they are losing weight. Make sure their eyes are bright and now swollen and the shell has no sores on it.

- Do not over water the grass or the enclosure. Too much water can lead to fungal diseases. Tortoises prefer dry habitats.

- Watch for information or books about gopher tortoises and get them to learn more about their natural history and management.

10 Comments regarding Mitigation Parks

The information provided above is pertinent to larger, managed mitigation parks. Specifically here are some points that are very important to the long term success of these very important conservation areas.

1. Develop a long term management and monitoring program. Tortoise well being and habitat should be the primary goal of such facilities. If it is mixed with silviculture or human recreation, then these must take a backseat to what is important for the tortoises.

2. See the chapter on Relocation regarding size. Tortoise mitigation parks on site or off should be no less than 25 acres and no more than 2 tortoises per acre if the site has been prepared for relocation. On site facilities that are smaller than this should be considered “tortoise parks” where tortoises should be managed in a way that they live out their lives with reproduction and native vegetation not important except for the health of the tortoises. These are extremely costly and very few have been developed over the past twenty years that are working according to the agreed to management plan.

3. Fire management is extremely important to sustaining the habitat and forage for gopher tortoises and various commensals. As these green spaces become surrounded by houses, roads, hospitals and airports, the likelihood of fire management will decrease and alternatives are important. We have been monitoring areas where we have been mowing in lieu of burning. It appears that the grass diversity is fine but there may be long term declines in other species of forage plants. This may be offset by disking. It is important to maintain an open tree and shrub canopy (20-40%) and some open soil (20-40%) indicating that the herbaceous layer is not too thick which reduces diversity and the ability of tortoises to move around. One of the other major problems with mitigation park management is the lack of budget and trained staff. Tortoises do not care about politics and financial situations and degradation begins to occur quickly. A good site can be degraded within 10-12 years.

4. Fencing and fence management is a must when the mitigation parks become ringed with infrastructure. Tortoises will continue to die on roads.

5. Rules should be set on relocation (see Relocation Chapter). Most importantly on or off site facilities that are not enclosed in tortoise excluder fences should

be required to fence in the appropriate acreage in which the relocated tortoises should be placed. Hay bale fencing thus far has been the most successful.

6. Some areas have a problem with soils that are deep enough (above the groundwater table) or have disrupted sub surfaces (mine reclamation sites), which make it difficult for tortoises to dig their burrows. We have experimented with the use of artificial soil piles to alleviate this problem. We recommend that the most efficient berms are at the top, 8-10 feet on a side. The slope from the top should be no more that 3:1 and no less than 4:1. The soil should be sandy type with a little clay. These should be placed on site at least 3 months before any relocation is planned. Six to 8 inch diameter logs, 4 feet long can be buried 2/3 up from the bottom. This may encourage a tortoise to begin its burrow there.

7. Counties with Conservation lands programs and land management staff should investigate the possibility of having tortoise and other listed species mitigation (for incidental take) funds given to them in lieu of the FWC. These funds can be used to purchase land or permanent conservation easements on which tortoises can be relocated to in lieu of on site mitigation and according to local plans to sustain wildlife diversity.