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Halophytes and their potential as landscape plants

Schaefer, Christina Maria, M.L.Arch.
The University of Arizona, 1988

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HALOPHYTES
AND THEIR POTENTIAL AS
LANDSCAPE PLANTS

by
Christina Maria Schaefer

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A Master Thesis Submitted to the Faculty of the
SCHOOL OF RENEWABLE NATURAL RESOURCES
In Partial Fulfillment of the Requirements for the Degree of
MASTER OF LANDSCAPE ARCHITECTURE (MLA)
In the Graduate College
THE UNIVERSITY OF ARIZONA

1988
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SIGNED: Christian H. Zube

APPROVAL BY THESIS DIRECTOR

This thesis has been approved on the date shown below:

Dr. Ervin H. Zube
Professor of Renewable Natural Resources

Date
9-1-84
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ABSTRACT

Based upon literature search, field investigation, examination of the halophyte collection at the Environmental Research Laboratory in Tucson, Arizona, and an expert survey, 97 salt-tolerant plants have been identified for the use as landscape plants. The plants were screened at salinity levels between 5 and 40 ppt which are critical for plant survival. The globally gathered data revealed information about landscape criteria, such as aesthetic value, climate amelioration, soil stabilization, color, form and drought tolerance, which were organized into architectural, engineering and design categories. These landscape halophytes range from herbaceous ground covers to woody trees. The data were filed in a computer data base, including detailed information about the description and performance of every plant, habitat requirements, maintenance, landscape values and economic uses. The data base, which is continually up-dated, is a search-type, which functions as an information storage system and is designed to provide plant selection by needed characteristics or intended use.
PROBLEM STATEMENT

"Halophytes have an excellent potential for landscaping."
(Martin 1986)

This study addresses an opportunity which is very new to the landscape profession: the use of salt-tolerant plants in landscaping. The study attempts to assess and organize existing information in the field of salt-resistant plants for landscape use. In recent years, the natural tolerances of these plants to drought and salinity have been recognized (Casey 1972, Flowers 1986). However, there is a considerable lack of data due to limited research on halophytes as ornamentals and landscape plants. Therefore, research needs on the use of halophytes in arid landscape design have not yet been defined. This study organizes existing plant information, catalogs halophytes and outlines a research direction. Priorities are established based upon the assumption that certain existing halophytes are potentially useful for landscaping in dry and saline soils.

The data collected from literature and as a result of field and laboratory studies of salt and drought tolerant plants make the selection of certain halophytic plant species possible and identifies their landscape
potentials. Designated criteria, which are standard plant material information along with plant characteristics, were developed for assessing and classifying the potential of known hydro-halophytes and xero-halophytes which are evaluated for landscape use. This provides a usable collection of salt-tolerant plants that can be further expanded with the accumulation of new information. A practical plant palette in form of a data base and plant data sheets will be established for the demonstration of specific design functions. The selected plants are tolerant of periodically dry conditions as well as of salt at various salinity levels in order to meet the constraints of saline environments.

SALINIZATION AND WATER ECONOMY

Presently, the modern world faces the problem of scarcity of natural resources; we are realizing that our resources are limited. Boyko (1966) foresaw these problems and emphasized the necessity of an equilibrium between population growth and natural resources. It is important to recognize the fact that the era of exploitation is at its end. An era of thoughtful utilization, careful management, recycling of our precious resources and expansion into previously ignored fields, like the oceans and deserts, is on the verge of being born. We must focus on the restoration of the environment through the responsible utilization of renewable resources (Brower 1988). In the case of this paper these resources are saline soils and water.
One of the scarce non-renewable resources is fresh water. Our endowment of pure water is limited; ninety-seven percent of the total water on earth is in the form of sea water (Riley 1968), which has between 30,000 and 35,000 parts per million dissolved salt solids. Therefore, water itself is not a limiting factor on earth (Aller 1980). However, scarcity of fresh water will be one of the most serious problems facing us in the future. Thus, high quality water should be reserved for specific needs of potable water. Presently, 85-90% of the water in the United States is used for agricultural irrigation (Reisner 1986).

Deserts are characterized by the lack of fresh water. They comprise one-third of the earth's land surface, including the 30,000 km length of coastal deserts. In other words, thirty percent of the world's landmass is short of pure water. In these areas ground water is a finite and fossil resource and often too saline for commonly practiced irrigation and human consumption, while seawater and other brackish water sources are often readily available. This naturally occurring salinity of seawater and desert soils and water sources is called "primary salinity".

The accumulation of salts is particularly acute in arid regions, where evaporation greatly exceeds precipitation. Thus, the natural salts are likely to stay in the ground, instead of being washed out and recycled, as is the case in non-arid regions. A salinity problem arises when concentrations of salts, such as sodium carbonate, sodium chloride, sodium sulphate, or salts of magnesium are present in excessive amounts.
However, the problem of salinity is not limited to arid regions. Human mismanagement of land, such as removal of vegetation and malpracticed irrigation techniques cause salt build-up in soils that were previously non-saline (Flowers 1986). This so called "secondary salinity" appears to affect one-third of the world’s irrigated land (Peck 1975). Many of the countries in the world report a steadily increasing salinization of their soils and ground waters. The United States loses about 80,000 to 125,000 hectares of cropland per year to salt build-up (Yensen et al. 1981) and this phenomenon is not unique to the U.S. alone. For example, Australia reports an estimated 200,000 acres of land, which first supported good crop and pasture, being now only suitable for halophytic species (Peck 1975). In Iraq it is estimated that about three million tonnes of salt are added to the cultivated land each year (Goudie et al. 1977) and in Egypt irrigation caused 125,000 acres to become saline (Chapman 1974). The countries worst affected by salinity seem to be economically poor (Flowers 1986) and thus must find economically more efficient and suitable ways than commonly practiced to deal with the problems. The emphasis on utilization of the saline resources is justified particularly in those countries.

In most cases it is not economically feasible to overcome the problems of saline soils and saline irrigation water by attempting to substitute fresh water for saline water. In 1966 Udall argued that even the most economic desalting plant could not produce pure water at a rate competitive with the current sources of water for conventional agriculture. This is still valid today. "The full and true costs of the proposed desalting projects, now and for the next 20 years, are at least one whole order of magnitude greater
than the value of the water to agriculture", stated Clawson et al. in 1973 (p. 53). According to Reisner (1986) the desalinization plants in the American Southwest prove to be economically very inefficient and do not match their expected performance. The large volume of water required for field irrigation necessitates that the water be available at low cost. Only water of lower quality will remain to fulfill other needs such as irrigation of crops and plants. To use brackish water, plant-water relationships need to be understood and knowledge of plant relations to salts must be acquired. Significant work has been accomplished by Glenn et al. (1982), Yensen et al. (1983), O’Leary (1984), and Pasternak (1986), but much more is required to bring the possibilities of saline irrigation to its full potential.

PLANTS AND SALINITY

Most of us take plant life for granted. We are not aware of the fact that in a large number of places in the world the growth of plants is inhibited by stress induced by drought or salinity. In these cases vegetation is rare and very precious. In general, salt has a very hostile effect on plant life. However, in areas with salt affected soils, the demand for vegetation is as strong as in areas with non-saline soils (Kwei and Esmonde 1978; Clouston 1978).

Plants that grow naturally in moderate to high salt concentrations in alkaline and saline soils and water are "halophytes", versus "glycophytes" that grow in absence of Na salts. It has not been agreed upon, however,
whether halophytes only tolerate the salinity or actually thrive in it (Barbour 1970). Also, the level of salinity in soils and water that makes a plant a halophyte has not yet been defined.

Worldwide, plant scientists are increasingly becoming aware of both the need for and the possibility of raising economically useful plants under more saline conditions than has so far been thought possible (Epstein 1980). Thus, there exists the need to select and improve salt-tolerant wild plants to meet the needs of man (Somers 1980). The Environmental Research Laboratory in Tucson, Arizona, and the Ben-Gurion University in Beer-Sheva, Israel, conduct research on the development of new crop plants which are adapted to previously disregarded conditions. For example, drought resistant plants, such as Jojoba (*Simmondsia chinensis*) and Guayule (*Parthenium argentatum*) are grown for cosmetic and industrial wax and rubber production respectively, and plants which withstand salt water irrigation, such as *Salicornia spp.* and *Atriplex spp.*, are grown for oil and fodder production.

**LANDSCAPING OF DROUGHT AND SALT STRESSED ENVIRONMENTS**

Since saline environments predominate arid regions and coastal areas, landscape criteria for halophytes can be derived from the experience with drought tolerant plants. In recent years a significant number of potentially drought tolerant landscape plants have been identified, tested and used. Their widened acceptance and application by the landscape profession in
arid parts of the United States as well as in the Middle East is primarily due to the identification of water shortages. Within the past ten years, national and regional promotions, such as the "Xeriscape Program", have helped to build awareness of the problem and have expanded the interest in drought tolerant plants for landscape use.

Deserts are characterized by extreme environments and these limitations have to be considered in landscaping. Heat and solar radiation are merciless, rare occasions of rain and ever present winds can be torrential and erosive, dust can be very disturbing and destructive, water is scarce and expensive and often of low quality, and plant material is rare and probably known to the desert dwellers as "desert weeds". Yet, plant material can function as a means to modify these conditions (Clouston 1978). In particular, plants in desert surroundings are very beneficial to man's welfare by ameliorating a harsh climate or developing more benevolent microclimates. They may keep hot winds out of desert settlements or control air flow, thus modifying the hot and extreme temperatures and creating more pleasant and cooler climates. They may provide shade which has beneficial effects during hot and sunny days, such as preventing first degree burns from touching cars that are parked in the sun (Clouston 1978). They can reduce glare created by the sun hitting flat, smooth surfaces at an angle, which causes heat build up and which can be eye damaging (Duffield and Jones 1981). They may also stabilize soil and keep it from being subject to deflation and erosion, which is very likely to be caused by the severe desert winds and flash floods. Additionally, plants can protect people from wind blown sand, such as prevent dunes from moving
into settlements, which is commonly observed in deserts in Saudi Arabia and North Africa.

The literature suggests that plants that thrive in saline soils traditionally have not been thought of as landscape plants. As the list of drought resistant landscape plants grows, recognition of the usefulness of salt-tolerant plants increases. While many plants withstand drought (Duffield and Jones 1981), most plants cannot grow in saline conditions. Those plants that thrive in saline soils, however, do not always fulfill the requirements of landscape plants. Since, in deserts and coastal areas, saline soils often exceed non-saline soils and severe droughts are a critical factor limiting plant growth, a list of halo- and xerophytic plant species for landscaping purposes is crucial in desert landscapes. This research is directed to finding solutions to the problem of identifying salt-resistant plant species that are potentially useful as landscape plants.

RELATIONSHIP OF LANDSCAPE ARCHITECTURE TO SALINITY RESEARCH

Professional landscape architects practicing in arid regions and particularly in hot coastal and inland deserts lack information about plant materials suitable for use in dry and saline environments. The task of the landscape profession is stewardship and enhancement of the environment. In a desert urban setting this means improving the quality of life by enhancing the positive qualities and protecting people from negative influences of the
desert. Ecologically, economically and also psychologically, the most desirable way of achieving this is often by using plants. Thus, plant materials need to be understood and their suitability for particular purposes that fulfill these human needs must be identified. A knowledge of salt-resistant landscape plants is therefore of critical importance for the landscape architect in arid and saline environments.
BACKGROUND

The problems of saline and alkaline soils, their vegetation and reclamation have been thoroughly discussed in the literature. Since the early twentieth century biologists, plant physiologists, botanists, ecologists, and the like have been concerned with the salt tolerance of certain plant species and their mechanisms of adaptation to saline environments. Many experiments were conducted with regard to agricultural issues, others are focused mainly on the importance of salt marshes. "... Most of the work on plant salinity tolerance has been done with crop plants. Such information as is available on decorative species tends to be piecemeal and has to be hunted out of the literature" (Willens 1978, p. 52). However, recent findings on the behavior of range plants in arid saline as well as natural salt marsh vegetation in many parts of the world allow conclusions about the potential for landscape use of these plants. Nevertheless, the use of halophytes as ornamentals has hardly been considered and only very few publications are available on this topic.
DEFINITION OF HALOPHYTES

The term halophyte was formulated in the early 19th century by Pallas and reported by the German Scientist Schrader in Goettingen, West Germany (Schrader 1809). It is derived from the greek "halo" (salt) and "phyton" (plant). Halophytes are considered to be those plants "whose protoplasm is resistant against a high percentage of salt" (Uphof 1941), especially against Na-ions. Halophytes grow naturally in alkaline and saline soils or in areas that are inundated by seawater, ranging from marine environments to salt deserts (Flowers 1986).

According to Barbour (1984) the term "halophyte" is not clearly defined. He reported on the obligate halophytic plant, which was defined by Weisenboeck (1969) and classified it in terms of its ability to achieve optimum growth at considerable salinity and also, unlike most salt tolerant plants, reproduce under moderate salt concentrations, in particular to germinate in salt water. He defined halophytes as plants requiring a salt concentration above a minimum of regular nutrient salts, which is less than 0.1%. Maximum limits vary with the habitat and may be very high, such as in sea water inundated conditions. Thus, he only considered plants that literally thrive in saline conditions to be obligate halophytes. This description applies only to Salicornia spp. and some mangrove species, e.g. Rhizophora mangle (Levitt 1980). Other species are believed to grow better under freshwater conditions, but are capable of tolerating saline
environments. While some scientists call these plants salt tolerant or salt-resistant (Menninger 1964, Morton 1981) others call them facultative halophytes (Uphof 1941, Barbour 1984).

The term "salt tolerant" and "salt resistant" is subject to different interpretations in the literature. Menninger (1964) defined salt tolerance as the ability to "tolerate salt in the soil" and to be "uninjured by salt spray". However, he did not give a definite salinity level for salt tolerant plants, nor did Morton (1981). Salt tolerance is defined by Somers (1980) as the sustenance of growth, or partial growth, which commonly decreases as salinity is increased. Salt tolerant plants are characterized by the absence of degeneration in the presence of salt (Smith 1988). These statements exclude productivity and are valid only in the context of mere survival of a plant. However, they include salt avoidance. Levitt (1980) stated that "plants differ widely in salt resistance, from sensitive ones that are prevented from normal growth by low concentrations of NaCl to the most resistant halophytes from saline habitats" (p. 395). He defined salt tolerance (tolerance to osmotic and deficiency stress) as being a subcategory for salt resistance, together with salt avoidance (salt exclusion, excretion, and dilution). However, in the case of halophytes, salt tolerance is the main factor of salt resistance due to the fact that the salt concentration of the cells approaches that of the external medium. Salt-resistant glycophytes and facultative halophytes commonly react to salt stress by avoidance (e.g. salt deciduousness).
The ability of halophytes to tolerate salinity is due to factors, such as the elucidation of salts by the roots (e.g. in certain mangrove genera), water storage in the tissues to balance osmotic pressure (e.g. in *Salicornia* spp. and *Suaeda* spp.) and resulting structural changes to the plant, the annual loss of organs with their contained salts or salt avoidance, (e.g. *Juncus maritimus*), ion accumulation and sequestration, or the excretion of salt through glands in leaves or stems (Poljakoff-Mayber and Gale 1975, Waisel 1972). The main factor of tolerance to high external salinity is defined by the osmotic adjustment within the body of the plant (Flowers 1986), which is the basis for cellular tolerance. Hereby, the plant employs certain physiological regulation and control mechanisms.

Halophytes have a close resemblance to xerophytes due to their similar stress factors. They respond to physically moist soils and water by being physiologically dry, this being a factor of osmotic pressure regulations (Uphof 1941). Halophytes have to endure even greater stress than xerophytes because the total moisture stress in saline soils at the same moisture level is much higher than in salt free soils (Boyko 1966). Most of the halophytes appear to be plants adapted to dry climates, with the exception of some aquatic halophytes. However, mangroves are reported to develop "xerophytic structures in relation to soil salinity" (Walsh 1974, p. 87), although they are plants adapted to tidal inundations and wet soils. On the contrary, facultative hydrohalophytes survive as well in salt-free dry soils as in saline soils (Aronson 1985).
The same disagreement and uncertainty we find with regard to the definition of halophytes also occurs in attempts to classify halophytes. Weisenboeck (1969), Chapman (1974), and Mudie (1974) pursued different strategies with some overlap. Waisel (1972) suggested four different classes according to

cclimate and habitat:

* xerohalophytes: deserts and arid environments
* hydrohalophytes: estuaries, salt marshes, wet soils
* hygrohalophytes: submerged (subtidal growth)
* aerohalophytes: salt spray, salt dust

salt levels:

* miohalophytes: salt tolerant < 5 ppt
* euhalophytes: true halophytes
  - mesohalophytes: 5 to 10 ppt
  - mesoeuhalophytes: 5 ppt to infinity
  - eueuhalophytes: 10 ppt to infinity

response:

* obligate: require salt
* periferential: optimal growth with salt
* supporting (facultative): survive in salt
* accidental: occasionally grow in salt
osmotic regulation:

* euhalophyte: accumulate salt (e.g. *Salicornia* spp.)

* crinohalophyte: excrete salt

* glycohalophyte: restrict salt from tissues

* pseudohalophytes: evade salt (roots reach fresh water, e.g. some *Prosopis* spp., Jojoba).

This paper regards all the mentioned four classes, but categorizes halophytes exclusively according to their salinity levels measured in parts per thousand.

**MEASURES OF SALINITY**

There is no standard method of measuring salt stress, however, deciSieman per meter (dS m\(^{-1}\)) is becoming standardized. At least seven different units of measurement are found in the literature. According to Levitt (1981), no single method of measurement is suitable in all cases of the several kinds of salt resistance.

Salinity may be measured directly as Total Dissolved Solids (TDS), in ppm or ppt, in percent, or sometimes in milligrams per liter (mg/l). Alternatively, it may be measured through the Electro-Conductivity (EC) of the solution. This is commonly expressed in mhos, mmhos, or umhos. EC-measurements depend upon Exchangeable Sodium Percentage (ESP) in the solution as well as temperature. The latest unit for salinity measurements is
decisieman, or dS m$^{-1}$, which is the equivalent to mmhos cm$^{-1}$ (Aronson 1988).

The U.S. Salinity Laboratory Staff (Richard 1954) defined a saline soil as having an EC of the saturation extract greater than 4 mmhos/cm (0.5%) and an exchangeable sodium percentage of 15.

The best way to understand salinity classification is with the relation of any measurement to salinity levels of seawater, which range from 30,000 ppm to 40,000 ppm, or 40 dS m$^{-1}$ to 56 dS m$^{-1}$ (dependent upon the type of ocean).

Based on information in the literature and practicality of this research I recommend the following classification of salinity levels:

<table>
<thead>
<tr>
<th>condition</th>
<th>ppm</th>
<th>ppt</th>
<th>%</th>
<th>mmhos cm$^{-1}$/dSm$^{-1}$</th>
</tr>
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<tr>
<td>fresh</td>
<td>&lt;500</td>
<td>&lt;.5</td>
<td>&lt;.05</td>
<td>&lt;.08</td>
</tr>
<tr>
<td>brackish</td>
<td>500-5000</td>
<td>.5-5</td>
<td>.05-.5</td>
<td>.08-8</td>
</tr>
<tr>
<td>saline</td>
<td>5000-30, 00</td>
<td>5-30</td>
<td>.5-3</td>
<td>8-40</td>
</tr>
<tr>
<td>seawater</td>
<td>32,000-40,000</td>
<td>32-40</td>
<td>3.2-4</td>
<td>40-56</td>
</tr>
<tr>
<td>hypersaline</td>
<td>&gt;40,000</td>
<td>&gt;40</td>
<td>&gt;4</td>
<td>&gt;56</td>
</tr>
</tbody>
</table>

Figure 1: Classification of Salinity Measures
SOILS AND IRRIGATION

Plant life is dependent on soil and water. In saline environments, both soil and water are contaminated with different salts. In order to understand the problems of salinity some information about saline soils and water and their effect on plants is essential. Most of the problems that occur in saline environments involve the clogging up of salt containing soils and thus, the formation of hard pans. In addition, mineral content and ion exchange capacity are important in the understanding of saline soils and waters.

Saline and alkaline soils differ in their values of exchangeable sodium percentage and their pH readings. Saline soils tend to be more acid, as opposed to alkaline soils (Hayward and Wadleigh 1949). Hayward and Wadleigh gave a general reference about soils physiology and soil qualities (saline and alkali soils). "Under normal conditions, soils affect yield through three primary factors: (a) moisture availability, (b) nutrient availability, and (c) physical condition. A forth factor, excess salt, may be present due to the accumulation of chemical components in the soil that are inhibitory to plant growth".

A very simple and easily understandable explanation of saline and alkaline soils was presented by Abrol and Fireman (1977) in their study of soil reclamation procedures. Clogged soils, making water unavailable to the plant, poor aeration, and toxicity characterize many saline and alkaline soils.
The problem of lack of water and salinity was addressed by Bernstein and Hayward (1958): "the available moisture supply in a given soil generally decreases as salinity increases...the higher the salinity, the greater is the residual soil moisture which is unavailable to the plant".

In the course of the biosaline concept, many authors stressed and discussed the restrictions and opportunities of irrigation with brackish and seawater (Framji 1976, San Pietro 1982, Pasternak et al. 1985).

HISTORY OF SALINITY RESEARCH

Historically, the first indication of salinization was given in scriptures of the ancient Sumers, Akkadians and Babylonians. After successfully cultivating their lands for 1000 to 1500 years the Sumers experienced various salinity problems. Their fields started to accumulate salts and thus made them unsuitable for agriculture. Crop failures economically weakened the dynasty and, from 2400 - 1800 B.C. the last Sumerian empire, the third Dynasty of Ur, fell (Reisner 1986, Aronson 1988).

The literature suggests that the first scientific interest in halophyte research originated in Germany in the early 19th century (Schrader, 1809). The first field and laboratory reports appeared in the 1930s, when German scientists discussed the chemistry of halophytes (Zellner 1926), the biology of halophytes (Schartz 1934) as well as various observations of dune
vegetation (Benecke 1930, Beiler 1939) and mangroves (Ascherson 1903; Walter 1936). In the forties, fifties and sixties Israeli researchers were responsible for a boom in saline research, after recognizing the problem of salinity in their country.

In 1941 Uphof collected the first information for a botanical review on the literature. He explained the term halophyte as well as the difference between obligatory and facultative halophytes, including a description of salt marshes and dryland halophytes and their geographical distribution.

In 1972 Casey published a review and selected bibliography on "Salinity Problems in Arid Lands Irrigation". He discussed the major sources of water, soil, and plant research related to salinity problems, that was undertaken in the years from approximately 1935 to 1970; most of the work dates from the 1960s. He mentioned the characteristics of most halophytes as having "stunted appearance, small dark green leaves, succulence, thick waxy cuticles, decreased shoot to root ratio, and appearance of leaf burn patterns". He also described osmotic pressure as well as mineral uptake of halophytes.

After the 70s, research on halophytes became much more detailed. Main contributors were Israeli, Australian, German, and American scientists, but also contributors from Egypt, England, France, the Netherlands, Spain, Mexico, Canada, India, and Pakistan.
In the 1970s three members of the United States National Science Foundation (NSF), Lewis Mayfield, James Aller, and Oskar Zaborsky, formulated the "biosaline concept": to conduct basic research and apply the results to remove handicaps that exist in taking full advantage of soil, brackish water and other unproductive areas. "Poor soils, high solar insolation and saline water, which prevail in arid lands, should be viewed as useful resources rather than as disadvantages" (Pasternak et al. 1985). Most of man's activities to convert the resources offered by desert areas to productive uses are based on modification of the environment to be suitable for plants and animals that are already used in other environments. The removal of salt from brackish water and the use of desalinated water for plant irrigation is not required by natural law (Aller 1980). Therefore, "the concept that could successfully grow plants and trees on soil which is high in saline concentration could be of very great importance to the future agricultural and economic development of many countries where food products are scarce and such areas are vast" (Hollaender 1980, p.5). Since then, the term biosaline has become one of the most important concepts in the problem of salinity. "The biosaline concept envisions the harmonious interplay of biological systems with saline environments for the ultimate benefit to man" (Aller 1980, p.9). San Pietro (1982) summarized all topics discussed in the International Workshop on Biosaline Research in La Paz, Mexico, including the need for economically useful plants in saline environments and their relationship to soil and water conditions.
UNDERSTANDING HALOPHYTES

The fundamental knowledge on the problem of salinity and halophytes was summarized by Waisel (1972). He provided broad coverage of the general problem of salinity and its cause, starting with explanations and origin of the global sources of salinity, saline soils, and saline water. He describes some halophytic plants, their biology, physiology, and adaptation mechanisms, suggests ways for ecological classification, and reports on their distribution.

Chapman (1974) included the basic knowledge and understanding of halophytes and salinity with focus on the salt marshes of the world. Most of his reports were based upon field investigations in British and Australian salt marshes. A classification of halophytes and a thoroughly described world-wide distribution was included. He added a chapter on the potential for economic use and soil reclamation for agricultural purposes, which represented one of the first records of the identification of uses for halophytes.

Poljakoff-Mayber and Gale (1975) emphasized the physiological response mechanisms of plants to overcome or integrate soil and water salinity. Introducing the problems of salinity in a general review, the editors continued with a compilation of reports on soil, water and salinity. Some potential economic uses of mangrove swamps and salt marshes were suggested by Chapman.
The latest review on the topic of halophytes was provided by Flowers (1986). After an introductory overview explaining definitions, occurrence of halophytes, and salinity problems, he continued to describe growth and development, and the cellular basis of tolerance and regulation, giving an excellent technical discussion of halophytes and their salt concentrations and tolerance mechanisms. In a brief paragraph about economic values of halophytes he stated: "They (halophytes) may be useful for grazing or fodder, or as ornamental plants, and have recently been advocated as a source of oils".

ECOLOGY OF DESERT HALOPHYTES

In 1949 Zohary and Orshansky undertook a thorough examination of the halophytic plant communities at the Dead Sea and the Judean Desert in Israel. They published a list of obligatory as well as tolerant halophytic plant species and their descriptions. The following plants "are confined to water bodies permanently carrying saline or brackish water": Phragmites communis, Juncus maritimus, Inula crithmoides, and Aeloropus littoralis. They also described species of Limonium, Mesembryanthemum, and Tamarix in terms of their salt tolerance as well as Atriplex halimus, Suaeda fruticosa, Alhagi maurorum, Nitraria retusa, and Athrocnemum glaucum. Hayward and Wadleigh (1949) reported on figs, grapes, and olives as tolerating minimal salt levels. However, Phoenix dactylifera (date palm) seemed to be the most resistant desert ornamental and fruit plant with a salt tolerance of 10 ppt to 30 ppt.
Fireman and Hayward (1952) mentioned plants as indicators for soil conditions, in particular pH and salinity. They described species of Atriplex as well as Sacrubatus vermiculatus and their occurrence on particular saline soils, the plant response to these conditions, as well as their effect as to the increase of ESP, pH and salinity in the soil underneath these plants.

A more detailed study was conducted by Golegolabe and Zargar (1958). A vegetation survey of the salt desert of Massileh and the classification of the plants according to the salt contents of the soils allowed for the establishment of a list of halophytic plant species for the saharo-arabian deserts. Simonneau (1958) mentioned plant species which occur in soils as saline as other plants (glycophytes) cannot tolerate.

The salt tolerance of Suaeda maritima and its characteristic as being physiologically halophilic have been described by Flowers (1958). He concluded that growth stimulation for Suaeda happens at salt concentrations of 170 - 340 mM, and that the optimum levels of sodium chloride are these of seawater. Other species of the shrubby ground cover Suaeda have been described by many authors (Zid and Boukhris 1977; Storey and Wyn-Jones 1979, Sankary and Barbour 1972).

Barbour (1970) wrote an important report on the question of halophytes as being obligate. He found that only Salicornia thrives in salt, all other halophytes only tolerate it. This was denied by Sankary and Barbour (1972), who proved experimentally that other halophytes, e.g. Salsola vermiculata and Haloxyton articulatum, need certain salt concentration in soil or water.
to grow. *Salsola vermiculata*, *S. foetida*, and *Haloxylon articulatum*, plants mainly distributed in the Middle East and North Africa, proved to germinate well up to 4% NaCl (Sankary et al. 1972).

In a description of saline desert habitats in Egypt and their plant cover, Rahman et al. (1976) showed the qualities of various desert halophytes that mainly belong to the saharo-arabian vegetation classification.

Another good description of wild halophytic plant communities, their distribution and species variety, is given in Danin's (1978) report of the Judean Desert. He found that salinity increases with aridity and as a result of leaf litter from the halophytic semi-shrub vegetation he examined. Danin (1983) also revealed information on desert plant communities, among them some very tolerant halophytes. He described the most common plants in detail, such as *Atriplex spp.*, *Aizoon hispanicum*, *Mesembryanthemum nodiflorum*, and *Tamarix nilotica*.

*Simmondsia chinensis* (jojoba), a plant native to the Sonoran desert, was described by various authors and found somewhat salt tolerant (Al-Ani et al. 1972, Tal et al. 1979, Rasoolzadegan 1980). However, specific salinity levels are not available. Jojoba is a very common shrub used in landscaping of arid environments.

*Tamarisks* (*T. ramossisima*: Kleinkopf 1974; *T. tetragyna*: Kalyr and Poljakoff-Mayber 1976) are very well adapted to the conditions of their
saline habitats. Their salt tolerance and value as landscape plants for screening and windbreaks are appreciated. However, Tamarisks accumulate salt in little drops on their leaves, which drop and seep into the soil. In this way they contribute to increased salinization of their own environments, which does not affect them, but inhibits other plants to grow beneath them (Kelly and Schnadelbach 1976).

In the course of their search for oil producing halophytes, Glenn and Watson (1981) of the ERL in Tucson described a number of halophytic plants that have potential for being used as ornamentals.

*Limonium axillare* (Mahmoud et al. 1983) and *L. vulgaris* (Zid 1977) have been used as landscape plants in the Middle East and are described as evergreen, salt tolerant under-shrubs in wet and dry regions.

Frey and Kierschner (1983) examined the zoning of various halophytes in Turkey, Jordan, and Iran as to their tolerance of salinity. They mainly observed xerohalophytes, such as species of Atriplex, Salicornia, Aeloropus, Tamarix, and Nitraria, as well as *Seidlitzia rosmarinifolia*, *Cressa cretica*, and *Prosopis farcta*. Sarir et al. (1984) from Pakistan listed seven plant species (among them *Acacia jacquemontii*, *Capparis decidua*, and *Tamarix aphylla*) that proved to be salt tolerant in their research.

During an observation of plant adaptation to saline areas, Braidek and Jones (1984) found many species that show tolerance of saline soils in Canadian prairies. In particular, they studied the two plants *Kochia scoparia* and *Atriplex patula var. hastata*. 
Kochia indica (Rezek and Sadek 1984) and K. scoparia (Braidek and Jones 1984) were studied in terms of their potential for halophyte utility and with regard to fodder production. The latter has been used in desert landscaping in Israel (Schaefer 1983).

SPECIES OF ATRIPLEX

Most members of the genus Atriplex are found to be salt tolerant, many of them being true halophytes. The genus comprises about 200 species worldwide (Kelley 1982). It belongs to the Chenopods, which is assumed to include most halophytic plant species. Atriplex seems to be a dryland halophyte that most researchers are interested in (Taft 1980, Somers 1980); many authors involved in salinity research have considered various Atriplex species as their test plant. They seem to have a higher potential of being valuable landscape halophytes than other plant species. Therefore, the species Atriplex is given special attention in the literature review.

Many of the habitats of Atriplex, like rangelands, deserts, and salt marshes, are becoming increasingly important as economically valuable natural resources. As a genus of many adaptations to stressful environments, such as drought resistance as well as tolerance of wet conditions, it is potentially valuable for various resource utilizations. Atriplex is used in soil stabilization, particularly in arid lands, and fire prevention (Kelley 1982). Many authors discovered Atriplex species as being
important sources of animal fodder and forage plant as well as food for birds and rodents (Sankary and Barbour 1972, Wiley-Taft 1980, Kelley 1982, Pasternak 1986). However, the recognized value of Atriplex as low cost maintenance plants along road sides in Middle Eastern deserts is decreased by the fact that free roaming grazing animals prefer the taste of these plants.

The excretion of salt through leaves and the vesiculate hairs as a mechanism for salt tolerance as well as the salt uptake through the root system have been described by many authors (A. hastata and A. vesicaria: Black 1956; A. halimus: Mozafar and Goodin 1970; A. polycarpa: Sankary and Barbour 1972; A. hymenelytra, A. polycarpa, A. canescens: Hunt 1975; A. spongiosa: Zid and Boukhris 1977; Storey and Wyn-Jones 1979; A. patula var. subspicata: Braidek and Jones 1981). McKell (1975) described Atriplex as an "island of fertility" due to its ability to accumulate nutrition beneath the plant, but it also increases the salt content in the soil due to leaf litter. This phenomena was also found by Sharma and Tongway (1973), who reported on A. nummularia and A. vesicaria as increasing soil salinity and pH in the 0 - 15 cm horizon beneath the bushes. During the shedding season after droughts (fall and winter for Australia) the litter of salt rich leaves and fruits is decomposed on the ground and the salts leached into the soil with rain. Some Atriplex species seem to be able to recycle these salt through uptake in their own root systems.
ECOLOGY OF SALT MARSH PLANTS AND MANGROVES

Salt marshes exhibit a great variety of flora and fauna while supporting one of the world’s most complex ecosystems (Carlton 1975, Zedler 1982), which is unique in its position as transition from wet water habitats to dry land habitats. Salt marshes supply a community of organisms dominated by plants that are tolerant of wet and saline soils, partial coverage by tidal waters, poor aeration, and shifting of soil conditions (Joshi and Bhosale 1982). The distribution of salt marshes is worldwide, including littoral and inland marshes, or salines (Chapman 1974). In a survey of the floristic composition of 30 community types and their members in Egyptian salt marshes, Zahran (1982) discovered that 90% of the plants are not only tolerant to saline soils but also to arid climates.

Most salt marsh halophytes reproduce vegetatively, and readily germinate under reduced salinity concentrations, such as exist after rains and floods (Zedler 1982). However, long periods of freshwater inundation kills most halophytes, as observed by the author. The function of a salt marsh ecosystem is strongly influenced by the tidal circulation. Zedler described California salt marsh flora and fauna and their interacting ecosystems, including the endangered species Cordylanthus maritimus. Among other salt marsh halophytes she mentioned Batis maritima, Jaumea carnosa, Frankenia grandifolia, Limonium californicum, Monanthocloe littoralis, as well as the more drought tolerant Distichlis spicata. This plant also grows vigorously in saline soils in New Mexico and Mexico and was found to be
very useful for revegetation of disturbed sites, such as mine spoils and road sites (Cluff 1983). Distichlis palmeri was discovered by Yensen (1982) as a valuable, high protein grain used by native Indians as flour.

Salt marsh reclamation was described by Seneca (1974), Lewis (1982) and Zedler (1984) giving indications of salt measurements, damages to marshes and their elimination, and salt marsh restoration, preservation and management. According to the authors, Spartina alterniflora appears to be very valuable for control of shore erosion, but does not withstand heavy wave action. Plants are grown in special nurseries, however, transplanting methods are not yet fully understood (Seneca 1974).

Mangroves are included in the thorough descriptions of coastal salt marshes in Florida by Carlton (1975, 1977). In most literature the term mangrove is used with a double meaning, indicating either a woody plant formation in tropical and subtropical tidal zones (Barth 1982), which is also called "mangal", or the woody plant species per se. Mangrove is a West Indian name given to a formation of trees and shrubs inhabiting the coast of tropical and sub-tropical seas (Waisel 1972). They are taxonomically not uniform and include at least twelve genera in eight families. Barth describes taxonomy, geographical distribution, and mangrove communities, finding that mangroves are not limited to coastal areas, but also grow inland.

Walsh (1974), in his thorough review of mangroves, described their habitats as being silt, sand, peat, muddy wet soils, and coral reefs. "Salt water per se is not a physical requirement of mangroves" (p. 54). However,
some mangrove species showed increased survival rates at increased salinity levels, and maximum growth occurred at concentrations equivalent to seawater.

Mangroves are of "exceptional biological importance" (Joshi 1982) due to their function as living buffers between land and sea, protection and stabilization of coasts and habitat for wildlife. Teas (1980) and Olmsted (1981) gave a detailed overview of different mangrove species, their habitat, growth, salt tolerance and potential use. The mangrove species *Avicennia maritima* was described in further detail by Danin (1983).

Mangroves are one of the most important sources for timber, fuel, posts, poles, railroad ties, and tannin in the tropics. The members of the family Rhizophoraceae are most often managed. Walsh (1974) and Teas (1980) gave the pros and cons of mangrove silviculture, stating their value for utilization, but also danger for overexploitation. Teas and Sordo et al. (1982) suggested desalinization qualities through salt excretion for many mangrove species, in particular *Avicennia germinans*. They appear to possess an extraordinary ability to remove excess salts from the absorbed water.

**INDICATION OF HALOPHYTES AS LANDSCAPE PLANTS**

Although there is a substantial body of literature that deals with halophytes, the literature available on halophytes as landscape plants is scarce. The Boyko Institutes of Applied Research in Beer Sheva, Israel, and
the ERL in Tucson, Arizona, are currently involved in research on ornamental halophytes. However, specific information is not yet published.

Menninger (1964) described a comprehensive flora of coastal vegetation, mainly in Florida and Tropical America. He did not give concrete measures of salinity, but uses the zonation of vegetation to describe tolerance to salinity. He divided his zones into three belts, of which belt 1 is the most appropriate for the purpose of this study. Belt 1 plants are the ones closest to sea level. "To be admitted to this group, a plant must stand up under the most rigorous conditions. It must tolerate salt in the soil,...be uninjured by salt spray,...be able to withstand sand blasting...and retain its...beauty" (p. 16).

Morton (1981) listed plants for ornamental and landscape use in Florida, including many plants for seashore landscapes. Plants were classed as salt tolerant or salt-resistant according to the degree of damage suffered in saline situations or salt spray exposures. This classification was based on experience and not on water and salt analyses. Therefore, definite salt tolerance levels are not obtainable.

Barrik (1979) limited the salt tolerance levels of studied plants to an average of 2,000 ppm (3 dS m⁻¹) in soils and irrigation water. His classification of salt tolerance involved the plant's ability to be "highly resistant to salt drift and can be used in exposed environments" (p. 5). His listing of salt tolerant Florida landscape plants was informative with the understanding that he rather deals with brackish than saline conditions.
Mudie (1974) addressed the economic uses of halophytes including their ornamental and landscape values. She stated that "the ability of halophytes to tolerate relatively high soil and water salinities invites consideration of their use in agriculture, horticulture, and industry in water-short and saline soil regions". She developed a taxonomic list of 550 species which are members of both dry and wet saline habitats and belong to the general groups of miohalophytes and euhalophytes (see classification). Only part of this list is available in the literature. She listed the halophytes within their botanical families, their use, their salinity group and range of tolerance of salinity.

Kelly and Schnadelbach (1976) discussed the vegetation in Saudi Arabia with potential for the establishment and irrigation of desert landscape plants and described some of the xerophytic and halophytic plant groups (e.g. Atriplex and Tamarix species). Unfortunately, the list of plants is relatively incomplete and the description of some plants as salt tolerant, halophyte, or hammada plant is very vague. Nevertheless, this presentation was based upon personal experience and its value as to how to treat ornamentals in a harsh desert environment should not be ignored.

Kwei and Esmonde (1978) gave a well presented overview of landscape plants in the United Emirates. They focused mainly on drought tolerant plant species, but included salinity levels for most plants. Their source of information regarding salt tolerance is unknown. However, plant descriptions for each plant are profound and accurate.
A valuable source for salt tolerant plants is the publication of the proceedings of two symposia on landscaping the Middle East, held in the U.K. (Cochrane and Brown 1978). Based on personal experience and practice in Middle Eastern deserts, the authors gave descriptions and potential solutions to salinity problems (Willens, p. 50), and suggestions for drought and salt tolerant plant species for landscaping (Lee, p. 84; Glasspoole, p. 123). Aspects on planting and maintenance were included. However, the indications of salt tolerance given are not very detailed.

Two articles in the Garden magazine (Sep/Oct 1986) mentioned recent research in Israel. Cardozo and Hirsch introduced the work on the development of arid-land ornamentals of Dr. Dov Pasternak at Ben-Gurion University of the Negev in Beer-Sheva. Martin, in her article about the salinity research projects of the ERL in Tucson, Arizona, noted: "Israeli researchers were among the first to look at arid lands aesthetics and halophyte ornamentals and they remain in the forefront of ornamentals research".

After a substantial number of experiments carried out during the last five years Pasternak and his study team submitted a progress report that deals with fodder production and ornamentals under seawater irrigation. The research group had studied 150 different plant genera, which have a potential for at least some salt tolerance. They considered these to be representatives of "about 7% of the known halophytes of the world" (Pasternak 1986). Out of these, seventy-eight grew successfully with seawater irrigation; forty-two species failed in the seawater plots, but grew
successfully in the laboratory test plots. Of seven successful Atriplex species, *A. barclayana* produced outstanding results, followed by *A. nummularia*. The research team prepared a computerized global data base of halophytes, with emphasis on their potential economic uses (Aronson 1988).
METHODS

This study is based upon literature review, field investigation, collection examination, and expert survey. Conclusions are drawn from the literature, personal observations and from experiments conducted in various laboratories throughout the world. The major data source is the halophyte collection established at the Environmental Research Laboratory (ERL) in Tucson, Arizona.

The following flowchart illustrates the steps in the methodology:

Figure 2: Flowchart of Research Methodology
IDENTIFICATION OF CONSTRAINTS

The identification of constraints is essential in order to restrict the data collection to the scope of the research. The purpose of this study is: (a) to select those salt-resistant plants that function beyond a salinity level where common glycophytes cannot grow and are therefore outcompeted by halophytes; and (b) to establish categories for uses and functions that are necessary to be fulfilled by any landscape plant, and thus by landscape halophytes.

Range of Salt Tolerance

The first step involved the definition of salinity levels. There is a variety of plants that are known to grow in brackish water and soils considered as slightly saline by the author. These particular plants are commonly used as landscape plants for areas where salts in soil (mostly sandy soils) and irrigation water does not exceed 5 parts per thousand (ppt). The gap in knowledge of functioning landscape plants starts with salt concentrations of 5-10 ppt. There are no plants presently known to survive salt concentrations greater than 50 ppt. Therefore, it was deemed appropriate to limit the screening process to a total range of 5 to greater than 40 ppt (in steps of 5-10, 10-20, 20-30, and 30-40, >40). In other words, the tolerance should range from higher concentrations of brackish water to high salinity levels of seawater. These levels of salinity are critical to plant growth; any plant which does not tolerate salt levels higher than 5 ppt was
considered a non-salt tolerant plant and thus was not included in the selection procedure.

Landscape Criteria

The next step was the preliminary identification of primary characteristics and potential uses of landscape plants in saline arid environments. The data were based upon examples and suggestions in the literature as well as upon personal and professional experience with uses of plants.

This includes characteristics, such as:

* potential for wide geographical distribution
* ease of propagation for establishment in nurseries
* potential for aesthetic enhancement, such as having bright colors and interesting shapes of flowers and fruits, extraordinary form and color of foliage (i.e. silver cast on leaves, decorative growth form such as pagoda shape), and other ornamental characteristics
* tolerance of urban conditions, such as atmospheric pollution, compacted soils, dust, etc.

and potential uses, such as for:

* shade trees
* wind breaks
* dust reduction
* fire retardance
* hundred percent ground cover
* stabilization of erosion prone soils
* sand binders
* soil reclamation
* the preservation and enhancement of existing ecosystems,
  such as wildlife feeding plants, and the ability to provide shelter, protection, and nesting sites.

WORKSHEETS

After the definition of constraints, worksheets (appendix A) were created for the purpose of recording all collected data. These worksheets were handwritten and contained detailed information on each collected halophyte in the form of a check list. The categorization of the worksheets is directly associated with the plant characteristics and uses, which were defined through the identification of constraints. Each selected attribute was meant to identify certain landscape characteristics or uses of the particular plant entered into the worksheet. The lay-out of the list was compiled using ideas and examples from literature on botanical nomenclature and terminology (Wait 1986, Harrington and Durrell 1957).
The main categories are:

* scientific and common name, family, country of origin, 
  ERL ID number
* plant description
* habitat information
* maintenance information
* landscape values
* economic uses

The purpose of the worksheets was to simplify the data accumulation and to assist with the entry of information into a computer data base.

LITERATURE SEARCH

The literature search involved the selection of the most common and widely distributed halophytes discussed in the literature. The criteria for the selection were: salinity levels (tolerance), habitat, abundance, form, type, and information on health and disease resistance of the particular plant.

The essence of this study was derived from literature in related fields, such as biochemistry, botany, plant physiology, soil science, hydrology, ecology, and the like. Most research has been undertaken in these fields, either as field studies or experimental laboratory research.
The types of literature most frequently employed were plant science and ecology journals, and floras (e.g. Zohary 1966, Specht 1972). Textbooks as well as conference proceedings produced another important source of information. Upon request by mail, unpublished papers, other publications and internal progress reports (e.g. progress reports from the Ben-Gurion University of the Negev in Beer-Sheva) were obtained from individual researchers.

The sources used to retrieve most of the literature were the Science Library of the University of Arizona and the library of the Environmental Research Laboratory. Other information was received through Interlibrary Loan with libraries in Florida and California, through the California Sea Grant Program and progress reports written for the ERL.

FIELD INVESTIGATION

Field investigations were conducted in Israel, Egypt, Mexico and the United States. Following the suggestions in the literature review about potential locations of salt-effected soils, additional field trips were undertaken. Encountered species were compared with various authors' reports on the same species, yet in some cases different ecotypes dependent on the particular plant's habitat of the plant described by an author.
The following locations were selected because of geographical diversity, accessibility, and existence of comparable literature on the vegetation of the chosen area. (All latitute information is from Amiran 1973).


2. 1982 - 1985: various places in the Negev Desert in Israel, including the Arava Valley and the Dead Sea (latitude: 30-31°, Dead Sea: 31° N, 400m below sea level).


(Climate and soils for location 1 through 3)

**Climate:** hot and dry summers, rainy season in winter; annual precipitation ranging from 10mm to 80mm; mean annual temperature ranging from 9°C to 28°C, maximum temperature being 46°C (Danin 1983).

**Soils:** sand, loess, regs, hamadas, chalk, marl, clay, and bedded limestone.Regs, hamadas and marl being mostly saline (Danin 1983).


**Climate:** dry summers, rainy season from October to March; annual precipitation averaging 400 mm; mean annual temperature ranging from 10°C to 25°C (Schaefer 1983).

**Soils:** marine sands (sand dunes) and solonchalks (Rodin 1973).


**Climate:** two rainy seasons, one in winter, one in summer; very hot and dry throughout the year; mean annual precipitation ranging from 10mm to 40mm; mean annual temperature ranging from 10°C to 30°C; maximum temperature averaging 46°C (local climatological data).
Soils: Colluvial and alluvial soils and often saline, sandy gravel. Bajadas containing solonchalks and caliche (hardpans) (local data).

6. January 1986: Death Valley, California (latitude: $36^0$ N, 100m below sea level).
Climate: rainy season in winter, slight rains in summer; very hot and very dry throughout the year; mean annual precipitation 30mm; mean annual temperature ranging from $0^0$C to $30^0$C, maximum temperature being $48^0$C (Hunt 1975).
Soils: Bassanite, calcite sand and silt, silt and granular gypsum, highly alkaline; salt crusts up to 30 cm thick in the center of the salt pan (Hunt 1975).

Climate: warm dry summers, cool moist winters; mean annual precipitation 40 mm; mean annual temperature ranging from $10^0$C to $20^0$C, maximum temperature being $32^0$C (Zedler 1984).
Soils: marine sediments, low aeration, hypersaline; semi diurnal tides with tidal amplitude of 1.1m (Zedler 1984).

Climate: hot summers and warm winters; rainy season in the summer; mean annual precipitation ranging from 10mm to 30mm; mean temperature staying below 20°C; mean annual temperature ranging from 10°C to 30°C (Meigs 1973).

Soils: marine sediments, low aeration, semi diurnal tides with tidal amplitude of 7.2m (local data).

COLLECTION EXAMINATION

Observation of the ERL collection over one vegetation period (fall ’87 to summer ’88) granted insight into plant behavior and performance under greenhouse conditions. To date, the collection contains plants from Arizona, California, Hawaii, Delaware, Sonora and Baja California in Mexico, New Zealand, Australia, South Africa, Brazil, Argentina, Chile, Peru, and Israel. The Environmental Research Lab displays 27 species of Atriplex, which have potential value as ornamentals.

The ERL collection is based upon field investigation, seed collection during collection trips (Yensen 1981) and seed donation. Identification of plants was performed with help of the particular floras of the examined areas (Yensen 1981, Watson 1987), or was given with the donated seeds. Only in a few cases were plants received as seedlings or cuttings; most of the plants were established from seed.
Salt tolerance screening was performed on many specimens in the seedling stage, very few plants were tested as cuttings. The plants were planted in 2" square sand plots and put on flood tables. River sand was used in order to prevent salt build-up when the plots dry out between waterings, and to guarantee accurate salt measurements. The test plants were flooded twice daily with nutrient solution at different salt concentrations, starting with 0 ppt, changing to 10 ppt, etc., up to 40 ppt. This irrigation water was prepared to resemble naturally occurring salt conditions, in particular seawater. Irrigation at different salinity levels took place for one week each, except at seawater concentration. Here, plants were irrigated with 40 ppt for more than one week, indicating their potential of tolerance. The number of weeks of seawater irrigation were specially recorded. The general performance of test plants under saline water irrigation was recorded in screening books (Carter 1988).

EXPERT SURVEY

Upon completion of all of the above mentioned screening processes some plants were left for which information on either their definite salt tolerance or on their landscape values was lacking. However, a potential for use as halophytic landscape plants was indicated due to remarks in literature or appearance in field investigation. Since no further information was available, professionals who deal with halophytes were addressed
personally. These professionals are botanists, biologists, range managers, and soil scientists in the U.S.A., Israel, and Australia who have studied various halophytes in context with their interests.

A list of those plants about which information was lacking (appendix B) was sent to the selected professionals, accompanied by a printed form of the worksheets (appendix C). The professionals were asked to enter the plants and the information available to them into the worksheets and, in addition, to answer some specific questions (appendix D) on certain plant material regarding salt tolerance and ornamental value.

**WORKSHEET ENTRIES**

Every datum collected on a particular plant was recorded in the worksheets (one set of worksheets for every single plant), except the data acquired from the expert survey, which were entered by the experts on specially prepared worksheets. Thus, the handwritten worksheets contained all information collected from field investigation, literature search and collection examination, while the data on the worksheets used for the survey were separately entered.
FINDINGS

The attempt to create plant data sheets and a data base of potentially useful landscape halophytes was successful as the first step in a broad research project. The accumulation of results enabled the establishment of the halophyte data base, which to date consists of 97 plant species (appendix I), but is subject to constant expansion, editing and changing. Although the list is incomplete it was possible to accumulate considerable detailed information about most plants selected for the plant matrix.

DATA BASE

A computer data base was created, which was based upon variables related to plant characteristics and landscape uses, as they were indicated in the worksheets. In order to maximize the utility of the data base subcategories were developed in conjunction with data base development, such as growth forms and rates within the category of "plant description", or architectural, landscape, and engineering qualities within the category of "landscape values". Of available data bases, neither CAPS nor D-base could fulfill the needed detail capabilities. The multidimensional character of the necessary plant information pointed to the necessity of employing a more
sophisticated data base, thus R-base was chosen. The final product is a computerized compilation of current halophyte information. It allows for the input of certain attributes, e.g. required salt tolerance, user demands, color of flowers, and so forth, upon an output of appropriate plants, as well as the input of plant species upon the output of their characteristics (see scenarios, appendix H). Thus, specific plant lists, plant data sheets, plant information and possibly, planting specifications can be put together easily and efficiently. It makes possible instant access to plant material information for the design of halophytic landscapes as well as the preparation of a user-friendly information set which can be easily forwarded to different interest groups.

PLANT DATA SHEETS

For users without the possibility of computer access plant data sheets were designed as part of the output of the data base. All currently screened halophytes are listed alphabetically according to their botanical names (appendix I). Since the plant data sheets are computer print-outs of the plant data base they can be modified according to users’ specifications, e.g. lists organized according to the ERL categorization, or lists of various plants combined with various user categories, or lists of plant specification for design and planning purposes.
PLANTS IDENTIFIED

Generally, combining results from the literature search, the ERL collection and the expert survey, provided most useful results. The majority of data for the data base were compiled from these information sources. Field investigations served as an inventory source, upon which the data collection was established. Most plants were found through one of the four methods and then backed up through one or more of the remaining methods (for listing of the sources of selected plants see appendix E).

Literature Review

Literature on studies of Simmondsia chinensis suggested that it is not tolerant of salt concentrations higher than 5 ppt (Razoolzadegan 1980, Tal et al. 1979). Dodonea viscosa was excluded very early in the study due to suggestions in the literature (Duffield and Jones 1981) as to its insufficient tolerance of salinity higher than 2 ppt. For Capparis decidua and various species of Acacias, in particular A. jacquemontii and A. tortilis different authors disagree about their properties in terms of salt tolerance. Due to suggestions in Danin (1983) it was decided to exclude them from the selection for insufficient information on their salt resistance. Further studies on the salt tolerance of Acacia species might, however, encourage their incorporation into the data base upon obtainance of detailed tolerance levels. The endangered species Cordylanthus maritimus has potential ornamental value, but might be difficult to establish in nursery or...
greenhouse conditions. This conclusion has to be further identified.

Field Investigation

The following plants were identified during field investigation trips:

**ISRAEL**

1. Negev Desert:
   

2. Dead Sea:
   
   *Calotropis procera*

3. Mediterranean Coast:
   
   *Oenothera drummondii, Mesembryanthemum spp., Carpobrotus edulis, Glottiphylum spp.*

**EGYPT**

Sinai (Red Sea coast):

*Avicennia maritima*
MEXICO

Puerto Penasco:

Salicornia bigelovii, Suaeda spp., Distichlis spicata, D. palmeri, Batis maritima.

U.S.A

1. Death Valley:

Atriplex hymenelytra, A. canescens, A. polycarpa, Allenrolfea occidentalis, Pluchea sericea, Distichlis spicata.

2. Southern California (coast):

Distichlis spicata, Spartina foliosa, Salicornia virginica, Salicornia bigelovii, Mesembryanthemum crystallinum, M. nodiflorum.

3. Southern Arizona:

Simmondsia chinensis, Dodonea viscosa, Tamarix aphylla, Atriplex spp. (A. canescens).

After the field investigation and in comparison with the literature, many plants were excluded for their lack of ornamental value, for example all species of Salicornia, Salsola and Haloxylon, Kochia scoparia, K. indica and most Suaeda species. Calotropis procera and Clerodendron inerme were considered, however, due to their decorative appearance, despite the fact that both plants perform better in very low salt levels. However, they show sufficient capability to withstand salt concentrations of 5 ppt.
Collection Examination

The examination of the ERL collection revealed a very good performance of *Atriplex nummularia* and *A. lentiformis* as trimmed hedges. The majority of plants in the collection did not survive screening with irrigation water beyond a salt concentration of 10 ppt. The plants with potential for landscaping and which tolerated salinity of 40 ppt for more than one week were:

<table>
<thead>
<tr>
<th>Maireana brevifolia</th>
<th>Atriplex paludosa</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. triangularis</td>
<td>A. barclayana</td>
</tr>
<tr>
<td>A. lentiformis</td>
<td>A. isatidea</td>
</tr>
<tr>
<td>A. cinerea</td>
<td>A. patula</td>
</tr>
<tr>
<td>A. rhagodioides</td>
<td>A. sagittifolia</td>
</tr>
<tr>
<td>A. inflata</td>
<td>A. velutinella</td>
</tr>
<tr>
<td>A. bunburyana</td>
<td>A. lampa</td>
</tr>
<tr>
<td>A. spongiosa</td>
<td>A. vestita</td>
</tr>
<tr>
<td>A. undulata</td>
<td>A. halimus</td>
</tr>
<tr>
<td>A. camarones</td>
<td>A. atacamensis</td>
</tr>
<tr>
<td>A. hastata</td>
<td>A. repanda</td>
</tr>
<tr>
<td>Sesuvium verrucosum</td>
<td>S. portulacastrum</td>
</tr>
<tr>
<td>Crithmum maritimum</td>
<td>Juncus maritimus</td>
</tr>
<tr>
<td>Heliotropium curassavicum</td>
<td>Batis maritima</td>
</tr>
<tr>
<td>Limonium perezi</td>
<td>Rhagodia gauchaudiana</td>
</tr>
<tr>
<td>Monochlamys albicans</td>
<td>Leptochloa uninervia</td>
</tr>
<tr>
<td>Triglochin straada</td>
<td>Puccinellia distans</td>
</tr>
<tr>
<td>Pluchea camphorata</td>
<td>Distichlis palmeri</td>
</tr>
</tbody>
</table>
In the case of *Nitraria retusa*, *Athrocnemum glaucum*, *A. halocnemoides*, and *A. fruticosum* field investigation and collection examination revealed contradictory results. Observance in the field suggested the incompetence of all latter plants to amplify aesthetic value due to their grayish and dilapidated appearance. However, examination of the ERL collection showed their value as ornamentals in enhanced growing conditions. *Nitraria retusa* appeals for its showy red fruit, and all species of *Athrocnemum* are attractive due to their unusual structure.

**Expert Survey**

The response rate of the expert survey was 75%. Eight surveys were mailed, of which two went to Australia, one to Israel, one to France, one to California, one to Florida, and one was mailed within Tucson, Arizona.

The experts agreed with most of the results. They disagreed with the salt tolerance of *Gazania splendens*, which was stated by two out of three sources as tolerating more than 5ppt. Therefore, it was included in the database.
Further disagreement occurred in their personal opinion about the ornamental value of the following five plants:

- **Grindelia squarrosa**
  - no: 80%
  - yes: 20%

- **Gutterrezia amplexicaulis**
  - no: 100%
  - yes: 0%

- **Halocnemum strobilaceum**
  - no: 80%
  - yes: 20%

- **Halopeplis amplexicaulis**
  - no: 100%
  - yes: 0%

- **Seidlitzia rosmarinifolia**
  - no: 40%
  - yes: 60%

Conclusively, only **Seidlitzia rosmarinifolia** was included in the data base with the indication of possible disadvantages, such as being weedy and invasive, which were the major reasons that only 60% of the experts qualified this plant as ornamental.

Recommendations on **Enchylaena tomentosa** were exclusively taken from the survey, this being the only data source. All participants of the survey commented very positively on its salt resistance as well as potential landscape use.

The following plants were eliminated due to their insufficient salt resistance, as recommended in the survey:

- **Artemisia monosperma**
- **F. pseudo-sycomorus**
- **Oenothera drummondii**
- **Ruellia ciliosa**
- **Z. spina-christi**

- **Eleagnus pungens**
- **Melia azadarach**
- **Parkinsonia aculeata**
- **Rusellia juncea**
- **Ziziphys iujuba**

- **Ficus retusa**
- **Nerium oleander**
- **Pittosporum tobira**
Aizoon hispanicum and Prosopis farcta, which were identified as suitable in the literature as well as through field observations, received criticism by two experts referring to their disadvantages. *A. hispanicum*, as an annual, has high maintenance requirements and a very low reseeding rate. Thus, it was suggested to use perennial species such as *A. canariense*. *P. farcta* is known as a noxious weed, which can be beneficial as a pioneering plant for revegetation, and disadvantageous in terms of being invasive and possibly destructive to less competitive plants. Both, *A. canariense* and *P. farcta*, were included in the data base with indication of their possible disadvantages.

**PLANT CHARACTERISTICS AND LANDSCAPE VALUES**

The plants selected and entered in the data base (see Plants Identified, p. 57 and Plant Data Sheets, appendix I) cover a broad and diverse range of different landscape features. Under optimal growing conditions, which are individually different and dependent upon environmental factors, such as salt concentrations, soil conditions, humidity, irrigation and so forth, the following list indicates the distribution of the 97 plants screened to date:
tall trees 8%  bedding plants 29%
small trees 10%  vines 2%
large shrubs 40%  ornamental grasses 6.5%
small shrubs 66%  turf grasses 5%
ground covers 15%  annuals 9%

(The percentages do not add up to 100%, because many plants incorporate more than one growth form, e.g. a plant can be an annual, a grass and a ground cover at the same time).

The majority of the selected plants prefer salt concentrations of lower intensity. Some of them survive higher concentrations, however, they display characteristics which decrease their value as landscape plants. *Calotropis procera*, for example, becomes "salt deciduous", a typical behavior of salt avoidance, which causes the tree to shed its leaves.

There is a definite gap noticeable in the distribution of plants at the 10-20 ppt and the 30-40 ppt limit. The following distribution of salt concentrations was found:

- 5 - 10 ppt 14%
- 10 - 20 ppt 31%
- 20 - 30 ppt 18%
- 30 - 40 ppt 32%
- > 40 ppt 5%
The high distribution values at the salinity levels of 10-20 ppt is attributed to the fact that the majority of selected plants accept this "moderate" range of salt concentration. The high distribution in the 30-40 ppt range is due to the abundance of Atriplex species among the chosen halophytes (23%). Most Atriplex species tolerate relatively high salt concentrations and can be irrigated with 75% to 100% seawater.
DISCUSSION

Salt affected lands, like coastal marshes, inland deserts, and saline rangelands, are productive, functioning ecosystems. With proper management they can remain productive and very beneficial for man. Productivity can even be increased without loss of their ecological function, and without great economic input (Kelley 1982). Proper management requires the understanding of soil, plant and water relationships in salinity affected areas.

Most of the world's salt affected soils lie within impoverished or third world countries where desalinization techniques or the pumping of fresh water for irrigation purposes is highly uneconomical, as well as unethical: "an importation of water is an importation of culture" suggested the American poet Gary Snyder (Kelley 1982). The utilization of nuclear power for the desalinization of seawater, so less costly than conventional methods of desalinization, is environmentally doubtful. It is ecologically inefficient to create new fresh water ecosystems where salt water ecosystems are prevalent, while decreasing the ground water table and thus the availability of potable water sources elsewhere.
Therefore, the utilization of saline soil and water resources and related plant life is the most ethically, economically, and ecologically efficient way to manage vegetation in the future. This applies to crops as well as to landscape plants.

SUMMARY OF RESULTS

The primary contributions of this study are the initial inventory of halophytes and the identification of halophytes regarding their utility as landscape plants. Worldwide, 97 salt tolerant landscape plants were identified and tested for salinity levels ranging from 5 ppt to 40 ppt. The information was compiled during field investigations, with help of a literature review, the examination of the ERL halophyte collection and by conducting an expert survey. Literature research and ERL collection examination revealed the majority of data. The information about every single plant was verified by at least two out of the four methods. Some plants, which initially were considered applicable for entry into the data analysis, were abandoned after further evaluation according to contradictory information given in the remaining sources, or for the fact that they did not correspond with plant characteristics and user categories which were established in the methodology.

The information about the landscape halophytes was organized into a systematic data base for the purpose of categorizing and making readily available data that have been collected and any future data that will be
collected relevant to landscape halophytes. The data base is intended to enhance the marketability of ornamental halophytes as an instant tool in the planning and design of "biosaline landscapes". In addition, it enhances the manageability of existing and future information on halophytes.

Taxonomic differences appeared in the case of some species. *Maireana sedifolia* is listed as *Kochia sedifolia* in most Middle Eastern literature. *Prosopis farcta* shows as *Prosopis farcata*. *Limonium axillare* is also reported as *Limonium auxillare*, and *Seidlitzia rosmarinifolia* is also known as *Seidlitzia rosmarinus*. *Carpobrotus edulis* and *Mesembryanthemum edule* appear to be the same plant. The fact of many halophytes displaying various ecotypes creates a problem in the use of the data base. In the data base, ecotypes are distinguished by their ERL identification number.

ASSOCIATION OF PLANT CHARACTERISTICS AND USER VALUES

The categories and attributes in the data sheets were selected to describe the plants and their landscape values. A plant's potential for landscaping is attributed to its characteristics and qualities, such as:

* ornamental value, enhanced by bright showy flowers and fruits, foliage contrasting in color and texture, growth form, etc.;
* functions as a shade tree due to large canopy and dense leaf structure;
* ability to reduce dust by covering the ground;
* blockage and diversion of the wind or reducing wind velocity through a dense barrier of foliage;
* capability to stabilize soils employing vast and extended root systems;
* pioneer plants for ability to withstand poor environmental conditions and grow in disturbed soils.

The tables in appendix G may provide some understanding of the relationship between plant characteristics and their landscape uses as they appear in the data base. The tables illustrate the association between user categories and plant characteristics for the purpose of easy reference to attributes which identify a plant as a landscape plant. Some of the categories lack detailed background information and thus can only be assumed. For example, fire retardance is dependent, among others, on low oil content and high relative moisture content within the plant, which is difficult to measure. Thus, information about fire retardance is mainly obtained from the literature and not derived by the author. The tolerance of city conditions is mainly influenced by the plant’s tolerance of compressed soils, high air pollution and dust. Only dust tolerance can be derived by observation of certain plant characteristics. Comments on maintenance recommendations and other landscape qualifications, such as tolerance of compacted soils and atmospheric pollution, as well as canopy density, are not available for halophytes. Some plants, like *Alhagi maurorum* and *Prosopis farcta* were observed as being weedy and invasive. This is indicated in the data base. Data on ecological behavior, such as competition, were not always obtainable. Zedler (1982, 1984) described the interaction of fauna and flora in California salt marshes. This information is potentially useful for conclusions about the ecological value of some halophytes, such as providing nesting sites, cover, or food sources for wildlife.
Many of the plants included in the data base might not be considered ornamental appealing. However, these plants fulfill important qualities in landscape engineering, such as soil stabilization, afforestation, or fire prevention. Other economic uses are indicated in the data base with no declaration of completeness. Some of these uses might contradict the use as an ornamental landscape plant, e.g. in the case of some Atriplex species which are also valuable forage plants and thus subject to grazing.

**ECOTYPES**

In every environment selective pressure is imposed on the vegetation, which enhances competitiveness of a plant species, community, or an entire ecosystem. The harsher the conditions the more tolerant of these conditions a plant has to be in order to survive. Extreme environmental stress, such as cold, heat, drought and/or salinity, demand certain adaptation mechanisms from a plant for survival (Levitt 1980). These adaptation mechanisms can be temporary or permanent. They mostly result in some changes in the plant, which can be of morphological, anatomical, phenological or physiological manner (Waisel 1972). All these changes can be genetically fixed within one type of a certain plant species. The plant with these "different" appearances are called ecotypes.

Various ecotypes of a plant genus may display different kinds of tolerance toward salinity (physiological change), or different cycles of flowering and fruiting (phenological change). Morphological and anatomical
changes are most important for this study of landscape halophytes. Morphological changes appear within the structure of a plant, whereas anatomical change applies to plant parts and organs.

Ecotypes are characterized by their own specific environment, therefore, it is important to catalog the exact location of the origin of the seed or plant. Because ecotypes are genetically determined, plant reproduction displays the same ecotypical characteristics as the original plant germplasm. For example, four ecotypes of \textit{Sesuvium portulacastrum} display different morphological and anatomical features depending on their habitat. The ecotype collected in Brazil has big purple flowers and small succulent leaves, most leaves and stems being dark red. The ecotypes from Peru and Israel show similar flowers as the one from Brazil, but their leaves are much bigger, less succulent and deep green in color. In contrast, the ecotype from Mexico (Baja California) has tiny white flowers and very small, fleshy green leaves. \textit{Atriplex lentiformis} specimens from Mexico show big grayish leaves that are slightly curled on the edges, while another ecotype of the same species from South Africa displays very small, light green leaves which are completely curled.

It is, therefore, very important to classify the particular ecotypes of a plant for the purpose of cataloging. So far, the solution to this problem has been the exact organization and administration of plants according to their catalog number (which appears as "ERL ID #" in the data base). In this way, a customer who values a \textit{Sesuvium portulacastrum} for its purple flowers will not mistakenly receive an ecotype from Mexico with white
flowers, only because the ecotype or catalog number was disregarded. The
taxonomic identification of ecotypes within the ERL collection according to
their varieties and subspecies is foreseen in the future.

FURTHER RESEARCH

This study is intended only to represent the first step in a chain of
studies. It was performed to compile all available information and clear the
path for more experimental and practical applications. The plant data sheets
do not claim completeness and might even exhibit some mistakes that
hopefully will be corrected through future research.

The following are recommendations for further work in this field:

* The plant data sheets should be evaluated, revised and expanded
  following field experience as well as experiments.
* Field testing should be the major consideration of future work. The
  ERL in Tucson and the Ben-Gurion University in Beer-Sheva, Israel,
  presently operate field tests for halophytic ornamentals. Another
  opportunity is provided by the test plots of the Agricultural
  Experimental Station and the Agricultural Extension Service of the
  University of Arizona, as well as the Soil Conservation Service.
* The identification of ecotypes, subspecies and varieties, and the
  taxonomical correction of species identification should be pursued
  with all plants included in the data base as well as for the ERL
collection.
Actual experience with the use of halophytes in landscaping should be evaluated. The Solar Oasis Project of the ERL could be a potential test source. It would be helpful to emphasize the competitive behavior of plants as well as their growing conditions and maintenance requirements.

The validity of the plant data sheets should be established. This could be achieved by the distribution of the list and representative plants among professionals (nurserymen, horticulturist, gardeners, landscape contractors, and landscape architects) for the establishment of new landscape criteria. The criteria proposed in this paper can be compared with criteria established by the professionals. Recommendations can be made as to whether the selected plants deserve more attention.

Information which is directly related to landscape uses of halophytes and which is not currently available should be accumulated. This includes: data on canopy density for shade trees, dust reduction and wind breaks; tolerance to urban conditions, such as compacted soils, atmospheric pollution, etc.; pest and disease resistance; frost recovery; ease of propagation; ecological value; and many more.

To enhance the utility of the data base as a tool for landscape planning in saline environments it should be regularly maintained and edited, and expanded to include a list of planting specifications, such as container size, plant size, and other shipping information.
Halophyte (gr. hals = sea, salt; phyton = plant): A halophyte is a plant that grows in saline environments. The ability of this group of plants to tolerate salinity is basically formed by the elucidation of salt by the roots, water storage in the tissues to balance osmotic pressure, or the excretion of salt through glands in leaves or stems (Poljakoff-Mayber and Gale 1975, Waisel 1972). It has not yet been agreed upon whether halophytes only tolerate the salinity or actually thrive in it. Also, the level of salinity in soils and water that makes a plant a halophyte has not yet been defined.

Hydrohalophyte (gk. hudor = water): A hydrohalophyte is a halophyte which prefers wet growing conditions.

Xerohalophyte (gk. xeros = dry): A xerohalophyte is a dryland halophyte being mostly drought tolerant.

Xerophyte: A xerophyte is a drought loving plant, which thrives in dry soils by employing different stress avoidance mechanisms, such as reducing its life cycle to a short period of time (annuals), or dormancy during times of stress.

Glycophyte: Glycophytes are "sweet" plants that cannot grow in the presence of Na salts (Levitt 1980).
**Parts per million (ppm):** Parts per million is a measure of salinity by weight of the dissolved matter in million parts of water. Ppm is numerically about equivalent to milligrams per litre.

**Parts per thousand (ppt):** Parts per thousand measures salinity in thousand parts of water.

**Percent (%):** Percent is applied as percentage of salt particles in the solution, measured in hundreds.

**Milligrams per litre (mg/l):** Milligrams per litre translates into milligrams of solute per litre of solution.

**Millimhos per centimeter (mmhos/cm, mmhos cm⁻¹):** Millimhos is a measure of salinity and a unit for the expression of electro conductivity, usually taken at 25⁰ C. It is derived from mho which is the reciprocal of ohm. It is normally quoted as EC x 10³.

**Micromhos per Centimeter (umhos/cm, umhos cm⁻¹):** Micromhos, or EC x 10⁶, is often found as an equivalent measure of salinity.

**DeciSieman per meter (dS m⁻¹):** DeciSieman per meter, or Sieman per centimeter (S m⁻¹), is equivalent to mmhos cm⁻¹.
**Electro-conductivity (EC):** The electro-conductivity is the ability of a solution to conduct or transmit electrical charge. It serves as a measurement for the degree of salinity of a particular solution and is a means of expressing the salinity of a soil in terms related to plant growth. The U.S. Salinity Staff (1954) defined a saline soil as having an EC of the saturation extract of greater than 4 millimhos/cm (0.5%). 3 mmhos/cm is roughly equivalent to 0.1% salt on the dry soil basis.

**Total Dissolved Solids (TDS):** The total dissolved solids presumably act to limit plant growth through the deleterious effect of soil solution osmotic potential (Casey 1972). The TDS is a direct measure of salinity.

**Exchangeable Sodium Percentage (ESP):** The exchangeable sodium percentage indicates the degree of saturation of the soil exchange complex of sodium and is expressed as a percentage of the cation exchange capacity (Salinity Laboratory Staff 1952). It states the level of Na in the soil. The higher the ESP the higher the soil alkalinity and the directly correlated pH-value, which decreases soil permeability to water.

**Saline Soil:** A saline soil displays excess salts, mostly soluble salts, with an EC above 4 mmhos/cm, a pH below 8.5, and an ESP below 15%. It is characterized by (a) increased osmotic pressure of soil solution and decrease in physiological availability of water to the plant, and (b) concentrated soil solution conducive to accumulation of toxic quantities of various ions within the plant (Hayward and Wadleigh 1949).
Alkaline Soil: Alkaline soil is a saline soil with an EC above 4 mmhos/cm, and ESP above 15%, and a pH above 8.5. Chemically, alkalinity is a reflection of the amount of exchangeable Na present, and physically, a condition of poor soil structure resulting in low soil hydraulic conductivity and aeration (Casey 1972). It is characterized by (a) high percentage of adsorbed alkali cations on the exchange complex of these soils which depress the availability of calcium and magnesium, (b) hydroxyl ion sufficiently high to be toxic to the plant, and (c) accumulation of adsorbed Na on the exchange complex which disperses the effect on the soil and destroys the permeability to water and air (Hayward and Wadleigh 1949).

Seawater: Seawater is of high salinity. Salt levels vary depending on the location. Smaller oceans or interior seas have higher salt rates than larger oceans. The salt concentrations of seawater range between 30 ppt and 40 ppt.

Brackish Water: Brackish water is water of relatively low salinity, ca. 500-5000 ppm dissolved salts (Pasternak and San Pietro 1985).

Ecotype: An ecotype is a plant that displays different phenological, physiological, morphological, or anatomical features as a result of stress. Ecotypes are taxonomically expressed as subspecies (ssp.) for phenologic change or variety (var.) for genetic change.
HALOPHYTES - WORKSHEETS

APPENDIX A: Worksheets

ENTITY ID #:  
SCIENTIFIC NAME:  
COMMON NAME:  
FAMILY:  
COUNTRY OF ORIGIN:  

PLANT DESCRIPTION

• GROWTH FORM:
  - large tree  - small tree (12'-24')  - large shrub (6'-12')  - small shrub  
  - ground cover  - grass  - vine  - bedding plant

• GROWTH RATE:
  - fast  - medium  - slow

• MATURITY HEIGHT (meters):
  - < 1.2  - 1.2 - 1.5  - 1.5 - 2.1  - 1.3  - 2.1 - 3.5  - 3.5 - 5.0  - 5.0 - 10.0  - 10.0 - 20.0  - 20.0 - 40.0  - > 40

• PLANT TYPE:
  - annual  - perennial  - succulent  - herbaceous  - woody  - rosette (fern)  - palm  
  - conifer  - broadleaf  - evergreen  - drought deciduous  - frost deciduous  - salt deciduous

• GROWTH HABIT:
  - horizontal  - vertical  - branching  - weeping  - arching  - spreading  - mounding  - trailing  
  - columnar  - pagoda  - triangular  - conical  - umbrella  - dome  - vase  - oval  - round

• TRUNK:
  - type:  multi  - single  - straight  - leaning  - armored
  - color:  green  - yellow  - red  - white

• FOLIAGE:
  - type:  simple  - compound  - pinnate  - bipinnate
  - ARRANGEMENT:  alternate  - opposite  - clustered  - whorled  - fascicled
FOLIAGE (continued)

SHAPE: scale-like, awl-shape, linear, oblong, spatulate, elliptic, lanceolate, ovate, obovate, triangular, fleshy

BASE: cuneate, attenuate, cordate

TIP: acute, acuminate, mucronate, truncate, emarginate

SURFACE: pubescent, vesicular hair, hispidulous, glaucous, rough, smooth, dull, shiny, sticky, waxy, fine, solid, leathery

COLOR: light green, dark green, reddish, blueish, silver, gray, yellow, fall coloring

FORM: small, medium, large, dense, sparse

FRAGRANCE: significant, insignificant

FLOWERS:

SEASON: JAN, FEB, MARCH, APRIL, MAY, JUNE, JULY, AUG, SEP, OCT, NOV, DEC

TYPE: simple, compound

ARRANGEMENT: solitary, clustered

SHAPE: rotate, capitulate, funnel, salver, bilabiate, papilionaceous

COLOR: white, cream, yellow, orange, red, pink, purple, lavender, dark blue, light blue, bicolor, edgy, insignificant

FORM: small, medium, large, dense, sparse

FRAGRANCE: significant, insignificant

POLLINATION: wind, blown, insects, animals, water-flushed

SEX: unisexual, monoecious, dioecious

FRUIT:

SEASON: spring, summer, fall, winter

TYPE: simple, complex, infertile

ARRANGEMENT: solitary, clustered

SHAPE: pod, capsule, cone, follicle, nut, grain, berry

FORM: small, medium, large, dense, sparse

COLOR: gray, brown, black, white, yellow, red, purple, white, green

用途: edible, poisonous
- ARMOR:
  long thorns short thorns spikes fuzz

- Roots:
  rhizomes corn bulb tuber fibrous lateral tap air-roots roots at nodes

HABITAT INFORMATION

- EXPOSURE:
  aridity humidity sun part-shade shade wind dust reflected heat cold

- HARDINESS:
  tender (≥32°F) half-hardy (≥20°F) hardy (<20°F)

- WATER:
  drought resistant low (dry) average high (ample) flooding

- SOIL:
  acid alkaline neutral clay loam sandy-loam sand silt humus peat thick thin withstands poor soil

- SALTS (ppm):
  WATER: 5-10 10-20 20-30 30-40
  SOIL: 5-10 10-20 20-30 30-40

- POPULATION ABUNDANCE:
  endangered rare abundant cultivated plant
MAINTENANCE INFORMATION

- PROPAGATION:
  cuttings division layer seedlings seed spores bulb rhizomes suckers

- TRANSPLANTING:
  easy intermediate difficult not recommended

- PLANTING TIME:
  spring summer fall winter any time

- SOIL SUBSTITUTES:
  fertilizers minerals mulch vermiculite gravel glaring-reduction

- CULTURE:
  mulching weeding airming burlapping staking pruning grafting
  low intermediate high

- PESTS & DISEASES:

- GROWING PROBLEMS:


LANDSCAPE VALUES

• ARCHITECTURAL:
  espalier trellis masonry screen hedge row street tree bedding
  natural fencing shade non-walk-on ground cover walk-on ground cover
  containers hanging baskets patio rock-garden turf

• ENGINEERING:
  bank cover barrier erosion control sand binder soil stabilization
  revegetation soil reclamation wind break dust break noise barrier
  soil moisture retaining fire retardant afforestation pioneer

• DESIGN:
  accent fragrance ornamental color foliage form space creator
  view creator visual screen silhouette specimen canopy filler

• PHYSICAL SCREENING:
  impenetrable moderate light dangerous narrow wide high short

• LANDSCAPE THEME:
  rustic formal natural desert tropical oriental transitional understory

• DISADVANTAGES:
  thorns litter poisonous pests very tender brittle/fragile slow growth
  slow germination low germination rate hard to propagate salt deciduous
  increased salinity in soil will die if overwatered fire-prone allergenic invasive
  weedy
ECONOMIC USES:

- PARTS:
  bark  sap  root  flower  fruit  leaf  whole  plant

- MEDICINAL:
  medicinal

- EDIBLE:
  grains  foods  oil  drinks

- ANIMAL:
  forage  wildlife

- INDUSTRIAL:
  dye  wax  oil  rubber  soap  baskets  rope  tannin  timber

- FUEL WOOD:
  fuel  wood

- FLOWERS:
  cutting  flowers
APPENDIX B: List of Plants for Expert Survey

List of plants to enter in enclosed plant list-worksheet

Alhagi maurorum
Aizoon hispanicum
Aristida ssp. (species that you find applicable)
Artemisia monosperma
Demostachya bipinnata
Enchylaena tomentosa
Gazania splendens
Myoporum parviflorum
Ruellia ciliosa
Rusellia juncea
Seidlitzia rosmarinifolia
Sesbania grandiflora
Spergularia diandra marginata
Thespesia populnea

Please, if any of these plant are known to you, fill all the information into the provided plant worksheet. Thank you very much for your help.
APPENDIX C: Expert Survey

HALOPHYTES

Plant List - Worksheet

Scientific name: ____________________________ Common name: ____________________________
Family: ____________________________ Country of Origin: ____________________________

Plant Description:

* Growth Form:
  - large tree
  - small tree
  - large shrub
  - small shrub
  - ground cover
  - grass
  - vine: self-climbing
  - vine: supported
  - bedding plant

* Growth Rate:
  - fast
  - medium
  - slow

* Mature Height:
  - < 20 cm
  - 20 – 50 cm
  - 50 cm – 1 m
  - 1 – 5 m
  - 5 – 10 m
  - 10 – 15 m
  - 15 – 20 m
  - > 20 m

* Flowers:
  - spring
  - summer
  - fall/autumn
  - winter

* Plant Type:
  - annual
  - perennial
  - succulent
  - herbaceous
  - woody
  - rosette
  - palm
  - conifer
  - broadleaf evergreen
  - drought deciduous
  - frost deciduous

* Plant Type:
  - annual
  - perennial
  - succulent
  - herbaceous
  - woody
  - rosette
  - palm
  - conifer
  - broadleaf evergreen
  - drought deciduous
  - frost deciduous

* Growth Habit:
  - branching
  - weeping
  - vertical
  - horizontal
  - columnar
  - mounding
  - spreading
  - oval
  - round
  - triangular
  - vase shape
  - trailing
  - conical
  - dome
  - ellipsoid

* Armor:
  - long thorns
  - short thorns
  - spikes
  - fuzz

* Armor:
  - long thorns
  - short thorns
  - spikes
  - fuzz

* Roots:
  - rhizome
  - bulb
  - tuberous
  - lateral
  - fibrous
  - tap
  - corm

* Roots:
  - rhizome
  - bulb
  - tuberous
  - lateral
  - fibrous
  - tap
  - corm

* Foliation:
  - simple
  - compound
  - alternate
  - opposite
  - clustered
  - linear
  - oblong
  - elliptic
  - lanceolate
  - ovate
  - obovate
  - rough
  - vesicular hairs
  - smooth
  - dull
  - shiny
  - sticky
  - light green
  - dark green
  - yellow
  - bluish
  - gray-green
  - silver
  - fall color
  - small
  - medium
  - large

* Pollination:
  - wind-blown
  - insects
  - animals

* Pollination:
  - wind-blown
  - insects
  - animals

* Fruit:
  - spring
  - summer
  - fall/autumn
  - winter
  - infertile
  - pod
  - capsule
  - follicle
  - nut
  - grain
  - berry
  - color: __________
  - edible
  - poisonous
Habitat Information:

* **Exposure:**
  - aridity
  - humidity
  - cold
  - sun
  - part-shade
  - shade
  - wind
  - dust
  - reflected heat

* **Frost Recovery:**
  - fast
  - medium
  - slow
  - none

* **Hardiness:**
  - tender (> 32°F)
  - half-hardy (> 20°F)
  - hardy (< 20°F)

* **Soils:**
  - acid
  - alkaline
  - neutral
  - clay
  - loam
  - sandy-loam
  - sand
  - silt
  - humus
  - thin
  - thick

* **Water:**
  - drought resistant
  - low (dry)
  - average
  - high (ample)
  - flooding

* **Salts (ppt):**
  - 5-10
  - 10-20
  - 20-30
  - 30-40

* **Abundance:**
  - endangered
  - rare
  - abundant
  - cultivated

Maintenance Information:

* **Propagation:**
  - cuttings
  - division
  - layer
  - seedlings
  - spores
  - bulb
  - rhizomes
  - other: _______

* **Transplanting:**
  - easy
  - intermediate
  - difficult
  - not recommended

* **Planting Time:**
  - spring
  - summer
  - fall/autumn
  - winter

* **Soil Substitutes:**
  - fertilizers
  - minerals
  - mulch
  - vermiculite
  - gravel
  - glazing reducers

* **Culture:**
  - mulching
  - weeding
  - pruning
  - staking
  - airing
  - low
  - intermediate
  - high

* **Pests/Diseases:**
  - __________
  - __________
  - __________
  - __________

* **Growing Problems:**
  - __________
  - __________
  - __________
  - __________
Landscape Values:

* Architectural:
espalier
trellis
masonry
foundation
screen
hedge
row
bedding
street tree
natural fencing
background
shade
ground cover
containers
hanging baskets
patio

* Physical Screening:
  impenetrable
  moderate
  light
dangerous
  narrow
  wide
  high
  short

* Engineering:
  bank cover
  barrier
  erosion control
  sand binder
  soil stabilization
  revegetation
  soil reclamation
  wind breaks
  noise barrier
  moisture retainer

* Disadvantages:
  thorns
  litter
  poisonous
  increases salt
  dies if overwatered
  pests
  very tender
  brittle/fragile
  slow growth
  low germination
  hard to propagate
  allergenic

* Design:
  accent
  fragrance
  ornamental
  color
  foliage
  form
  space-creator
  view-creator
  specimen
  visual screen
  canopy
  filler

* Site Location:
  north
  south
  east
  west

* Uses:
  medicinal
  edible
  food production
  animal fodder
  industrial
  indicator

* Remarks/Comments:

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
APPENDIX D: Questions for Expert Survey

Questions:

I would appreciate it very much if you could give me some information about the salt tolerance and salinity levels of soil and water for the following plants:

Acrostichum aureum
Alhagi maurorum
Aizoon hispanicum
Aristida spp.
Armeria maritima
Artemisia monosperma
Cocos nucifera
Demostachya bipinnata
Eleagnus pungens
Enchylaena tomentosa
Ficus retusa
F. pseudo-sycomorus
Gazania splendens
Inula crithmoides
Iva xanthifolia
I. frutescens
I. imbricata
Luniziera sp.
Melia azadarach
Myoporum parviflorum
Nerium oleander
Oenothera drummondii
Orthocarpus luteus
Parkinsonia aculeata
Prosopis farcta
Punica granatum
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<tr>
<th>Plant Name</th>
<th>Value as Ornamentals</th>
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<td>Ruellia ciliosa</td>
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<td>Rusellia juncea</td>
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<td>Seidlitzia rosmarinifolia</td>
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<td>Spergularia diandra</td>
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<td>S. marginata</td>
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<td>Thespiesa populnea</td>
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<td>Thevetia nereifolia</td>
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<td>T. peruviana</td>
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<td>Trachomitum venetum</td>
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<td>Ziziphus spina-christi</td>
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<td>Z. jujuba</td>
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In addition, I would like to ask you for your personal opinion on the value as ornamentals for the following plants:

- **Grindelia squarrosa**: yes no
- **Gutierrezia amplexicaulis**: yes no
- **Halocnemum strobilaceum**: yes no
- **Halopeplis amplexicaulis**: yes no
- **Seidlitzia rosmarinifolia**: yes no
<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Literature Review</th>
<th>Field Observations</th>
<th>Collection Examination</th>
<th>Expert Survey</th>
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Symbols:

\[ \boldsymbol{\bullet} \] = necessarily contributes to particular landscape use.

\[ \bigcirc \] = does not contribute; has a negative effect on particular landscape use.

\[ \square \] = does not apply; might enhance the value, but does not necessarily contribute to the particular landscape use.
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Table 7: Landscape Values influenced by Soil, Distribution, Propagation, and Maintenance
APPENDIX G: Glossary for Worksheets and Data Base

-0-: no data available or not applicable.

GENERAL INFORMATION

ERL ID #: Categorization of halophytes within the ERL halophyte collection.
Scientific Name: Botanical nomenclature; genus, species and variety of plant.
Common Name: English name, if existing.
Family: Family within the plant kingdom.
Country of Origin: Area or country a particular plant is native to or is commonly occurring.

PLANT DESCRIPTION

Growth Form: Form and descriptive growth term of particular plant.
- large tree: A woody plant that produces one main trunk and a more or less distinct and elevated head; taller than 10 meters.
- small tree: same as above; between 5 and 10 meters.
- large shrub: A woody plant that remains low and produces shoots or multi-trunks from its base; larger than 2 meters.
- small shrub: same as above; between .5 and 2 meters.
- ground cover: A leafy or woody plant that spreads out horizontally and covers the ground more or less evenly.
- grass: A leafy plant, mainly of the family Gramineae, having narrow leaves, hollow, jointed stems, and spikes or clusters of membranous flowers.
- vine: Any plant with long thin stems, prostrate on the ground or capable of climbing using tendrils, etc.
- bedding plant: A leafy plant with decorative flowers or fruits

Growth Rate: At best a comparative term; used to indicate the rate at which the plant reaches maturity or the height and spread per year under optimal growing conditions.
- fast: more than 10" per year
- medium: 3-10" per year
- slow: 0-3" per year

Mature Height (meters): Height a plant reaches at full growth, assuming good growing conditions, expressed in meters.

Plant Type: Plant characteristics.
- annual: Of one growing season's duration from seed to maturity to death.
- perennial: Of two or more growing season's duration (in this case including biennial, which is two growing seasons).
- succulent: Fleshy and full of juice; thick appearance of leaves or stems.
herbaceous: Not woody, dying down each year to crown in temperate climates.

woody: Plants with hard, fibrous xylem beneath the bark of branches and stems. Being entirely woody, or having a woody base.

rosette: A dense basal cluster of leaves arranged in circular fashion, characteristically of the family Palmaceae, with an unbranched trunk and a high crown of pinnate or palmate leaves.

conifer: Evergreen plants, usually of the order of Coniferales, whose leaves are acicular, filiform or awl-shaped.

broadleaf evergreen: Plants which are clothed in leaves throughout the year, but are not conifers.

drought deciduous: Plants which are capable of shedding their leaves without damaging the plant, due to dormancy caused by drought.

frost deciduous: Same as above, due to dormancy caused by frost.

salt deciduous: Same as above, due to dormancy caused by (in this case) high salt concentrations.

Growth Habit: Different growing shapes of plants.

horizontal: Generally being wider than high.
vertical: Generally being higher than wide.
branching: Having many branches; spreading out in branches.

weeping: Major part of branches arching down in a hanging fashion.
arching: Branches growing in a bow-like fashion.
spreading: spreading out horizontally close to the surface.

mounding: Close to the ground, width larger than height.
trailing: Growing up supporting structures.
columnar: Narrow growth form; height three or more times width.
pagoda  triangular  conical
pagoda: Branches growing horizontally in relation to trunk.
triangular: Triangular in elevation, height two times width.
conical: Triangular in elevation with point at base.

umbrella  dome  vase
umbrella: Round headed with trunk, half circle in elevation, width three
times height or more.
dome: Round headed with trunk, with about the same width as vertical
distance.
vase: Arching upward with main limbs conspicuously bowing outward.

Trunk: In this case describing all woody or leafy stems.

multi: Two or more main trunks growing from plant base.
single: One single trunk, as in most trees.
straight: Tendency of plant for vertical growth.
leaning: Tendency of plant to lean, if not supported; particularly as
young plants.
armored: Thorns or other armor on trunk

Foliage: Leaves and branchlets.

Type:
simple: Of only one part, not completely divided into separate segments.
compound: Completely separated into two or more leaflets.
pinnate: Compound leaf with the leaflets on two opposite sides of an
elongated axis.
bipinnate: Doubly or twice-pinnate, the primary divisions once-again
pinnate.
Arrangement:

alternate: Borne singly and not opposite, in leaves one at a node.
opposite: Leaves two at a node and situated across the stem from each other.

clustered: Two or more leaves at a node.
whorled: Three or more leaves arranged in a circle around a stem or some common axis.
fascicled: Borne in close bundles.

Shape:

scale-like: Leave resembling the scale of a fish or reptile.
awl-shape: Tapering gradually upward from a broader base to a sharp point, narrowly triangular.
linear: Narrow and flat with parallel sides.
oblong: Two to four sides longer than wide and the sides parallel or nearly so.
spatulate: Broad and rounded at apex and tapering at base; flattened, spoon shaped.
elliptic: Widest in center, and two ends equal.
lanceolate: Several times longer than wide, broadest toward the base and tapering to apex.

ovate: Egg-shaped in outline; attached to the widest end.

obovate: Inversely ovate, attached to the narrow end.

triangular: Resembling a triangle, attached to wide side, with pointy tip.

fleshy: thick, juicy, possibly succulent leaves.

lanceolate  ovate  obovate  triangular

Base:

cuneate: Wedge shaped; rather narrowly triangular, the acute angle downward.

attenuate: Gradually narrowing to the base, this usually narrow and slender.

cordate: Of a conventional heart shape.

cuneate  attenuate  cordate

Tip:

acute: Tapering to the apex with the sides straight or nearly so; usually less tapering than acuminate.

acuminate: Tapering to the apex, the sides more or less pinched in before reaching the tip.

mucronate: With a sharp and abrupt, tooth-like tip.

truncate: Squared at the tip.

emarginate: With a shallow notch at the apex.

pointed: Gradually tapering to the apex, forming a point.

notched: With a deep notch at the apex.
Surface:
  pubescent: Covered with short soft hairs.
  vesicular hairs: Hairs containing vesicles, or bladder-like cells.
  hirsute: With coarse and stiff hairs.
  glaucous: Covered with a whitish or bluish waxy covering.
  rough: Of rough texture when touched.
  smooth: Of glabrous, smooth texture when touched.
  dull: Matte appearance, not shiny.
  shiny: Glossy appearance.
  sticky: Covered with resins, juices, sap, etc.
  waxy: Covered with waxy substances.
  fine: Of very soft and fragile fashion.
  solid: Of strong fashion.
  leathery: Of solid and stiff fashion.

Color:
  light green: Bright green with a yellowish tint.
  dark green: Deep green.
  colorful stems: Reddish or purple coloration of leaf stems.
  fallcoloring: Change of color from green to red, brown, yellow, or orange; mostly occurring in fall as a preparation for winter dormancy.

Form:
  small: Size of leaf up to 1 cm in length.
  medium: Size of leaf between 1 cm and 5 cm in length.
  large: Leaf larger than 5 cm in length.
  dense: Great number and amount of foliage close together.
  sparse: Spotty appearance of foliage; open crown.

Fragrance: (Flowers or fruits, for later reference).
  significant: Noticeable scent of leaves.
  insignificant: No scent.

Flowers: The reproductive structure of a seed-bearing plant; every flowering portion, including spikes of grasses.
Season: Months throughout which plants develop and bear flowers.
Sex: Male and female plants.
  bisexual: Having both stamens and pistils in the same flower (perfect).
  dioecious: Unisexual (imperfect) having the staminate and pistillate on
  separate plants.
  monoecious: Unisexual (imperfect) but the staminate and pistillate borne
  on the same plant.

Type:
  simple: Flowers containing one set of reproductive organs and petals.
  compound: Flowers containing two or more sets of reproductive organs
  and petals.

Arrangement:
  solitary: One flower per stem.
  clustered: More than one flower per stem.

Shape:
  rotate: A wheel-shaped corolla.
  campanulate: Bell-shaped; cup-shaped with a flaring rim, hanging.
  funnel: with the tube widening upward passing gradually into the limb.
  salver: A corolla with a long slender tube, abruptly flaring into a
  circular limb.

bilabiate: Two-lipped corolla.
papilionaceous: Typical flower of the Leguminosae with standard wings
  and keel.
spike: Flowers sessile on a more or less elongated axis with younger
  flowers ate the apex.
panicle: Arching spikes (pedicles) with inflorescence along a main axis.
bilabiate papilionaceous spike panicle

Color:
- bicolored: Having two colors in one flower, e.g. tips of petals being another color than bottom of petals.
- showy: Being of very bright and obvious color.
- insignificant: Flowers of inconspicuous appearance.

Form:
- small: Size up to .5 cm.
- medium: Size between .5 and 3 cm in diameter.
- large: Size larger than 3 cm in diameter.

Pollination: Distribution of pollen or seeds; options include wind-blown, by insects, other animals, e.g. forage animals and birds which distribute seeds in their dropping, and water-flushed.

Fruit: The ripened ovaries of seed bearing plants.

Shape:
- pod: Any dry dehiscent fruit, especially fruit of a legume.
- capsule: Any dehiscent fruit made up of more than one carpel.
- cone: Dry multiple fruit consisting of overlapping scales.

pod capsule cone

follicle: A dry fruit with one carpel, splitting at one side only.
- nut: A one-seeded, dehiscent fruit with a hard wall.
- grain: A swollen seed-like structure.
- berry: A fleshy, pulpy fruit with immersed seeds.
Follicle, nut, grain, berry

Form:
- **small**: Size up to .5 cm in length.
- **medium**: Size between .5 and 5 cm in length.
- **large**: Size greater than 5 cm in length.

Use:
- **edible**: Fruit not poisonous, possibly tasty, in uncooked form.
- **poisonous**: Fruit toxic in uncooked form.

Armor: Provided with thorns, spines, prickles or sharp hairs.
- **long thorns**: A stiff, hard, sharp-pointed emergence with vascular tissue; longer than 2 cm.
- **short thorns**: Same as above; shorter than 2 cm.
- **spines**: Deep-seated, rigid outgrowth from the stem, not pulling off with the bark with absence of vascular tissue.
- **fuzz**: Pointy or sharp hairs.

Roots: The descending axis of the plant without nodes and internodes and absorbing moisture from the ground.
- **rhizomes**: Prostrate, more or less elongated stem growing partly or completely beneath the surface or the ground; usually rooting at the nodes and becoming upcurved at apex.
- **corm**: A thickened vertical solid underground stem.
- **bulb**: A subterranean leaf-bud with fleshy scales.
- **tuber**: A thickened short, usually subterranean stem having numerous buds called eyes.
fibrous: Composed of or resembling fibers.
lateral: Borne on the sides of a structure or object; horizontally spread out root system.
tap: The primary root continuing the axis of the plant downward into great depth of the soil.
air-roots: Roots borne above the ground or water.
roots at nodes: Rooting nodes of branches close to the ground.

HABITAT INFORMATION

Exposure: Environmental factors a plant might be exposed to.
aridity: A plant's tolerance to lacking moisture because of insufficient rainfall or irrigation.
humidity: A plant's tolerance to dampness, particularly in the air.
sun: The need of a plant to be exposed to sun light for an average of 12 hours.
part-shade: A plant's tolerance of diffused light or of the non-availability of sun light for 2 to 6 hours.
shade: A plant's tolerance of dark condition, e.g. in a situation where the sun is blocked for twelve hours or more.
wind: A plant's ability to sustain a straight growth form in strong consistent winds and storms stronger than 40 miles per hour.
dust: A plant's tolerance to great amounts of dust and sand particles without significant damage.
reflected heat: A plant's tolerance to direct sunlight, strong heat and glare reflected off a smooth surface.
cold: A plant's tolerance to temperatures below 20°F.

Hardiness: A plant's resistance to, or tolerance of, frost or freezing temperatures.
tender: A plant's disability to survive temperatures lower than freezing.
half-hardy: A plant's disability to survive temperatures lower than 10°C.
The plant may freeze in temperatures below freezing, but recover easily.
hardy: A plant's ability to survive temperatures lower than 10°C.
Water: Watering requirements of a plant.

drought resistant: Ability to survive periods of drought, in which the plant does not receive supplementary irrigation. However, plants must be established before they become drought resistant.

low (dry): Deep, widely spaced irrigation.

average: Irrigation when the top five centimeters are dry.

high (ample): Soil is damp to the touch.

flooding: Occasional flooding of the plant, covering the ground with more than one centimeter of water; comparable to tidal inundations.

Soil: The soil conditions a plant requires, tolerates, or readily grows in.

acid: Soils with pH of less than 7 in the area occupied by the roots.

alkaline: Soil with a pH of greater than 7 in the root zone.

neutral: The range of a soil between the pH of 6.5 to 7.2.

clay: The smallest of the soil mineral particles, characterized by slow drainage (poor drainage), limited aeration, but best nutrient-holding capacity.

loam: Generally a fertile, manageable soil consisting principally of sand and clay particles with some silt and humus.

sandy-loam: See above, but with more sandy parts and better drainage.

sand: The largest of the soil mineral particles; characterized by good aeration, quick passage of water and quick warming.

silt: Intermediate to small soil particles, generally alluvial soils; fairly poor drainage.

humus: Decomposed organic matter in the soil, increasing aeration, water holding capacity and fertility; improves soil structure.

peat: Decomposed remains of mosses, adding to soil acidity and water retention; keep soils moist.

thick: A plant's requirement of soils thicker than 10 cm for successful establishment.

thin: A plant's tolerance of soils thinner than 10 cm.

withstands poor soil: A plant's ability to survive or thrive in thin soils with poor drainage, low fertility and poor aeration.

Salts: A plant's tolerance or the amounts of sodium chloride dissolved in soil or water (expressed in parts per thousand). The higher salt concentrations are usually tolerated by the plant, but do not necessarily contribute to their decorative appearance. Salt marsh plants which tolerate tidal inundations are indicated with a tolerance to seawater concentrations in the water and lower salt concentrations for dry soil.

5-10: Brackish conditions.

10-20: Moderately saline conditions.

20-30: High saline conditions.

30-40: Seawater conditions or above.


endangered: Endangered as classified by rare: Locally abundant, but globally rare.

abundant: Globally present in abundance, very common.

cultivated: Plants which are improved for commercial interest, as food crops or ornamentals, outside their natural habitat.
Propagation: Reproduction and multiplication of plants.

- cuttings: Portions of stem or root that can be induced to form roots and develop into new plants.
- division: Separation of clumps of stems with rooted base to form new plants.
- layer: The rooting of a branch while it is still attached to the plant.
- seedlings: The establishment of a plant through germination of seeds.
- spores: A reproductive cell capable of reproducing a new plant; usually located above ground.
- bulb: The reproduction of a bulb-bearing plant by separating the little "daughter bulbs".
- rhizomes: Rooting a stem that creeps along the surface or underground at its nodes, forming new plants where it roots.
- suckers: Mainly for trees, any strong vertical shoot growing from the main framework of trunk to form a new tree.
- grafting: Insertion of section of one plant into the branch or trunk of another to improve the quality of the plant.

Transplanting: Moving a near-mature or mature plant to another location.

- easy: Does not involve difficult procedures; plant survival likely.
- intermediate: Involves elaborate procedures; plant survival likely.
- difficult: Involves elaborate procedures; plant survival unlikely.
- not recommended: Plant survival very unlikely or impossible.

Planting Time: Season of the year where plant establishment is most successful.

- spring: From March to May.
- summer: From June to August.
- fall: From September to November.
- winter: From December to February.
- any time: Success of plant establishment is not influenced by planting season.

Soil Substitutes: Substitutes that improve soil structure and fertility and make plant establishment and growth more successful. In this case substitutes are recommended, but not necessary for plant survival.

- fertilizers: Chemical, such as gypsum, or organic, such as compost.
- minerals: Minerals, such as perlite or sand.
- mulch: A loose, usually organic material, placed loose on the ground to reduce evaporation and weed growth or insulate from rapid temperature change.
- vermiculate: Mineral to improve aeration of soil.
- gravel: Stone mulch, reduces evaporation.
- glaring-reduction: Dark, textured materials which increase the soil surface and break glare.

Culture: Maintenance of plant material to improve growth rates and appearance. In this case, actions are suggested, but not necessary for the survival of plants.
mulching: Application of mulch.
weeding: Elimination of weedy plants which may dominate and eventually destroy the desired plants.
airing: Application of vermiculate, sand, or other materials that improve aeration of soil.
burlapping: Wrapping of trunk with burlap for the establishment of a newly planted or transplanted tree to prevent sunburn and to decrease evapotranspiration.
staking: Anchoring plant and training of trunk to grow straight by tying it to a supporting structure.
pruning: The tolerance of a plant to clipping and pruning of its leaves and branches and trimming in the shape of formal hedges.
mowing: Cutting of grasses required for use as turf and lawn.

Pests and Diseases: Any observed pests, diseases, bugs, fungi, etc. that might weaken the plant, can be listed in this space.
Growing Problems: Any observed growing problems, disadvantages or difficulties may be listed in this space.

LANDSCAPE VALUES

Architectural: Values that enhance the architectural function of a plant in an urban context.

espalier: The ability of a plant to be trained to grow in a flat pattern against a wall or fence.
trellis: The ability of a plant, such as a supported vine, to grow along a support structure.
masonry: The ability of a plant, such as a self-supported vine, to grow along a wall or a fence with aerial rootlets.

background: A large growing shrub or tree with attractive foliage and the requirement of low maintenance.
screen: A plant or grouping of plants used to exclude view or noise.
hedge: A plant or grouping of plants pruned to shape to exclude view or noise and to be used with formal and informal landscaping.
row: A group of trees that are planted in a straight line.
street-tree: A tree used for planting along roadways, which does not grow too tall, but might require space. It should be adapted to city conditions and be of clean appearance, pest-free, and with high heading habit.
bedding: A mass of herbaceous plants or small shrubs with decorative flowers or foliage.
natural fencing: A grouping of very strong plants that form an almost impenetrable screen.
shade: A tree with dense foliage and relatively large habit of growth; may be deciduous or evergreen.
non-walk-on ground cover: Low, vigorous competitive plants used to cover the soil, which are sensitive to trampling.
walk-on ground cover: See before, but resistant to trampling.
containers: Shrub or tree of restricted growth and root system that will thrive for years in the limited space of a container.
hanging basket: Shrub, ground cover or vine with decorative hanging branches that thrive in a small suspended containers.

patio: Trees or shrubs of relatively small stature with small root systems that withstand the restrictive growth in small yard-situations.

rock-garden: small shrubs, ground covers or bedding plants that grow in rocky areas as their natural habitat and enhance the visual quality of large rocks.

turf: Plants, mainly grasses, that cover the ground evenly and densely, can be walked on and mowed for a carpet-like appearance.

Engineering: Plants that can be used for repair or enhancement of soils or natural environments.

bank cover: Plants that grow along riverbanks and on slopes.

barrier: impenetrable row or mass of shrubs and small trees.

erosion control: Plants that keep soils from sliding or washing away due to their soil-retaining lateral root systems.

sand binder: Plants that grow in sand and keep dunes from moving and sand from blowing away due to their strong lateral root systems.

soil stabilization: Plants that stabilize soils from being moved by wind and water.

revegetation: Plants that can be used in vegetation establishment of previously non-vegetated, possibly disturbed soils.

soil reclamation: Plants that can be used to enhance previously poor or disturbed soils.

wind break: Trees that withstand strong winds and are able to divert winds from designated areas. They possess dense evergreen foliage, deep strong root systems, are disease resistant and fire resistant, and can grow in close proximity to each other.

dust break: Plants that withstand great amounts of dust and larger particles and prevent dust or larger particles from being deflated. They are closely associated with wind breaks and ground covers.

noise barrier: Shrubs and trees that possess dense, evergreen foliage and can grow closely together to reduce noise transmission.

soil moisture retainer: Plant that have the ability to retain soil moisture within high soil horizons due to their holding capacity in the roots.

fire retardant: Plants that prevent fire from transmission due to their high moisture and low oil content.

afforestation: Preferably trees that grow in a closed mass where previously no trees were established.

pioneer: A plant that is able to spread in areas where other plants cannot grow, and amend the environment for the establishment of more sensitive plants.

Design: Plants that are able to assist in design functions.

accent: A plant used to attract attention to a desirable feature.

fragrance: Plants that give off pleasant odor either from flower, fruit, or foliage.

ornamental: Plants that display interesting and aesthetical features, like colorful flowers or unusual shape.
color: Color of flowers, fruit, or bark, which are showy and create great appeal. Color is a design quality that evokes the greatest responses.

foliage: Color or shape of foliage, which is showy or extraordinary.
form: unusual or appealing shapes and forms of plants.

space-creator: Compact shrubs or trees that assist with screening certain things and making other things visible and that divide a landscape entity for the designation of different user areas.

view-creator: Decorative plants that direct attention to themselves or attractive structures by creating interesting form because of arrangement.

visual screen: Attractive plants that direct attention away from unattractive structures or scenes.
silhouette: Tall shrubs or trees that display extraordinary shapes which can be seen from distance or as outlines at night.
specimen: A plant with particularly attractive habit of growth which has a good appearance when viewed alone.
canopy: A plant with a large crown of interesting shape or color.
filler: Fast growing plants for the quick establishment of a mass planting.

Physical Screening: A plant’s ability to screen from view, noise or penetration, usually used for a grouping of plants.
impenetrable: Impossible for human, animal or vehicle to penetrate without destroying.
moderate: Penetration possible, but injury to plant or penetrator likely.
light: Penetration possible.
dangerous: Injury of penetrator very likely.
narrow: The overall screening effect is rather compressed.
wide: The overall screening effect is large.
high: Screening of objects in eye-level.
short: Screening shorter than eye-level.

Landscape Theme: Focus or comparable topic of landscape appearance with the usage of a particular plant.
rustic: Traditional rural focus.
formal: Evenly shaped and linear, geometrical focus.
natural: Naturally appearing focus.
desert: Resembling grayish desert vegetation.
tropical: Giving the sensation of tropical, lush vegetation.
oriental: Resembling the vegetation of oriental gardens.
transitional: Resembling vegetation of temperate climates as a transition from desert climates to humid vegetation types.
understory: Shrubs resembling understory vegetation in forests.

Disadvantages: Possible shortcomings, weaknesses and imperfections of plants.
thorns: Possibly painful and injury causing.
litter: Plants that cause damage or create filth by shedding leaves, fruits, branches and other parts.
poisonous: Dangerously toxic and poisonous plant parts.
pests: Susceptibility of plants to pests and diseases, which cause damage to the plants.
very tender: Inability of plant to survive cooler temperatures.
brittle/fragile: Possible damage caused by falling branches or other plant parts.
slow growth: A plant that takes many years to reach maturity or a designated height.
slow germination: A plant that is not easily established from seed and develops very slowly.
hard to propagate: A plant that is very difficult to reproduce under non-natural circumstances.
salt deciduous: A plant that tolerates high salinity, but sheds leaves or other plant parts as a matter of salt avoidance.
increases salinity in soil: Plants that shed salt containing parts, such as leaves, which decompose in the soil leaving the uncomposed salt behind and thus increasing the soil salinity.
will die if overwatered: Drought tolerant plants that require low waterings and are very sensitive to possibly high waterings of neighboring plants or to damp turf situations.
fire-prone: Plants that are easily inflammable due to low moisture and high oil content.
allergenic: Plants that cause allergies due to the fact that they possess very fine pollen which is wind-blown, or sap or surfaces which are possibly toxic or cause irritation of eyes, nose, lungs, or skin.
invasive: Weedy plants which are spreading very easily and are likely to dominate other plants.

Indicator Plant for: Indication of certain habitat conditions by the type of vegetation, e.g. the presence of Prosopis spp. usually indicates deep subsurface water.

ECONOMIC USES

Parts: Portions and components of particular plant that is economically useful or commonly used.
Medicinal: Plants used for medication or for healing.

Edible: Plants used for human consumption.
grains: Plants eaten as cereals, flour, etc.
oils: Mostly seeds processed for cooking oils.
foods: Plants eaten as vegetables, fruit, or other dishes, or plants that assist in food production (e.g. cheese making).
drinks: Plants processed for drinks, or plants that assist in the making of drinks (e.g. brewing of beer).

Animal: Plants used for animal consumption or for the enhancement of wildlife ecosystems.
forage: Plants grown for feed and pasture.
wildlife: Plants that serve as wildlife feeding plants or cover and nesting sites.
Industrial: Plants that are commercially used for industrial or domestic production.

- dye: Plants used as industrial dyes or fabric and food dyes.
- wax: Plants used for industrial wax production.
- oil: Plants used for industrial oil production or as a substitute for synthetic oils.
- rubber: Plants used for industrial rubber production or as a substitute for conventional rubber.
- soap: Plants used for soap and detergent production or as a substitute for conventional and synthetic soaps.
- baskets: Plant materials used for basket making, mainly by indigenous populations.
- rope: Plants used in rope making, mainly by indigenous populations.
- tannin: Plants, mainly mangroves, used for the production of tannin.
- timber: Plants used as construction materials or in furniture making.

Fuelwood: Plants used as fire wood or as an alternative industrial fuel.

Flowers: Plants grown commercially for the use of their flowers.

- cutting flowers: Flowers used commercially as cutting flowers or dried flowers.
APPENDIX H: Scenarios for the Use of the Data Base

SCENARIO 1:

location: Inland Desert in North-West Egypt
purpose: Wind Screen for Agricultural Fields.
conditions: Hot, dry summers; mild winters (average of 10 frost nights/a) with winter rains (average of 80 mm/a) and strong winds; mostly sandy soils with a soil salinity of 8 ppt on site; no fresh water availability. No manpower availability.

requirements for site planning:
* height of screen: 20 feet
* dense foliage
* supportive root system
* resistance to drought and aridity
* wind resistance
* soil conditions: sandy soils
* salt tolerance of 8 ppt in soil
* should require no maintenance
* should function as wind break,

search conditions in data base:
* large tree or small tree
* foliage: dense
* roots: tap or lateral
* water: drought resistant
* exposure: aridity, sun, wind,
* soils: sand, sandy-loam
* salt tolerance soil: 5-10
* culture: low
* landscape values: wind break

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<td>Seaside Mahoe</td>
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For the description of the particular plants see plant data sheets (Appendix I).
SCENARIO II

location: Dead Sea Coast, Israel
purpose: Ornamental Oasis-Type Design for Hotel Patio
conditions: Hot and dry summers; mild winters (no frost) with winter rains (average 50 mm/a); strong winds and dust storms in spring and fall blowing highly saline air from the Dead Sea; reflected heat off concrete pavement around the hotel; poor hardpan soils, mostly sand and loess, mixed with silt; soil salts: 6 ppt, salts in water: 45 ppt; fresh water available, but very scarce; maintenance personnel available.

requirements for site planning:
* trees, bedding plants and turf grass
* ornamental features, such as showy flowers, colorful bark or stems, nice foliage, possibly contrasty, decorative growth forms
* resistance to heat, reflected heat, winds, dust, and aridity
* salt: for trees and bedding plants: 7 ppt, for turf up to 20 ppt (the Dead Sea water is to be mixed with fresh water to achieve lower salt concentrations)
* soils: sandy, sandy loam and silt, can be enhanced with fertilizers, minerals, and mulches
* landscape features fulfilling certain architectural and design qualities, such as rock garden, patio situation, turf, etc.

search conditions in data base:
* trees: large or small tree
* growth form: umbrella
* trunk color: red
* landscape value: patio and shade
* salt tolerance: 5-10 ppt
* bedding plants: flower color:
  * white or lavender
  * salt tolerance: 5-10 ppt
  * landscape value: bedding
  * soils: sand or sandy-loam or silt
  * grass: foliage: dense
  * landscape value: turf
  * salt tolerance: 10-20 ppt
  * culture: low or intermediate or high
  * soil substitutes: fertilizers and mulches

data base output:

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<td>Algaroba Bean, Mesquite</td>
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<td>0024</td>
<td>Thespesia</td>
<td>populnea</td>
<td>-0-</td>
<td>Portia Tree, Aden Apple, Umbrella Tree, Seaside Mahoe</td>
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<tr>
<td>771</td>
<td>Callistemon</td>
<td>rigidus</td>
<td>-0-</td>
<td>Stiff, Bottlebrush</td>
</tr>
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</table>
For the description of the particular plants see plant data sheets (Appendix I).
SCENARIO III

location: Safford, Arizona, U.S.A.
purpose: Revegetation of Pasture Land
conditions: Hot and dry summers; mild winters (occasionally frost); winter and summer rains (average 200 mm/a). Soils generally poor and thin with caliche (hardpan) layers close to the surface, salt build-up in soil locally up to 20 ppt. Saline wells for irrigation with salinity levels up to 17 ppt.

requirements for site planning:
* shrubs and ground covers
* wide spreading root systems
* fairly drought tolerant
* somewhat frost resistant
* salinity levels in soil up to 20 ppt, in water up to 17 ppt
* withstand poor soil conditions and grow in fairly thin soils
* low maintenance requirements
* has to function as soil stabilization and erosion control as well as revegetation and pioneer plants.

search conditions in data base:
* large shrub or small shrub or ground cover
* roots: lateral
* exposure: aridity, sun
* hardiness: hardy
* water: drought resistant or low (dry)
* soil: poor soil and thin
* salt soil: 10-20 ppt
* salt water: 10-20 ppt
* culture: low
* landscape value: revegetation and erosion control and soil stabilization and pioneer.

data base output:

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<td>Alhagi</td>
<td>maurorum</td>
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<td>undulata</td>
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<td>Maireana</td>
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<td>Silver Salt Bush</td>
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</table>

For the description of the particular plants see plant data sheets (Appendix I).
APPENDIX I: Plant Data Sheets

SALT TOLERANT LANDSCAPE PLANTS

Acrostichum aureum var. -0- Pteridaceae
Swamp Fern, Saltwater Fern, Leather Fern, Mangrove Fern
Country of origin: West Indies, S. Amer
ERL Id#: 0001

PLANT DESCRIPTION

Growth Form: small_shrub bedding_plant
Growth Rate: fast
Growth Habit: arching vase_shape
Plant Type: perennial rosette frost_deciduous

Trunk:
- Form: multi-
- Color: -0-

Foliage:
- Type: pinnate
- Form: large dense
- Base: -0-
- Surface: smooth
- Fragrance: insignificant

Flowers:
- Type: -0-
- Form: -0-
- Season: -0-
- Fragrance: -0-
- Sex: bisexual

Fruit:
- Type: -0-
- Form: -0-
- Season: Nov Dec Jan
- Use: -0-
- Armor: -0-
- Roots: rhizome fibrous

HABITAT INFORMATION

Exposure: aridity humidity part_shade shade
Hardiness: hardy -10C
Salt-water ppt: 5-10 10-20 20-30 Salt-soil: 5-10
Water: average high amp1e
Soil Type: acid loam peat
Soil Thickness: thick

MAINTENANCE INFORMATION

Propagation: division spores
Transplanting: difficult
Culture: mulching pruning low intermediate
Planting Time: -0-
Soil Substitutes: fertilizers mulch
Pests & Diseases: -0-
Growing Problems: -0-

LANDSCAPE VALUES

Architectural: bedding non_waIk_on_gnd_cvr containers rock_garden
Engineering: soil moisture_retainer barrier
Design: ornamental foliage form filler silhouette accent
Landscape Theme: tropical transitional understory
Physical Screening: moderate wide
Disadvantages: litter
Indicator Plant for: -0-

USES

- Medicinal: -0-
- Edible: -0-
- Fuel: -0-
- Industrial: -0-

Remarks & Comments: Grows in association with Rhizophora mangle; tolerates occasional inundations with seawater

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
Salt tolerant landscape plants

Aeluropus lagopoides var. -0-

Country of origin: Mediterranean, Sahar

ERL Id#: 875

PLANT DESCRIPTION

Growth Form: grass ground_cover
Growth Habit: spreading vase_shape
Plant Type: perennial herbaceous

Trunk:
- Form: -0-

Foliage:
- Type: simple
- Form: small sparse
- Base: -0-
- Surface: pubescent solid
- Fragrance: -0-

Flowers:
- Type: compound
- Form: medium
- Season: May Jun Jul Aug
- Fragrance: insignificant
- Sex: monoecious

Fruit:
- Type: -0-
- Form: -0-
- Season: -0-
- Use: -0-
- Armor: -0-

HABITAT INFORMATION

Exposure: aridity sun part_shade dust

Hardiness: hardy <-10C
Salt-water ppt: 5-10 10-20 20-30 30-40
Water: drought_resistant low_dry average

Soil Type: sandy_loam

MAINTENANCE INFORMATION

Propagation: seed rhizomes
Culture: pruning intermediate low
Soil Substitutes: fertilizers

Growing Problems: -0-

LANDSCAPE VALUES

Architectural: walk_on_gnd_cvr turf
Engineering: bank_cover erosion_control sand_binder soil_stabilization dust
Design: foliage filler
Landscape Theme: natural transitional
Physical Screening: light short

Disadvantages: invasive

USES

Plant Part: -0-
Medicinal: -0-
Edible: -0-
Animal: -0-
Fuel: -0-
Flowers: -0-
Industrial: -0-

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
SALT TOLERANT LANDSCAPE PLANTS

**Aeluropus littoralis** var. -0-

**Country of origin**: Coastal Areas of the

---

**PLANT DESCRIPTION**

**Growth Form**: grass ground_cover  
**Growth Habit**: spreading vase_shape  
**Plant Type**: perennial herbaceous  
**Trunk**:  
- **Form**: -0-  
- **Color**: -0-

**Foliage**:  
- **Type**: simple  
- **Arrangement**: alternate  
- **Form**: medium dense  
- **Shape**: lanceolate scale_like  
- **Base**: -0-  
- **Surface**: smooth shiny fine  
- **Tip**: acuminated  
- **Color**: light_green  
**Fragrance**: insignificant  

**Flowers**:  
- **Type**: compound  
- **Arrangement**: clustered  
- **Season**: Apr May Jun Jul  
- **Shape**: spike  
- **Fragrance**: insignificant  
- **Color**: light_green  
- **Pollination**: wind_blowed  

**Sex**: monoecious  
**Fruit**:  
- **Type**: -0-  
- **Arrangement**: -0-  
- **Form**: -0-  
- **Shape**: grain  
- **Color**: brown  

**HABITAT INFORMATION**

**Exposure**: humidity sun part_shade  
**Hardiness**: hardy_-10C  
**Population Abund**: abundant  
**Salt-water ppt**: 5-10 10-20 20-30 30-40  
**Water**: average high ample flooding  
**Soil Type**: loam  
**Soil Substitutes**: -0-  
**Soil Thickness**: thick  
**Salt-soil**: 5-10 10-20  

---

**MAINTENANCE INFORMATION**

**Propagation**: seed rhizomes  
**Transplanting**: easy  
**Culture**: -0-  
**Planting Time**: spring  
**Soil Substitutes**: -0-  
**Pests & Diseases**: -0-  
**Growing Problems**: -0-  

---

**LANDSCAPE VALUES**

**Architectural**: walk on gnd_cvr turf  
**Engineering**: bank_cvr sand_binder soil_stabilization  
**Design**: foliage filler  
**Landscape Theme**: natural transitional  
**Physical Screening**: light short  
**Disadvantages**: -0-  
**Indicator Plant for**: -0-  

---

**USES**

**Plant Part**: -0-  
**Medicinal**: -0-  
**Edible**: -0-  
**Animal**: -0-  
**Fuel**: -0-  
**Industrial**: -0-  
**Flowers**: -0-  

**Remarks & Comments**: -0-

---

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
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SALT TOLERANT LANDSCAPE PLANTS

Aizoaceae

A. canariense var. -0-

Country of origin: Africa, Australia

PLANT DESCRIPTION

Growth Form: ground_cover
Growth Habit: mounding spreading horizontal
Plant Type: perennial succulent herbaceous
Trunk:
Form: -0-
Color: -0-
Type: simple
Arrangement: alternate
Base: cuneate
Shape: oblong lanceolate spatulate
Surface: fine
Color: -0-
Foliage:
Type: -0-
Arrangement: -0-
Form: large
Shape: papilionaceous
Base: cuneate
Color: white cream yellow insignific
Surface: fine
Fragrance: insignificant
Flowers:
Type: -0-
Arrangement: -0-
Form: medium
Shape: papilionaceous
Season: Jan Feb Mar Apr
Color: white cream yellow insignific
Pollination: -0-
Sex: bisexual
Fruit:
Type: -0-
Arrangement: -0-
Form: small
Shape: capsule
Season: -0-
Color: white cream yellow insignific
Use: -0-
Armor: -0-
Roots: -0-

HABITAT INFORMATION

Exposure: aridity sun dust
Hardiness: half hardy >=-10C
Salt-water ppt: -0-
Salt-soil: 5-10 10-20
Water: drought_resistant
Soil Type: sand poor_soil
Soil Thickness: thin

MAINTENANCE INFORMATION

Propagation: seed
Culture: pruning high
Pest & Diseases: -0-
Growing Problems: -0-
Transplanting: -0-
Planting Time: -0-

LANDSCAPE VALUES

Architectural: non_walk on gnd_cvr
Engineering: bank_cover erosion_control soil_stabilization revegetation pio
Landscape Theme: natural desert understory
Physical Screening: short
Disadvantages: low_germination_rate
Indicator Plant for: -0-

USES

Medicinal: -0-
Animal: -0-
Flowers: -0-

Remarks & Comments: This plant needs maintenance for cleaning and reseeding. It tends to be biennial.

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
**PLANT DESCRIPTION**

- **Growth Form:** small shrub ground cover
- **Growth Habit:** branching spreading conical
- **Plant Type:** perennial woody
- **Trunk:**
  - **Form:**
  - **Color:**
- **Foliage:**
  - **Type:** simple
  - **Form:** medium sparse
  - **Base:**
  - **Surface:** pubescent smooth
  - **Fragrance:**
- **Flowers:**
  - **Type:**
  - **Form:** medium
  - **Season:** Apr May Jun Jul Aug
  - **Fragrance:**
- **Sex:**
- **Fruit:**
  - **Type:**
  - **Form:** medium
  - **Season:**
  - **Use:**
  - **Color:**
- **Roots:**

**HABITAT INFORMATION**

- **Exposure:** aridity sun dust
- **Hardiness:** tender >=0C
- **Salt-water ppt:** 5-10 10-20
- **Water:** drought_resistant low_dry
- **Salt-soil:** 5-10 10-20
- **Soil Type:** alkaline neutral clay sandy_loam
- **Soil Thickness:** thick

**MAINTENANCE INFORMATION**

- **Propagation:**
- **Transplanting:**
- **Culture:**
- **Planting Time:**
- **Soil Substitutes:**
- **Pests & Diseases:**
- **Growing Problems:**

**LANDSCAPE VALUES**

- **Architectural:** screen natural_fencing non_walk_on_gnf cvr
- **Engineering:** bank_cover revegetation pioneer dust_break
- **Design:** filler
- **Landscape Theme:** natural desert
- **Physical Screening:** light
- **Disadvantages:** invasive
- **Indicator Plant for:**

**USES**

- **Medicinal:**
- **Animal:**
- **Flowers:**
- **Industrial:**

**Remarks & Comments:** Noxious weed in alluvial, deep soils. Drought resistant but tolerates wet soils.

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
**Salt Tolerant Landscape Plants**

**Allenrolfea occidentalis var. -0-**

**Iodine Bush**

Country of origin: Tropical Americas

ERL Id#: 624

---

**PLANT DESCRIPTION**

**Growth Form**: small shrub ground cover

**Growth Rate**: fast

**Growth Habit**: spreading horizontal branching weep

**Mature Height**: 20-50 cm

**Plant Type**: annual perennial succulent broadleaf evergreen woody

**Trunk**:

- **Form**: multi-

**Foliage**:

- **Type**: simple
- **Form**: small
- **Base**: -0-
- **Surface**: glaucous shiny fine
- **Fragrance**: insignificant

**Flowers**:

- **Type**: simple
- **Form**: small dense
- **Season**: Nov Dec Jan
- **Fragrance**: insignificant
- **Sex**: bisexual

**Fruit**:

- **Type**: -0-
- **Form**: small dense
- **Season**: Nov Dec Jan
- **Use**: edible

**Armor**: -0-

---

**HABITAT INFORMATION**

**Exposure**: aridity sun reflected heat wind

**Hardiness**: -0-

**Salt-water ppt**: 10-20 20-30

**Water**: drought resistant low dry average

**Soil Type**: -0-

**Salt-soil**: 5-10 10-20 20-30

---

**MAINTENANCE INFORMATION**

**Propagation**: seed

**Transplanting**: -0-

**Culture**: -0-

**Planting Time**: -0-

**Soil Substitutes**: -0-

**Pests & Diseases**: -0-

**Growing Problems**: -0-

---

**LANDSCAPE VALUES**

**Architectural**: non walk on gnd cvr

**Engineering**: erosion control soil stabilization

**Design**: form filler

**Landscape Theme**: natural desert transitional

**Physical Screening**: wide short

**Disadvantages**: -0-

**Indicator Plant for**: -0-

---

**USES**

**Plant Part**: -0-

**Medicinal**: -0-

**Edible**: -0-

**Animal**: -0-

**Fuel**: -0-

**Flowers**: -0-

**Industrial**: -0-

**Forests**: small

---

**Remarks & Comments**: Resembles Salicornia.

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
Armeria maritima var. sabina

Common Tuft

Country of origin: Mediterranean

ERL Id#: 0008

Growth Form: bedding_plant
Growth Habit: mounding spreading branching
Plant Type: perennial herbaceous rosette drought_deciduous
Trunk:

Form: multi-
Foliage:
Type: simple
Form: large dense
Base: -0-
Surface: leathery solid
Fragrance: insignificant
Flowers:
Type: compound
Form: large dense
Season: Mar Apr May Jun Jul
Fragrance: -0-
Sex: monoecious
Fruit:
Type: -0-
Form: -0-
Season: -0-
Use: -0-
Armor: -0-

PLANT DESCRIPTION

Growth Rate: fast
Mature Height: 20-50cm

Foliage:
Type: simple
Form: large dense
Base: -0-
Surface: leathery solid
Fragrance: insignificant

Flowers:
Type: compound
Form: large dense
Season: Mar Apr May Jun Jul
Fragrance: -0-

Plant Description

Color: green
Arrangement: whorled
Shape: awl shaped linear
Tip: pointed
Color: light green
Arrangement: clustered
Shape: campanulate
Color: white pink showy
Pollination: -0-

Fruit:
Type: -0-
Form: -0-
Season: -0-
Use: -0-

MAINTENANCE INFORMATION

Propagation: seed cutting division
Transplanting: easy
Planting Time: spring fall

Culture:
pruning
low airing

Soil Substitutes: fertilizers

Pests & Diseases: -0-
Growing Problems: -0-

LANDSCAPE VALUES

Architectural: row bedding containers rock_garden
Engineering: bank_cover sand_binder dust_break
Design: ornamental color filler

Physical Screening: light short

Disadvantages: litter

USES

Medicinal: -0-
Animal: -0-
Flowers: -0-

Remarks & Comments: Flowers in globular heads on long stalks. Needs perfect drainage. no water logged soils. Hybridizes

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
**Arthrocnemum fruticosum**

**Country of origin:** Arabo-Sudanian  
**ERL Id:** 906

### Plant Description

- **Growth Form:** small shrub ground cover  
- **Growth Habit:** branching conical spreading  
- **Plant Type:** perennial succulent broadleaf evergreen

### Trunk:
- **Form:** multi-  
- **Color:** green

### Foliage:
- **Type:** compound  
- **Shape:** awl-shaped fleshy  
- **Tip:** -  
- **Surface:** glaucous smooth  
- **Color:** dark green bluish colorful  
- **Arrangement:** clustered

### Flowers:
- **Type:** small  
- **Arrangement:** clustered  
- **Shape:** insignificant  
- **Pollination:** wind_blown insects

### Fruit:
- **Type:** -  
- **Shape:** insignificant  
- **Pollination:** -  
- **Color:** -  
- **Arrangement:** clustered

### Habitat Information

- **Exposure:** aridity humidity sun  
- **Hardiness:** -  
- **Salt-water ppt:** 10-20 20-30 30-40  
- **Salt-soil:** 5-10 10-20 20-30 30-4  
- **Water:** low_dry average high ample flooding  
- **Soil Type:** Soil Thickness: -  
- **Propagation:** seed  
- **Transplanting:** easy

### Maintenance Information

- **Culture:** low  
- **Soil Substitutes:** -  
- **Pests & Diseases:** -  
- **Growing Problems:** -  
- **Planting Time:** spring

### Landscape Values

- **Architectural:** non_walk_on_gnd_cvr  
- **Engineering:** bank_cover erosion_control soil_stabilization revegetation plo

### Design:
- **Form:** color filler  
- **Landscape Theme:** natural transitional  
- **Physical Screening:** light short

### Disadvantages:
- **Indicator Plant for:** -  
- **USES**
  - **Medicinal:** -  
  - **Animal:** -  
  - **Flowers:** -  
  - **Industrial:** -  

- **Remarks & Comments:** Valuable wildlife plant.

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
Arthrocnemum halocnemoides var. -0-

Country of origin: Arabo-Sudanian

---

PLANT DESCRIPTION

Growth Form: small shrub ground cover
Growth Habit: branching conical spreading
Plant Type: perennial succulent broadleaf evergreen
Trunk:
- Form: multi-
- Color: green

Foliage:
- Type: compound
- Form: small
- Base: -0-
- Surface: glaucous smooth
- Fragrance: insignificant

Flowers:
- Type: small
- Season: May Jun Jul Aug Sep
- Fragrance: insignificant

Sex: bisexual

Fruit:
- Type: -0-
- Season: -0-
- Use: -0-
- Armor: -0-

Flowering: insignificant

---

HABITAT INFORMATION

Exposure: aridity humidity sun
Hardiness: tender >0C
Salt-water ppt: 10-20 20-30 30-40
Salt-soil: 5-10 10-20 20-30 30-4
Water: low_dry average high_ample flooding
Soil Type: -0-
Soil Thickness: -0-

---

MAINTENANCE INFORMATION

Propagation: seed
Transplanting: easy
Culture: low
Planting Time: spring
Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: -0-

---

LANDSCAPE VALUES

Architectural: non_walk_on_gnd_cvr
Engineering: bank_cover erosion_control soil_stabilization revegetation pio
Design: form color filler
Landscape Theme: natural transitional
Physical Screening: light short
Disadvantages: -0-
Indicator Plant for: -0-

---

USES

- Plant Part: -0-
- Medicinal: -0-
- Edible: -0-
- Animal: wildlife
- Fuel: -0-
- Industrial: -0-
- Flowers: -0-

Remarks & Comments: Valuable wildlife plant.

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
**SALT TOLERANT LANDSCAPE PLANTS**

**Aster tenuifolius var. -0- Compositae**

**Country of origin: North America**

**ERL Id#: 0028**

---

**PLANT DESCRIPTION**

- **Growth Form:** bedding plant
- **Growth Habit:** vertical spreading conical
- **Plant Type:** perennial herbaceous
- **Trunk:**
  - **Form:** -0-
- **Foliage:**
  - **Type:** simple
  - **Form:** medium sparse
  - **Base:** -0-
  - **Surface:** smooth
- **Flowers:**
  - **Type:** compound
  - **Form:** medium dense
  - **Season:** Jun Jul Aug Sep Oct
- **Fruit:**
  - **Type:** -0-
- **Sex:** bisexual
- **Color:**
  - **Trunk:** -0-
  - **Foliage:** alternate
  - **Flower:** white lavender showy
  - **Fruit:** brown
  - **Roots:** rhizome lateral fibrous

---

**HABITAT INFORMATION**

- **Exposure:** humidity sun part shade cold
- **Hardiness:** hardy <-10C Population Abund: abundant
- **Salt-water ppt:** 5-10 Salt-soil: 5-10
- **Water:** average high ample
- **Soil Type:** alkaline sandy loam loam sand humus Soil Thickness: thick

---

**MAINTENANCE INFORMATION**

- **Propagation:** cutting division Transplanting: -0-
- **Culture:** low Planting Time: spring
- **Soil Substitutes:** fertilizers minerals
- **Pests & Diseases:** -0-
- **Growing Problems:** Needs enhanced soil for higher salinities

---

**LANDSCAPE VALUES**

- **Architectural:** bedding containers rock garden
- **Engineering:** bank cover revegetation
- **Design:** accent color filler
- **Landscape Theme:** rustic natural transitional
- **Physical Screening:** -0-
- **Indicator Plant for:** -0-

---

**USES**

- **Plant Part:** -0-
  - **Medicinal:** -0-
  - **Animal:** -0-
  - **Fuel:** -0-
  - **Flowers:** -0-
- **Industrial:** -0-

---

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
Atriplex amnicola var. -0- Chenopodiaceae
Salt Bush
Country of origin: -0-

PLANT DESCRIPTION
Growth Form: large shrub 6-12ft Growth Rate: -0-
Growth Habit: arching round dome Mature Height: -0-
Plant Type: perennial woody broadleaf evergreen
Trunk: Form: -0- Color: red
Fragrance: insignificant

HABITAT INFORMATION
Exposure: aridity sun reflected heat dust Hardiness: -0- Population Abund: -0-
Salt-water ppt: -0- Salt-soil: -0-
Water: drought resistant low dry Soil Type: -0- Soil Thickness: -0-

MAINTENANCE INFORMATION
Propagation: cutting seed Transplanting: -0-
Culture: -0- Planting Time: -0-
Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: -0-

ARCHITECTURAL VALUES
Screen natural fencing containers

DESIGN: filler visual screen
Landscape Theme: desert
Physical Screening: -0-

Uses
Medicinal: -0- Animal: -0-
Flowers: -0-

Physical Screening: -0-

Remarks & Comments: Ornamentally very valuable.

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SALT TOLERANT LANDSCAPE PLANTS

Atriplex barclayana var. -0-
Salt Bush
Country of origin: Australia, Mexico
ERL Id#: 552

PLANT DESCRIPTION
Growth Form: small shrub ground cover
Growth Habit: vertical ranching conical round
Plant Type: perennial woody broadleaf evergreen
Trunk:
Type: -0-
Formation: -0-
Foliage:
Type: simple
Form: -0-
Base: -0-
Surface: glaucous smooth fine
Fragrance: insignificant
Flowers:
Type: compound
Season: Apr May Jun Sep Oct Nov
Fragrance: insignificant
Sex: bisexual
Fruit:
Type: -0-
Form: -0-
Season: -0-
Use: -0-
Armor: -0-
Roots: lateral

DESCRIPTION:
Growth Rate: medium
Mature Height: 20-50cm

HABITAT INFORMATION
Exposure: aridity sun wind reflected heat
Hardiness: half hardy >=-10C
Salt-water ppt: 10-20 20-30 30-40
Salt-soil: 10-20 20-30 30-40
Water: drought resistant low dry
Soil Type: sandy_loam sand poor soil
Soil Thickness: -0-

MAINTENANCE INFORMATION
Propagation: seed cutting
Transplanting: easy
Culture: -0-
Planting Time: spring
Soil Substitutes: -0-
Growing Problems: -0-

LANDSCAPE VALUES
Architectural: screen non walk_on_gnd_cvr rock garden
Engineering: bank_cover erosion_control soil_stabilization revegetation
Design: foliage space creator filter
Landscape Theme: desert understory
Physical Screening: wide short
Disadvantages: increases salinity_in_soil
Indicator Plant for: -0-

USES
Plant Part: whole_plant leaf
Medicinal: -0-
Edible: -0-
Animal: forage
Fuel: -0-
Flowers: -0-
Industrial: -0-

Remarks & Comments: Increase salinity in soil; short lived; tasty to animals, therefore not recommended for road sides.

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SALT TOLERANT LANDSCAPE PLANTS

*Salt Bush*

*Salt Tolerant Landscape Plants*

**Country of origin:** South Africa

**Plant Description**

**Growth Form:** small shrub ground cover

**Growth Habit:** branching mounding spreading conical

**Plant Type:** perennial woody broadleaf evergreen

**Trunk:**

- **Form:**
- **Color:**

**Foliage:**

- **Type:** simple
- **Form:** medium sparse
- **Base:** cuneate
- **Surface:** glaucous smooth fine
- **Fragrance:** insignificant

**Flowers:**

- **Type:**
- **Form:**
- **Season:** Jun Jul Aug
- **Fragrance:** insignificant

**Fruit:**

- **Type:**
- **Form:**
- **Season:**
- **Use:**
- **Armor:**
- **Roots:**

**Growth Rate:** medium

**Mature Height:** 1-3m

**Arrangement:** alternate

**Shape:** ovate elliptic

**Tip:** rounded notched

**Color:** silver gray

**Habitat Information**

**Exposure:** aridity sun wind reflected heat

**Hardiness:** half hardy >= -10C

**Population Abund:** cultivated plant

**Salt-water ppt:** 10-20 20-30 30-40

**Salt-soil:** 10-20 20-30 30-40

**Water:** drought resistant low dry

**Soil Type:** sandy loam poor soil

**Soil Thickness:**

**Maintenance Information**

**Propagation:** cutting seed

**Culture:** pruning low intermediate

**Soil Substitutes:**

**Pests & Diseases:**

**Growing Problems:**

**Transplanting:**

**Planting Time:**

**Landscaping Values**

**Architectural:** screen hedge non walk on gnd cvr

**Engineering:** revegetation

**Design:** ornamental space creator specimen filler

**Landscape Theme:** desert transitional

**Physical Screening:** wide short

**Disadvantages:**

**Indicator Plant for:**

**Uses**

- **Plant Part:**
- **Medicinal:**
- **Animal:**
- **Flowers:**
- **Industrial:**

**Remarks & Comments:** Can be pruned or shaped for dense hedge or specimen plant.

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SALT TOLERANT LANDSCAPE PLANTS

Atriplex bunburyana var. -0- Chenopodiaceae
Salt Bush
Country of origin: -0-

PLANT DESCRIPTION

Growth Form: small shrub
Growth Habit: round mounding
Plant Type: perennial woody broadleaf evergreen

Trunk:
Form: -0-
Type: simple
Base: -0-
Surface: glaucous solid

Flowers:
Type: -0-
Form: small
Season: -0-
Fragrance: insignificant

Sex: bisexual

Fruit:
Type: -0-
Form: -0-
Season: -0-
Use: -0-
Armor: -0-

DESCRIPTION

Evergreen
Color: -0-
Growth Rate: -0-
Mature Height: -0-
Arrangement: alternate
Shape: elliptic
Tip: pointed
Color: light green gray

Color: light green gray

Pollination: wind blown

FRAGRANCE: insignificant

HABITAT INFORMATION

Exposure: aridity sun reflected heat dust
Hardiness: -0-
Salt-water ppt: -0-
Salt-soil: -0-
Water: drought resistant low dry
Soil Type: -0-
Soil Thickness: -0-

MAINTENANCE INFORMATION

Propagation: cutting seed
Culture: -0-
Soil Substitutes: -0-
Growing Problems: -0-

LANDSCAPE VALUES

Architectural: screen natural fencing
Engineering: revegetation soil stabilization dust break
Design: filler
Landscaping Theme: desert
Physical Screening: -0-
Indicator Plant for: -0-

USES

Plant Part: -0-
Medicinal: -0-
Edible: -0-
Animal: -0-
Fuel: -0-
Flowers: -0-
Industrial: -0-

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SALT TOLERANT LANDSCAPE PLANTS

Atriplex canescens var. -0-  
Chenopodiaceae

Country of origin: U.S.A., Mexico

PLANT DESCRIPTION

Growth Form: large shrub 6-12 ft  
Growth Habit: branching dome round  
Plant Type: perennial woody broadleaf evergreen

Trunk:
- Form: -0-
- Foliage: simple
- Base: cuneate
- Surface: glaucous smooth solid

Flowers:
- Type: -0-
- Form: -0-
- Season: -0-
- Fragrance: insignificant

Fruit:
- Type: -0-
- Form: -0-
- Season: -0-

Foliage:
- Type: simple
- Form: medium sparse
- Base: cuneate
- Surface: glaucous smooth solid

Flower:
- Type: -0-
- Form: -0-
- Season: -0-

Use: -0-

HABITAT INFORMATION

Exposure: aridity sun wind reflected heat
Hardiness: hardy < -10 C
Salt-water ppt: 10-20 20-30 30-40
Water: drought resistant low dry
Salt Soil: 10-20 20-30 30-40

MAINTENANCE INFORMATION

Propagation: cutting
Culture: pruning low intermediate
Soil Substitutes: minerals
Growing Problems: -0-

LANDSCAPE VALUES

Architectural: hedge natural fencing screen non walk on ground cover
Engineering: erosion control barrier soil stabilization revegetation soil repair
Landscape Theme: desert transitional
Physical Screening: wide high moderate
Disadvantages: Increases salinity in soil low germination rate
Indicator Plant for: -0-

USES

Plant Part: whole plant leaf
Edible: -0-
Fuel: -0-
Industrial: -0-

Remarks & Comments: Use in mass plantings, for soil reclamation and revegetation; very tough plant. Increases soil salts

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SALT TOLERANT LANDSCAPE PLANTS

*Atriplex halimus* var. -0-
Silver Orache, Silver Salt Bush

Country of origin: Australia, Saharo-Ar

---

**PLANT DESCRIPTION**

**Growth Form:** Large shrub 6-12ft
**Growth Rate:** -0-
**Growth Habit:** Round vase shape ellipsoid branching
Mature Height: 1-3m

**Trunk:**
- **Form:** -0-
- **Color:** white

**Foliation:**
- **Type:** simple
- **Arrangement:** alternate
- **Form:** medium dense
- **Shape:** obovate triangular
- **Base:** cuneate
- **Tip:** pointed
- **Surface:** glaucous vesicular hairs
- **Color:** silver gray bluish
- **Fragrance:** insignificant

**Flowers:**
- **Type:** -0-
- **Form:** small
- **Season:** Apr May Jun Jul Aug Sep Oct
- **Arrangement:** clustered
- **Shape:** spike
- **Color:** yellow insignificant
- **Pollination:** wind blown

**Fruit:**
- **Type:** -0-
- **Form:** -0-
- **Season:** Nov Dec Jan
- **Arrangement:** -0-
- **Shape:** berry
- **Color:** -0-

**Armor:** -0-

---

**HABITAT INFORMATION**

**Exposure:** aridity sun reflected heat dust

**Hardiness:** -0-
**Population Abund:** abundant

Salt-water ppt: 10-20 20-30 30-40
Salt-soil: 5-10 10-20 20-30

Water: drought resistant low dry

Soil Type: alkaline silt poor soil

Soil Thickness: -0-

---

**MAINTENANCE INFORMATION**

**Propagation:** seed cutting
**Transplanting:** easy
**Culture:** -0-
**Planting Time:** spring

**Soil Substitutes:** -0-

**Pests & Diseases:** bellshape galls on young stems,-0-

**Growing Problems:** -0-

---

**LANDSCAPE VALUES**

Architectural: screen natural fencing

Engineering: bank cover revegetation soil reclamation pioneer noise barrier

Design: filler visual screen space creator

Landscape Theme: desert

Physical Screening: moderate high

Disadvantages: increases salinity in soil

Indicator Plant for: -0-

---

**USES**

Medicinal: -0-
Edible: -0-
Animal: forage
Flowers: -0-
Industrial: -0-

---

Remarks & Comments: Leaves look green in winter when wet and silver in summer when dry; salt crystals reflect sun light.

SALT TOLERANT LANDSCAPE PLANTS

Atriplex hastata var. hastata
Salt Bush, Fat Hen
Chenopodiaceae

Country of origin: Australia
ERL Id#: 466

Growth Form: small_shrub
Growth Habit: branching vertical conical
Plant Type: broadleaf_evergreen woody

Trunk:
Form: -0-
Color: -0-

Foliage:
Type: simple
Form: large dense
Base: cuneate cordate
Surface: smooth
Fragrance: -0-

Flowers:
Type: -0-
Form: small
Season: Jun Jul Aug Sep Oct
Fragrance: -0-

Fruit:
Type: -0-
Form: -0-
Season: -0-
Use: -0-
Armored: -0-

Growth Rate: fast
Mature Height: 20-50cm

HABITAT INFORMATION
Exposure: aridity sun wind reflected_heat
Hardiness: hardy, <-10C
Salt-water ppt: 20-30 30-40
Salt-soil: 10-20 20-30 30-40
Water: drought_resistant low_dry
Soil Type: poor_soil
Soil Thickness: thin

MAINTENANCE INFORMATION
Propagation: seed cutting
Transplanting: easy
Culture: low
Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: -0-
Planting Time: -0-

LANDSCAPE VALUES
Architectural: screen natural_fencing rock_garden
Engineering: soil_stabilization revegetation soil_reclamation erosion_contr
Design: filler
Landscape Theme: -0-
Physical Screening: moderate light
Disadvantages: -0-
Indicator Plant for: -0-

USES
Plant Part: whole_plant leaf
Medicinal: -0-
Edible: -0-
Fuel: -0-
Industrial: -0-

Remarks & Comments: -0-

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
Atriplex isatidea
Salt Bush var. -0-

Country of origin: -0-  ERL Id#: 482

SALT TOLERANT LANDSCAPE PLANTS
Chenopodiaceae

PLANT DESCRIPTION

Growth Form: small shrub  Growth Rate: medium
Growth Habit: arching vase shape branching  Mature Height: 1-3m
Plant Type: perennial woody broad leaf evergreen

Trunk:
Form: -0-  Color: white

Foliation:
Type: simple  Arrangement: alternate whorled
Form: large  Shape: obovate elliptic
Base: cuneate  Tip: pointed
Surface: leathery glaucous  Color: silver gray
Fragrance: insignificant

Flowers:
Type: -0-  Arrangement: -0-
Form: -0-  Shape: -0-
Season: Aug Sep Oct  Color: white insignificant
Fragrance: -0-  Pollination: wind blown
Sex: -0-

Fruit:
Type: -0-  Arrangement: -0-
Form: -0-  Shape: berry
Season: -0-  Color: -0-
Use: -0-  Roots: -0-

HABITAT INFORMATION

Exposure: aridity sun wind reflected heat
Hardiness: half hardy >= -10C  Population Abund: -0-
Salt-water ppt: 20-30 30-40  Salt-soil: 10-20 20-30 30-40
Water: drought resistant low dry
Soil Type: sandy loam poor soil  Soil Thickness: -0-

MAINTENANCE INFORMATION

Propagation: -0-  Transplanting: -0-
Culture: low  Planting Time: -0-
Soil Substitutes: -0-  Growing Problems: -0-

LANDSCAPE VALUES

Architectural: hedge natural fencing rock garden
Engineering: revegetation
Design: ornamental foliage form space creator
Landscape Theme: formal desert transitional
Physical Screening: moderate light
Disadvantages: -0-
Indicator Plant for: -0-

USES

Plant Part: whole plant leaf  Medicinal: -0-
Edible: -0-  Animal: forage
Fuel: -0-  Flowers: -0-
Industrial: -0-


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SALT TOLERANT LANDSCAPE PLANTS

Atriplex lentiformis var. -0- Chenopodiaceae

Salt Bush

Country of origin: -0- ERL Id#: 553

PLANT DESCRIPTION

Growth Form: large shrub 6-12 ft
Growth Habit: branching round conical
Plant Type: perennial woody broadleaf evergreen

Trunk:
- Form: -0-
- Color: -0-

Foliage:
- Type: simple
- Form: medium dense
- Base: cordate
- Surface: smooth solid
- Fragrance: insignificant

Flowers:
- Type: -0-
- Form: -0-
- Season: -0-
- Fragrance: -0-
- Sex: -0-

Fruit:
- Type: -0-
- Form: -0-
- Season: -0-
- Use: -0-
- Armor: -0-

Exposure: aridity sun wind reflected heat
Hardiness: hardy <-10 C
Salt-waterppt: 10-20 20-30 30-40
Water: drought resistant low dry
Soil Type: sandy loam sand poor soil

HABITAT INFORMATION

Salt-soil: 10-20 20-30 30-40

Mature Height: 1-3m

Growth Rate: medium

MAINTENANCE INFORMATION

Propagation: -0-
Culture: low intermediate pruning
Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: -0-

LANDSCAPE VALUES

Architectural: screen hedge natural fencing
Design: form space creator visual screen filler
Landscape Theme: desert transitional understory

Physical Screening: wide high moderate

Disadvantages: -0-
Indicator Plant for: -0-

USES

Plant Part: whole plant leaf
Medicinal: -0-
Edible: -0-
Animal: forage
Fuel: -0-
Industrial: -0-

Flowers: -0-

Remarks & Comments: Can be pruned as dense hedge. Curly leaves.

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**SALT TOLERANT LANDSCAPE PLANTS**

<table>
<thead>
<tr>
<th>Atriplex nummularia var. -0-</th>
<th>Chenopodiaceae</th>
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</thead>
<tbody>
<tr>
<td>Salt Bush</td>
<td>ERL Id#: 489</td>
</tr>
<tr>
<td>Country of origin: Australia, Middle East</td>
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**PLANT DESCRIPTION**

<table>
<thead>
<tr>
<th>Growth Form:</th>
<th>large shrub 6-12ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth Habit:</td>
<td>vertical conical</td>
</tr>
<tr>
<td>Plant Type:</td>
<td>perennial woody broadleaf evergreen</td>
</tr>
<tr>
<td>Trunk:</td>
<td></td>
</tr>
<tr>
<td>Form:</td>
<td>-0-</td>
</tr>
<tr>
<td>Foliage:</td>
<td></td>
</tr>
<tr>
<td>Type:</td>
<td>simple</td>
</tr>
<tr>
<td>Form:</td>
<td>large dense</td>
</tr>
<tr>
<td>Base:</td>
<td>cuneate</td>
</tr>
<tr>
<td>Surface:</td>
<td>glaucous smooth</td>
</tr>
<tr>
<td>Fragrance:</td>
<td>insignificant</td>
</tr>
<tr>
<td>Flowers:</td>
<td></td>
</tr>
<tr>
<td>Type:</td>
<td>compound</td>
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<tr>
<td>Form:</td>
<td>small</td>
</tr>
<tr>
<td>Season:</td>
<td>Apr May Jun Jul Aug</td>
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<tr>
<td>Fragrance:</td>
<td>insignificant</td>
</tr>
<tr>
<td>Sex:</td>
<td>bisexual</td>
</tr>
<tr>
<td>Fruit:</td>
<td></td>
</tr>
<tr>
<td>Type:</td>
<td>-0-</td>
</tr>
<tr>
<td>Form:</td>
<td>small</td>
</tr>
<tr>
<td>Season:</td>
<td>Oct Nov Dec Jan</td>
</tr>
<tr>
<td>Use:</td>
<td>-0-</td>
</tr>
<tr>
<td>Armor:</td>
<td>-0-</td>
</tr>
</tbody>
</table>

**HABITAT INFORMATION**

| Exposure: | aridity sun wind reflected heat |
| Hardiness: | hardy < -10C |
| Salt-water ppt: | 10-20 20-30 30-40 |
| Salt-soil: | 5-10 10-20 20-30 30-4 |
| Water: | drought resistant low dry |
| Soil Type: | poor soil |
| Soil Thickness: | thin |
| Population Abund: | abundant |

**MAINTENANCE INFORMATION**

| Propagation: | cutting seed |
| Culture: | pruning low intermediate |
| Soil Substitutes: | -0- |
| Pests & Diseases: | -0- |
| Growing Problems: | -0- |
| Transplanting: | easy |
| Planting Time: | spring |

**LANDSCAPE VALUES**

| Architectural: | screen hedge natural fencing |
| Engineering: | erosion control soil stabilization revegetation soil reclamation |
| Design: | color specimen visual screen filler |
| Landscape Theme: | formal desert |
| Physical Screening: | moderate high |
| Disadvantages: | increases salinity in soil |
| Indicator Plant for: | -0- |

**USES**

| Plant Part: | whole plant leaf |
| Edible: | -0- |
| Animal: | forage |
| Fuel: | -0- |
| Industrial: | -0- |

**Remarks & Comments:** Might increase salinity in ground; short lived; can be pruned or shaped for hedge or specimen plant.

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SALT TOLERANT LANDSCAPE PLANTS

Atriplex paludosa var. -0- Chenopodiaceae

Salt Bush

Country of origin: -0-

PLANT DESCRIPTION

Growth Form: small shrub
Growth Habit: vertical branching dome conical
Plant Type: perennial woody broadleaf evergreen

Trunk:
Form: -0-
Color: -0-

Foliage:
Type: simple
Form: small dense
Base: cuneate
Surface: glaucous smooth fine
Fragrance: insignificant

Flowers:
Type: -0-
Arrangement: whorled
Shape: linear lanceolate elliptic
Tip: acuminate
Color: light green gray bluish

Fruit:
Type: -0-
Arrangement: berries
Shape: berry
Color: -0-

MAINTENANCE INFORMATION

Exposure: aridity sun wind reflected heat
Hardiness: 0 = -10C
Salt-water ppt: 5-10 10-20 20-30 30-40
Salt-soil: 5-10 10-20 20-30 30-4
Water: drought resistant low dry
Soil Type: sandy loam
Soil Thickness: -0-

Propagation: -0-
Culture: low intermediate
Soil Substitutes: -0-
Growing Problems: -0-

LANDSCAPE VALUES

Architectural: screen hedge containers
Engineering: revegetation
Design: foliage form space creator filler
Landscape Theme: formal desert transitional
Physical Screening: moderate short

Disadvantages: -0-

USES

Plant Part: -0-
Medicinal: -0-
Edible: -0-
Animal: -0-
Fuel: -0-
Flowers: -0-
Industrial: -0-

Remarks & Comments: Fine textured foliage.

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### SALT TOLERANT LANDSCAPE PLANTS

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Country of origin</th>
<th>ERL Id#</th>
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<tbody>
<tr>
<td><em>Atriplex patula</em> var. <em>hastata</em></td>
<td>Salt Bush</td>
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#### PLANT DESCRIPTION

<table>
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<tr>
<th>Trait</th>
<th>Description</th>
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<tbody>
<tr>
<td>Growth Form</td>
<td>small shrub ground cover</td>
</tr>
<tr>
<td>Growth Habit</td>
<td>branching vertical conical</td>
</tr>
<tr>
<td>Plant Type</td>
<td>perennial woody broadleaf evergreen</td>
</tr>
<tr>
<td>Trunk</td>
<td>Form: -0- Color: -0-</td>
</tr>
<tr>
<td>Foliage</td>
<td>Type: simple Arrangement: alternate</td>
</tr>
<tr>
<td></td>
<td>Form: large dense Shape: triangular</td>
</tr>
<tr>
<td></td>
<td>Base: cuneate Tip: mucronate</td>
</tr>
<tr>
<td></td>
<td>Surface: vesicular hairs glaucous sm Color: light green</td>
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<td>Flowers</td>
<td>Type: -0- Arrangement: -0-</td>
</tr>
<tr>
<td></td>
<td>Form: small Shape: spike Color: yellow insignificant</td>
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<tr>
<td></td>
<td>Season: -0- Fragrance: insignificant Pollination: wind blown</td>
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<td>Sex</td>
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<td>Fruit</td>
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<td></td>
<td>Form: small Shape: berry Color: red</td>
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<td></td>
<td>Season: -0-</td>
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<tr>
<td></td>
<td>Use: -0-</td>
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<tr>
<td>Armor</td>
<td>-0- Roots: lateral</td>
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<td>Growth Rate</td>
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<td>Mature Height</td>
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<td>Flowers Form</td>
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<td>Flowers Sex</td>
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<td>Flowers Use</td>
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<tr>
<td>Flowers Armor</td>
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<td>Flowers Growth Rate</td>
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#### HABITAT INFORMATION

<table>
<thead>
<tr>
<th>Trait</th>
<th>Description</th>
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<tr>
<td>Exposure</td>
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<td>Hardiness</td>
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<td>Salt-water ppt</td>
<td>5-10 10-20 20-30 30-40</td>
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<tr>
<td>Salt-soil</td>
<td>5-10 10-20 20-30 30-40</td>
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<tr>
<td>Water</td>
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<td>Soil Type</td>
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#### MAINTENANCE INFORMATION

<table>
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<tr>
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<tr>
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<td>Culture</td>
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<td>Soil Substitutes</td>
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<td>Pests &amp; Diseases</td>
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<td>Growing Problems</td>
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#### LANDSCAPEVALUES

<table>
<thead>
<tr>
<th>Trait</th>
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<tr>
<td>Architectural</td>
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<tr>
<td>Engineering</td>
<td>dust_break revegetation soil_stabilization</td>
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<tr>
<td>Design</td>
<td>filler</td>
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<td>Landscape Theme</td>
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<td>Physical Screening</td>
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<tr>
<td>Disadvantages</td>
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<td>Indicator Plant for</td>
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#### USES

<table>
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<th>Trait</th>
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<td>Edible</td>
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<td>Animal</td>
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<td>Fuel</td>
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<td>Flowers</td>
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<td>Remarks &amp; Comments</td>
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(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
SALT TOLERANT LANDSCAPE PLANTS

Atriplex semibaccata var. -0-  
Salt Bush  
Country of origin: -0-  
ERL Id#: 230

PLANT DESCRIPTION

Growth Form: ground_cover  
Growth Habit: branching horizontal  
Plant Type: perennial woody broadleaf evergreen  
Trunk:  
Form: -0-  
Foliage:  
Type: simple  
Form: small dense  
Base: -0-  
Surface: glaucous vesicular_hairs fi  
Fragrance: insignificant  
Flowers:  
Type: -0-  
Form: small  
Season: -0-  
Fragrance: insignificant  
Sex: bisexual  
Fruit:  
Type: -0-  
Form: -0-  
Season: -0-  
Armor: -0-  
Roots: lateral  

DESCRIPTION

Evergreen  
Color: -0-  
Growth Rate: -0-  
Mature Height: -0-  
Arrangement: alternate  
Shape: elliptic  
Tip: pointed  
Color: light_green  
Arrangement: -0-  
Shape: spike  
Color: yellow insignificant  
Pollination: wind_blown  
Fragrance: insignificant  

HABITAT INFORMATION

Exposure: aridity sun reflected_heat dust  
Hardiness: -0-  
Salt-water ppt: 10-20 20-30 30-40  
Water: drought_resistant low_dry  
Salt-soil: 5-10 10-20 20-30  
Soil Type: -0-  
Soil Thickness: -0-  

MAINTENANCE INFORMATION

Propagation: cutting seed  
Culture: -0-  
Transplanting: -0-  
Planting Time: -0-  
Soil Substitutes: -0-  
Pests & Diseases: -0-  
Growing Problems: -0-  

LANDSCAPE VALUES

Architectural: screen natural_fencing  
Engineering: revegetation soil_stabilization dust_break noise_barrier  
Design: filler  
Landscape Theme: desert  
Physical Screening: -0-  
Disadvantages: increases_salinity_in_soil  
Indicator Plant for: -0-  

USES

Plant Part: whole_plant leaf  
Medicinal: -0-  
Edible: -0-  
Animal: forage  
Fuel: -0-  
Flowers: -0-  
Industrial: -0-  

Remarks & Comments: -0-  

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SALT TOLERANT LANDSCAPE PLANTS

Atriplex undulata var. -0- Chenopodiaceae
Salt Bush
Country of origin: -0-

ERL Id#: 163

PLANT DESCRIPTION

Growth Form: small_shrub
Growth Habit: arching vase_shape
Plant Type: perennial woody broadleaf evergreen

Trunk:
Form: -0-
Color: -0-

Foliage:
Type: simple
Form: small dense
Base: -0-
Surface: glaucous solid
Fragrance: insignificant

Flowers:
Type: -0-
Form: small
Season: -0-
Fragrance: insignificant
Sex: bisexual

Fruit:
Type: -0-
Form: -0-
Season: -0-
Use: -0-
Armored: -0-
Roots: lateral

Growth Rate: medium
Mature Height: 1-3m

HABITAT INFORMATION

Exposure: aridity sun wind reflected_heat
Hardiness: half Hardy >-10C
Salt-water ppt: 10-20 20-30 30-40
Salt-soil: 5-10 10-20 20-30 30-4
Water: drought resistant low_dry
Soil Type: sandy_loam
Soil Thickness: thin

MAINTENANCE INFORMATION

Propagation: cutting
Culture: pruning low
Soil Substitutes: -0-
Pollination: wind_blowed
Growing Problems: -0-

LANDSCAPE VALUES

Architectural: screen hedge natural_fencing
Engineering: revegetation soil_stabilization pioneer
Design: foliage form space creator filler
Landscape Theme: desert transitional
Physical Screening: moderate
Disadvantages: increases salinity in soil
Indicator Plant for: -0-

USES

Plant Part: whole plant
Medicinal: -0-
Edible: -0-
Animal: forage
Fuel: -0-
Flowers: -0-
Industrial: -0-


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SALT TOLERANT LANDSCAPE PLANTS

Avicennia germinans var. -0-
Black Mongrove
Country of origin: Tropics

PLANT DESCRIPTION

Growth Form: small tree 12-24ft
Growth Habit: branching dome
Plant Type: perennial woody broadleaf evergreen

Trunk:
- Form: multi-
- Color: red

Foliage:
- Type: simple
- Form: large sparse
- Base: -0-
- Surface: pubescent leathery shiny
- Fragrance: insignificant

Flowers:
- Type: simple
- Form: small
- Season: Mar Apr May
- Fragrance: significant

Sex: monoecious

Fruit:
- Type: -0-
- Form: medium
- Season: -0-
- Use: poisonous

Armor: -0-

Description:
- Evergreen
- Color: red
- Growth Rate: -0-
- Mature Height: 11-20m
- Arrangement: opposite
- Shape: oblong elliptic
- Tip: mucronate
- Color: dark green gray

Flower:
- Plant Type: perennial woody broadleaf evergreen

HABITAT INFORMATION

Exposure: humidity sun wind
Hardiness: tender >0C
Salt-water ppt: 10-20 20-30 30-40
Water: average high ample flooding
Soil Type: clay silt peat poor soil

Population Abund: abundant
Salt-soil: 5-10 10-20 20-30 30-4
Soil Thickness: -0-

MAINTENANCE INFORMATION

Propagation: seed
Culture: pruning
Soil Substitutes: -0-
Growing Problems: -0-

Architectural: screen row natural fencing shade
Engineering: barrier soil stabilization noise barrier soil moisture retain
Design: form space creator visual screen filler
Landscape Theme: natural tropical transitional
Physical Screening: impenetrable high
Disadvantages: -0-

Indicator Plant for: -0-

USES

Plant Part: bark whole plant
Medicinal: -0-
Edible: -0-
Fuel: -0-
Industrial: tannin


(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
Batis maritima var. -0-  Batidaceae, Ba
Country of origin: American Tropics  ERL Id#: 785

PLANT DESCRIPTION
Growth Form: small shrub ground cover  Growth Rate: -0-
Growth Habit: spreading branching conical  Mature Height: 20-50cm
Plant Type: perennial herbaceous
Trunk:  Form: -0-  Color: -0-
Foliage:
Type: simple  Arrangement: opposite whorled
Form: small sparse  Shape: linear scale-like fleshy
Base: -0-  Tip: pointed
Surface: smooth  Color: light green
Fragrance: significant
Flowers:
Type: simple  Arrangement: solitary
Form: small  Shape: berry
Season: Mar Apr May Jun Jul Aug Sep  Color: insignificant
Fragrance: -0-  Pollination: -0-
Sex: dioecious
Fruit:
Type: -0-  Arrangement: -0-
Form: medium  Shape: berry
Season: -0-  Color: -0-
Use: -0-  Roots: roots at nodes rhizome fibrous
Growth Rate: -0-
Mature Height: 20-50cm

HABITAT INFORMATION
Exposure: -0-  Population Abund: abundant
Hardiness: -0-  Salt-water ppt: 5-10 10-20 20-30 30-40
Water: average high ample flooding  Salt-soil: 5-10 10-20 20-30
Soil Type: alkaline acid silt peat poor soil  Soil Thickness: thin

MAINTENANCE INFORMATION
Propagation: rhizomes seed  Transplanting: easy
Culture: weeding  Planting Time: -0-
Soil Substitutes: -0-
Pests & Diseases: -0-  -0-
Growing Problems: rarely forms dense cover

LANDSCAPE VALUES
Architectural: walk on gnd cvr  Engineering: bank cover erosion control soil stabilization pioneer
Design: filler  Landscape Theme: natural
Physical Screening: short  Disadvantages: invasive
Indicator Plant for: -0-

USES
Plant Part: -0-  Medicinal: -0-
Edible: -0-  Animal: -0-
Fuel: -0-  Flowers: -0-
Industrial: -0-

Remarks & Comments: Withstands water logging. Roots upon contact with soil.

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**SALT TOLERANT LANDSCAPE PLANTS**

**Borrichia frutescens var. -0-**

**Sea Oxeye**

Country of origin: Mexico, Florida

**Compositae**

**ERL Id#: 777**

---

**PLANT DESCRIPTION**

**Growth Form:** small shrub

**Growth Habit:** spreading vertical

**Plant Type:** perennial woody broadleaf, evergreen

**Trunk:**
- **Form:** straight
- **Color:** -0-

**Foliage:**
- **Type:** simple
- **Form:** medium dense
- **Base:** attenuate
- **Surface:** -0-
- **Fragrance:** significant

**Flowers:**
- **Type:** compound
- **Form:** -0-
- **Season:** All
- **Fragrance:** -0-
- **Sex:** monoecious

**Fruit:**
- **Type:** -0-
- **Form:** medium
- **Season:** -0-
- **Use:** -0-
- **Armor:** -0-
- **Roots:** rhizome

---

**HABITAT INFORMATION**

**Exposure:** sun

**Hardiness:** hardy < -10C

**Salt-water ppt:** 5-10 10-20

**Water:** low_dry average

**Soil Type:** sandy_loam

**Salt-soil:** 5-10 10-20

**Soil Thickness:** thick

---

**MAINTENANCE INFORMATION**

**Propagation:** -0-

**Culture:** -0-

**Soil Substitutes:** -0-

**Pests & Diseases:** -0-

**Growing Problems:** -0-

**Transplanting:** -0-

**Planting Time:** -0-

---

**ARCHITECTURAL VALUES**

**Architectural:** hedge bedding

**Engineering:** -0-

**Design:** fragrance ornamental color

**Landscape Theme:** rustic natural

**Physical Screening:** light

**Disadvantages:** invasive

---

**Landscape Theme:** rustic natural

**Physical Screening:** light

**Disadvantages:** invasive

**Indicator Plant for:** -0-

---

**USES**

**Plant Part:** -0-

**Medicinal:** -0-

**Edible:** -0-

**Animal:** -0-

**Fuel:** -0-

**Flowers:** -0-

**Industrial:** -0-

---

**Remarks & Comments:** Can be invasive, spreads by runners

---

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
Callistemon rigidus var. -0-
Stiff Bottlebrush
Country of origin: Australia

PLANT DESCRIPTION

Growth Form: small_tree_12-24ft
Growth Habit: branching broad_sweeping umbrella
Plant Type: perennial woody broadleaf_evergreen
Trunk: Form: armored

Foliage:
Type: simple
Form: large sparse
Base: attenuate
Surface: leathery solid dull
Fragrance: insignificant
Flowers:
Type: simple
Form: medium large
Season: Mar Apr May Jun
Fragrance: -0-
Sex: -0-
Fruit:
Type: -0-
Form: -0-
Season: -0-
Use: -0-
Armor: spikes

HABITAT INFORMATION

Exposure: aridity sun part_shade reflected_heat
Hardiness: half hardy => -10C
Salt-water ppt: 5-10
Water: drought_resistant low_dry
Soil Type: alkaline

MAINTENANCE INFORMATION

Propagation: layer seed
Culture: pruning low
Pests & Diseases: -0-
Growing Problems: -0-

LANDSCAPE VALUES

Architectural: screen hedge street_tree natural_fencing patio
Engineering: -0-
Design: ornamental color foliage form view_creator silhouette
Landscape Theme: formal tropical oriental desert
Physical Screening: moderate impenetrable high
Disadvantages: -0-
Indicator Plant for: -0-

USES

Plant Part: -0-
Medicinal: -0-
Edible: -0-
Animal: -0-
Floral: -0-
Flowers: -0-
Industrial: -0-
Remarks & Comments: Least graceful bottlebrush, but drought and salt tolerant.

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SALT TOLERANT LANDSCAPE PLANTS

Calotropis procera var. -0- Asclepiadaceae

Country of origin: Tropical Africa

ERL Id#: 0002

PLANT DESCRIPTION

Growth Form: small tree 12-24ft large shrub 6-12ft Growth Rate: medium
Plant Type: succulent woody frost deciduous salt deciduous drought decid

Trunk:
Form: single multi-
Color: white

Foliage:
Type: simple
Form: large sparse
Base: -0-
Surface: pubescent solid glaucous Fragrance: insignificant

Flowers:
Type: simple
Form: large
Season: May Jun Jul Sep Aug
Fragrance: significant Pollination: insects

Sex: -0-

Fruit:
Type: simple
Form: large dense
Season: Sep Oct Nov Dec
Use: poisonous

HABITAT INFORMATION

Exposure: aridity sun reflected heat dust
Hardiness: tender >0C
Salt-water ppt: 5-10
Salt-soil: 5-10
Water: drought resistant low dry
Soil Type: alkaline sandy loam sand
Soil Thickness: -0-

MAINTENANCE INFORMATION

Propagation: cutting seed Transplanting: -0-
Culture: -0-
Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: foliage not wind resistant

LANDSCAPE VALUES

Architectural: hedge row patio screen
Engineering: sand binder dust break
Design: ornamental foliage canopy accent view creator specimen
Landscape Theme: 0-
Physical Screening: light high
Disadvantages: poisonous will die if overwatered allergic
Indicator Plant for: -0-

USES

Plant Part: sap fruit leaf bark Medicinal: medicinal
Edible: foods drinks Animal: -0-
Fuel: -0-
Flowers: -0-
Industrial: -0-

Remarks & Comments: Should be protected from strong winds. Very good for sand dunes.

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SALT TOLERANT LANDSCAPE PLANTS

Carpobrotus edulis var. -0- Aizoaceae
Country of origin: South Africa ERL Id#: 691

Growth Form: ground_cover Growth Rate: fast
Growth Habit: mounding spreading trailing Mature Height: <20cm
Plant Type: annual perennial succulent woody broadleaf-evergreen

PLANT DESCRIPTION
Trunk:
Form: -0-
Color: red

Foliage:
Type: simple
Form: large dense
Base: -0-
Surface: smooth sticky solid
Fragrance: insignificant

Flowers:
Type: compound
Form: large dense
Season: Mar Apr May Jun Jul
Fragrance: -0-
Pollination: water_flushed

Sex: monoecious

Fruit:
Type: -0-
Form: small
Season: -0-
Use: edible
Armor: -0-
Roots: roots_at_nodes

HABITAT INFORMATION
Exposure: aridity humidity sun part_shade
Hardiness: half_hardy_-10C Population Abund: -0-
Salt-water ppt: 5-10 Salt-soil: 5-10
Water: low_dry average
Soil Type: alkaline sandy_loam sand Soil Thickness: -0-

MAINTENANCE INFORMATION
Propagation: cutting Transplanting: easy
Culture: intermediate Planting Time: spring
Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: -0-

LANDSCAPE VALUES
Architectural: bedding non_waIk_on_gnd_cvr containers rock_garden
Engineering: bank_cover erosion_control sand_binder soil_stabilization
Design: ornamental color foliage filler
Landscape Theme: natural tropical transitional
Physical Screening: wide short
Disadvantages: -0-
Indicator Plant for: -0-

USES
Plant Part: -0- Medicinal: -0-
Edible: -0- Animal: -0-
Flower: -0- Industrial: -0-


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SALT TOLERANT LANDSCAPE PLANTS

Casuarina equisetifolia var. -0- Casuarinaceae
She Oak, Australian Pine
Country of origin: Australia, Tropics ERL Id#: 0009

PLANT DESCRIPTION

Growth Form: large tree
Growth Habit: vertical pagoda triangular
Plant Type: perennial woody broadleaf evergreen

Trunk:
Form: single leaning
Color: -0-

Foliage:
Type: simple
Form: medium dense
Base: -0-
Surface: glaucous smooth leathery
Fragrance: -0-

Flowers:
Type: -0-
Form: small
Season: Apr
Fragrance: -0-

Fruit:
Type: -0-
Form: small
Season: -0-

Use: -0-

Armor: -0-

HABITAT INFORMATION

Exposure: aridity sun part_shade reflected_heat
Hardiness: tender >0C Population Abund: cultivated_pla
Salt-water ppt: 5-10 10-20 Salt-soil: 5-10 10-20
Water: drought_resistant
Soil Type: alkaline clay sand poor_soil Soil Thickness: thin

MAINTENANCE INFORMATION

Propagation: cutting seed
Culture: pruning staking low
Soil Substitutes: fertilizers
Pests & Diseases: -0-
Growing Problems: -0-

LANDSCAPE VALUES

Architectural: screen hedge row shade street_tree
Engineering: sand_binder soil_stabilization revegetation wind_breaks affore
Design: specimen canopy visual_screen
Landscape Theme: formal oriental transitional
Physical Screening: high
Disadvantages: very_tender
Indicator Plant for: -0-

USES

Plant Part: bark Medicinal: -0-
Edible: -0-
Animal: -0-
Fuel: -0-
Flowers: -0-
Industrial: timber

Remarks & Comments: -0-

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SALT TOLERANT LANDSCAPE PLANTS

Chrithmum maritimum var. -0- Umbelliferae
Rock Samphire
Country of origin: Atlantic and Mediter
ERL Id#: 497

PLANT DESCRIPTION

Growth Form: small shrub bedding plant
Growth Rate: medium
Growth Habit: horizontal spreading vase shape
Mature Height: 50cm-1M
Plant Type: perennial herbaceous broad leaf evergreen

Trunk:
Form: -0-
Color: -0-

Foliage:
Type: compound
Form: medium dense
Base: cuneate
Surface: glaucous smooth shiny leathery
Color: dark green bluish
Shape: oblong spatulate fleshy
Tip: acuminate

Fragrance: significant

Flowers:
Type: compound
Form: medium large sparse
Season: May Jun Aug Sep Oct
Fragrance: insignificant
Color: cream yellow
Pollination: -0-

Sex: monoecious

Fruit:
Type: small
Form: compound
Season: Oct Nov Dec
Use: -0-

Armor: -0-
Roots: corm

HABITAT INFORMATION

Exposure: sun part shade
Hardiness: hardy < -10C
Salt-water ppt: 5-10 10-20
Water: low, dry
Soil Type: sandy loam sand
Population Abund: rare
Salt-soil: 5-10 10-20
Soil Thickness: -0-

MAINTENANCE INFORMATION

Propagation: seed
Culture: low
Transplanting: -0-
Planting Time: -0-

Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: -0-

LANDSCAPE VALUES

Architectural: bedding non walk on gnd cvr rock garden
Engineering: bank cover soil stabilization
Design: filler color form
Landscape Theme: rustic natural transitional
Physical Screening: moderate
Disadvantages: -0-
Indicator Plant for: -0-

USES

Plant Part: whole plant
Medicinal: -0-
Edible: -0-
Animal: wildlife
Fuel: -0-
Flowers:
Industrial: -0-

Remarks & Comments: -0-

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
Chrysothamnus nauseosus var. -0- Compositae

Country of origin: West USA, N. Mexico

PLANT DESCRIPTION

Growth Form: large_shrub 6-12ft
Growth Habit: vertical Branching conical
Plant Type: perennial woody broadleaf evergreen
Trunk:
  Form: multi
  Color: white yellow gray

Foliage:
  Type: simple
  Form: medium dense
  Base: -0-
  Surface: pubescent glaucous smooth
  Fragrance: significant

Flowers:
  Type: compound
  Form: medium dense
  Season: -0-
  Fragrance: insignificant

Fruit:
  Type: -0-
  Form: -0-
  Season: -0-

HABITAT INFORMATION

Exposure: aridity sun reflected_heat
Hardiness: hardy < -10C
Salt-water ppt: 5-10 10-20
Salt-soil: > 5-10
Water: drought_resistant
Soil Type: alkaline poor_soil
Soil Thickness: thin

MAINTENANCE INFORMATION

Propagation: seed cutting
Culture: -0-
Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: -0-
Transplanting: -0-
Planting Time: -0-

LANDSCAPE VALUES

Architectural: row hedge screen
Engineering: bank_cover erosion_control soil_stabilization revegetation pio
Design: filler fragrance visual_screen
Landscape Theme: natural desert
Physical Screening: moderate
Disadvantages: poisonous
Indicator Plant for: -0-

USES

Plant Part: -0-
Medicinal: -0-
Edible: -0-
Animal: -0-
Fuel: -0-
Flowers: -0-
Industrial: -0-

Remarks & Comments: Toxic, but unpalatable and smelling.

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SALT TOLERANT LANDSCAPE PLANTS

Clerodendron inermis var. -0-

Wild Jasmine

Country of origin: India, Subtropical U

ERL Id#: 1224

PLANT DESCRIPTION

Growth Form: small shrub ground cover vine
Growth Habit: horizontal spreading trailing
Plant Type: perennial woody broadleaf evergreen
Trunk:

Form: -0-
Length: -0-
Color: -0-

Foliage:

Type: simple
Form: large dense
Base: rounded
Surface: smooth fine
Fragrance: insignificant

Arrangement: opposite
Shape: elliptic obovate
Tip: rounded
Color: dark green

Flowers:

Type: simple
Form: medium
Season: May Jun Jul Aug
Fragrance: significant
Sex: monoecious

Arrangement: solitary
Shape: rotund
Color: white red purple bicolored sh
Pollination: -0-

Fruit:

Type: -0-
Form: -0-
Season: -0-
Use: -0-

Armored: -0-
Roots: lateral

HABITAT INFORMATION

Exposure: aridity humidity sun part shade
Hardiness: half hardy >-10C
Salt-water ppt: 5-10
Water: low dry average high ample
Soil Type: sandy loam sand peat

MAINTENANCE INFORMATION

Propagation: seed cutting
Transplanting: intermediate
Culture: pruning low intermediate
Planting Time: -0-
Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: -0-

LANDSCAPE VALUES

Architectural: espalier trellis masonry hedge natural fencing non
Engineering: bank cover erosion control
Design: ornamental visual screen filler
Landscape Theme: oriental understory
Physical Screening: moderate wide
Disadvantages: -0-
Indicator Plant for: -0-

USES

Plant Part: -0-
Medicinal: -0-
Edible: -0-
Animal: -0-
Fuel: -0-
Flowers: -0-
Industrial: -0-

Remarks & Comments: Pretty white flowers with red or purple interior.

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SALT TOLERANT LANDSCAPE PLANTS

Cocos nucifera var. -0- Palmae
Coconut Palm
Country of origin: East Indies, Tropics
ERL Id#: 0005

PLANT DESCRIPTION

Growth Form: large_tree
Growth Habit: branching vertical
Plant Type: perennial woody palm broadleaf evergreen

Trunk:
Form: single multi-straight
Color: -0-

Foliage:
Type: pinnate
Form: large dense
Base: -0-
Surface: rough solid leathery
Color: light green

Flowers:
Type: -0-
Form: small
Season: -0-
Fragrance: insignificant

Fruit:
Type: -0-
Form: large
Season: -0-
Use: edible
Color: brown

HABITAT INFORMATION

Exposure: aridity sun dust wind
Salt-water ppt: 5-10 10-20 20-30
Water: drought resistant low dry average
Soil Type: sandy loam sand poor soil
Salt-soil: 5-10 10-20

MAINTENANCE INFORMATION

Propagation: seed
Transplanting: easy
Culture: mulching
Planting Time: -0-
Pests & Diseases: .Lethal Yellowing

LANDSCAPE VALUES

Architectural: row street_tree
Engineering: -0-
Design: ornamental form space creator view creator silhouette
Landscape Theme: desert tropical
Physical Screening: light high
Disadvantages: -0-
Indicator Plant for: -0-

USES

Plant Part: fruit bark root
Medicinal: medicinal
Edible: foods drinks
Animal: -0-
Fuel: -0-
Industrial: timber baskets rope
Flowers: -0-

Remarks & Comments: Tendency to lean. 'Malayan Dwarf' and Golden varieties resistant to "Lethal Yellowing".

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
Conocarpus erectus var. -0- Combretaceae
Buttonwood Mangrove
Country of origin: American Tropics ERL Id#: 968

PLANT DESCRIPTION
Growth Form: small_tree_12-24ft Growth Habit: vertical round ellipsoid
Plant Type: perennial woody broadleaf evergreen
Trunk:
Form: single Color: red
Foliation:
Type: simple Arrangement: alternate
Form: medium dense Shape: oblong elliptic obovate
Base: cuneate Tip: pointed
Surface: smooth shiny leathery Color: light green gray colorful-stem
Fragrance: insignificant
Flowers:
Type: simple Arrangement: clustered
Form: small Shape: campanulate panicle
Season: Jun Jul Aug Sep Color: yellow cream insignificant
Fragrance: insignificant Pollination: -0-
Sex: dioecious
Fruit:
Type: -0- Arrangement: clustered
Form: small sparse Shape: cone
Season: -0- Color: brown red green
Use: -0-
Armor: -0- Roots: -0-

HABITAT INFORMATION
Exposure: sun part_shade
Hardiness: tender >0C Population Abund: abundant
Salt-water ppt: 10-20 20-30 Salt-soil: 5-10
Water: average high_ample
Soil Type: alkaline loam peat poor_soil Soil Thickness: -0-

MAINTENANCE INFORMATION
Propagation: cutting layer seed Transplanting: -0-
Culture: mulching intermediate Planting Time: -0-
Soil Substitutes: fertilizers
Pests & Diseases: -0- Growing Problems: -0-

LANDSCAPE VALUES
Architectural: hedge row screen non_walk_on_gnd_cvr
Engineering: bank_cover barrier soil_stabilization revegetation afforestation
Design: foliage filler space_creator
Landscape Theme: natural transitional
Physical Screening: moderate
Physical Character: -0-
Indicator Plant for: -0-

USES
Plant Part: whole_plant bark Medicinal: medicinal
Edible: -0- Animal: -0-
Fuel: -0- Flowers: -0-
Industrial: timber tannin

Remarks & Comments: Associated with mangroves; high adaption to various conditions. Var. sericea: silver color leaves

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
SALT TOLERANT LANDSCAPE PLANTS

**Cotula coronopifolia var. -0- Compositae**

Country of origin: South Africa

**ERL Id#: 722**

---

### PLANT DESCRIPTION

**Growth Form:** ground_cover bedding_plant

**Growth Habit:** mounding spreading

**Plant Type:** perennial herbaceous

**Trunk:**
- **Form:** -0-
- **Color:** -0-

**Foliage:**
- **Type:** compound
- **Form:** medium dense
- **Base:** -0-
- **Surface:** smooth shiny fine
- **Fragrance:** insignificant

**Flowers:**
- **Type:** compound
- **Form:** small dense
- **Season:** Mar Apr May Jun Jul Aug
- **Fragrance:** insignificant
- **Sex:** -0-

**Fruit:**
- **Type:** -0-
- **Arrangement:** -0-
- **Shape:** berry
- **Color:** -0-

**Status:** medium

**Height:** 20-50cm

---

### HABITAT INFORMATION

**Exposure:** aridity sun

**Hardiness:** -0-

**Salt-water ppt:** 5-10 10-20

**Water:** drought_resistant low_dry average

**Soil Type:** sandy_loam sand

**Population Abund:** rare

**Salt-soil:** 5-10 10-20

**Soil Thickness:** thick

---

### MAINTENANCE INFORMATION

**Propagation:** cutting seed

**Culture:** low

**Soil Substitutes:** -0-

**Transplanting:** -0-

**Pests & Diseases:** -0-

**Planting Time:** -0-

**Growing Problems:** -0-

---

### LANDSCAPE VALUES

**Architectural:** bedding non_walk_on_gnd_cv containers hanging_baskets rock_my

**Engineering:** bank cover

**Design:** accent ornamental color foliage filler

**Landscape Theme:** oriental natural

**Physical Screening:** light short

**Disadvantages:** -0-

**Indicator Plant for:** -0-

---

### USES

**Plant Part:** -0-

**Medicinal:** -0-

**Edible:** -0-

**Animal:** -0-

**Fuel:** -0-

**Flowers:** -0-

**Industrial:** -0-

**Remarks & Comments:** Flowers are yellow buttons, leaves are very ornamental.

---

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
### Plant Description

<table>
<thead>
<tr>
<th>Trait</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth Form</td>
<td>ground cover</td>
</tr>
<tr>
<td>Growth Habit</td>
<td>mounding conical</td>
</tr>
<tr>
<td>Plant Type</td>
<td>perennial herbaceous</td>
</tr>
<tr>
<td>Trunk</td>
<td></td>
</tr>
<tr>
<td>Foliage</td>
<td></td>
</tr>
<tr>
<td>Form: simple</td>
<td></td>
</tr>
<tr>
<td>Arrangement: alternate</td>
<td></td>
</tr>
<tr>
<td>Shape: elliptic ovate</td>
<td></td>
</tr>
<tr>
<td>Base: small dense</td>
<td></td>
</tr>
<tr>
<td>Tip: acute pointed</td>
<td></td>
</tr>
<tr>
<td>Surface: pubescent fine</td>
<td></td>
</tr>
<tr>
<td>Color: light green gray</td>
<td></td>
</tr>
<tr>
<td>Fragrance: insignificant</td>
<td></td>
</tr>
<tr>
<td>Flowers</td>
<td></td>
</tr>
<tr>
<td>Type: simple</td>
<td></td>
</tr>
<tr>
<td>Form: small</td>
<td></td>
</tr>
<tr>
<td>Season: May Jun Jul Aug Sep Oct Nov</td>
<td></td>
</tr>
<tr>
<td>Fragrance: significant</td>
<td></td>
</tr>
<tr>
<td>Pollination: insects</td>
<td></td>
</tr>
<tr>
<td>Sex: -</td>
<td></td>
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<tr>
<td>Fruit</td>
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<tr>
<td>Type: -</td>
<td></td>
</tr>
<tr>
<td>Form: -</td>
<td></td>
</tr>
<tr>
<td>Season: -</td>
<td></td>
</tr>
<tr>
<td>Use: -</td>
<td></td>
</tr>
<tr>
<td>Armor: -</td>
<td></td>
</tr>
<tr>
<td>Roots: -</td>
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</tr>
<tr>
<td>Hormones</td>
<td></td>
</tr>
<tr>
<td>Pollen</td>
<td></td>
</tr>
<tr>
<td>Germination</td>
<td></td>
</tr>
<tr>
<td>Propagation</td>
<td>seed</td>
</tr>
<tr>
<td>Transplanting</td>
<td>-</td>
</tr>
<tr>
<td>Culture</td>
<td>-</td>
</tr>
<tr>
<td>Soil Substitutes</td>
<td>-</td>
</tr>
<tr>
<td>Growing Problems</td>
<td>Very sensitive to changing environmental conditions</td>
</tr>
</tbody>
</table>

### Habitat Information

<table>
<thead>
<tr>
<th>Trait</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure</td>
<td></td>
</tr>
<tr>
<td>Hardiness</td>
<td>half hardy &gt;= -10C</td>
</tr>
<tr>
<td>Population Abund</td>
<td>rare</td>
</tr>
<tr>
<td>Salt-water ppt</td>
<td>5-10 10-20 20-30</td>
</tr>
<tr>
<td>Salt-soil</td>
<td>5-10 10-20</td>
</tr>
<tr>
<td>Water</td>
<td>average</td>
</tr>
<tr>
<td>Soil Type</td>
<td>silt</td>
</tr>
<tr>
<td>Soil Thickness: thick</td>
<td></td>
</tr>
<tr>
<td>Propagation</td>
<td>seed</td>
</tr>
<tr>
<td>Transplanting</td>
<td>-</td>
</tr>
<tr>
<td>Culture</td>
<td>-</td>
</tr>
<tr>
<td>Soil Substitutes</td>
<td>-</td>
</tr>
<tr>
<td>Pests &amp; Diseases</td>
<td>-</td>
</tr>
<tr>
<td>Growing Problems</td>
<td>Very sensitive to changing environmental conditions</td>
</tr>
</tbody>
</table>

### Landscape Values

- Architectural: non_walk_on_gnd_cvr rock_garden containers
- Engineering: bank_cover
- Design: fragrance ornamental
- Landscape Theme: natural
- Physical Screening: light
- Indicator Plant for: changing conditions

### Uses

<table>
<thead>
<tr>
<th>Trait</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicinal</td>
<td>-</td>
</tr>
<tr>
<td>Animal</td>
<td>-</td>
</tr>
<tr>
<td>Flowers</td>
<td>-</td>
</tr>
</tbody>
</table>

**Remarks & Comments:** Sensitive and instable plant. Ecologically very valuable as wildlife plant.

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
SALT TOLERANT LANDSCAPE PLANTS

**Distichlis spicata var. -0-**
**Graminae**
**Seashore Salt Grass**
**Country of origin:** American Continent  
**ERL Id#: 165**

---

**PLANT DESCRIPTION**

**Growth Form:** grass  
**Growth Habit:** arching weeping horizontal spreading  
**Mature Height:** 20-50cm  
**Plant Type:** perennial herbaceous

- **Trunk:** Form: -0-  
  Foliage: Type: simple  
  Form: medium dense  
  Base: -0-  
  Surface: fine smooth  
  Fragrance: insignificant  
  Trunk: Form: -0-  
  Foliage: Type: simple  
  Form: medium dense  
  Base: -0-  
  Surface: fine smooth  
  Fragrance: insignificant

- **Flowers:** Type: compound  
  Form: medium dense  
  Season: Jun Jul Aug  
  Fragrance: insignificant  
  Sex: dioecious  
  Foliage: Type: simple  
  Form: medium dense  
  Base: -0-  
  Surface: fine smooth  
  Fragrance: insignificant  
  Sex: dioecious

- **Fruit:** Type: -0-  
  Form: small  
  Season: -0-  
  Armor: -0-  
  Roots: rhizome fibrous

---

**HABITAT INFORMATION**

- **Exposure:** aridity sun  
- **Hardiness:** half hardy >= -10C  
- **Salt-water ppt:** 5-10 10-20 20-30 30-40  
- **Salt-soil:** 5-10 10-20 20-30  
- **Water:** drought resistant low_dry average high_am  
- **Soil Type:** sand sandy_loam  
- **Soil Thickness:** -0-  
- **Propagation:** seed rhizomes  
- **Culture:** low  
- **Pest & Diseases:** -0-  
- **Growing Problems:** -0-  
- **Growing Time:** -0-  
- **Planting Time:** -0-

---

**MAINTENANCE INFORMATION**

- **Transplanting:** easy  
- **Planting Time:** -0-  
- **Trimming:** -0-  
- **Pruning:**  
- **Irrigation:** low

---

**LANDSCAPE VALUES**

- **Architectural:** turf walk_on_gnd_cvr  
- **Engineering:** bank_cover sand_binder  
- **Design:** -0-  
- **Landscape Theme:** formal natural  
- **Physical Screening:** -0-  
- **Indicator Plant for:** -0-

---

**USES**

- **Medicinal:** -0-  
- **Edible:** foods grains  
- **Animal:** -0-  
- **Flowers:** -0-  
- **Industrial:** -0-

---

**Remarks & Comments:** Appearance similar to Bermuda grass; valuable use-turf, not as decorative lawn; leaves pointy.

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SALT TOLERANT LANDSCAPE PLANTS

Enchylaena tomentosa var. -0-

Ruby Saltbush

Country of origin: Australia

Chenopodiaceae

ERL Id#: 0006

PLANT DESCRIPTION

Growth Form: small shrub ground cover
Growth Habit: branching horizontal mounding spread
Plant Type: perennial succulent

Trunk:
- Form: -0-
- Color: white

Foliage:
- Type: simple
- Form: small
- Base: -0-
- Surface: glaucous pubescent
- Fragrance: -0-

Flowers:
- Type: -0-
- Form: small
- Season: Jan Feb Mar Apr May
- Fragrance: -0-

Fruit:
- Type: -0-
- Season: Jun Jul Aug
- Use: -0-

Armor: -0-

Habitat Information

Exposure: aridity sun part shade reflect
Hardiness: tender > 0C
Salt-water ppt: 5-10 10-20 20-30
Water: drought resistant

Salt-soil: 5-10 10-20 20-30 30-4

Soil Type: acid alkaline neutral clay sand
Soil Thickness: thin

Maintenance Information

Propagation: seed
Culture: low
Soil Substitutes: -0-
Growing Problems: can be weedy

Architectural: non_walk_on_gnd_cv screen
Engineering: bank_cover erosion_control soil_stabilization revegetation
Design: filler
Landscape Theme: natural desert
Physical Screening: short
Disadvantages: invasive
Indicator Plant for: -0-

Uses

Plant Part: fruit whole plant
Medicinal: -0-
Edible: foods
Animal: feed
Fuel: fuelwood
Flowers: -0-

Remarks & Comments: Tendency to become weedy.

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SALT TOLERANT LANDSCAPE PLANTS

Fimbristilis spathacea var. '0-

Cyperaceae

Country of origin: American Tropics, Me

ERL Id#: 12

PLANT DESCRIPTION

Growth Form: grass bedding plant

Growth Habit: weeping arching conical

Plant Type: perennial broadleaf evergreen herbaceous

Trunk:

Form: -0-

Foliage:

Type: simple

Form: dense large

Base: -0-

Surface: solid leathery

Fragrance: insignificant

Flowers:

Type: compound

Form: large dense

Season: Apr May Jun

Fragrance: insignificant

Sex: monoecious

Fruit:

Type: -0-

Form: medium dense

Season: Jul Aug Sep Oct Nov

Fragrance: insignificant

Sex: -0-

Armor: -0-

Roots: fibrous

HABITAT INFORMATION

Exposure: sun

Hardiness: half Hardy >= -10C

Salt-water ppt: 5-10 10-20

Water: average high ample

Salt-soil: 5-10 10-20

Soil Type: sandy-loam

Soil Thickness: -0-

MAINTENANCE INFORMATION

Propagation: seed

Culture: low

Soil Substitutes: -0-

Pests & Diseases: -0-

Growing Problems: -0-

Transplanting: -0-

Planting Time: -0-

LANDSCAPE VALUES

Architectural: bedding containers rock_garden

Engineering: -0-

Design: ornamental form specimen view creator

Landscape Theme: oriental

Physical Screening: -0-

Disadvantages: -0-

Indicator Plant for: -0-

USES

Plant Part: -0-

Medicinal: -0-

Edible: -0-

Animal: -0-

Fuel: -0-

Flowers: -0-

Industrial: -0-

Flowers: -0-

Remarks & Comments: Attractive brown seedheads.

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
SALT TOLERANT LANDSCAPE PLANTS

*Frankenia grandifolia* var. -0- 
*Frankeniaceae*

Country of origin: Subtropical Coasts  
ERL Id#: 702

**PLANT DESCRIPTION**

Growth Form: small shrub ground cover  
Growth Habit: branching arching conical spreading  
Mature Height: 20-50cm  
Plant Type: perennial succulent broadleaf evergreen  
Trunk: Form: -0-  
Color: -0-

Foliage: Type: simple  
Form: medium sparse  
Base: -0-  
Surface: solid  
Fragrance: insignificant

Flowers: Type: simple  
Form: small  
Season: -0-  
Fragrance: -0-  
Use: -0-

Fruit: Type: -0-  
Form: -0-  
Season: -0-  
Use: -0-  
Armor: -0-  
Roots: tap

**HABITAT INFORMATION**

Exposure: aridity sun  
Hardiness: half hardy >=-10C  
Salt-water ppt: 10-20 20-30  
Water: drought resistant low dry average

**MAINTENANCE INFORMATION**

Propagation: seed  
Culture: -0-  
Soil Substitutes: -0-  
Pests & Diseases: -0-  
Growing Problems: -0-

**LANDSCAPE VALUES**

Architectural: non walk on gnd cvr  
Engineering: bank cover erosion control soil stabilization revegetation  
Design: color foliage filler  
Landscape Theme: natural transitional desert  
Physical Screening: light  
Indicator Plant for: -0-

**USES**

Plant Part: -0-  
Medicinal: -0-  
Edible: -0-  
Animal: -0-  
Industrial: -0-  
Flowers: -0-  
Remarks & Comments: Salt tolerance greater under moist conditions. Leaves fold under high salinity. Roots in water.

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
SALT TOLERANT LANDSCAPE PLANTS

Frankenia palmeri var. -0- Frankeniaceae

-0-

Country of origin: Subtropical Deserts

PLANT DESCRIPTION

Growth Form: small shrub ground cover
Growth Habit: mounding spreading
Plant Type: perennial succulent broadleaf evergreen

Trunk:
Form: -0-
Color: -0-

Foliage:
Type: simple
Form: small dense
Base: -0-
Surface:
Fragrance: insignificant

Flowers:
Type: simple
Season: -0-
Fragrance: -0-
Sex: bisexual

Fruit:
Type: -0-
Season: -0-
Use: -0-

Flower Arrangement: opposite whorled
Leaf Arrangement: opposite
Shape: scale-like linear
tip: rounded

Color: light green

HABITAT INFORMATION

Exposure: aridity sun
Hardiness: half hardy >= -10°C
Salt-water ppt: 10-20 20-30
Salt-soil: 5-10 10-20 20-30
Water: drought resistant low dry average

MAINTENANCE INFORMATION

Propagation: seed
Culture: -0-
Transplanting: -0-
Culture Time: -0-
Growing Problems: -0-

LANDSCAPE VALUES

Architectural: non walk on gnd cvr
Engineering: bank cover soil stabilization revegetation
Design: color foliage filler
Landscape Theme: natural transitional desert
Physical Screening: light
Disadvantages: -0-
Indicator Plant for: -0-

USES

Medicinal: -0-
Animal: -0-
Flowers: -0-

Remarks & Comments: Salt tolerance greater under moist conditions; leaves fold under high salinity. Roots in water.

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
Gaillardia pulchella var. -0- Compositae

Country of origin: -0- ERL Id#: 797

Growth Form: small shrub bedding plant
Growth Habit: branching conical mounding
Plant Type: perennial herbaceous broadleaf evergreen

Trunk:
Form: multi-
Color: green

Foliage:
Type: simple
Form: large dense
Base: attenuate
Surface: hirsute fine dull
Fragrance: insignificant

Flowers:
Type: compound
Form: large dense
Season: Mar Apr May Jun Jul
Fragrance: -0-

Sex: monoecious

Fruit:
Type: -0-
Form: medium
Season: Sep Oct Nov
Use: -0-

HABITAT INFORMATION
Exposure: sun
Hardiness: hardy < -10 C
Salt-water ppt: 5-10 10-20
Salt-soil: 5-10

MAINTENANCE INFORMATION
Propagation: seed Transplanting: -0-
Culture: low Planting Time: -0-
Soil Substitutes: -0- Soil Thickness: -0-
Growing Problems: -0-

LANDSCAPE VALUES
Architectural: bedding containers
Engineering: erosion_control bank_cover
Design: ornamental color viewcreator filler
Landscape Theme: rustic formal oriental
Physical Screening: moderate wide short
Disadvantages: invasive
Indicator Plant for: -0-

USES
Plant Part: -0- Medicinal: -0-
Edible: -0- Animal: -0-
Fuel: -0- Flowers: -0-
Industrial: -0-

Remarks & Comments: Can be invasive. Reseeds easily.

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
SALT TOLERANT LANDSCAPE PLANTS

Galenia pubescens var. -0-

Country of origin: South America (Chile)

PLANT DESCRIPTION

Growth Form: ground_cover
Growth Habit: spreading mounding round
Plant Type: perennial woody broadleaf evergreen herbaceous
Trunk:
Form: -0-

Foliage:
Type: simple
Form: small dense
Base: attenuate
Surface: pubescent fine
Fragrance: insignificant

Flowers:
Type: simple
Form: small dense
Season: Mar Apr May Jun Jul
Fragrance: -0-
Sex: bisexual

Fruit:
Type: -0-
Form: -0-
Season: -0-
Use: -0-
Armor: -0-

HABITAT INFORMATION

Exposure: sun part shade
Hardiness: hardy <-10C
Salt-water ppt: 5-10 10-20
Water: low dry average
Soil Type: sandy loam loam sand

MAINTENANCE INFORMATION

Propagation: seed
Culture: low
Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: -0-
Transplanting: -0-
Planting Time: -0-

LANDSCAPE VALUES

Architectural: bedding non_walk_on_gnd_cvr containers rock_garden
Engineering: -0-
Design: form filler
Landscape Theme: tropical oriental
Physical Screening: light short
Disadvantages: -0-
Indicator Plant for: -0-

USES

Plant Part: -0-
Medicinal: -0-
Edible: -0-
Animal: -0-
Fuel: -0-
Flowers: -0-
Industrial: -0-

Remarks & Comments: -0-

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
PLANT DESCRIPTION

Gazania splendens var. -0-

Growth Form: bedding plant
Growth Rate: fast
Mature Height: 20-50cm

Plant Type: perennial herbaceous rosette
Trunk: Form: -0-
Color: -0-

Foliage:
Type: simple
Form: medium dense
Base: -0-
Surface: glaucous smooth dull fine
Fragrance: insignificant

Flowers:
Type: compound
Form: large dense
Season: Dec Jan Feb Mar Apr May
Fragrance: significant
Sex: bisexual

Fruit:
Type: -0-
Form: -0-
Season: -0-
Use: -0-

Armor: -0-
Roots: lateral fibrous

HABITAT INFORMATION

Exposure: aridity sun reflected heat
Hardiness: half hardy >= 10C
Salt-water ppt: 5-10
Water: low dry
Soil Type: sand
Population Abund: cultivated_pla
Salt-soil: 5-10
Soil Thickness: -0-

MAINTENANCE INFORMATION

Propagation: cutting division see
Culture: intermediate
Salt-water ppt: 5-10
Salt-soil: 5-10
Soil Substitutes: fertilizers minerals mulch
Pests & Diseases: -0-
Growing Problems: -0-

Transplanting: easy
Planting Time: spring su

LANDSCAPE VALUES

Architectural: bedding non_walk_on_gnd cvr containers rock_garden
Engineering: dust_retainer soil_stabilizer
Design: accent ornamental color filler
Landscape Theme: tropical
Physical Screening: light
Indicator Plant for: -0-

USES

Plant Part: -0-
Edible: -0-
Fuel: -0-
Industrial: -0-

Medicinal: -0-
Animal: -0-
Flowers: -0-

Remarks & Comments: Very good ornamental. Flowers close at night.

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
<table>
<thead>
<tr>
<th><strong>PLANT DESCRIPTION</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Growth Form:</strong></td>
<td>ground_cover</td>
</tr>
<tr>
<td><strong>Growth Habit:</strong></td>
<td>mounding spreading horizontal</td>
</tr>
<tr>
<td><strong>Plant Type:</strong></td>
<td>perennial succulent</td>
</tr>
<tr>
<td><strong>Trunk:</strong></td>
<td></td>
</tr>
<tr>
<td>Form:</td>
<td>0-</td>
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<tr>
<td><strong>Foliage:</strong></td>
<td></td>
</tr>
<tr>
<td>Type:</td>
<td>simple</td>
</tr>
<tr>
<td>Form:</td>
<td>large dense</td>
</tr>
<tr>
<td>Base:</td>
<td>0-</td>
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<tr>
<td>Surface:</td>
<td>glaucous smooth shiny solid</td>
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<tr>
<td><strong>Flowers:</strong></td>
<td></td>
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<td>Type:</td>
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</tr>
<tr>
<td>Season:</td>
<td>Apr May Jun Jul Aug</td>
</tr>
<tr>
<td>Fragrance:</td>
<td>insignificant</td>
</tr>
<tr>
<td><strong>Fruit:</strong></td>
<td></td>
</tr>
<tr>
<td>Type:</td>
<td>0-</td>
</tr>
<tr>
<td>Season:</td>
<td>0-</td>
</tr>
<tr>
<td><strong>Roots:</strong></td>
<td>roots_at_nodes lateral</td>
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<table>
<thead>
<tr>
<th><strong>HABITAT INFORMATION</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exposure:</strong></td>
<td>sun reflectedheat</td>
</tr>
<tr>
<td><strong>Hardiness:</strong></td>
<td>half hardy &gt;= -10C</td>
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<tr>
<td><strong>Salt-water ppt:</strong></td>
<td>20-30</td>
</tr>
<tr>
<td><strong>Water:</strong></td>
<td>low_dry average high_ample</td>
</tr>
<tr>
<td><strong>Salt-soil:</strong></td>
<td>5-10 10-20</td>
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<table>
<thead>
<tr>
<th><strong>MAINTENANCE INFORMATION</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Propagation:</strong></td>
<td>0-</td>
</tr>
<tr>
<td><strong>Culture:</strong></td>
<td>low</td>
</tr>
<tr>
<td><strong>Soil Substitutes:</strong></td>
<td>0-</td>
</tr>
<tr>
<td><strong>Growing Problems:</strong></td>
<td>0-</td>
</tr>
</tbody>
</table>

**LANDSCAPE VALUES**
- Architectural: bedding non_walk_on_gnd_cvr rock_garden containers
- Engineering: bank_cover erosion_control sand_binder soil_stabilization
- Design: ornamental color foliage filler
- Landscape Theme: natural tropical
- Physical Screening: wide short
- Disadvantages: 0
- Indicator Plant for: 0-

**USES**
- Medicinal: 0-
- Animal: 0-
- Flowers: 0-

Remarks & Comments: Tolerates salt spray and occasional inundations. Old leaves stay on which gives shabby appearance.

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
SALT TOLERANT LANDSCAPE PLANTS

Heliotropium curassavicum var. -0- Boraginaceae
Chinese Pursley, Heliotrope
Country of origin: SW USA, Tropics
ERL Id#: 786

PLANT DESCRIPTION

Growth Form: small_shrub ground_cover
Growth Habit: mounding spreading broad_sweeping
Plant Type: annual perennial herbaceous broadleaf evergreen

Trunk:
- Form: -0-
- Color: -0-

Foliage:
- Type: simple
- Form: medium dense
- Base: cuneate
- Surface: glaucous smooth shiny leath

Flowers:
- Type: simple
- Form: small dense
- Season: Mar Apr May Jun Jul
- Fragrance: -0-
- Sex: monoecious

Fruit:
- Type: compound

Exposure: aridity sun
Hardiness: hardy <-10C
Salt-water ppt: 5-10 10-20 20-30
Water: drought resistant average
Soil Type: sandy_loam loam

HABITAT INFORMATION

Population Abund: rare abundant
Salt-soil: 5-10 10-20 20-30
Soil Thickness: -0-

MAINTENANCE INFORMATION

Propagation: -0-
Culture: pruning low
Transplanting: -0-
Planting Time: -0-

LANDSCAPE VALUES

Architectural: non_walk_on_gnd_cvr rock_garden
Engineering: -0-
Design: ornamental form
Landscape Theme: oriental
Physical Screening: short
Disadvantages: invasive
Indicator Plant for: -0-

USES

Plant Part: -0-
Medicinal: -0-
Edible: -0-
Animal: -0-
Fuel: -0-
Flowers: -0-
Industrial: -0-

Remarks & Comments: Can be invasive.

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**SALT TOLERANT LANDSCAPE PLANTS**

*Inula cri thmoides* var. *-0-

**Golden Samphire**

*Compositae*

**Country of origin:** Mediterranean, West **ERL Id#: 0016**

---

**PLANT DESCRIPTION**

**Growth Form:** small shrub bedding plant ground cove **Growth Rate:** -0-

**Growth Habit:** branching conical **Mature Height:** 20-50cm

**Plant Type:** perennial succulent herbaceous rosette

**Trunk:**
- **Form:** multi-
- **Color:** green

**Foliation:**
- **Type:** simple compound
- **Form:** -0-
- **Base:** -0-
- **Surface:** shiny fleshy
- **Fragrance:** -0-

**Fowers:**
- **Type:** compound
- **Form:** large dense
- **Season:** May Jun Jul Aug Sep Oct
- **Arrangement:** solitary
- **Shape:** rotan panicale
- **Color:** yellow orange
- **Fragrance:** -0-
- **Sex:** monoecious

**Fruit:**
- **Type:** -0-
- **Form:** -0-
- **Season:** -0-
- **Use:** -0-
- **Arrangement:** clustered
- **Shape:** nut
- **Color:** -0-
- **Roots:** -0-

---

**HABITAT INFORMATION**

**Exposure:** sun

**Hardiness:** hardy <-10C **Population Abund:** -0-

**Salt-water ppt:** 5-10 10-20 20-30 **Salt-soil:** 5-10

**Water:** average

**Soil Type:** sand sandy loam clay poor soil **Soil Thickness:** -0-

---

**MAINTENANCE INFORMATION**

**Propagation:** division seed **Transplanting:** -0-

**Culture:** -0- **Planting Time:** -0-

**Soil Substitutes:** -0-

**Pests & Diseases:** -0-

**Growing Problems:** -0-

---

**LANDSCAPE VALUES**

**Architectural:** rock garden non walk on gnd cvr bedding containers

**Engineering:** soil stabilization

**Design:** accent ornamental color

**Landscape Theme:** transitional natural

**Physical Screening:** -0-

**Disadvantages:** -0-

**Indicator Plant for:** -0-

---

**USES**

**Plant Part:** -0-

**Medicinal:** -0-

**Edible:** -0-

**Animal:** -0-

**Fuel:** -0-

**Flowers:** -0-

**Industrial:** -0-

**Remarks & Comments:** -0-

---

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
Ipomoea pes-caprae var. -0- Convolvulaceae

Beach Morning Glory

Country of origin: North American Tropi

ERL Id#: 754

---

**PLANT DESCRIPTION**

**Growth Form:** ground_cover vine  
**Growth Habit:** spreading horizontal trailing  
**Mature Height:** 20-50cm  
**Plant Type:** perennial herbaceous broadleaf_evergreen  

**Trunk:**  
- Type: -0-  
- Form: -0-  
- **Color:** -0-  

**Foliage:**  
- Type: simple  
- Form: large  
- Base: rounded  
- **Shape:** obovate  
- **Base:** emarginate notched  
- **Color:** light_green  

**Surface:** smooth leathery

**Fragrance:** insignificant

**Flowers:**  
- Type: simple  
- Form: large sparse  
- **Shape:** salver  
- **Season:** May Jun Jul Aug Sep  
- **Fragrance:** insignificant  
- **Color:** pink purple lavender  

**Sex:** bisexual

**Fruit:**  
- **Type:** -0-  
- **Shape:** capsule  
- **Season:** -0-  
- **Color:** -0-  

**Exposure:** aridity sun

**Hardiness:** half Hardy, >= -10C

**Salt-water ppt:** 10-20

**Water:** low_dry average

**Soil Type:** sandy_loam sand

---

**HABITAT INFORMATION**

**Population Abund:** abundant culti

**Salt-soil:** 10-20

---

**MAINTENANCE INFORMATION**

**Propagation:** seed  
**Transplanting:** -0-  
**Culture:** pruning  
**Planting Time:** -0-  
**Soil Substitutes:** -0-  
**Pests & Diseases:** -0-  
**Growing Problems:** -0-  

---

**LANDSCAPE VALUES**

**Architectural:** espalier trellis masonry screen non_walk_on_gnd_cvr  
**Engineering:** sand_binder soil_stabilization erosion_control  
**Design:** ornamental color foliage  
**Landscape Theme:** natural tropical oriental  
**Physical Screening:** -0-  
**Disadvantages:** -0-  
**Indicator Plant for:** -0-  

---

**USES**

**Plant Part:** fruit root  
**Edible:** -0-  
**Medicinal:** medicinal  
**Animal:** -0-  
**Flowers:** -0-  
**Industrial:** -0-  

**Remarks & Comments:** Flowers open in the morning, close before noon.

---

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### SALT TOLERANT LANDSCAPE PLANTS

**Iresine portulacoides var. -0-**

**Amaranthaceae**

**Country of origin:**

**ERL Id#: 24**

---

#### PLANT DESCRIPTION

**Growth Form:** ground_cover bedding_plant  
**Growth Habit:** mounding spreading round  
**Plant Type:** perennial succulent herbaceous broadleaf evergreen

**Trunk:**

**Form:** -0-  
**Color:** red

**Foliage:**

**Type:** simple  
**Form:** small dense  
**Base:** -0-  
**Surface:** smooth shiny  
**Color:** dark_green reddish colorful

**Flowers:**

**Type:** compound  
**Form:** small dense  
**Season:** All  
**Color:** white showy  
**Pollination:** Insects

**Fruit:**

**Type:** -0-  
**Shape:** spike  
**Season:** -0-  
**Color:** -0-  
**Roots:** rhizome

---

#### HABITAT INFORMATION

**Exposure:** sun  
**Hardiness:** tender >0C  
**Salt-water ppt:** 5-10 10-20  
**Water:** low_dry average  
**Soil Type:** sandy_loam humus  
**Population Abund:** rare  
**Salt-soil:** 5-10  
**Soil Thickness:** thick

---

#### MAINTENANCE INFORMATION

**Propagation:** cutting  
**Culture:** intermediate  
**Soil Substitutes:** fertilizers  
**Growing Problems:** -0-  
**Transplanting:** -0-  
**Planting Time:** spring su

---

#### LANDSCAPE VALUES

**Architectural:** bedding non_walk_on_gnd_cvr containers hanging_baskets rock_  
**Engineering:** soil_stabilization dust_break  
**Design:** accent fragrance ornamental color specimen  
**Landscape Theme:** tropical oriental  
**Physical Screening:** light  
**Disadvantages:** -0-  
**Indicator Plant for:** -0-  
**USES**

**Medicinal:** -0-  
**Animal:** -0-  
**Fuel:** -0-  
**Flowers:** -0-  
**Industrial:** -0-  
**Remarks & Comments:** Very decorative red stems; flowers have a honey-like scent.

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
SALT TOLERANT LANDSCAPE PLANTS

Iresine rhizomatosa var. -0-

Country of origin: Tropical salt marsh

-0-

Amaranthaceae

ERL Id#: 784

---------------------------------------------------------------------

PLANT DESCRIPTION

Growth Form: ground_cover bedding_plant vine
Growth Habit: horizontal mounding spreading
Mature Height: <20cm
Plant Type: perennial herbaceous broadleaf evergreen

Trunk:
Type: -0-
Color: red

Foliage:
Type: simple
Form: medium dense
Base: -0-
Surface: smooth shiny
Fragrance: insignificant

Flowers:
Type: compound
Form: small dense
Season: Mar Apr May Jun Jul
Fragrance: significant
Sex: bisexual

Fruit:
Type: -0-
Form: small dense
Season: -0-
Use: -0-

Armor: -0-
Roots: rhizome roots at nodes

---------------------------------------------------------------------

HABITAT INFORMATION

Exposure: sun
Hardiness: tender_>0C
Salt-water ppt: 5-10 10-20 20-30
Water: low_dry average
Soil Type: sandy_loam loam
Soil Thickness: thick

---------------------------------------------------------------------

MAINTENANCE INFORMATION

Propagation: cuttings seed rhizome
Culture: low
Planting Time: spring summer
Soil Substitutes: fertilizers
Pests & Diseases: -0-
Growing Problems: -0-

---------------------------------------------------------------------

LANDSCAPE VALUES

Architectural: bedding non_walk_on_gnd_cvr containers hanging_baskets rock_ 
Engineering: bank_cover soil_stabilization
Design: fragrance ornamental foliage color form view_creator specimen
Landscape Theme: tropical oriental
Physical Screening: moderate short
Disadvantages: -0-
Indicator Plant for: -0-

---------------------------------------------------------------------

USES

Plant Part: -0-
Medicinal: -0-
Edible: -0-
Animal: -0-
Fuel: -0-
Flowers: -0-
Industrial: -0-

---------------------------------------------------------------------

Remarks & Comments: Ornamental foliage and reddish stems. Flowers smell like honey.

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SALT TOLERANT LANDSCAPE PLANTS

Iva frutescens var. -0- Compositae

Marsh Elder
Country of origin: West Indies, South U
ERL Id#: 0026

PLANT DESCRIPTION

Growth Form: small_shrub
Growth Habit: vertical conical
Plant Type: annual woody
Trunk:
Form: straight
Foliage:
Type: -0-
Form: medium
Base: -0-
Surface: pubescent
Fragrance: insignificant
Flowers:
Type: -0-
Form: small
Season: Jun Jul Aug Sep
Fragrance: insignificant
Sex: dioecious
Fruit:
Type: -0-
Form: -0-
Season: -0-
Use: -0-
Armor: -0-

HABITAT INFORMATION

Exposure: aridity sun dust
Hardiness: -0-
Salt-water ppt: 10-20 20-30
Salt-soil: 5-10 10-20
Water: drought_resistant low_dry
Soil Type: sand peat
Soil Thickness: -0-

MAINTENANCE INFORMATION

Propagation: seed
Culture: -0-
Soil Substitutes: -0-
Growing Problems: -0-
Transplanting: -0-
Planting Time: -0-

LANDSCAPE VALUES

Architectural: screen containers
Engineering: barrier dust_break
Design: form filler
Landscape Theme: natural transitional
Physical Screening: light
Disadvantages: -0-
Indicator Plant for: -0-

USES

Plant Part: -0-
Medicinal: -0-
Edible: -0-
Animal: -0-
Fuel: -0-
Flowers: -0-
Industrial: -0-

Remarks & Comments: -0-

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
**Jaumea carnosa var. -0- Compositae**
**Country of origin: Coastal USA**
**ERL Id#: 1100**

### PLANT DESCRIPTION

- **Growth Form:** ground_cover
- **Growth Habit:** mounding spreading
- **Plant Type:** perennial succulent herbaceous broadleaf evergreen
- **Trunk:** Form: -0-, Color: -0-
- **Foliation:**
  - **Type:** simple
  - **Form:** small dense
  - **Base:** -0-
  - **Surface:** smooth shiny solid
  - **Fragrance:** insignificant
- **Flowers:**
  - **Type:** -0-
  - **Form:** -0-
  - **Season:** -0-
  - **Fragrance:** -0-
  - **Sex:** -0-
- **Fruit:**
  - **Type:** -0-
  - **Form:** small
  - **Season:** Sep Oct Nov
  - **Color:** brown
  - **Use:** edible
  - **Armor:** -0-
- **Roots:** rhizome roots at nodes

### HABITAT INFORMATION

- **Exposure:** sun
- **Hardiness:** hardy <-10C
- **Salt-water ppt:** 5-10 10-20
- **Water:** low_dry average
- **Soil Type:** sandy_loam sand

### MAINTENANCE INFORMATION

- **Propagation:** rhizomes
- **Transplanting:** -0-
- **Culture:** intermediate
- **Planting Time:** -0-
- **Soil Substitutes:** -0-
- **Pests & Diseases:** -0-
- **Growing Problems:** -0-

### LANDSCAPE VALUES

- **Architectural:** non_walk_on_gnd_cvr rock_garden
- **Engineering:** bank_cover erosion_control sand_binder soil_stabilization soil_design: color filler
- **Landscape Theme:** natural transitional
- **Physical Screening:** light
- **Disadvantages:** -0-
- **Indicator Plant for:** -0-

### USES

- **Plant Part:** -0-
  - **Medicinal:** -0-
  - **Edible:** -0-
  - **Animal:** -0-
  - **Fuel:** -0-
  - **Flowers:** -0-
  - **Industrial:** -0-

**Remarks & Comments:** Develops long runners under low salinity. Ecologically valuable wildlife plant (food, shelter).

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Country of origin</th>
<th>ERL Id#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sea Rush</td>
<td>Juncus maritimus var. -0-</td>
<td>World Coastal Desert</td>
<td>458</td>
</tr>
</tbody>
</table>

**PLANT DESCRIPTION**

- **Growth Form**: grass, ground_cover
- **Growth Habit**: arching, vase_shape, vertical, conical
- **Mature Height**: 1-3m
- **Plant Type**: perennial, herbaceous, broad_leaf, evergreen
- **Trunk**: Form: -0-
- **Foliage**: Type: simple, Form: large dense, Base: -0-, Surface: shiny, solid, leathery, Fragrance: insignificant
- **Flowers**: Type: -0-, Form: -0-, Season: -0-, Fragrance: -0-, Sex: dioecious
- **Fruit**: Type: -0-, Form: small, Season: -0-, Use: -0-, Armor: -0-, Roots: tap, fibrous

**HABITAT INFORMATION**

- **Exposure**: humidity, sun, part_shade, shade, wind
- **Hardiness**: half hardy, >=-10C
- **Population Abund**: abundant
- **Salt-water ppt**: 5-10, 10-20, 20-30
- **Salt-soil**: 5-10, 10-20
- **Water**: high, ample, flooding
- **Soil Type**: clay, sandy, loam, sand, silt
- **Soil Thickness**: thick

**MAINTENANCE INFORMATION**

- **Propagation**: division, seed
- **Culture**: airing, low
- **Soil Substitutes**: -0-
- **Pests & Diseases**: -0-
- **Growing Problems**: -0-
- **Transplanting**: easy
- **Planting Time**: -0-

**LANDSCAPE VALUES**

- **Architectural**: walk_on, gnd_cvr, containers
- **Engineering**: bank_cover, sand_binder, soil_stabilization, revegetation, soil_re
- **Design**: ornamental, filler, silhouette
- **Landscape Theme**: transitional
- **Physical Screening**: moderate, wide
- **Dissadvantages**: -0-
- **Indicator Plant for**: -0-

**USES**

- **Plant Part**: leaf
- **Medicinal**: -0-
- **Edible**: -0-
- **Animal**: wildlife
- **Fuel**: -0-
- **Industrial**: baskets
- **Flowers**: -0-

**Remarks & Comments**: Ornamental filler, grass, not for turf because of sharp, pointed tips. Old yellow leaves stay on plan.

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SALT TOLERANT LANDSCAPE PLANTS

Laguncularia racemosa var. -0- Combretaceae
White Mangrove
Country of origin: World Coastal Tropic ERL Id#: 1225

PLANT DESCRIPTION

Growth Form: small_tree_12-24ft Growth Rate: -0-
Growth Habit: branching dome ellipsoid Mature Height: 11-20m
Plant Type: perennial woody broadleaf evergreen

Trunk:
Form: single straight Color: red

Foliage:
Type: simple Arrangement: opposite
Form: large Shape: oblong elliptic ovate
Base: rounded Tip: rounded
Surface: smooth shiny leathery Color: dark green fall coloring colo
Fragrance: insignificant

Flowers:
Type: simple Arrangement: clustered
Form: small sparse Shape: campanulate spike
Season: -0- Color: white cream insignificant
Fragrance: insignificant Pollination: water flushed
Sex: dioecious

Fruit:
Type: -0- Arrangement: -0-
Form: -0- Shape: berry
Season: -0- Color: -0-
Use: -0-
Armor: -0-
Roots: lateral airroots

HABITAT INFORMATION

Exposure: humidity sun Population Abund: abundant culti
Hardiness: tender_>=0C Salt-soil: 5-10 10-20
Salt-water ppt: 20-30 30-40 Water: flooding
Soil Type: silt peat Soil Thickness: thick

MAINTENANCE INFORMATION

Propagation: suckers Transplanting: not recom
Culture: -0- Planting Time: -0-
Soil Substitutes: -0- Pests & Diseases: -0-
Growing Problems: -0-

LANDSCAPE VALUES

Architectural: screen row street_tree shade
Design: space_creator canopy
Landscape Theme: tropical
Physical Screening: moderate high
Indicator Plant for: waterlogged soils

USES

Plant Part: bark Medicinal: -0-
Edible: -0- Animal: -0-
Fuel: fuel_wood Flowers: -0-
Industrial: timber tannin

Remarks & Comments: Grows in mangrove swamps in seawater (leaves carry salt glands). Economically very useful.

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Salt Tolerant Landscape Plants

Lasthenia glabrata var. -0- Compositae

Country of origin: California

ERL Id#: 0020

PLANT DESCRIPTION

Growth Form: bedding plant
Growth Habit: branching vertical conical
Plant Type: annual succulent herbaceous

Trunk:
Form: single
Color: -0-

Foliage:
Type: compound
Form: large
Base: -0-
Surface: smooth
Fragrance: -0-

Flowers:
Type: compound
Form: -0-
Season: Mar Apr May
Fragrance: -0-
Sex: bisexual

Fruit:
Type: -0-
Form: small
Season: -0-
Use: edible
Armor: -0-

HABITAT INFORMATION

Exposure: sun
Hardiness: half-hardy >=-10C
Salt-water ppt: 5-10
Salt-soil: 5-10
Water: average
Soil Type: clay alkaline
Soil Thickness: -0-

MAINTENANCE INFORMATION

Propagation: seed
Culture: high
Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: -0-
Transplanting: -0-
Planting Time: winter sp

LANDSCAPE VALUES

Architectural: bedding containers
Engineering: -0-
Design: ornamental color foliage filler
Landscape Theme: natural rustic transitional
Physical Screening: light
Indicator Plant for: -0-

USES

Plant Part: fruit
Medicinal: -0-
Edible: foods
Animal: -0-
Fuel: -0-
Flowers: -0-
Industrial: -0-

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SALT TOLERANT LANDSCAPE PLANTS

**Limonium axillare var. -0-**

Country of origin: Saharo-Arabian

**Erl Id#: 927**

**PLANT DESCRIPTION**

**Growth Form:** small shrub bedding plant

**Growth Habit:** mounding round

**Plant Type:** perennial woody rosette

**Trunk:**
- Form: -0-

**Foliage:**
- Type: simple
- Form: medium sparse
- Base: cuneate
- Surface: glaucous smooth
- Fragrance: insignificant

**Flowers:**
- Type: compound
- Form: small dense
- Season: Mar Apr May Jun Jul
- Fragrance: insignificant
- Sex: monoecious

**Fruit:**
- Type: -0-
- Form: -0-
- Season: -0-
- Use: -0-

**Armor:** -0-

**Growth Rate:** -0-

**Mature Height:** 20-50 cm

**FRUIT**

**Shape:** salver

**COLOR:** white lavender bicolored show animals

**Exposure:** aridity sun reflected heat dust

**Hardiness:** hardy <-10 C

**Salt-water ppt:** 10-20 20-30

**Salt-soil:** 5-10 10-20 20-30

**Water:** drought resistant low dry

**Soil Type:** poor soil

**Soil Thickness:** thin

**MAINTENANCE INFORMATION**

**Propagation:** cutting seed

**Culture:** -0-

**Transplanting:** -0-

**Soil Substitutes:** -0-

**Planting Time:** -0-

**Pests & Diseases:** -0-

**Growing Problems:** -0-

**Architecture:** bedding non walk on gnd cvr rock garden

**Engineering:** soil stabilization dust break

**Design:** ornamental color accent

**Landscape Theme:** desert

**Physical Screening:** light

**Disadvantages:** brittle/fragile

**Indicator Plant for:** sterile soils

**USES**

**Plant Part:** flower

**Medicinal:** -0-

**Edible:** -0-

**Animals:** -0-

**Fuel:** -0-

**Flowers:** cutting flowers

**Industrial:** -0-

**Remarks & Comments:** Very drought tolerant and tolerant of sterile soils.

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**SALT TOLERANT LANDSCAPE PLANTS**

**Limonium olefolium var. -0-**

- **Country of origin:** Tropical Coasts
- **Family:** Plumbaginaceae
- **ERL Id#:** 929

<table>
<thead>
<tr>
<th><strong>PLANT DESCRIPTION</strong></th>
<th><strong>GROWTH FORM:</strong> small shrub bedding plant</th>
<th><strong>GROWTH RATE:</strong> medium</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GROWTH HABIT:</strong> mounding round</td>
<td><strong>Mature Height:</strong> 50cm-1M</td>
<td></td>
</tr>
</tbody>
</table>

**Plant Type:** perennial woody rosette

**Trunk:**
- **Form:** -0-
- **Color:** -0-

**Foliation:**
- **Type:** simple
- **Arrangement:** whorled
- **Form:** medium dense
- **Shape:** lanceolate linear
- **Base:** cuneate
- **Tip:** rounded
- **Surface:** glaucous smooth leathery
- **Color:** dark green gray colorful stem
- **Fragrance:** insignificant

**Flowers:**
- **Type:** simple
- **Arrangement:** clustered
- **Form:** small dense
- **Shape:** salver
- **Season:** Apr May Jun Jul Aug
- **Color:** lavender light blue showy
- **Pollination:** animals
- **Sex:** monoecious

**Fruit:**
- **Type:** -0-
- **Form:** -0-
- **Season:** -0-
- **Color:** -0-

**Exposure:** sun part_shade

**Hardiness:** -0-

**Salt-water ppt:** 5-10 10-20

**Water:** average

**Soil Type:** sandy-loam

**Population Abund:** rare

**Salt-soil:** 5-10 10-20

**Soil Thickness:** thick

**Propagation:** cutting seed

**Culture:** intermediate pruning

**Soil Substitutes:** fertilizers

**Pests & Diseases:** -0-

**Growing Problems:** -0-

**MAINTENANCE INFORMATION**

**Transplanting:** -0-

**Planting Time:** -0-

**Landscaping Use:** cutting_flowers

**Architectural:** bedding non_walk_on_gnd_cvr rock_garden

**Engineering:** accent ornamental color specimen

**Landscape Theme:** formal rustic

**Physical Screening:** light

**Disadvantages:** brittle/fragile

**Indicator Plant for:** -0-

**USES**

**Medicinal:** -0-

**Animal:** -0-

**Flowers:** cutting_flowers

**Remarks & Comments:** Very ornamental.

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SALT TOLERANT LANDSCAPE PLANTS

Limonium perezii var. -0-  
Sea Lavender  
Plumbaginaceae  
Country of origin: Canary Islands  
ERL Id#: 929

PLANT DESCRIPTION

Growth Form: small shrub bedding plant  
Growth Habit: branching mounding dome  
Plant Type: perennial herbaceous rosette  
Trunk:  
Form: -0-  
Color: -0-

Foliage:  
Type: simple  
Form: large dense  
Base: -0-  
Surface: dull solid leathery  
Fragrance: insignificant

Flowers:  
Type: compound  
Form: large dense  
Season: Mar Apr May Jun Jul Aug Sep  
Fragrance: insignificant

Sex: monoecious

Fruit:  
Type: -0-  
Form: -0-  
Season: -0-  
Color: -0-  
Use: -0-

Armor: -0-  
Roots: lateral

HABITAT INFORMATION

Exposure: aridity sun reflected heat  
Hardiness: half hardy >= -10C  
Salt-water ppt: 5-10 10-20 20-30  
Salt-soil: 5-10 10-20  
Water: drought resistant low dry  
Soil Type: sandy loam  
Soil Thickness: thick

MAINTENANCE INFORMATION

Propagation: cutting  
Culture: pruning high  
Soil Substitutes: fertilizers minerals  
Growing Problems: -0-  
Transplanting: -0-  
Planting Time: spring

LANDSCAPE VALUES

Architectural: bedding screen non walk on gnd cvr containers rock garden  
Engineering: bank cover sand binder  
Design: accent ornamental color view creator specimen  
Landscape Theme: tropical  
Disadvantages:  
Indicator Plant for: -0-

USES

Plant Part: flower  
Medicinal: -0-  
Edible: -0-  
Animal: -0-  
Fuel: -0-  
Flowers: cutting flowers

Remarks & Comments: Treat as biennial, therefore, needs care. Large curly basal leaves.

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
**Limonium pruinosum**  
**Sea Lavender**

**Country of origin:** Middle East  
**ERL Id#:** 930

<table>
<thead>
<tr>
<th><strong>PLANT DESCRIPTION</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plant Type:</strong> perennial woody rosette</td>
<td></td>
</tr>
<tr>
<td><strong>Trunk:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Base:</strong> cordate</td>
<td></td>
</tr>
<tr>
<td><strong>Form:</strong> -0-</td>
<td></td>
</tr>
<tr>
<td><strong>Foliage:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Type:</strong> simple</td>
<td></td>
</tr>
<tr>
<td><strong>Form:</strong> light green gray</td>
<td></td>
</tr>
<tr>
<td><strong>Base:</strong> -0-</td>
<td></td>
</tr>
<tr>
<td><strong>Surface:</strong> rough leathery</td>
<td></td>
</tr>
<tr>
<td><strong>Color:</strong> -0-</td>
<td></td>
</tr>
<tr>
<td><strong>Fragrance:</strong> insignificant</td>
<td></td>
</tr>
<tr>
<td><strong>Flowers:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Type:</strong> compound</td>
<td></td>
</tr>
<tr>
<td><strong>Form:</strong> small dense</td>
<td></td>
</tr>
<tr>
<td><strong>Season:</strong> Jun Jul Aug Sep</td>
<td></td>
</tr>
<tr>
<td><strong>Color:</strong> white lavender bicolored show</td>
<td></td>
</tr>
<tr>
<td><strong>Pollination:</strong> -0-</td>
<td></td>
</tr>
<tr>
<td><strong>Sex:</strong> monoecious</td>
<td></td>
</tr>
<tr>
<td><strong>Fruit:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Type:</strong> -0-</td>
<td></td>
</tr>
<tr>
<td><strong>Form:</strong> -0-</td>
<td></td>
</tr>
<tr>
<td><strong>Season:</strong> -0-</td>
<td></td>
</tr>
<tr>
<td><strong>Use:</strong> -0-</td>
<td></td>
</tr>
<tr>
<td><strong>Armor:</strong> -0-</td>
<td></td>
</tr>
</tbody>
</table>

**HABITAT INFORMATION**

| **Exposure:** aridity sun dust |  |
| **Hardiness:** half hardy >= -10C |  |
| **Salt-water ppt:** 5-10 10-20 20-30 |  |
| **Salt-soil:** 5-10 10-20 20-30 |  |
| **Water:** low dry average |  |
| **Soil Type:** sandy loam sand poor soil |  |
| **Soil Thickness:** thin |  |

**MAINTENANCE INFORMATION**

| **Propagation:** cutting seed |  |
| **Culture:** pruning intermediate |  |
| **Transplanting:** -0- |  |
| **Planting Time:** spring |  |
| **Pests & Diseases:** -0- |  |
| **Growing Problems:** -0- |  |

**LANDSCAPE VALUES**

| **Architectural:** bedding screen non_walk_on_gnd_cvr containers rock_garden |  |
| **Engineering:** dust_break soil_stabilization revegetation |  |
| **Design:** accent ornamental color |  |
| **Landscape Theme:** tropical rustic |  |
| **Physical Screening:** light |  |
| **Disadvantages:** brittle/fragile |  |
| **Indicator Plant for:** -0- |  |

**USES**

| **Plant Part:** flower |  |
| **Medicinal:** -0- |  |
| **Edible:** -0- |  |
| **Animal:** -0- |  |
| **Fuel:** -0- |  |
| **Industrial:** -0- |  |
| **Flowers:** cutting_flower |  |

**Remarks & Comments:** -0-

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SALT TOLERANT LANDSCAPE PLANTS

Lumnitzera coccinea var. -0- Combretaceae
-0-

Country of origin: Kenya, India, Polyn

PLANT DESCRIPTION

Growth Form: small_tree_12-24ft
Growth Habit: dome
Plant Type: perennial woody broadleaf_evergreen
Trunk:
Form: -0-
Type: simple
Base: -0-
Surface: shiny

Flowers:
Type: -0-
Arrangement: alternate clustered
Shape: oblong
Tip: -0-
Color: dark_green

Exposure: humidity sun
Hardiness: tender_>0C
Salt-water ppt: 10-20 20-30 30-40
Water: high_ample flooding
Soil Type: sand loam silt peat
Soil Thickness: thick

Propagation: seed
Culture: -0-
Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: -0-

LANDSCAPE VALUES

Architectural: street_tree patio row screen
Engineering: erosion_control fire_retardant
Design: ornamental color form canopy
Landscape Theme: tropical
Physical Screening: moderate high
Disadvantages: -0-
Indicator Plant for: -0-

USES

Plant Part: -0-
Medicinal: -0-
Edible: -0-
Animal: -0-
Fuel: -0-
Flowers: -0-

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SALT TOLERANT LANDSCAPE PLANTS

Lumnitzera racemosa var. -0- Combretaceae
Kulasi
Country of origin: Kenya, India, Polynesia
ERL Id#: 0017

PLANT DESCRIPTION

Growth Form: small_tree_12-24ft
Growth Habit: dome
Plant Type: perennial woody broadleaf evergreen
Trunk:
  Form: -0-
  Color: -0-
Foliage:
  Type: simple
  Form: large dense
  Base: -0-
  Surface: shiny
  Fragrance: insignificant
Flowers:
  Type: -0-
  Form: medium dense
  Season: -0-
  Fragrance: -0-
  Pollination: -0-
  Sex: dioecious
Fruit:
  Type: -0-
  Form: small
  Season: -0-
  Use: -0-
  Armor: -0-
  Roots: airroots

HABITAT INFORMATION

Exposure: humidity sun
Hardiness: tender >20C
Salt-water ppt: 10-20 20-30 30-40
Water: high_ample flooding
Soil Type: sand loam silt peat
Population Abund: abundant
Salt-soil: 5-10 10-20
Soil Thickness: thick

MAINTENANCE INFORMATION

Propagation: seed
Culture: -0-
Soil Substitutes: -0-
Growing Problems: -0-
Transplanting: -0-
Planting Time: -0-

LANDSCAPE VALUES

Architectural: street_tree patio row screen
Engineering: erosion_control fire_retardant bank_cover
Design: form canopy
Landscape Theme: tropical
Physical Screening: moderate high
Disadvantages: -0-
Indicator Plant for: -0-

USES

Plant Part: sap bark
  Medicinal: medicinal
  Edible: -0-
  Animal: -0-
  Fuel: fuelwood
  Flowers: -0-
  Industrial: timber

Remarks & Comments: Occurs in mangrove swamps at high tidal inundations.

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**PLANT DESCRIPTION**

**Growth Form:** large shrub 6-12 ft  
**Growth Rate:** medium  
**Growth Habit:** branching round  
**Mature Height:** 3-5 m  
**Plant Type:** woody drought_deciduous perennial

**Trunk:**  
- **Form:** -0-  
- **Color:** white

**Foliage:**  
- **Type:** simple  
- **Arrangement:** opposite clustered  
- **Form:** small dense  
- **Shape:** spatulate obovate  
- **Base:** attenuate  
- **Tip:** rounded  
- **Surface:** -0-  
- **Color:** dark_green bluish gray  
- **Fragrance:** insignificant

**Flowers:**  
- **Type:** simple  
- **Arrangement:** clustered  
- **Form:** small  
- **Season:** Mar Apr May Jun Jul Aug  
- **Color:** purple lavender  
- **Pollination:** -0-  
- **Sex:** monoecious

**Fruit:**  
- **Type:** -0-  
- **Arrangement:** -0-  
- **Form:** small  
- **Shape:** berry  
- **Season:** -0-  
- **Color:** red

**Armor:** short thorns  
**Roots:** lateral

**HABITAT INFORMATION**

**Exposure:** aridity sun  
**Hardiness:** half Hardy > = -10 C  
**Salt-Water Ppt:** 5-10 10-20  
**Water:** drought_resistant low_dry  
**Soil Type:** sandy_loam sand humus  
**Salt-soil:** 5-10 10-20  
**Soil Thickness:** thick

**MAINTENANCE INFORMATION**

**Propagation:** cutting seed layer s  
**Transplanting:** easy  
**Culture:** pruning intermediate  
**Planting Time:** -0-  
**Pests & Diseases:** -0-  
**Growing Problems:** Sheds leaves in summer. Suckers can be invasive.

**LANDSCAPE VALUES**

**Architectural:** hedge screen natural_fencing  
**Engineering:** sand_binder barrier  
**Design:** color accent specimen  
**Landscape Theme:** formal desert transitional  
**Physical Screening:** impenetrable moderate wide  
**Disadvantages:** thorns invasive  
**Indicator Plant for:** -0-  

**USES**

**Plant Part:** -0-  
**Medicinal:** -0-  
**Edible:** -0-  
**Animal:** -0-  
**Fuel:** -0-  
**Flowers:** -0-  
**Industrial:** -0-  

**Remarks & Comments:** Do not plant close to flower beds because of invasive suckers. Plant loses leaves in summer.

---

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SALT TOLERANT LANDSCAPE PLANTS

Lycium rachidocladum var. -0- Solanaceae
Boxthorn

Country of origin: World Tropics and De
ERL Id#: 169

--- PLANT DESCRIPTION ---

Growth Form: small shrub
Growth Habit: branching spreading mounding
Plant Type: woody broadleaf evergreen perennial

Trunk:
- Form: -0-  Color: -0-

Foliation:
- Type: simple  Arrangement: alternate clustered
- Form: small  Shape: linear scale like
- Base: -0-  Tip: rounded
- Surface: find smooth  Color: light green

Flowers:
- Type: simple  Fragrance: insignificant
- Form: small  Season: Mar Apr May Jun Jul Aug
- Season: -0-  Pollination: -0-
- Sex: monoecious

Fruit:
- Type: -0-  Arrangement: -0-
- Form: small  Shape: berry
- Season: -0-  Color: red
- Use: edible
- Armor: short thorns

Growth Rate: medium
Mature Height: 50cm-1M

--- HABITAT INFORMATION ---

Exposure: aridity sun
Hardiness: half hardy >= -10C
Salt-water ppt: 5-10 10-20
Water: drought resistant low dry
Soil Type: sandy loam sand humus

Population Abund: rare
Salt-soil: 5-10 10-20
Soil Thickness: thick

--- MAINTENANCE INFORMATION ---

Propagation: cutting seed layer's
Culture: low
Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: Suckers can be invasive.
Transplanting: easy
Planting Time: -0-

--- LANDSCAPE VALUES ---

Architectural: non walk on gnd cvr
Engineering: sand binder soil stabilization
Design: accent color filler
Landscape Theme: formal desert transitional
Physical Screening: moderate wide
Disadvantages: thorns invasive
Indicator Plant for: -0-

--- USES ---

Plant Part: -0-
Medicinal: -0-
Edible: -0-
Animal: -0-
Fuel: -0-
Flowers: -0-
Industrial: -0-

Remarks & Comments: Do not plant close to flower beds because of invasive suckers.

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### Plant Description

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Growth Form</strong></td>
<td>small shrub</td>
</tr>
<tr>
<td><strong>Growth Habit</strong></td>
<td>branching vertical columnar vase_sha</td>
</tr>
<tr>
<td><strong>Mature Height</strong></td>
<td>1-3m</td>
</tr>
<tr>
<td><strong>Plant Type</strong></td>
<td>perennial succulent woody broadleaf evergreen</td>
</tr>
<tr>
<td><strong>Trunk</strong></td>
<td>Form: multi</td>
</tr>
<tr>
<td></td>
<td>Color: -0-</td>
</tr>
<tr>
<td><strong>Foliage</strong></td>
<td>Type: simple</td>
</tr>
<tr>
<td></td>
<td>Form: small dense</td>
</tr>
<tr>
<td></td>
<td>Base: rounded</td>
</tr>
<tr>
<td></td>
<td>Shape: linear lanceolate scale_like</td>
</tr>
<tr>
<td></td>
<td>Color: bluish silver</td>
</tr>
<tr>
<td><strong>Flowers</strong></td>
<td>Arrangement: clustered</td>
</tr>
<tr>
<td></td>
<td>Season: Apr May Jun</td>
</tr>
<tr>
<td></td>
<td>Shape: follicle</td>
</tr>
<tr>
<td></td>
<td>Color: insignificant</td>
</tr>
<tr>
<td><strong>Fruit</strong></td>
<td>Arrangement: -0-</td>
</tr>
<tr>
<td></td>
<td>Season: Jul Aug Sep Oct</td>
</tr>
<tr>
<td></td>
<td>Type: small</td>
</tr>
<tr>
<td></td>
<td>Color: white</td>
</tr>
<tr>
<td><strong>Habitat Information</strong></td>
<td>Exposure: aridity sun reflected heat dust</td>
</tr>
<tr>
<td></td>
<td>Hardiness: hardy &lt;=-10C</td>
</tr>
<tr>
<td></td>
<td>Salt-water ppt: 5-10 10-20</td>
</tr>
<tr>
<td></td>
<td>Salt-soil: 5-10 10-20 20-30</td>
</tr>
<tr>
<td></td>
<td>Water: drought resistant low_dry</td>
</tr>
<tr>
<td></td>
<td>Soil Type: sandy_loam sand poor_soil</td>
</tr>
<tr>
<td></td>
<td>Soil Thickness: -0-</td>
</tr>
</tbody>
</table>

### Maintenance Information

- **Propogation:** cuttings seed
- **Transplanting:** easy
- **Culture:** low
- **Soil Substitutes:** -0-
- **Growing Problems:** -0-
- **Architectural:** screen hedge natural_fencing containers rock_garden
- **Engineering:** barrier erosion_control revegetation soil_reclamation dust_bre
- **Landscape Theme:** formal desert
- **Physical Screening:** moderate short
- **Disadvantages:** invasive
- **Indicator Plant for:** -0-

### Uses

- **Plant Part:** -0-
- **Medicinal:** -0-
- **Edible:** -0-
- **Animal:** -0-
- **Fuel:** -0-
- **Flowers:** -0-
- **Industrial:** -0-

### Remarks & Comments

Accent due to its outstanding color of foliage. Leaves are upright conical spikes.

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
Mesembryanthemum crystallinum var. -0- Ice Plant
Country of origin: South Africa

ERL Id#: 1067

**PLANT DESCRIPTION**

**Growth Form:** ground_cover bedding  
**Growth Habit:** mounding spreading branching  
**Plant Type:** annual succulent herbaceous

**Trunk:**
- **Form:** -0-
- **Color:** -0-

**Foliation:**
- **Type:** simple
- **Form:** large dense
- **Base:** -0-
- **Surface:** sticky fine
- **Fragrance:** insignificant

**Flowers:**
- **Type:** compound
- **Form:** medium dense
- **Season:** Feb Mar Apr May Jun
- **Fragrance:** insignificant
- **Sex:** bisexual

**Fruit:**
- **Type:** -0-
- **Form:** medium
- **Season:** -0-
- **Use:** -0-

**Armor:** -0-

**Growth Rate:** -0-

**Mature Height:** 20-50cm

**Arrangement:** opposite whorled  
**Shape:** ovate spatulate fleshy  
**Color:** silver

**Exposure:** aridity sun dust  
**Hardiness:** tender>-0C  
**Salt-water ppt:** 5-10 20-30  
**Water:** low_dry average high_ample  
**Soil Type:** sandy_loam sand silt  
**Population Abund:** cultivated_pla  
**Salt-soil:** 5-10  
**Soil Thickness:** -0-

**MAINTENANCE INFORMATION**

**Propagation:** seed  
**Culture:** high  
**Soil Substitutes:** -0-

**Pests & Diseases:** -0-

**Growing Problems:** -0-

**Transplanting:** easy  
**Planting Time:** spring

**LANDSCAPE VALUES**

**Architectural:** masonry non_walk_on_gnd_cvr containers hanging_baskets rock_  
**Engineering:** bank_cover sand_binder soil_stabilization dust_break  
**Design:** accent ornamental color foliage  
**Landscape Theme:** tropical  
**Physical Screening:** light low  
**Disadvantages:** hard_to_propagate  
**Indicator Plant for:** -0-

**USES**

**Plant Part:** leaf  
**Medicinal:** -0-

**Edible:** foods  
**Animal:** wildlife

**Fuel:** -0-

**Industrial:** -0-

**Flowers:** -0-

**Remarks & Comments:** Can be treated as biennial. Densely covered with glistening vesicles.

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SALT TOLERANT LANDSCAPE PLANTS

Mesembryanthemum forsskallii var. -0- Aizoaceae
Fig Marigold
Country of origin: Mediterranean ERL Id#: 689

PLANT DESCRIPTION

Growth Form: ground_cover Growth Rate: fast
Growth Habit: horizontal spreading mounding Mature Height: <20cm
Plant Type: annual succulent
Trunk:
Form: -0-
Foliage:
Type: simple Arrangement: opposite whorled
Form: small dense Shape: ovate fleshy
Base: -0-
Surface: glaucous sticky fine Tip: -0-
Fragrance: insignificant Color: gray light_green
Flowers:
Type: compound Arrangement: solitary
Form: medium dense Shape: rotat
Season: Mar Apr May Jun Jul Fragrance: insignificant Pollination: insects water_flushe
Color: white cream
Sex: bisexual
Fruit:
Type: -0- Arrangement: -0-
Form: -0- Shape: -0-
Season: Mar Apr May Use: -0-
Color: -0-
Armor: -0- Roots: lateral

HABITAT INFORMATION

Exposure: aridity sun reflected_heat
Hardiness: tender >0C Population Abund: abundant culti
Salt-water ppt: 5-10 10-20 20-30 Salt-soil: 5-10 10-20 20-30
Water: drought resistant low dry average Soil Type: sand silt poor soil
Soil Thickness: thin

MAINTENANCE INFORMATION

Propagation: cutting seed Transplanting: easy
Culture: -0- Planting Time: winter
Soil Substitutes: -0- -0-
Growing Problems: -0-
Armed: -0-

LANDSCAPE VALUES

Architectural: bedding non_walk_on_gnd_cvr
Engineering: bank_cover soil_stabilization
Design: ornamental color filler
Landscape Theme: desert oriental
Physical Screening: moderate wide short
Disadvantages: -0-
Indicator Plant for: poor soil moisture

USES

Plant Part: -0- Medicinal: -0-
Edible: -0- Animal: -0-
Fuel: -0- Flowers: -0-
Industrial: -0-

Remarks & Comments: Hydrochastic. Turns yellow when dry. Flowers only open during midday.

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SALT TOLERANT LANDSCAPE PLANTS

Mesembryanthemum nodiflorum var. -0- Aizoaceae
Fig Marigold
Country of origin: Mediterranean, Middle East
ERL ID#: 0010

PLANT DESCRIPTION
Growth Form: ground cover
Growth Habit: horizontal spreading mounding
Plant Type: annual succulent
Trunk: Form: -0-
Color: green red
Foliage:
Type: simple
Form: small dense
Base: -0-
Surface: glaucous sticky
Fragrance: insignificant
Flowers:
Type: compound
Form: small dense
Season: Mar Apr May Jun
Fragrance: insignificant
Sex: bisexual
Fruit:
Type: -0-
Form: -0-
Season: Nov Dec Jan Feb
Use: -0-
Armor: -0-
Roots: lateral roots at nodes

HABITAT INFORMATION
Exposure: aridity sun reflected heat
Hardiness: half hardy >=-10C
Population Abund: abundant culture
Salt-water ppt: 5-10 10-20 20-30 30-40
Salt-soil: 5-10 10-20 20-30
Water: drought resistant low average
Soil Type: alkaline neutral silt poor soil
Soil Thickness: thin

MAINTENANCE INFORMATION
Propagation: cutting seed
Transplanting: easy
Culture: -0-
Planting Time: spring
Soil Substitutes: minerals
Pests & Diseases: -0-
Growing Problems: -0-

LANDSCAPE VALUES
Architectural: bedding non walk on gnd cvr containers hanging bas
Engineering: bank cover soil stabilization
Design: ornamental color filler
Landscape Theme: -0-
Physical Screening: moderate wide short
Disadvantages: -0-
Indicator Plant for: poor soil moisture

USES
Plant Part: -0-
Medicinal: -0-
Edible: -0-
Animal: -0-
Fuel: -0-
Flowers: -0-
Industrial: -0-

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SALT TOLERANT LANDSCAPE PLANTS

Monanthochloa littoralis var. -0- Graminae
Shoregrass, Key Grass
Country of origin: Subtropical Americas
ERL Id#: 163

PLANT DESCRIPTION

Growth Form: grass ground_cover
Growth Rate: -0-
Growth Habit: horizontal mounding spreading
Mature Height: <20cm
Plant Type: perennial herbaceous broadleaf evergreen
Trunk:
Form: -0-
Color: -0-
Foliation:
Type: simple
Form: small dense
Base: -0-
Surface: solid leathery
Fragrance: insignificant
Flowers:
Type: compound
Form: small
Season: Mar Apr May Sep Oct
Fragrance: insignificant
Sex: monoecious
Fruit:
Type: -0-
Form: -0-
Season: -0-
Use: -0-
Armor: -0-
Roots: rhizome roots_at_nodes

HABITAT INFORMATION

Exposure: sun
Hardiness: half hardy >-10C
Salt-water ppt: 5-10 10-20 20-30
Salt-soil: 5-10
Water: average high_ample
Soil Type: poor_soil
Population Abund: abundant
Soil Thickness: 0-

MAINTENANCE INFORMATION

Transplanting: -0-
Planting Time: -0-
Propagation: rhizomes
Culture: -0-
Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: Does not flower, fruit and seed readily

ARCHITECTURAL: walk_on_gnd_cvr rock_garden turf
ENGINEERING: bank_cover erosion_control soil_stabilization sand_binder
DESIGN: filler
LANDSCAPE THEME: natural
PHYSICAL SCREENING: low
DISADVANTAGES: low_germination_rate hard_to_propagate
INDICATOR PLANT FOR: -0-

USES

Plant Part: -0-
Medicinal: -0-
Edible: -0-
Animal: -0-
Fuel: -0-
Flowers: -0-
Industrial: -0-

Remarks & Comments: Runners up to 3 feet long, propagation rarely by seedlings. Leaves are prickly (no barefoot use lawn)

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SALT TOLERANT LANDSCAPE PLANTS

Nolana crassulifolia var. -0- Nolanaceae

Country of origin: Coastal South America
ERL Id#: 228

Growth Form: ground_cover bedding_plant
Growth Habit: branching mounding vase_shape
Plant Type: perennial herbaceous broadleaf evergreen

Trunk:
- Form: -0-
- Color: -0-

Foliage:
- Type: simple
- Form: medium sparse
- Base: -0-
- Surface: glaucous smooth fine sticky
- Fragrance: insignificant

Flowers:
- Type: simple
- Form: small dense
- Season: Mar Apr May Jun Jul
- Fragrance: -0-
- Pollination: -0-
- Sex: -0-

Fruit:
- Type: -0-
- Form: -0-
- Season: -0-
- Use: -0-

Armor: -0-

HABITAT INFORMATION

Exposure: aridity sun
Hardiness: tender >0C
Salt-water ppt: 5-10 10-20
Water: low_dry average
Soil Type: sand

Propagation: seed cutting
Culture: high
Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: Can act like an annual

MAINTENANCE INFORMATION

Transplanting: -0-
Planting Time: -0-

LANDSCAPE VALUES

Architectural: bedding non_walk_on_gnd_cvr rock_garden
Engineering: -0-
Design: color filler
Landscape Theme: oriental
Physical Screening: -0-
Indicator Plant for: -0-

USES

Medicinal: -0-
Animal: -0-
Flowers: -0-

Remarks & Comments: Forms mats on rocks near seacoast. Treated as an annual

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SALT TOLERANT LANDSCAPE PLANTS

Paspalum vaginatum var. -0- Gramineae
Salt Jointgrass, Seashore Paspalum, Silt Grass
Country of origin: Continental America, ERL Id#: 1228

--- PLANT DESCRIPTION ---

Growth Form: grass ground_cover
Growth Habit: horizontal spreading
Plant Type: perennial herbaceous broadleaf_evergreen

Trunk:
- Form: -0-
- Color: -0-

Foliage:
- Type: simple
- Form: medium dense
- Base: -0-
- Surface: shiny fine
- Fragrance: insignificant

Flowers:
- Type: compound
- Form: medium sparse
- Season: Aug Sep Oct Nov
- Fragrance: insignificant
- Pollination: wind_blowed
- Sex: monoecious

Fruit:
- Type: infertile
- Form: -0-
- Season: -0-
- Use: -0-
- Armor: -0-

--- HABITAT INFORMATION ---

Exposure: sun
Hardiness: tender_>0C
Salt-water ppt: 5-10 10-20 20-30
Water: average
Soil Type: sandy_loam loam sand silt

--- MAINTENANCE INFORMATION ---

Propagation: seed rhizomes
Culture: pruning airing intermediate
Soil Substitutes: fertilizers
Growing Problems: -0-
Transplanting: easy
Planting Time: spring

--- LANDSCAPE VALUES ---

Architectural: walk_on_gnd_cvr turf
Engineering: bank_cover erosion_control sand_binder
Design: -0-
Landscape Theme: natural transitional
Physical Screening: light low
Disadvantages: -0-
Indicator Plant for: -0-

--- USES ---

Plant Part: whole_plant
Medicinal: -0-
Edible: -0-
Animal: forage
Fuel: -0-
Flowers: -0-
Industrial: -0-

Remarks & Comments: Spreads by runners. Excellent, fine textured turf grass that withstands high salinity.

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SALT TOLERANT LANDSCAPE PLANTS

Plantago crassifolia var. -0- Plantaginaceae

Country of origin: Mediterranean ERL Id#: 934

- PLANT DESCRIPTION
  - Growth Form: ground_cover bedding_plant Growth Rate: fast
  - Growth Habit: horizontal mounding Mature Height: <20cm
  - Plant Type: perennial herbaceous rosette
  - Trunk: Form: -0-
  - Foliage: Color: -0-
    - Type: simple Arrangement: alternate whorled
    - Form: small dense Shape: linear fleshy
    - Base: -0- Tip: acute
    - Surface: glaucous smooth leathery Color: bluish gray
    - Fragrance: insignificant
  - Flowers: Arrangement: clustered
    - Type: compound Shape: funnel spike
    - Season: Feb Mar Apr May Jun Jul Aug Color: white
    - Fragrance: significant Pollination: insects
  - Sex: bisexual
  - Fruit: Arrangement: -0-
    - Type: -0- Shape: capsule
    - Form: -0- Color: -0-
    - Season: -0-
    - Use: -0-
    - Armor: -0- Roots: rhizome corm

- HABITAT INFORMATION
  - Exposure: humidity sun part_shade wind cold
  - Hardiness: hardy <-10C Population Abund: rare
  - Salt-water ppt: 5-10 10-20 Salt-soil: 5-10
  - Water: aaverage high ample flooding Soil Thickness: -0-

- MAINTENANCE INFORMATION
  - Propagation: seed Transplanting: -0-
  - Culture: -0- Planting Time: -0-
  - Soil Substitutes: -0- Growing Problems: -0-
  - Pests & Diseases: -0-

- LANDSCAPE VALUES
  - Architectural: non_walk_on_gnd_cvr rock_garden containers
  - Engineering: revegetation
  - Design: filler color Landscape Theme: natural transitional rustic
  - Physical Screening: light Disadvantages: invasive
  - Indicator Plant for: -0-

- USES
  - Plant Part: fruit Medicinal: medicinal
  - Edible: -0- Animal: -0-
  - Fuel: -0- Flowers: -0-
  - Industrial: -0-

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**SALT TOLERANT LANDSCAPE PLANTS**

**Phoenix dactylifera var. -0-**  
**Palmaceae**  
**Date Palm**

**Country of origin:** N. Africa, W. Asia.  
**ERL Id#: 0012**

**PLANT DESCRIPTION**

<table>
<thead>
<tr>
<th>特征</th>
<th>描述</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Growth Form:</strong></td>
<td>大型树</td>
</tr>
<tr>
<td><strong>Growth Habit:</strong></td>
<td>垂直型</td>
</tr>
<tr>
<td><strong>Plant Type:</strong></td>
<td>多年生灌木树干</td>
</tr>
<tr>
<td><strong>Trunk:</strong></td>
<td>形式：单直立</td>
</tr>
</tbody>
</table>
|**Foliage:**|类型：复羽叶
形式：大
表面：粗糙蓝灰色固体
芳香：无显著|
|**Flowers:**|类型：-0-
形状：-0-
季节：Feb Mar Apr May
芳香：-0-
性别：雌雄异株|
|**Fruit:**|类型：-0-
形状：中等密集
季节：Sep Oct Nov
用途：可食
盔甲：-0-
根：-0-|
|**PLANT DESCRIPTION**|生长速率：快
成熟高度：20-40m|
|**Growth Rate:**|快|
|**Mature Height:**|20-40m|

**HABITAT INFORMATION**

<table>
<thead>
<tr>
<th>特性</th>
<th>描述</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exposure:</strong></td>
<td>干旱，湿度，阳光，风，反射热</td>
</tr>
</tbody>
</table>
|**Hardiness:**|半耐寒，>=-10C
耐寒等级：半耐寒
耐寒温度：>=-10C|
|**Salt-water ppt:**|5-10, 10-20, 20-30, 30-40
海盐份：5-10%
耐盐土壤：5-10%
水：耐旱，低湿，平均，高
用途：耐旱，低湿，平均，高|
|**Soil Type:**|沙质土，土壤厚度：-0-|

**MAINTENANCE INFORMATION**

<table>
<thead>
<tr>
<th>维护</th>
<th>描述</th>
</tr>
</thead>
</table>
|**Propagation:**|种子，吸芽
移栽：介
种植时间：夏季
土壤替代：-0-|
|**Culture:**|修剪，反包
土壤病害：Palm Heart Rot, Fiber Rot, Bud Rot, Leaf Spot
生长问题：芽ґ|
|**Architectural:**|行道树
工程：土壤保水保持器
设计：观赏，花，空间创建者
景观主题：正式，沙漠，热带
物理遮挡：轻，窄，高
缺点：落叶
指示植物：-0-|
|**USES**|医药：-0- 可食：食品
燃料：-0- 花：-0- 工业：木材，篮子，绳子
备注：根穿透较少含盐土壤。
耐受偶尔的潮汐淹没。
日期美味的食物|

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**SALT TOLERANT LANDSCAPE PLANTS**

**Phragmites australis** (comm var. -0-)

**Gramineae**

**Common Reed Grass**

**Country of origin:** World Marshes

**ERL Id#:** 933

---

### PLANT DESCRIPTION

<table>
<thead>
<tr>
<th>Trait</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Growth Form:</strong></td>
<td>grass</td>
</tr>
<tr>
<td><strong>Growth Habit:</strong></td>
<td>vertical vase_shape</td>
</tr>
<tr>
<td><strong>Plant Type:</strong></td>
<td>perennial herbaceous</td>
</tr>
<tr>
<td><strong>Trunk:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Foliage:</strong></td>
<td></td>
</tr>
<tr>
<td>Type:</td>
<td>simple</td>
</tr>
<tr>
<td>Form:</td>
<td>large dense</td>
</tr>
<tr>
<td>Base:</td>
<td>-0-</td>
</tr>
<tr>
<td>Surface:</td>
<td>leathery rough</td>
</tr>
<tr>
<td>Fragrance:</td>
<td>insignificant</td>
</tr>
<tr>
<td><strong>Flowers:</strong></td>
<td></td>
</tr>
<tr>
<td>Type:</td>
<td>compound</td>
</tr>
<tr>
<td>Form:</td>
<td>large dense</td>
</tr>
<tr>
<td>Season:</td>
<td>Oct Nov Dec Jan</td>
</tr>
<tr>
<td>Fragrance:</td>
<td>insignificant</td>
</tr>
<tr>
<td><strong>Fruit:</strong></td>
<td></td>
</tr>
<tr>
<td>Type:</td>
<td>-0-</td>
</tr>
<tr>
<td>Form:</td>
<td>large</td>
</tr>
<tr>
<td>Season:</td>
<td>-0-</td>
</tr>
<tr>
<td>Use:</td>
<td>-0-</td>
</tr>
<tr>
<td>Armor:</td>
<td>-0-</td>
</tr>
<tr>
<td><strong>Roots:</strong></td>
<td>rhizome fibrous tap</td>
</tr>
</tbody>
</table>

**Growth Rate:** fast

**Mature Height:** 3-5m

---

### HABITAT INFORMATION

<table>
<thead>
<tr>
<th>Trait</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exposure:</strong></td>
<td>humidity sun part_shade wind cold</td>
</tr>
<tr>
<td><strong>Hardiness:</strong></td>
<td>hardy_&lt;-10C</td>
</tr>
<tr>
<td><strong>Salt-water ppt:</strong></td>
<td>5-10 10-20 20-30 30-40 40-50</td>
</tr>
<tr>
<td><strong>Salt-soil:</strong></td>
<td>5-10 10-20 20-30 30-40 40-50</td>
</tr>
<tr>
<td><strong>Water:</strong></td>
<td>average high_ample flooding</td>
</tr>
<tr>
<td><strong>Soil Type:</strong></td>
<td>clay loam silt</td>
</tr>
</tbody>
</table>

**Population Abund:** abundant culti

**Soil Thickness:** thick

---

### MAINTENANCE INFORMATION

<table>
<thead>
<tr>
<th>Trait</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Propagation:</strong></td>
<td>division seed</td>
</tr>
<tr>
<td><strong>Culture:</strong></td>
<td>low</td>
</tr>
<tr>
<td><strong>Soil Substitutes:</strong></td>
<td>minerals</td>
</tr>
<tr>
<td><strong>Growing Problems:</strong></td>
<td>-0-</td>
</tr>
</tbody>
</table>

**Transplanting:** easy

**Planting Time:** spring su

---

### LANDSCAPE VALUES

**Architectural:** screen bedding natural_fencing

**Engineering:** bank_cover barrier erosion_control soil_stabilization revegeta

**Design:** ornamental foliage form silhouette

**Landscape Theme:** formal natural oriental

**Physical Screening:** moderate high

**Disadvantages:** -0-

**Indicator Plant for:** saline water

---

### USES

<table>
<thead>
<tr>
<th>Trait</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plant Part:</strong></td>
<td>leaf</td>
</tr>
<tr>
<td><strong>Medicinal:</strong></td>
<td>-0-</td>
</tr>
<tr>
<td><strong>Edible:</strong></td>
<td>-0-</td>
</tr>
<tr>
<td><strong>Animal:</strong></td>
<td>-0-</td>
</tr>
<tr>
<td><strong>Fuel:</strong></td>
<td>-0-</td>
</tr>
<tr>
<td><strong>Flowers:</strong></td>
<td>-0-</td>
</tr>
<tr>
<td><strong>Industrial:</strong></td>
<td>baskets rope</td>
</tr>
</tbody>
</table>

**Remarks & Comments:** Commonly used as ornamental grass.

---

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SALT TOLERANT LANDSCAPE PLANTS
Phyla nodiflora var. -0- Verbenaceae
Frogfruit, Matgrass, Capeweed, Turkey_Tangle, Lippia
Country of origin: Tropical and Subtrop
ERL Id#: 384

PLANT DESCRIPTION
Growth Form: ground_cover bedding_plant
Growth Habit: trailing mounding spreading
Plant Type: perennial herbaceous broadleaf evergreen
Trunk:
Form: -0-
Foliage:
Type: compound
Form: medium dense
Base: cuneate
Surface: hirsute rough solid
Fragrance: insignificant
Flowers:
Type: compound
Form: small dense
Season: Mar Apr May Jun Jul Aug Sep
Fragrance: -0-
Sex: bisexual
Fruit:
Type: -0-
Form: small
Season: -0-
Use: -0-
Armor: -0-

HABITAT INFORMATION
Exposure: humidity sun
Hardiness: half-hardy_-10C
Salt-water ppt: 5-10
Water: low_dry average
Soil Type: sandy_loam sand
Population Abund: abundant culture
Salt-soil: 5-10
Soil Thickness: thick

MAINTENANCE INFORMATION
Propagation: division seed
Culture: low pruning
Soil Substitutes: fertilizers
Pests & Diseases: -0-
Growing Problems: -0-
Transplanting: -0-
Planting Time: -0-
Roots: roots_at_nodes

LANDSCAPE VALUES
Architectural: bedding walk_on_gnd_cvr rock_garden turf
Engineering: bank_cover soil_stabilization dust_break
Design: color foliage ornamental filler
Landcape Theme: oriental
Physical Screening: light low
Indicator Plant for: -0-

USES
Plant Part: whole_plant
Edible: -0-
Floral: -0-
Industrial: -0-
Medicinal: -0-
Animal: wildlife
Flowers: -0-


(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
**Prosopis farcta**  
**Mesquite**  
Country of origin: Irano-Turanian, Medi

---

### PLANT DESCRIPTION

**Growth Form:** large shrub 6-12ft  
**Growth Habit:** branching weeping umbrella  
**Plant Type:** perennial woody drought_deciduous  
**Trunk:**  
- **Form:** multi- armored  
- **Color:** -0-  
**Foliage:**  
- **Type:** compound bipinnate  
- **Form:** medium  
- **Base:** -0-  
- **Surface:** hirsute rough  
- **Fragrance:** insignificant  
**Flowers:**  
- **Type:** compound  
- **Form:** small  
- **Season:** Apr May Jun Jul Aug  
- **Fragrance:** -0-  
- **Sex:** -0-  
**Fruit:**  
- **Type:** -0-  
- **Form:** medium  
- **Season:** Sep Oct Nov Dec Jan  
- **Use:** edible  
- **Armor:** short thorns  
- **Roots:** rhizome tap

---

### HABITAT INFORMATION

**Exposure:** aridity sun reflected heat dust  
**Hardiness:** half hardy >-10C  
**Salt-water ppt:** 5-10 10-20  
**Salt-soil:** 5-10  
**Water:** drought_resistant  
**Soil Type:** alkaline clay sandy_loam loam  
**Soil Thickness:** thin thin

---

### MAINTENANCE INFORMATION

**Propagation:** seed suckers  
**Culture:** weeding intermediate  
**Soil Substitutes:** -0-  
**Growing Problems:** -0-  
**Transplanting:** -0-  
**Planting Time:** anytime  
**Soil Substitutes:** -0-  
**Pests & Diseases:** -0-

---

### LANDSCAPE VALUES

**Architectural:** screen hedge row  
**Engineering:** bank_cover barrier erosion_control revegetation soil_reclamation  
**Design:** filler  
**Landscape Theme:** natural desert  
**Physical Screening:** moderate dangerous  
**Disadvantages:** thorns invasive  
**Indicator Plant for:** -0-

---

### USES

**Plant Part:** fruit whole_plant  
**Medicinal:** -0-  
**Edible:** foods grains  
**Animal:** -0-  
**Fuel:** fuelwood  
**Flowers:** -0-  
**Industrial:** timber

---

Remarks & Comments: Can be invasive and very weedy.

---

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
**SALT TOLERANT LANDSCAPE PLANTS**

**Prospis juliflora var. -0-**

*Leguminosae, M*

Algaroba Bean, Mesquite

Country of origin: West & North America

ERL Id#: 0014

---

**PLANT DESCRIPTION**

**Growth Form:** small_tree 12-24ft

**Growth Habit:** umorella

**Plant Type:** perennial woody drought_deciduous

**Trunk:**

- Form: single armored
- Color: -0-

**Foliage:**

- Type: pinnate
- Form: small
- Base: -0-
- Surface: rough
- Fragrance: insignificant

**Flowers:**

- Type: compound
- Form: small
- Season: Apr May
- Fragrance: -0-
- Sex: -0-

**Fruit:**

- Type: -0-
- Form: medium
- Season: Jul Aug Sep Oct
- Use: edible
- Armor: short_thorns
- Color: light_green

**HABITAT INFORMATION**

**Exposure:** aridity sun reflected_heat dust

**Hardiness:** half hardy > = -10C

**Salt-water ppt:** 5-10 10-20

**Salt-soil:** 5-10

**Water:** drought_resistant

**Soil Type:** sandy_loam sand silt

**Soil Thickness:** thin

**MAINTENANCE INFORMATION**

**Propagation:** seed suckers

**Culture:** low

**Soil Substitutes:** -0-

**Pests & Diseases:** -0-

**Growing Problems:** -0-

**LANDSCAPE VALUES**

**Architectural:** screen hedge row shade

**Engineering:** barrier erosion_control pioneer afforestation dust_break

**Design:** ornamental form canopy space_creator

**Landscape Theme:** natural formal desert

**Physical Screening:** moderate dangerous high

**Disadvantages:** thorns invasive

**Indicator Plant for:** -0-

**USES**

**Plant Part:** fruit whole_plant

**Medicinal:** -0-

**Edible:** fodds grains

**Animal:** -0-

**Fuel:** fuelwood

**Flowers:** -0-

**Industrial:** timber

**Remarks & Comments:** Not very wind resistant.

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**SALT TOLERANT LANDSCAPE PLANTS**

**Puccinellia distans var. -0-**  
**Country of origin:** Mediterranean, Irano  
**ERL Id#: 449**

---

**PLANT DESCRIPTION**

<table>
<thead>
<tr>
<th>Character</th>
<th>Value</th>
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<tbody>
<tr>
<td>Growth Form</td>
<td>grass</td>
</tr>
<tr>
<td>Growth Habit</td>
<td>arching vase_shape</td>
</tr>
<tr>
<td>Plant Type</td>
<td>perennial herbaceous</td>
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<tr>
<td>Trunk Form</td>
<td>-0-</td>
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<tr>
<td>Foliage Type</td>
<td>simple</td>
</tr>
<tr>
<td>Foliage Form</td>
<td>large dense</td>
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<tr>
<td>Foliage Base</td>
<td>-0-</td>
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<tr>
<td>Foliage Surface</td>
<td>smooth fine</td>
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<tr>
<td>Foliage Fragrance</td>
<td>insignificant</td>
</tr>
<tr>
<td>Flowers Type</td>
<td>compound</td>
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<tr>
<td>Flowers Form</td>
<td>large</td>
</tr>
<tr>
<td>Flowers Season</td>
<td>Apr May Jun</td>
</tr>
<tr>
<td>Flowers Fragrance</td>
<td>insignificant</td>
</tr>
<tr>
<td>Flowers Pollination</td>
<td>wind_blowed</td>
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<tr>
<td>Fruit Type</td>
<td>-0-</td>
</tr>
<tr>
<td>Fruit Form</td>
<td>-0-</td>
</tr>
<tr>
<td>Fruit Season</td>
<td>Jul Aug Sep</td>
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<tr>
<td>Fruit Use</td>
<td>-0-</td>
</tr>
<tr>
<td>Armor</td>
<td>-0-</td>
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<tr>
<td>Roots</td>
<td>rhizome</td>
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**HABITAT INFORMATION**

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<tr>
<th>Character</th>
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<tr>
<td>Exposure</td>
<td>humidity sun part_shade wind cold</td>
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<tr>
<td>Hardiness</td>
<td>hardy_-10C</td>
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<tr>
<td>Salt-water ppt</td>
<td>5-10 10-20 20-30</td>
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<tr>
<td>Salt-soil</td>
<td>5-10 10-20 20-30</td>
</tr>
<tr>
<td>Soil Type</td>
<td>alkaline clay sandy_loam loam poor_so</td>
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**MAINTENANCE INFORMATION**

<table>
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<tr>
<th>Character</th>
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<tbody>
<tr>
<td>Propagation</td>
<td>seed rhizomes</td>
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<tr>
<td>Culture</td>
<td>low</td>
</tr>
<tr>
<td>Soil Substitutes</td>
<td>-0-</td>
</tr>
<tr>
<td>Growing Problems</td>
<td>-0-</td>
</tr>
<tr>
<td>Transplanting</td>
<td>-0-</td>
</tr>
<tr>
<td>Planting Time</td>
<td>-0-</td>
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**LANDSCAPE VALUES**

<table>
<thead>
<tr>
<th>Character</th>
<th>Value</th>
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<tbody>
<tr>
<td>Architectural</td>
<td>screen bedding containers patio rock_garden</td>
</tr>
<tr>
<td>Engineering</td>
<td>bank_cover erosion_control soil_stabilization soil_moisture_re</td>
</tr>
<tr>
<td>Design</td>
<td>foliage form space_creator</td>
</tr>
<tr>
<td>Landscape Theme</td>
<td>natural transitional</td>
</tr>
<tr>
<td>Physical Screening</td>
<td>moderage high</td>
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<tr>
<td>Disadvantages</td>
<td>-0-</td>
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<tr>
<td>Indicator Plant for</td>
<td>moist saline soils</td>
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**USES**

<table>
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<tr>
<th>Character</th>
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<tr>
<td>Plant Part</td>
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<tr>
<td>Medicinal</td>
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<tr>
<td>Edible</td>
<td>-0-</td>
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<tr>
<td>Animal</td>
<td>wildlife</td>
</tr>
<tr>
<td>Fuel</td>
<td>-0-</td>
</tr>
<tr>
<td>Flowers</td>
<td>-0-</td>
</tr>
</tbody>
</table>

---

**Remarks & Comments:** Ecologically valuable wildlife plant for salt marshes.

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
SALT TOLERANT LANDSCAPE PLANTS
Rhagodia gaudichaudiana var. -0- Chenopodiaceae
Salt Bush Country of origin: Australia ERL Id#: 543

PLANT DESCRIPTION
Growth Form: small shrub
Growth Habit: arching weeping branching
Plant Type: perennial woody broadleaf evergreen
Trunk:
  Form: -0-
  Color: -0-
Foliage:
  Type: simple
  Arrangement: opposite
  Form: small
  Shape: triangular
  Base:
  Surface: glaucous solid
  Tip: rounded
  Fragrance: insignificant
Flowers:
  Type: simple
  Arrangement: opposite
  Form: small
  Shape: spike
  Season: -0-
  Color: white insignificant
  Fragrance: insignificant
  Pollination: wind blown
Sex: bisexual
Fruit:
  Type: -0-
  Arrangement: -0-
  Form: -0-
  Shape: -0-
  Season: -0-
  Color: -0-
  Use: -0-
  Armor: -0-
  Roots: lateral

HABITAT INFORMATION
Exposure: sun aridity
Hardiness: hardy <-10C
Salt-water ppt: 10-20
Salt-soil: 5-10 10-20
Water: low_dry
Soil Type: -0-
Soil Thickness: -0-

MAINTENANCE INFORMATION
Propagation: cutting seed
Culture: low
Soil Substitutes: -0-
Watering: -0-
Fertilizer: -0-
Transplanting: -0-
Planting Time: -0-
Growing Problems: -0-

LANDSCAPE VALUES
Architectural: screen row natural fencing
Engineering: soil stabilization noise barrier
Design: accent color foliage form visual screen
Landscape Theme: desert transitional
Physical Screening: moderate
Disadvantages: -0-
Indicator Plant for: -0-

USES
Plant Part: -0-
  Medicinal: -0-
  Edible: -0-
  Animal: -0-
  Fuel: -0-
  Flowers: -0-
  Industrial: -0-


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**SALT TOLERANT LANDSCAPE PLANTS**

**Rhizophora mangle** var. -0-  
*Rhizophoraceae*  
*C. Mangle*  
Country of origin: World Tropics  
ERL Id#: 0027

### PLANT DESCRIPTION

- **Growth Form:** large_tree  
- **Growth Habit:** umbrella dome  
- **Plant Type:** perennial woody frost_deciduous  
- **Trunk:**  
  - Form: -0-  
  - Color: -0-  
- **Foliage:**  
  - Type: simple  
  - Arrangement: opposite  
  - Shape: oblong elliptic  
  - Base: large sparse  
  - Tip: acute  
  - Surface: smooth solid leathery  
  - Fragrance: insignificant  
  - Color: light_green fall_coloring  
- **Flowers:**  
  - Type: -0-  
  - Arrangement: -0-  
  - Shape: -0-  
  - Season: -0-  
  - Fragrance: -0-  
  - Sex: monoecious  
  - Pollination: -0-  
- **Fruit:**  
  - Type: -0-  
  - Arrangement: solitary  
  - Shape: nut  
  - Season: Jun Jul Aug  
  - Color: green  
  - Use: -0-  
- **Armor:** -0-  
  - Roots: airroots

### HABITAT INFORMATION

- **Exposure:** humidity sun  
- **Salt-water ppt:** 20-30 30-40  
- **Salt-soil:** 5-10 10-20 20-30 30-4  
- **Water:** average high_ample flooding  
- **Soil Type:** silt humus peat  
- **Soil Thickness:** thick  
- **Population Abund:** abundant  
- **Transplanting:** not_recom  
- **Planting Time:** -0-  
- **Soil Substitutes:** mulch

### MAINTENANCE INFORMATION

- **Propagation:** seed  
- **Culture:** intermediate  
- **Soil Substitutes:** mulch  
- **Pests & Diseases:** -0-  
- **Growing Problems:** -0-  
- **ARCHITECTURAL:** screen row street_tree shade patio  
- **Engineering:** soil_stabilization revegetation afforestation soil_moisture_re  
- **Design:** specimen visual_screen canopy  
- **LANDSCAPE THEME:** tropical  
- **Physical Screening:** impenetrable high  
- **Disadvantages:** -0-  
- **Indicator Plant for:** -0-  

### USES

- **Plant Part:** bark root  
  - Medicinal: -0-  
  - Animal: -0-  
  - Flowers: -0-  
  - Industrial: dye timber tannin

- **Remarks & Comments:** *Dicotyledonae*; produces seedlings on tree. Stilted roots(prop roots) from branches.

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
Sesbania bispinosa var. -0- Leguminosae
Prickly Sesban, Sesbania Pea
Country of origin: Australia, Tropical
ERL Id#: 0019

PLANT DESCRIPTION
Growth Form: large shrub 6-12ft
Growth Habit: vertical columnar
Plant Type: annual woody
Trunk:
   Form: -0-
   Foliage:
      Type: compound
      Form: large
      Base: rounded
      Surface: glaucous
      Fragrance: insignificant
Flowers:
   Type: simple
   Form: medium
   Season: May Jun Jul Aug
   Fragrance: significant
   Sex:
Fruit:
   Type: -0-
   Form: large
   Season: -0-
   Use: edible
   Armor: spikes

HABITAT INFORMATION
Exposure: sun part shade
Hardiness: tender >0C
Salt-water ppt: 5-10
Water: average high ample flooding
Soil Type: alkaline sandy loam silt
Population Abund: abundant culti
Salt-soil: 5-10
Soil Thickness: thick

MAINTENANCE INFORMATION
Propagation: seed
Culture: intermediate
Soil Substitutes: fertilizers
Pests & Diseases: -0-
Growing Problems: Does not tolerate pruning
Transplanting: -0-
Planting Time: -0-

LANDSCAPE VALUES
Architectural: screen patio
Engineering: -0-
Design: ornamental color view, creator silhouette
Landscape Theme: oriental tropical
Physical Screening: moderate inpenetrable high
Disadvantages: thorns
Indicator Plant for: -0-

USES
Plant Part: bark leaf fruit
   Medicinal: medicinal
Edible: -0-
   Animal: -0-
   Flowers: -0-
   Industrial: rope

Remarks & Comments: Natural insect repellant.

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SALT TOLERANT LANDSCAPE PLANTS

Sesuvium portulacastrum var. 29

Sea Purslane

Country of origin: American Tropics

Erl Id#: 29

Growth Form: ground_cover
Growth Habit: spreading mounding horizontal
Plant Type: perennial herbaceous succulent broadleaf evergreen

PLANT DESCRIPTION

Trunk:
Form: -0-
Color: red

Foliage:
Type: simple
Form: small dense
Base: -0-
Surface: shiny leathery
Fragrance: insignificant

Flowers:
Type: simple
Form: small dense
Season: all
Fragrance: insignificant
Sex: monoecious

Fruits:
Type: -0-
Form: -0-
Season: -0-
Use: -0-

HABITAT INFORMATION

Exposure: sun
Hardiness: half hardy > = -10C
Salt-water ppt: 5-10 10-20
Water: low dry average
Soil Type: sandy loam sand
Population Abund: rare
Salt-soil: 5-10 10-20
Soil Thickness: -0-

MAINTENANCE INFORMATION

Propagation: seed
Transplanting: -0-
Culture: low
Planting Time: -0-
Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: -0-

LANDSCAPE VALUES

Architectural: non_walk_on_gnd_cvr hanging_baskets containers rock_garden b
Engineering: bank_cover soil_stabilization
Design: accent ornamental color filler specimen
Landscape Theme: oriental
Physical Screening: low
Disadvantages: -0-
Indicator Plant for: -0-

USES

Plant Part: -0-
Medicinal: -0-
Edible: -0-
Animal: -0-
Fuel: -0-
Flowers: -0-
Industrial: -0-

Remarks & Comments: Stable about three or four years.

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SALT TOLERANT LANDSCAPE PLANTS

Sesuvium portulacastrum var. 327
Sea Purslane
Country of origin: American Tropics
ERL Id#: 327

PLANT DESCRIPTION
Growth Form: ground_cover
Growth Rate: medium
Growth Habit: spreading branching horizontal
Plant Type: perennial herbaceous broadleaf evergreen succulent

Trunk:
Form: -0-
Foliage:
Type: simple
Form: medium sparse
Base: -0-
Surface: dull leathery
Fragrance: insignificant

Flowers:
Type: simple
Form: medium dense
Season: all
Fragrance: insignificant

Fruit:
Type: -0-
Form: -0-
Season: -0-
Use: -0-
Armor: -0-
Color: bluish
Arrangement: solitary
Shape: capsule
Pollination: insects

HABITAT INFORMATION
Exposure: sun
Hardiness: half hardy _>=-10C
Salt-water ppt: 5-10 10-20
Water: low_dry average
Soil Type: sandy_loam sand
Population Abund: rare
Salt-soil: 5-10 10-20
Soil Thickness: -0-

MAINTENANCE INFORMATION
Propagation: seed
Culture: low
Soil Substitutes: -0-
Growing Problems: -0-
Transplanting: -0-
Planting Time: -0-

LANDSCAPE VALUES
Architectural: non_walk_on_gnd_cvr containers rock_garden bedding
Engineering: bank_cover soil_stabilization
Design: accent ornamental color filler
Landscape Theme: oriental
Physical Screening: low
Disadvantages: -0-
Indicator Plant for: -0-

USES
Plant Part: -0-
Medicinal: -0-
Edible: -0-
Animal: -0-
Fuel: -0-
Flowers: -0-

Remarks & Comments: Stable about three to four years.

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SALT TOLERANT LANDSCAPE PLANTS

Sesuvium portulacastrum var. 719
Sea Purslane
Country of origin: Mexico
ERL Id#: 719

---

PLANT DESCRIPTION

Growth Form: ground cover
Growth Habit: spreading mounding horizontal
Plant Type: perennial herbaceous broadleaf evergreen succulent
Trunk:
- Form: -0-
- Color: -0-

Foliation:
- Type: simple
- Arrangement: opposite
- Shape: lanceolate fleshy
- Base: -0-
- Surface: shiny leathery
- Tip: pointed
- Color: dark green

Flowers:
- Type: simple
- Arrangement: solitary
- Form: small dense
- Season: Mar Apr May Jun Jul Aug Sep
- Fragrance: insignificant
- Color: white showy
- Pollination: insects

Fruit:
- Type: -0-
- Arrangement: solitary
- Form: -0-
- Season: -0-
- Use: -0-
- Armor: -0-
- Roots: lateral

---

HABITAT INFORMATION

Exposure: sun
Hardiness: half hardy >= -10C
Salt-water ppt: 5-10 10-20
Salt-soil: 5-10 10-20
Soil Type: sandy loam sand

---

MAINTENANCE INFORMATION

Propagation: seed
Culture: low
Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: -0-

---

LANDSCAPE VALUES

Architectural: non walk on gnd cvr hanging baskets containers rock garden b
Engineering: bank cover soil stabilization
Design: accent ornamental color filler specimen
Landscape Theme: tropical oriental
Physical Screening: low
Disadvantages: -0-
Indicator Plant for: -0-

---

USES

Plant Part: -0-
Medicinal: -0-
Edible: -0-
Animal: -0-
Fuel: -0-
Flowers: -0-
Industrial: -0-

Remarks & Comments: Stable about three to four years.

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
SALT TOLERANT LANDSCAPE PLANTS

Sesuvium verrucosum var. -0-

Country of origin: American Tropics

PLANT DESCRIPTION

Growth Form: ground_cover
Growth Habit: spreading branching horizontal
Plant Type: perennial herbaceous succulent broadleaf evergreen

Trunk:
Form: -0-
Color: -0-
Type: simple
Form: small dense
Base: -0-
Surface: smooth
Fragrance: insignificant

Flowers:
Type: simple
Form: small dense
Season: Apr May Jun Jul Aug Sep Oct
Fragrance: insignificant
Sex: monoecious

Fruit:
Type: -0-
Form: -0-
Use: -0-
Armor: -0-

HABITAT INFORMATION

Exposure: sun
Hardiness: hardy >0C
Salt-water ppt: 5-10 10-20 20-30 30-40
Water: drought resistant low dry
Soil Type: sandy loam sand

MAINTENANCE INFORMATION

Propagation: seed
Culture: low
Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: -0-

LANDSCAPE VALUES

Architectural: non walk on gnd cvr rock garden
Engineering: pioneer dust break soil stabilization bank cover
Design: filler
Landscape Theme: natural oriental tropical
Physical Screening: low

USES

Plant Part: -0-
Medicinal: -0-
Edible: -0-
Animal: -0-
Fuel: -0-
Flowers: -0-
Industrial: -0-

Remarks & Comments: Stable to three or four years.

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**SALT TOLERANT LANDSCAPE PLANTS**

**Spartina alterniflora** var. -0-  
**Smooth Cordgrass**  
**Gramineae**  
**Country of origin:** Europe, N. Africa, A  
**ERL Id#: 0025**

---

**PLANT DESCRIPTION**

<table>
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<tr>
<th>Trait</th>
<th>Value</th>
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<td>grass ground_cover</td>
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<tr>
<td><strong>Growth Habit:</strong></td>
<td>vertical weeping</td>
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<tr>
<td><strong>Plant Type:</strong></td>
<td>perennial herbaceous</td>
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<tr>
<td><strong>Trunk:</strong></td>
<td>Form: -0-</td>
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<tr>
<td><strong>Foliage:</strong></td>
<td>Color: -0-</td>
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<tr>
<td>Type:</td>
<td>simple</td>
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<tr>
<td>Form:</td>
<td>large dense</td>
</tr>
<tr>
<td>Base:</td>
<td>-0-</td>
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<tr>
<td>Surface:</td>
<td>smooth solid</td>
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<td>Fragrance:</td>
<td>insignificant</td>
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<td><strong>Flowers:</strong></td>
<td>Type: compound</td>
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<tr>
<td>Season:</td>
<td>Jun Jul Aug Sep</td>
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<tr>
<td>Fragrance:</td>
<td>insignificant</td>
</tr>
<tr>
<td><strong>Fruit:</strong></td>
<td>Type: -0-</td>
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<td><strong>Exposure:</strong></td>
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<td><strong>Salt-water ppt:</strong></td>
<td>5-10 10-20 20-30 30-40</td>
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<td><strong>Salt-soil:</strong></td>
<td>5-10 10-20 20-30</td>
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<tr>
<td><strong>Water:</strong></td>
<td>average high ample flooding</td>
</tr>
<tr>
<td><strong>Soil Type:</strong></td>
<td>silt peat clay loam poor_soil</td>
</tr>
<tr>
<td><strong>Habitat Information</strong></td>
<td>Population Abund: abundant</td>
</tr>
<tr>
<td><strong>Salt-water ppt:</strong></td>
<td>5-10 10-20 20-30 30-40</td>
</tr>
<tr>
<td><strong>Salt-soil:</strong></td>
<td>5-10 10-20 20-30</td>
</tr>
<tr>
<td><strong>Water:</strong></td>
<td>average high ample flooding</td>
</tr>
<tr>
<td><strong>Soil Type:</strong></td>
<td>silt peat clay loam poor_soil</td>
</tr>
<tr>
<td><strong>Habitat Information</strong></td>
<td>Population Abund: abundant</td>
</tr>
<tr>
<td><strong>Salt-water ppt:</strong></td>
<td>5-10 10-20 20-30 30-40</td>
</tr>
<tr>
<td><strong>Salt-soil:</strong></td>
<td>5-10 10-20 20-30</td>
</tr>
<tr>
<td><strong>Water:</strong></td>
<td>average high ample flooding</td>
</tr>
<tr>
<td><strong>Soil Type:</strong></td>
<td>silt peat clay loam poor_soil</td>
</tr>
</tbody>
</table>

---

**MAINTENANCE INFORMATION**

<table>
<thead>
<tr>
<th>Trait</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Propagation:</strong></td>
<td>seed rhizomes</td>
</tr>
<tr>
<td><strong>Transplanting:</strong></td>
<td>easy</td>
</tr>
<tr>
<td><strong>Culture:</strong></td>
<td>intermediate low</td>
</tr>
<tr>
<td><strong>Planting Time:</strong></td>
<td>spring fall</td>
</tr>
<tr>
<td><strong>Soil Substitutes:</strong></td>
<td>-0-</td>
</tr>
<tr>
<td><strong>Pests &amp; Diseases:</strong></td>
<td>-0-</td>
</tr>
<tr>
<td><strong>Growing Problems:</strong></td>
<td>Needs transplanting care if planted in tidal areas</td>
</tr>
</tbody>
</table>

---

**LANDSCAPE VALUES**

**Architectural:** bedding natural fencing  
**Engineering:** bank_cover erosion_control sand_binder soil_stabilization reve  
**Design:** filler  
**Landscape Theme:** natural transitional  
**Physical Screening:** moderate high  
**Disadvantages:** Invasive  
**Indicator Plant for:** -0-  
**USES**

<table>
<thead>
<tr>
<th>Plant Part</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Medicinal:</strong></td>
<td>-0-</td>
</tr>
<tr>
<td><strong>Animal:</strong></td>
<td>wildlife</td>
</tr>
<tr>
<td><strong>Flowers:</strong></td>
<td>-0-</td>
</tr>
<tr>
<td><strong>Industrial:</strong></td>
<td>-0-</td>
</tr>
</tbody>
</table>

**Remarks & Comments:** Withstands anaerobic soils, tidal inundations and flooding. Attracts mosquitoes.

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**SALT TOLERANT LANDSCAPE PLANTS**

**Spartina foliosa var. -0-**

**Graminae**

**Country of origin:** North American Coast  
**ERL Id#: 774**

---

### PLANT DESCRIPTION

**Growth Form:** grass  
**Growth Rate:** fast  
**Growth Habit:** vertical conical vase_shape  
**Mature Height:** 50cm-1M  
**Plant Type:** perennial herbaceous

**Trunk:**  
- **Form:** -0-  
- **Color:** -0-

**Foliage:**  
- **Type:** simple  
- **Form:** large dense  
- **Base:** -0-  
- **Surface:** solid leathery  
- **Color:** light_green

**Flowers:**  
- **Type:** -0-  
- **Season:** Jun Jul Aug Sep Oct  
- **Flower Arrangement:** -0-  
- **Flower Shape:** panicle  
- **Pollination:** wind_blown  
- **Fragrance:** insignificant  
- **Sex:** monoecious

**Fruit:**  
- **Type:** -0-  
- **Season:** -0-  
- **Fruit Arrangement:** -0-  
- **Fruit Shape:** grain  
- **Color:** -0-

**Armor:** -0-  
**Roots:** rhizome lateral

---

### HABITAT INFORMATION

**Exposure:** humidity sun part_shade wind  
**Hardiness:** hardy_>0C  
**Population Abundance:** abundant  
**Salt-water ppt:** 5-10 10-20 20-30 30-40  
**Salt-soil:** 5-10 10-20 20-30 30-4  
**Water:** average high ample flooding

**Soil Type:** silt peat poor_soil  
**Soil Thickness:** thick

---

### MAINTENANCE INFORMATION

**Propagation:** seed rhizomes  
**Transplanting:** intermedi  
**Culture:** -0-  
**Soil Substitutes:** -0-  
**Pests & Diseases:** -0-  
**Growing Problems:** Until established plant is sensitive to high waves

---

### LANDSCAPE VALUES

**Architectural:** -0-  
**Engineering:** bank_cover erosion_control soil_stabilization revegetation soil  
**Design:** filler silhouette  
**Landscape Theme:** natural  
**Physical Screening:** high  
**Disadvantages:** -0-  
**Indicator Plant for:** wildlife habitat

---

### USES

**Plant Part:** whole_plant  
**Medicinal:** -0-  
**Edible:** -0-  
**Animal:** wildlife  
**Fuel:** -0-  
**Flowers:** -0-  
**Industrial:** -0-

---

**Remarks & Comments:** Valuable revegetation plant. For transplanting: low wave activity and low salt. Withstands waterlogging

---

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SALT TOLERANT LANDSCAPE PLANTS

Spergularia media (marginat var. salina) Caryophyllaceae
Sea Spurrry, Downy Spurrry
Country of origin: World Temperate Coas ERL Id#: 730

PLANT DESCRIPTION

Growth Form: ground_cover
Growth Habit: weeping arching mounding horizontal
Mature Height: <20cm

Plant Type: perennial annual herbaceous

Trunk:
Form: -0-
Type: simple
Base: attenuate
Surface: pubescent smooth
Fragment: insignificant

Flowers:
Type: simple
Form: small
Season: Mar Apr May Jun Jul
Fragrance: -0-
Sex: bisexual

Fruit:
Type: -0-
Form: small
Season: -0-
Use: -0-

DESCRIPTION

Growth Rate: -0-
Color: -0-
Arrangement: opposite whorled
Shape: linear fleshy
Tip: acute
Color: light_green gray

HABITAT INFORMATION

Exposure: sun part_shade dust
Hardiness: -0-
Salt-water ppt: 5-10
Water: average
Soil Type: alkaline sandy_loam loam silt peat
Population Abund: rare
Salt-soil: 5-10
Soil Thickness: -0-

MAINTENANCE INFORMATION

Propagation: seed
Culture: high
Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: -0-

Transplanting: easy
Planting Time: spring

LANDSCAPE VALUES

Architectural: masonry bedding non_walk_on_gnd_cvr containers
Engineering: bank_cover soil_stabilization soil_moisture_retainer fire_reta
Design: filler
Landscape Theme: natural tropical
Physical Screening: -0-
Disadvantages: -0-
Indicator Plant for: -0-

USES

Plant Part: -0-
Medicinal: -0-
Edible: -0-
Animal: -0-
Fuel: -0-
Flowers: -0-
Industrial: -0-

Remarks & Comments: Treat as biennial. Flowers open at noon. Grows in muddy soils and withstands water logged soils.

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**SALT TOLERANT LANDSCAPE PLANTS**

*Sporobolus virginicus* var. -0-  
*Gramineae*

**Rushgrass**

Country of origin: American Tropics, So  
ERL Id#: 490

---

**PLANT DESCRIPTION**

<table>
<thead>
<tr>
<th>Plant Type</th>
<th>perennial herbaceous</th>
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<tbody>
<tr>
<td>Growth Form</td>
<td>ground_cover grass</td>
</tr>
<tr>
<td>Growth Habit</td>
<td>arching spreading vase_shape</td>
</tr>
<tr>
<td>Mature Height</td>
<td>20-50cm</td>
</tr>
<tr>
<td>Growth Rate</td>
<td>fast</td>
</tr>
</tbody>
</table>

---

**Trunk:**

<table>
<thead>
<tr>
<th>Form:</th>
<th>-0-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color:</td>
<td>-0-</td>
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</table>

**Foliage:**

<table>
<thead>
<tr>
<th>Type:</th>
<th>simple</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form:</td>
<td>small dense</td>
</tr>
<tr>
<td>Base:</td>
<td>-0-</td>
</tr>
<tr>
<td>Surface:</td>
<td>fine hirsute rough</td>
</tr>
<tr>
<td>Fragrance:</td>
<td>insignificant</td>
</tr>
</tbody>
</table>

**Flowers:**

<table>
<thead>
<tr>
<th>Type:</th>
<th>-0-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form:</td>
<td>medium sparse</td>
</tr>
<tr>
<td>Season:</td>
<td>Jun Jul Aug Sep</td>
</tr>
<tr>
<td>Fragrance:</td>
<td>insignificant</td>
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</table>

**Fruit:**

<table>
<thead>
<tr>
<th>Type:</th>
<th>-0-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form:</td>
<td>-0-</td>
</tr>
<tr>
<td>Season:</td>
<td>-0-</td>
</tr>
<tr>
<td>Use:</td>
<td>-0-</td>
</tr>
<tr>
<td>Armor:</td>
<td>-0-</td>
</tr>
<tr>
<td>Roots:</td>
<td>rhizome</td>
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</table>

**HABITAT INFORMATION**

<table>
<thead>
<tr>
<th>Exposure:</th>
<th>sun wind dust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardiness:</td>
<td>-0-</td>
</tr>
<tr>
<td>Salt-water ppt:</td>
<td>5-10 10-20 20-30</td>
</tr>
<tr>
<td>Salt-soil:</td>
<td>5-10 10-20</td>
</tr>
<tr>
<td>Water:</td>
<td>low_dry average high_ample</td>
</tr>
<tr>
<td>Soil Type:</td>
<td>clay sandy_loam sand loam</td>
</tr>
<tr>
<td>Soil Thickness:</td>
<td>-0-</td>
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</table>

**MAINTENANCE INFORMATION**

<table>
<thead>
<tr>
<th>Propagation:</th>
<th>seed rhizomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Culture:</td>
<td>pruning airing intermediate</td>
</tr>
<tr>
<td>Soil Substitutes:</td>
<td>fertilizers</td>
</tr>
<tr>
<td>Pests &amp; Diseases:</td>
<td>-0-</td>
</tr>
<tr>
<td>Growing Problems:</td>
<td>-0-</td>
</tr>
</tbody>
</table>

**LANDSCAPE VALUES**

<table>
<thead>
<tr>
<th>Architectural:</th>
<th>turf walk_on_gnd_cvr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering:</td>
<td>bank_cover soil_stabilization dust_break</td>
</tr>
<tr>
<td>Design:</td>
<td>-0-</td>
</tr>
<tr>
<td>Landscape Theme:</td>
<td>transitional natural</td>
</tr>
<tr>
<td>Physical Screening:</td>
<td>light</td>
</tr>
<tr>
<td>Disadvantages:</td>
<td>-0-</td>
</tr>
<tr>
<td>Indicator Plant for:</td>
<td>-0-</td>
</tr>
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</table>

**USES**

<table>
<thead>
<tr>
<th>Plant Part:</th>
<th>-0-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicinal:</td>
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</tr>
<tr>
<td>Edible:</td>
<td>-0-</td>
</tr>
<tr>
<td>Animal:</td>
<td>-0-</td>
</tr>
<tr>
<td>Fuel:</td>
<td>-0-</td>
</tr>
<tr>
<td>Industrial:</td>
<td>-0-</td>
</tr>
<tr>
<td>Flowers:</td>
<td>-0-</td>
</tr>
</tbody>
</table>

**Remarks & Comments:**

(c) Planetary Design Corporation, Inc., Halophyte Data Base V2.0, 1988
SALT TOLERANT LANDSCAPE PLANTS

Suaeda monoica var. -O-

Country of origin: Saharo-Arabian

PLANT DESCRIPTION

Growth Form: large shrub 6-12 ft
Growth Habit: branching conical
Plant Type: perennial succulent woody broadleaf evergreen
Trunk:

Form: -O-
Type: simple
Base: rounded
Surface: glaucous smooth dull fine

Foliage:

Type: simple
Form: small dense
Base: rounded
Surface: glaucous smooth dull fine

Flowers:

Type: simple
Form: small
Season: Apr May Jun Jul Aug Sep Oct

Fruit:

Type: -O-
Form: small
Season: -O-
Use: -O-
Armor: -O-

DESCRIPTION

Growth Rate: fast
Mature Height: 1-3 m

Color: -O-

Arrangement: alternate
Shape: scale like fleshy

Fragrance: insignificant

Exposure: aridity sun part shade reflected heat dust

Hardiness: -O-
Population Abund: abundant
Salt-water ppt: 20-30 30-40 Salt-soil: 10-20 20-30 30-40
Water: drought resistant low dry average
Soil Type: clay sandy loam loam poor soil

Propagation: cutting seed
Culture: low
Soil Substitutes: -O-
Pests & Diseases: -O-
Growing Problems: -O-

LANDSCAPE VALUES

Architectural: screen natural fencing
Engineering: barrier revegetation noise barrier pioneer dust break
Design: canopy filler
Landscape Theme: rustic desert transitional
Physical Screening: moderate high

HABITAT INFORMATION

Exposure: aridity sun part shade reflected heat dust

Hardiness: -O-
Population Abund: abundant
Salt-water ppt: 20-30 30-40 Salt-soil: 10-20 20-30 30-40
Water: drought resistant low dry average
Soil Type: clay sandy loam loam poor soil

Propagation: cutting seed
Culture: low
Soil Substitutes: -O-
Pests & Diseases: -O-
Growing Problems: -O-

MAINTENANCE INFORMATION

Soil Substitutes: -O-
Pests & Diseases: -O-
Growing Problems: -O-

USES

Plant Part: -O-
Medicinal: -O-
Edible: -O-
Animal: -O-
Fuel: -O-
Flowers: -O-

Remarks & Comments: Use as solitary shrub.

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SALT TOLERANT LANDSCAPE PLANTS

Tamarix aphylla var. -0- Tamaricaceae
Athel Tree, Tamarisk
Country of origin: N. Africa, Mediterrea
ERL Id#: 0023

PLANT DESCRIPTION

Growth Form: large_tree
Growth Habit: vertical dome ellipsoid
Plant Type: perennial woody broadleaf evergreen

Trunk:
Form: single straight
Color: red gray

Foliage:
Type: simple
Form: small
Shape: scale_like awl_shaped
Base: -0-
Surface: smooth
Tip: -0-
Color: bluish
Fragrance: insignificant

Flowers:
Type: compound
Form: small dense
Season: Jul Aug Sep Oct Nov
Shape: panicle
Color: white cream pink
Pollination: wind_blowed
Fragrance: insignificant
Sex: bisexual

Fruit:
Type: -0-
Form: small
Shape: capsule
Season: -0-
Use: -0-

Armor: -0-

Growth Rate: fast
Mature Height: 6-10m 11-

HABITAT INFORMATION

Exposure: aridity sun wind reflected_heat dust
Hardiness: half_hardy >= -10C
Salt-water ppt: 10-20
Salt-soil: 5-10 10-20
Water: drought_resistant low_dry average
Soil Type: alkaline sandy_loam loam sand
Soil Thickness: thick

MAINTENANCE INFORMATION

Propagation: cutting seed
Transplanting: easy
Culture: pruning low
Planting Time: -0-
Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: -0-

Architectural: screen hedge row street_tree shade
Engineering: bank_cover barrier sand_binder soil_stabilization wind_breaks
Design: ornamental space_creator specimen visual_screen canopy
Landscape Theme: formal desert
Physical Screening: moderate high
Growing Problems: invasive increases_salinity_in_soil

USES

Plant Part: bark
Medicinal: -0-
Edible: -0-
Animal: -0-
Fuel: fuelwood
Flowers: -0-
Industrial: timber


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SALT TOLERANT LANDSCAPE PLANTS

Tamarix gallica var. nilotica
Nile Tamarisk, Manna Plant
Country of origin: N. Africa, Middle East
ERL Id#: 0021

PLANT DESCRIPTION

Growth Form: small tree 12-24ft Growth Rate: slow
Growth Habit: vertical ellipsoid Mature Height: 3-5m
Plant Type: perennial woody broadleaf evergreen
Trunk:
  Form: single multi
  Color: red
Foliage:
  Type: simple
  Arrangement: -0-
  Shape: scale_like oblong
  Base: -0-
  Tip: -0-
  Surface: smooth sticky
  Color: dark_green
Fragrance: -0-
Flowers:
  Type: compound
  Arrangement: clustered
  Shape: panicle
  Season: Apr May Jun Jul Aug Sep
  Pollination: -0-
  Color: white pink
  Sex: bisexual
Fruit:
  Type: -0-
  Arrangement: -0-
  Shape: capsule
  Season: -0-
  Use: -0-
Armor: -0-
Roots: tap

HABITAT INFORMATION

Exposure: aridity sun wind reflected heat dust
Hardiness: half hardy >= -10C Population Abund: rare
Salt-water ppt: 5-10 Salt-soil: 5-10
Water: drought resistant low dry
Soil Type: alkaline poor soil Soil Thickness: thick

MAINTENANCE INFORMATION

Propagation: seed cutting Transplanting: easy
Culture: low Planting Time: -0-
Soil Substitutes: -0-
Pests & Diseases: -0-
Growing Problems: -0-

LANDSCAPE VALUES

Architectural: hedge screen
Engineering: erosion control sand_binder barrier wind_breaks noise_barrier
Design: filler
Landscape Theme: desert understory
Physical Screening: moderate high
Disadvantages: increases salinity in soil
Indicator Plant for: -0-

USES

Plant Part: sap Medicinal: -0-
Edible: foods Animal: -0-
Flower: -0-
Industrial: -0-

Remarks & Comments: Lots of varieties. Known as "manna"-plant fluid excreted by scale insects. Salt excreted by leaves.

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SALT TOLERANT LANDSCAPE PLANTS

Tamarix tetragyna var. -0- Tamaricaceae
Salt Cedar
Country of origin: N. Africa, W. Asia ERL Id#: 0022

PLANT DESCRIPTION
Growth Form: small tree 12-24ft Growth Rate: -0-
Growth Habit: vertical Ellipsoid Mature Height: 1-3m 3-5m
Plant Type: perennial woody broadleaf evergreen
Trunk:
Form: -0- Color: red
Foliage:
Type: simple Form: small Base: -0- Surface: smooth Fragrance: insignificant
Shape: scale_like oblong Tip: -0- Color: dark green gray

Flowers:
Type: compound Form: medium Season: Dec Jan Feb Mar Apr Fragrance: -0-
Arrangement: clustered Shape: panicle Color: white pink Pollination: wind blown
Sex: bisexual

Fruit:
Type: -0- Form: -0- Season: -0- Use: -0-
Arrangement: -0- Color: -0- Roots: tap

HABITAT INFORMATION
Exposure: aridity sun wind reflected heat dust Hardiness: half hardy >= -10C Population Abund: abundant
Salt-water ppt: 10-20 20-30 Salt-soil: 5-10 10-20
Water: drought resistant low dry Soi1 Type: alkaline poor soil Soil Thickness: thick

MAINTENANCE INFORMATION
Propagation: cutting seed Transplanting: easy Culture: low intermediate pruning Planting Time: -0-
Soil Substitutes: -0- Pests & Diseases: -0- Growing Problems: -0-

LANDSCAPE VALUES
Architectural: screen street tree shade Engineering: barrier erosion control sand binder wind breaks pioneer dust b
Design: visual screen space creator filler Landscape Theme: desert
Physical Screening: moderate high Disadvantages: increases salinity in soil
Indicator Plant for: -0-

USES
Plant Part: bark Medicinal: -0- Animal: -0-
Edible: -0- Fuel: fuelwood
Industrial: timber Flowers: -0-

Remarks & Comments: Salt excreted by leaves drops to the ground and increases salinity in soil beneath plant.

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Terminalia catappa  
Indian Almond  
Country of origin: Tropical Asia  
Combretaceae  
ERL Id#: 1211

**PLANT DESCRIPTION**
- **Growth Form:** large_tree  
- **Growth Habit:** vertical vase_shape  
- **Plant Type:** perennial woody  
- **Trunk:**  
  - **Form:** -0-  
  - **Foliation:**  
    - **Type:** simple  
    - **Form:** large dense  
    - **Base:** cunate  
    - **Surface:** shiny leathery  
    - **Foliation FRAGrance:** insignificant 
- **Flowers:**  
  - **Type:** simple  
  - **Form:** small  
  - **Season:** Jul Aug Sep  
  - **Fragrance:** insignificant 
- **Fruit:**  
  - **Type:** -0-  
  - **Form:** small  
  - **Season:** -0-  
  - **Use:** edible  
  - **Armor:** -0-  
  - **Roots:** -0-  
- **Exposure:** humidity sun wind  
- **Hardiness:** tender>_0C  
- **Salt-water ppt:** 5-10  
- **Water:** average  
- **Soil Type:** acid alkaline sand  
- **Population Abund:** cultivated_pla  
- **Salt-soil:** 5-10  
- **Exposure:** humidity sun wind  
- **Salt-water ppt:** 5-10  
- **Salt-soil:** 5-10  
- **Habitat Information:**  
- **Soil Thickness:** -0-  
- **Salt-water ppt:** 5-10  
- **Salt-soil:** 5-10  
- **Maintenance Information:**  
- **Propagation:** seed  
- **Transplanting:** easy  
- **Culture:** -0-  
- **Planting Time:** -0-  
- **Soil Substitutes:** fertilizers mulch minerals  
- **Pests & Diseases:** -0-  
- **Growing Problems:** -0-  
- **Landscape Values:**  
- **Architectural:** shade street_tree patio  
- **Engineering:** bank_cover  
- **Design:** ornamental foliage space_creator view_creator spec  
- **Landscape Theme:** formal tropical  
- **Physical Screening:** light high  
- **Disadvantages:** very_tender  
- **Indicator Plant for:** -0-  
- **Uses:**  
  - **Plant Part:** fruit leaf bark root  
  - **Medicinal:** medicinal  
  - **Edible:** foods  
  - **Fuel:** -0-  
  - **Animal:** -0-  
  - **Flowers:** -0-  
  - **Industrial:** dye  
  - **Remarks & Comments:** Should be planted in full sun.

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SALT TOLERANT LANDSCAPE PLANTS

**Thespesia populnea var. -0-**  
Malvaceae  
Portia Tree, Aden Apple, Umbrella Tree, Seaside Mahoe  
Country of Origin: Pantropical Shores  
ERL Id#: 0024

---

**PLANT DESCRIPTION**

**Growth Form:** large_tree  
**Growth Habit:** umbrella branching  
**Plant Type:** perennial woody broadleaf evergreen  
**Trunk:** Form: leaning  
Color: red  
**Foliage:**  
Type: simple  
**Form:** large dense  
**Base:** cordate  
**Surface:** shiny  
**Fragrance:** significant  
**Flowers:**  
Type: -0-  
**Form:** large dense  
**Season:** -0-  
**Fragrance:** -0-  
**Fruit:**  
Type: -0-  
**Form:** medium  
**Season:** -0-  
**Use:** -0-  
**Armor:** -0-  
**DESCRIPTI ON**  
**Growth Rate:** -0-  
**Mature Height:** 11-20m  
**-evergreen**  
**Color:** red  
**Arrangement:** -0-  
**Shape:** elliptic ovate triangular  
**Tip:** acuminated  
**Color:** dark_green  
**Flowers:**  
**Type:** -0-  
**Form:** large dense  
**Season:** -0-  
**Fragrance:** -0-  
**Fruit:**  
**Type:** -0-  
**Form:** medium  
**Season:** -0-  
**Use:** -0-  
**Armor:** -0-  
**HABITAT INFORMATION**  
**Exposure:** aridity sun  
**Hardiness:** -0-  
**Salt-water ppt:** 5-10  
**Water:** low_dry average  
**Soil Type:** sandy_loam  
**Population Abund:** cultivated_pla  
**Salt-soil:** 5-10  
**Soil Thickness:** -0-  
**MAINTENANCE INFORMATION**  
**Propagation:** cutting layer seed  
**Culture:** pruning staking intermediate  
**Soil Substitutes:** fertilizers minerals  
**Growing Problems:** Tends to lean if unattended  
**LANDSCAPE VALUES**  
**Architectural:** screen street_tree shade patio  
**Engineering:** wind_breaks  
**Design:** accent ornamental foliage color view_creator specimen  
**Landscape Theme:** tropical oriental  
**Physical Screening:** -0-  
**Disadvantages:** -0-  
**Indicator Plant for:** -0-  
**USES**  
**Plant Part:** bark fruit  
**Medicinal:** medicinal  
**Edible:** oils  
**Animal:** -0-  
**Fuel:** -0-  
**Flowers:** -0-  
**Industrial:** dye  
**Remarks & Comments:** Tends to lean if unattended.

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SALT TOLERANT LANDSCAPE PLANTS

Triglochin elongatum var. -0- Juncaginaceae

Country of origin: South Africa ERL Id#: 705

PLANT DESCRIPTION
Growth Form: ground_cover grass Growth Rate: -0- Growth Habit: arching Mature Height: 20-50cm
Plant Type: annual succulent herbaceous
Trunk:
Form: -0- Color: -0-
Foliation:
Type: -0- Form: large sparse Base: -0- Surface: smooth solid
Arrangement: -0- Tip: pointed Color: dark_green
Fragrance: insignificant
Flowers:
Type: -0- Arrangement: -0- Season: Jan Feb Mar Apr Color: white insignificant
Form: small Shape: spike Pollination: -0-
Sex: -0-
Fruit:
Type: -0- Arrangement: -0- Season: Mar Apr May Color: -0-
Form: -0- Shape: grain
Use: -0-
Armor: -0- Roots: rhizome roots_at_nodes

HABITAT INFORMATION
Exposure: part_shade cold Population Abund: rare
Hardiness: hardy_>0C Salt-water ppt: 10-20 20-30 30-40 Salt-soil: 5-10 10-20 20-30
Water: average high ample flooding Soil Thickness: -0-

MAINTENANCE INFORMATION
Propagation: rhizomes Transplanting: -0-
Culture: intermediate Planting Time: winter
Soil Substitutes: -0- -0-
Pests & Diseases: -0-
Growing Problems: -0-

LANDSCAPE VALUES
Architectural: non_walk_on_gnd_cvr
Engineering: erosion_control soil_stabilization
Design: -0-
Landscape Theme: transitional Physical Screening: light Disadvantages: -0-
Indicator Plant for: -0-

USES
Plant Part: -0- Medicinal: -0-
Edible: -0- Animal: -0-
Fuel: -0- Flowers: -0-
Industrial: -0-

Remarks & Comments: Good winter grass, dies back after early spring activity period. Grown in bog gardens or aquaria.

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REFERENCES


U. S. Regional Salinity Laboratory (1952). "Diagnosis and Improvement of Saline and Alkali Soils". Laboratory Staff (L. A. Richards).


