ELEMENT STEWARDSHIP ABSTRACT
for

Schinus terebinthifolius

Brazilian Pepper-tree

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The Nature Conservancy
Element Stewardship Abstract
For *Schinus terebinthifolius*

I. IDENTIFIERS

Common Name: BRAZILIAN PEPPER-TREE Global Rank: G3

General Description:
Schinus terebinthifolius is a shrub or small tree.

Diagnostic Characteristics:
Field characteristics are the odd-pinnate leaves with a narrowly winged rachis and rounded, often toothed leaflets which give off a strong smell of turpentine when crushed (Tomlinson 1980).

II. STEWARDSHIP SUMMARY

1)Attempt optimum control using methods appropriate to the life stage of the schinus, its dominance and the successional stage of the community for each occurrence.
2)Pursue and promote research for more effective biological controls including plant specific biocides and phytophagous fauna.
3)Obtain cooperation from other states to reduce use as an ornamental.
4)Where it is necessary, take legal action to block introduction of predators of potential phytophagous fauna specific to schinus.
5)Promote and participate in cooperative efforts amongst public and private agencies for total control statewide.
6)Obtain cooperation, financial, political, or practical support from agricultural circles to assist in research efforts for control.

III. NATURAL HISTORY

Range:
Schinus is a native of Argentina, Paraguay and Brazil. In its native range it is a sparse species and never attains the dominance that it acquires in some of the places where it is a naturalized exotic. Schinus has been introduced and become successfully naturalized in more than 20 countries and its range now forms 2 circum-global belts. In the U.S., Schinus (either S. molle or S. terebinthifolius) is found in southern Arizona, southern California, Texas, Louisiana, Hawaii, and the Commonwealth of Puerto Rico, as well as the Bahamas. Schinus was intentionally introduced into south Florida for use as an ornamental in 1891 although there is evidence of its presence 50 years earlier (Gogue et al. 1974). It is still planted in this capacity in California, Texas and Louisiana. In Florida, as in Hawaii, Bermuda, the Bahamas, and more recently in Australia, Schinus has become an an aggressive, rapidly spreading weed that displaces native vegetation (Bennett et al. 1988). This plant is a fast- growing aggressive shrub. It makes a dense canopy, shading out most vegetation it contacts (Ewel et al. 1982).

Habitat:
Schinus is a pioneer of disturbed sites, such as highway rights-of- way, fallow fields, and drained bald cypress stands, but is also successful in undisturbed natural environments (Woodall 1982). Native plant communities that it colonizes successfully include pinelands occupying non-urbanized remnants of the Miami rock ridge. It also invades hammocks and forms extensive stands in the mangrove forests of Everglades National Park (Ewel et al. 1982).

Reproduction:

Phenology (Ewel et al. 1982): Schinus flowering is remarkably synchronous and compressed and occurs at the same time year after year. Flowering activity is almost an exact inverse of its leaf flushing activity. Flowering begins in September and by mid-October almost every tree is in flower. Most flowering activity ceases in early November.

A small fraction of the population (about 10%) flowers in March- May. Some of these late bloomers are trees that did not flower in October, but for most the spring reproductive activity is a second flowering period.

Fruit ripening follows close behind flowering with most occurring between December and February. Most dispersal takes place soon thereafter, but some trees still retain fruit as late as July or August. Dehiscence of fruit-bearing inflorescences is faster on some sites than others.

Pollination (Ewel et al. 1982): Pollination research has shown that the most abundant visitors to schinus were Palpada vinetorum (a syrphid fly), Apis mellifera (Honey bee), and Polistes species and Mischocyttarus cubensis (species of wasp). It has been suggested that female flowers may be male flower mimics which attract foragers that might be after pollen, a phenomenon reported for the Caricaceae.

Dispersal (Ewel et al. 1982): Most schinus seeds are dispersed by animals but some dispersal does occur by gravity and some is by water. Catbirds (Dumatilla carolinensis) are commonly observed feeding on schinus fruits but they spend most of their time in woodlands and seldom venture into open fields. We know that raccoons (Procyon lotor) consume schinus fruits, and assume that opossums (Didelphus virginianus) do also. Mammal stools are sometimes encountered that contain hundreds of germinating schinus seeds. Mammals may not only disperse schinus but also effectively "plant" it with nutrient-rich fecal materials, thus perhaps giving the seedlings a competitive advantage over other species. Animal dispersal is certainly more important than dispersal by water or gravity.

Probably the most spectacular dispersal of schinus seed is effected by robins (Turdus migratorius). The robins eat vast quantities of schinus fruit and tend to exhaust the food supply in one area before relocating. They also move among several ecosystems, including both schinus-dominated successional forests and pinelands. There can be no doubt that they disperse large quantities of schinus seed into non-schinus dominated ecosystems, especially those that contain perches. Such communities include pinelands, hammocks, and roadsides beneath electric wires.

Unlike dispersal by catbirds, raccoons, and oppossums dispersal of schinus by robins is not predictable year after year. When they are present their activities are spectacular, and they undoubtedly move large amounts of schinus into habitats it would never reach otherwise. Their presence, like that of droughts, frost and hurricanes is not an annual phenomenon. When they are present, however they may move more schinus seed than all other dispersal agents combined.

Germination (Ewel et al. 1982): Field germination of Schinus occurs November-April, but most takes place January-February. In the Everglades study, germination after planting was concentrated primarily in the first 20 days of a 130 day observation period. Germination of the less vigorous seeds was not enhanced by mechanical or chemical scarification while a more vigorous test sample responded positively to 15 and 30 minute acid treatments but not to 60 minute treatments or mechanical scarification. This appears analogous to the conditions that might characterize the digestive tract of some of its dispersal agents.

The seed crop on a mature female is enormous and the viability rate of 30-60% produces a vast number of seedlings.

Research was undertaken at the Everglades Research Center on the germination rates of Wax Myrtle and Dahoon Holly, both of which are desirable native species that might be managed to enhance their competitive ability with schinus. Both species germinated more slowly than schinus with lower rates of germination. Scarification treatments increased germination rates of both the species. The researchers concluded that if either of the species is to be grown in vast quantities by direct seeding a tremendous quantity of seed would be required to insure successful seedling establishment.

The environmental factor that seems to be responsible for most schinus seedling mortality is water: either too much or too little. The driest time comes soon after the large annual surge of germination and results in the death of many seedlings. July, August and September are extremely wet months and the summer floodwaters probably account for much seedling mortality.

Survivorship (Ewel et al. 1982): The survivorship of naturally established seedlings is very high ranging from 66-100%. Such high survivorship is an unusual characteristic, even for mature-forest tree species. It is extremely rare to encounter such high survivorship in weedy species. The tenacity of its seedlings makes schinus an especially difficult species to compete with, as its seedlings seem to survive for a very long time in the dense shade of an older stand where they grow, although slowly, while in openings they grow very fast. Even seedlings whose growth has been suppressed for years will respond to canopy openings with rapid growth.

Once established seedlings can survive at all sites in the Everglades study areas (Ewel et al. 1982). Established seedlings grow quickly in most (but not all) young successional communities and slowly in most (but not all) older communities. Under good growing conditions, schinus can reproduce within 3 years after germination. About 20% of the schinus seedlings exposed to prescribed pineland fire resprout. In wet prairie subject to grazing and allowed to revert to native species, Myrica cerifera reinvaded. But when subjected to a prescribed burn schinus responded more quickly and soon dominated the area. Apparently where the grazing held back any potential schinus pioneers in the area, Myrica was able to establish a foothold that allowed it to establish headway over schinus. The fire apparently stresses the myrtle so much that the quick germinating schinus seedbank is able to establish dominance before the myrtle can rebound (Carlson, pers. comm. 1988).

The microsites created during farming are of little importance in influencing schinus invasion, and schinus invasions will not be reduced by levelling old rows and furrows (Ewel et al. 1982).

Schinus has many characteristics possessed by other weedy pioneer species: it grows rapidly; it is a prolific seed producer; its foliage flushes nearly continuously; it coppices vigorously; and it tolerates a wide range of site conditions. As a weed tree however, it is nearly unique in terms of the broad spectrum of characteristics it has which are more typical of mature ecosystem species: it produces relatively large, animal dispersed seeds; it has relatively large cotyledons which aid seedling survival; it is dioecious; it is insect pollinated; its seedlings are capable of survival in shaded conditions; and its reproductive activity is remarkably synchronous and compressed into a very short period (SCCF 1978).

IV. CONDITION

V. MANAGEMENT/MONITORING

Management Requirements:
Schinus is a rapid colonizer of disturbed habitats and various natural communities. It has no foliage value and forms a dense canopy, shading out most natural vegetation. In addition, although it was introduced as an ornamental, it can cause severe allergic reactions in people.

Without the cooperation of all private and public sectors an isolated effort at control is virtually futile.

Consensus among natural area managers should be established as to the priority and investment in time and money to be spent on the control of this pest. The consensus should extend to the degree and sequence of control efforts that will be made. Efforts to control or eradicate this pest should extend to the public and include making it illegal to cultivate, transplant or in any way promote the proliferation of the species. A fully coordinated and cooperative effort by both the public and private sectors should be instituted to fully eradicate this exotic.

Cooperation with other states should be pursued to curtail further sources of reinvasion.

Because of its broad array of ecological characteristics, an equally broad array of control strategies is called for including chemical treatments, mechanical manipulation (which must be used with great care and discretion; this frequently can have the opposite of the desired effect actually increasing density), and eventually biological control.

Management Programs:
Glossary of Methods of Treatment:

Basal Bark - herbicide is applied directly to the bark of the circumference of each stem/tree 12 to 15 inches above the ground.

Foliar - herbicide is applied to the leaves.

Hack and Squirt - cuts are made completely around the circumference of the tree with no more than 3 inch intervals between cut edges (overlapping cuts are preferable). Incisions should angle downward. Herbicide is applied to each cut until exposed area is thoroughly wet.

Mechanical - using heavy equipment (bulldozers, etc.) vegetation is removed. Root systems are removed in addition to the main plant.

Pull Up - entire plant, especially the root system, is removed. If as much as 1/4 inch of the root system is left in the ground, the plant may resprout.

The USDA Southeastern Forest Experiment Station (Woodall 1982) has investigated the use of 7 different herbicides for control of Schinus. The eight herbicides investigated include Hyvar (bromacil), Karmex (diuron), and Velpar (hexazinone) which are root absorbed, photosynthesis-blocking agents; these are the slowest acting and have the most residual activity (along with Tordon). Banvel-720 (dicamba plus 2,4D amine)and Tordon 101R (picloram plus 2,4-D amine) are foliage absorbed, hormonal herbicides. Ammate X (ammonium-sulfate), and Roundup (glyphosphate) are foliage absorbed; they are the fastest acting with the least residual activity, although their mode of action is unclear.

Seedlings were effectively controlled by root-absorbed, residual herbicides. All three hormonal herbicides gave good top-kill, but only Tordon (which is also root absorbed) consistently killed roots as well as shoots.

Because Schinus typically grows without strong competition from native plant species, partial or temporary control has little practical significance. If root systems are not killed, the site will soon be reoccupied by basal sprouts or root suckers. Furthermore, if the bush is a seed-bearing female, one must prepare for the highly probable seedling regeneration.

The only successful treatments for full sized bushes were the "basal spot" applications of Hyvar and Velpar. For widely scattered bushes where access to the main stem is difficult, basal spot treatments were unsurpassed for ease and effectiveness. They were also selective, in that nearby vegetation was not harmed. Hyvar and Velpar dissolve in soil moisture and are freely absorbed by roots. Since Schinus transpiration rate per unit leaf area is unusually high, and since it generally occupies an emergent canopy position, Schinus acts as a strong sink for soil-applied herbicides, thus minimizing leaching losses and off-target damage. Obviously, when Schinus is growing in the shade of other plants, this generalization does not hold (Woodall 1982).

The probability of success with any foliar herbicide will not be high.

Stump treatments are suitable only when aesthetic or fire-hazard considerations require that tops be removed from the site. They give only temporary control and are labor intensive. The two herbicides tested, Ammate, and Banvel (in descending order of effectiveness), are all appropriate.

With all techniques, a lack of sprouting for 1 or even 2 years may not guarantee that the roots' sprouting potential is completely exhausted. It is particularly important that defoliated-but-living tops not be removed from bushes treated with slow-acting, residual- type herbicides such as Velpar and Hyvar.

Recommendations: Karmex is recommended when the only objective is to kill seedlings. It is, compared to Hyvar or Velpar, less easily leached, making shallow rooted plants (seedlings) more susceptible than deeper rooted ones. However, on many south Florida sites, feeder roots of established desirable plants may also be very close to the surface; therefore, attention must always be paid to root distribution. Hyvar and Velpar are as effective on seedlings as Karmex, but are recommended only where larger Schinus are involved. Where soil characteristics or root distributions preclude soil herbicides, Tordon is recommended as a foliar spray (Woodall 1982).

Fire: In a comparison of the naturalization abilities of S. terebinthifolius and S. molle (Nilsen and Muller 1980) it is indicated that neither seed type can tolerate heat, thus none of the Schinus seeds will germinate following a fire although basal trunk and root sprouting can be aggressive. Seeds must be imported into the site following the fire in order to establish seedlings.

Loope and Dunevitz (1981) report that once that Schinus saplings attain a height of 1m most are able to survive fire by coppicing and, through more rapid growth than competing native hardwoods, increase dominance of the stand. They go on to conclude that a regime of prescribed burning at about 5 year intervals may result in excluding schinus from pine forests of Everglades National Park. The fire regime may have to be revised to allow pine regeneration which may also result in accelerated Schinus invasion at which point they recommend herbicide management techniques.

Rainfall: In southern California, rainfall is often intermittent followed by periods of drought. The slow germination of S. terebinthifolius may inhibit colonization in California by not allowing germination and root establishment because of the brief periods of relatively high soil moisture (Nilsen and Muller 1980). This characteristic has been exploited in south Florida between Everglades National Park and the L31 Flood protection levee. According to George Molner (pers. comm. 1988) this is a wetlands restoration technique that is frequently employed in this area when there are occurrences of wetland violations for agricultural development. In this area the substrate is "Rockglades" soil; lime or pinnacle rock that has been rock plowed or filled for agricultural purposes. This alteration of the habitat creates much shorter hydroperiods which are ideal invasion conditions for Schinus should the site be abandoned. Therefore to reestablish and encourage wetlands natives to return to these disturbed areas they are bulldozed back down to previous levels or lower than the natural grade prior to the disturbance. This effectively extends the hydroperiod and therefore creates less hospitable conditions for the reestablishment of the Schinus.

VI. RESEARCH

Management Research Programs:
In 1971, Ahmad and Jabbar reported a new species, the leafhopper- Typhlocyba karachiensis which appears "considerably specific" to Schinus.

Fosse (1978) has been sporadically studying phytophagous fauna of Schinus since Feb. 1976. Many different types of arthropods have been found, including Coleoptera spp., caterpillars (Lepidoptera), Hemiptera spp., Homoptera spp., mites, and others. None of these can be used in a biological control program.

Cassani (1986), during a 14-month study, recorded 115 arthropods which associated with Schinus. Of these, 46 were phytophagous but did not cause significant herbivory.

According to Bennett et al. (1988), D.H. Habeck (a co-author) recently reared the first recorded phytophagous torymid, Megastigmus, on the drupes of Schinus collected from Palm Beach, Florida.

This species has been recorded from S. molle in California. Part of the controversy surrounding the development of a phytophagous fauna in Florida for Schinus is the concern that insects that attack S. molle as well as S. terebinthifolius might not receive clearance for release in Florida because of the possibility that they might be inadvertently transported to California where S. molle is a prized ornamental.

Efforts are underway by California to obtain effective natural enemies of Calophya rubra, the psyllid pest that reduces the aesthetic value of S. molle trees that have been planted extensively along the highways. C. rubra attacks Schinus in Brazil, and may be assessed as a potential control of this weed in Florida. A case could be made to caution against the introduction of its natural enemies into California because of its potential adverse impact on the biological control of Schinus in Florida.

Bennett et al. (1988) further states that Schinus has been called one of Florida's best nectar producing plants and, although the honey has a distinct peppery taste which many consider unsuitable as table grade, it does have local acceptance. It will be necessary to ascertain the attitude of apiarists to the introduction of a control agent for Schinus. Bennett states that if there is a serious conflict of interest the problem must be resolved, by public hearing if necessary.

Goeden (1978) reported that heavy infestations of Schinus terebinthifolius by Epsismus sp. (released experimentally) had been observed on occasion in Hawaii but did not have a significant impact on the control of the plant. Bruchus atronotatus (also released experimentally) showed promise in limiting seed production but the latest overall assessment described Schinus as, at best, only partially controlled on the island of Hawaii.

IFAS and ESALQ entered into an agreement in 1986 to work on Schinus as one of several target pests of interest in Florida. Sampling for natural phytophagous enemies of Schinus is at present ongoing in Brazil. To date 140 herbivores have been reared. Studies following up on Hawaiian work on Bruchus atronotatus, Crassimorpha infuscata, Episimus utilis and on Liothrips ichini are in progress as well (Bennett et al. 1988).

Everglades National Park (Whiteaker, pers. comm. 1988) is beginning research on the seasonal effects of herbicide basal bark treatments on Schinus as well as a study on the effects of fire on Schinus. They are also planning, in fiscal year 1989, to follow up on the Loope and Dunevitz (1981) study.

Krauss (1963) reported on experiments with biological control of Schinus through the release of three species of schinus specific insects: Episimus sp., Crasimorpha sp., and Bruchus atronotatus. We have yet to learn the results of the experiments.

A report by Kaplan and MacGowan (1982) on the coffee lesion nematode (Pratylenchus coffeae) which is associated with suppressed growth and yield of citrus recommends control of Schinus as an important aspect of nematode management in P. coffeae-infested sites.

Morton (1979) reports that Schinus has been identified as a common host of the red-banded thrips (Selenothrips rubrocinctus). Heavy infestations of this predator are causing severe and sometimes fatal defoliation of mango trees in southern Florida. Morton indicates that this predator may be a viable means of biological control in wilderness areas only.

Burkhart (pers. comm. 1988) reports that Bruchus atronotatus, Crasimorpha infuscata and Episimus utilis have been introduced into Hawaii for control of Schinus. None of them is believed to be exerting any significant control. Burkhart further states that the possibility that further work on Schinus in Hawaii is unlikely since it is an important nectar source for the bee-keeping industry.

Dalrymple (pers. comm. 1988) reports a long term project, ongoing since 1984, on the habitat use of vegetational communities by amphibians and reptiles in Long Pine Key - Everglades National Park. The project is designed to evaluate "Hole-in-the-Donut" Schinus habitat use in relation to native fauna. A second ongoing project that Dalrymple is involved in is the evaluation of attempted wetlands restorations after rock-plowing/filling. This is a new project that involves several Dade county sites and Everglades National Park's Hole-in-the-Donut.

Management Research Needs:
Biological and integrated control strategies have not been fully investigated for Schinus. Further research needs to be done on:

1) host specific phytophagous fauna, 2) discovering the allelopathic substance in wax myrtle to develop for use in preventing Schinus invasion, and 3) developing a plant specific biocide that can be applied in mass quantities without endangering other flora or fauna.

VII. ADDITIONAL TOPICS

Common Control Methods Employed For Brazilian Pepper (Langeland 1988):

%Herbicide	Herbicide	Diluent	Application Method
100	Garlon 3A	None	Stump
100	2,4-D	None	Stump
100	Banvel	None	Stump
100	Garlon 4	None	Basal
20	Garlon 4	Diesel/- Cidekick	Basal
20	Garlon 3A	Water/diesel	Basal (seedlings)
15	Garlon 3A	Water/diesel	Foliar (seedlings)
5	Garlon 4	Diesel	Basal, hack & squirt
5	Garlon 4	Diesel	Basal (seedlings)
3	Garlon 4	Diesel	Basal (seedlings)
2	Garlon 4	Diesel	Basal, hack & squirt
2	Garlon 4	Water	Foliar (seedlings)
2	Garlon 4	Diesel	Basal (seedlings)
2	Garlon 3A	Water	Foliar
2	Banvel 720	Water	Foliar (seedlings)
None	None	None	Pull-up (seedlings)
None	None	None	Prescribed fire (seedlings)
None	None	None	Bulldozer

(All seedlings/saplings should be pulled with their entire root system intact.)

HERBICIDES MENTIONED

Tradename	Active Ingredients	Manufacturer
2,4-D	2,4-D	Various
Banvel	Dicamba	Velsicol
Banvel 720	Dicamba &2,4-D	Velsicol

Garlon 3A	Triclopyr Amine	Dow
Garlon 4	Triclopyr ester	Dow

VIII. INFORMATION SOURCES

Bibliography:

Abbassy, M. A. 1982. Naturally occurring chemicals for pest control III, Insecticidal and synergistic alkoids isolated form Schinus terebinthifolius Raddi. Med. Fac. Landbouww. Rinjksuniv. Gent. 47(2):695-699.

Ahmad, M. and A. Jabbar. 1971. Typhlocyba karachiensis, new species (Typhlocybinae: Homoptera) A pest of Schinus terebinthifolius in Karachi, West Pakistan. Agriculture Pakistan 22:107-112.

Austin, D. F. 1978. Exotic plants and their effects in southeastern Florida. Environmental Conservation 5(1).

Bennett, F. D., et al. 1988. Brazilian Peppertree -Prospects for biological control. Proc. VII Int. Symp. Biol. Contr. Weeds, 6-11, March 1988, Rome, Italy.

Burkhart, R. M. 1988. Exploratory Entomologist, Department of Agriculture, State of Hawaii. Letter to Susan C. Elfers, Science and stewardship intern, The Nature Conservancy, Winter Park Florida. August 3, 1988.

Cassani, J. R. 1986 Arthropods on Brazilian Peppertree, Schinus terebinthfolius (Anacardiaceae), in south Florida. Florida Entomologist 69(11):184-196.

Dalrymple, George, H. 1988. Department of Biological Sciences, Florida International University. Letter to Susan C. Elfers, Science and Stewardship intern, The Nature Conservancy, Winter Park, Florida. August 30, 1988.

Dunevitz, V. and Ewel, J. J. 1981. Allelopathy of Wax Myrtle (Myrica cerifera) on Schinus terebinthifolius. Florida Scientist 44(11):13-20.

Ewel, J. J., et al. 1982. Schinus in successional ecosystems of Everglades National Park. National Park Service, South Florida Research Center, Everglades National Park, Homestead, Fl. Report T-676. 141 p.

Fosse. 1978. Studies of Phytophagous Fauna of Schinus. In: Technical Proceedings for Control of Schinus in South Florida. Sanibel-Captiva Conservation Foundation, Inc.

Goeden, P. D. 1978. Part II. Biological control of weeds. Pp 357-414 in: Clausen, C. P., ed., Introduced Parasites and Predators of Arthropod Pests and Weeds: A World Review. US Dept of Agriculture Handbook 480. 545 p.

Gogue, G. J., C. J. Hurst, and L. Bancroft. 1974. Growth inhibition by Schinus terebinthifolius. HortScience 9(3):301.

Kaplan, D. T. and J. B. MacGowan. 1982. Ability of selected weeds and ornamentals to host Pratylenchus coffeae. Nematropica 12(2):165-170.

Krauss, N. L. H. 1963. Biological control investigations on Christmas Berry (Schinus terbinthifolius) and Emex (Emex spp.). Proceedings of the Hawaiian Entomological Society 18(2):281-288.

Kunkel, G. 1978. Flowering trees in subtropical gardens. Dr. W. Junk b. v. Publishers, The Hague. 246 p.

Langeland, K., ed. 1988. An industry survey of exotic pest plant control methods (Draft). Exotic Pest Plant Council. Joyce M. Kleen, Chairman.

Loope, L. L. and V. L. Dunevitz. 1981. Impact of fire exclusion and invasion of Schinus terebinthifolius on limestone rockland pine forests of southeastern Florida. Report T-645 National Park Service, South Florida Research Center, Everglades National Park, Homestead, Florida. 30 p.

Meador, R. E. II. 1977. The role of mycorrhizae in influencing succession on abandoned Everglades farmland. A thesis presented to the graduate council of the University of Florida.

Molnar, G. 1988. Biologist, Dade County Environmental Resources Dept. Personal communication with Susan C. Elfers, The Nature Conservancy, Florida Field Office, July 5, 1988.

Morton, J. F. 1979. Brazilian Pepper -its impact on people, animals, and the environment. Economic Botany 32(4):353-359.

Nilsen, E. T., and W. H. Muller. 1980. A comparison of the relative naturalization ability of two Schinus species in southern California. I. Seed Germination. Bull. Torrey Botanical Club 107(1);51-56.

Phillips, S. 1981. Memo: Brazilian Pepper control master plan and research project. The Sanibel Captiva Conservation Foundation, Inc. Sanibel, FL.

Sanibel-Captiva Conservation Foundation. 1978. Technical proceedings of techniques for control of Schinus in south Florida: a workshop for natural area managers. Sanibel-Captiva Conservation Foundation, Inc.

Tomlinson, P. B. 1980. The biology of trees native to tropical Florida. Printed and bound by Harvard University Printing Office, Allston, Mass.

Uphof, J.C. Th. 1968. Dictionary of Economic Plants. Stechert-Hafner Service Agency Inc., New York, New York. 591 p.

Whiteaker, Louis, D. 1988. Botanist, National Park Service, South Florida Research Center, Everglades National Park, Homestead, Florida. Personal communication with Susan C. Elfers, The Nature Conservancy, Florida Field Office, June 28, 1988.

Woodall, S. L. 1982. Herbicide tests for control of Brazilian-Pepper and Melaeuca in Florida. Southeastern Forest Experiment Station, Asheville, N. C. USDA Forest Service Research Note SE 314. 10 p.

Wunderlin, R.P. 1982. Guide to the vascular plants of central Florida. Univ. Presses Florida, Gainesville. 472 pp.

IX. DOCUMENT PREPARATION & MAINTENANCE

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