# PALMS IN SOUTHERN NAVADA PART I

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UNCE

# TEST QUESTIONS

1. There are no Palm trees native to southern Nevada T F ?
2. A Date palm can use as much water as a 700 sq. ft. area of turf. T F
3. Palms have a limited root system compared to other trees. T F
4. There are no palms native to desert areas. T F
5. Palm trees should always be skinned to prevent scorpions from climbing them. T F
6. Palms should be mulched with rocks to keep their roots warm . T F

# TREE of LIFE

Palms belong to one of the most valuable plant families. Their uses are woven into the folklore of many cultures.

Rain forest people depend on palms for their existence. Palms furnish timber, thatch, fiber, rope, furniture, baskets, hammocks, and waxes. They provide staples such as fruits, starch, sugars, wine, alcohol, and charcoal. They also produce medicines, ritual and totem objects, beads, perfumes, poisons, and vegetable ivory.

Cultivation of palms for sugar, alcohol, and fiber is being explored. Unfortunately, many palm species are disappearing due to habitat loss and exploitation.

# PALMS IN THE URBAN LANDSCAPE

**PALMS ARE THE MOST DISTINCTIVE PLANT MATERIALS IN THE LANDSCAPE PALETTE. THEY COMPRISE A VERY NATURAL GROUP OF PLANTS THAT EVEN PEOPLE WITH AN UNTRAINED EYE CAN READILY IDENTIFY. THEY IMPART TO THE LANDSCAPE THAT SO-SOUGHT AFTER EXOTIC, TROPICAL MOTIF THAT FEW IF ANY OTHER PLANTS CAN PROVIDE. HOWEVER, PALMS DIFFER FROM OTHER WOODY LANDSCAPE PLANTS IN THEIR ANATOMY, MORPHOLOGY, AND DEVELOPMENTAL GROWTH FEATURES.**



**(Donald R. Hodel Palms in the landscape Part 1 summer 2008 Western Arborist)**

# PALMS IN THE URBAN LANDSCAPE

**Palms have taken a hit lately regarding their worthiness and suitability as trees for our urban forests, primarily from politicians, who speak from a platform of ignorance. They purport that palms do not provide shade, collect rain water, or release oxygen as well as other trees. However, studies have documented that, generally, palms provide more or less the same benefits and amenities as most other trees and similarly, are about average emitters of volatile organic compounds.**

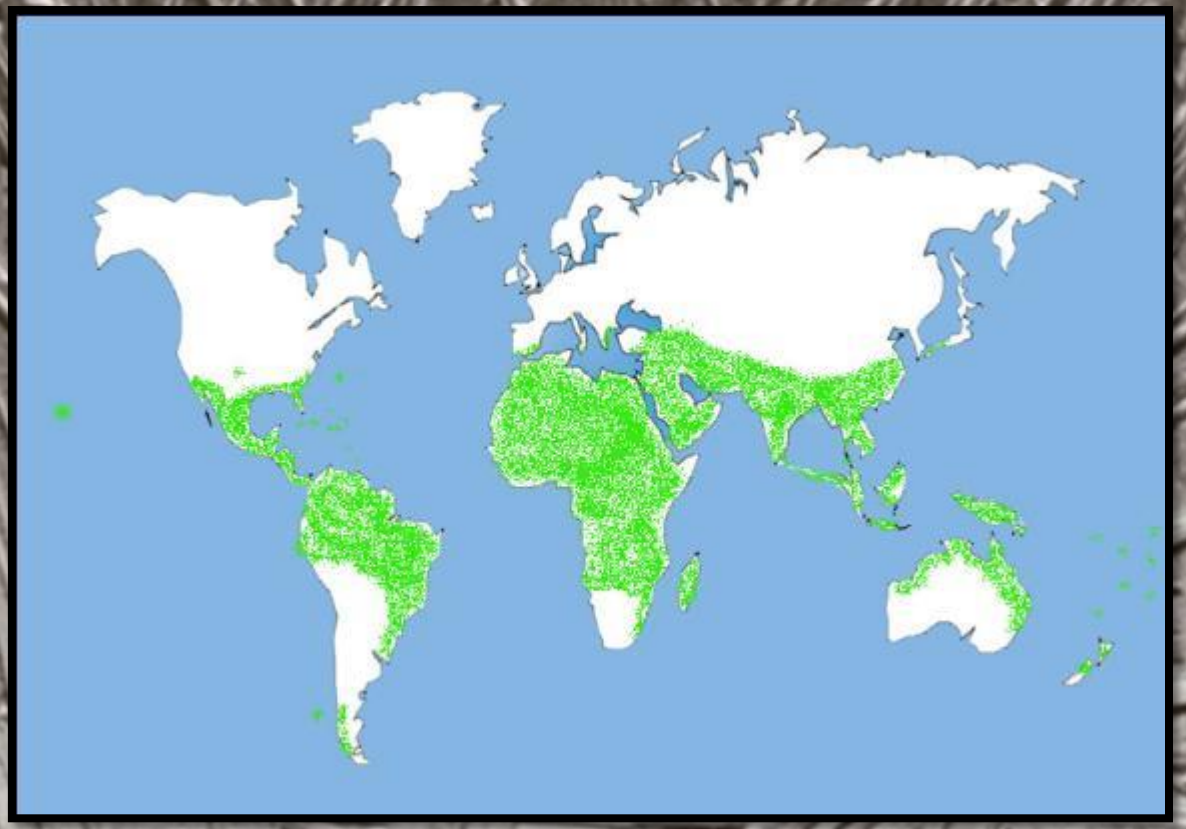
**Palms bring many other benefits to the landscape table, primarily the result of their unique structural biology, including their fibrous, adventitious root system that caused little hardscape damage, large specimens can be transplanted with relative ease, and they produce fewer (and large leaves) and inflorescences which produces less litter. They add to the exotic and dramatic theme they conjure up.**

**(Donald R. Hodel Palms in the landscape Part 1 summer 2008 Western Arborist)**

# PALM BASICS

2,500 TO 3,OOO SPECIES OF PALMS

- MOST PALMS ARE TROPICAL OR SUBTROPICAL
- A FEW ARE DESERT AND TEMPERATE



ADAPTED FROM PALMS OF SOUTH FLORIDA by GEORGE STEVENSON

# PALMS OF THE WORLD

**EUROPE**
- Chamaerops
- Phoenix

**AFRICA**
- Chamaerops
- Elaeis
- Hyphaene
- Phoenix

**INDIAN OCEAN**
- Bismarckia

- Chrysalidocarpus
- Dictyosperma
- Hyophorbe
- Latania
- Neodypsis

**INDIA**
- Arenga
- Borasus
- Caryota
- Cocos
- Corypha
- Nannorrhops
- Phoenix
- Wallichia

**MALAYSIA**
- Arenga
- Caryota
- Licuala
- Livistona
- Pinanga

- Ptychosperma

**CHINA – JAPAN**
- Livistona
- Rhapis
- Satakentia
- Trachycarpus

**AUSTRALASIA**

- Archontophoenix
- Brassiophoenix
- Carpentaria
- Drymophloeus
- Howeia
- Hydriastele
- Livistona
- Ptychosperma

**SOUTH SEAS**
- Drymophloeus
- Heterospathe
- Pritchardia
- Veitchia

**SOUTH AMERICA**
- Acrocomia
- Allagoptera
- Aiphanes
- Arecastrum
- Arikuryroba
- Attalea
- Bactris
- Butia
- Chamaedorea
- Geonoma
- Jubaea
- Maximiliana
- Orbignya
- Roystonea
- Polyandrococos
- Scheelea
- Syagrus

**CENTRAL AMERICA**
- Acoelorrhaphe
- Acrocomia
- Aiphanes
- Astrocaryum
- Chamaedorea
- Coccothrinax
- Cryosophila
- Gastrococos
- Reinhardtia
- Roystonea
- Synechanthus

**CARIBBEAN BASIN**
- Acoelorrhaphe
- Acrocomia
- Aiphanes
- Copernicia
- Gaussia
- Geonoma
- Opsiandra
- Pseudophoenix
- Roystonea
- Sabal
- Schippia
- Thrinax
- Zombia

**U. S. & MEXICO**
- Acoelorrphaphe
- Acrocomia
- Brahea
- Coccothrinax
- Pseudophoenix
- Rhapidophyllum
- Roystonea
- Sabal
- Serenoa
- Thrinax
- Washingtonia

**ADAPTED FROM**: Pages 232-233 PALMS OF SOUTH FLORIDA by GEORGE STEVENSON

# INTERESTING PALM FACTS

**Most versatile plant family in total uses**

**Most versatile plant family in food uses**

**World's longest woody vines**
**(RATTAN PALMS 500FT.+)**

# INTERESTING PALM FACTS

## WORLD'S LONGEST INFLORESCENCE

**(TALIPOT PALM LOOKS LIKE A 36 FT. CHRISTMAS TREE WITH 25 MILLION OF FLOWERS) HAPAXANTHIC PALM**

## WORLD'S LARGEST SEED

**(DOUBLE COCONUT 45 LBS.)**



Photos by P. Barry Tomlinson Kew Gardens Uk

# INTERESTING PALM FACTS

**WORLD'S BIGGEST LEAVES:**

**(CORYPHA UMBRACULIFERA)**

**WORLD'S LONGEST LEAVES:**

**(RAFFIA PALMS 65 FT.)**

Photos by P. Barry Tomlinson Kew Gardens Uk

# INTERESTING PALM FACTS

**WORLD'S SINGLE BEST STARCH SOURCE (SAGO PALM)**

**WORLD'S HARDEST SEED (IVORY NUT PALM)**

# INTERESTING PALM FACTS

PHOTO PALM AND CYCAD SOCIETY OF AUSTRALIA

## A NARCOTIC SEED THAT IS CHEWED

**(BETEL NUT PALM)**

## WORLD'S TALLEST PALM

**(CERROAYLON QUINDIUENSIS WAX PALM 200 FT)**

# INTERESTING PALM FACTS

**THERE ARE OVER 100 USES FOR THE COCONUT**

**OVER 1 BILLION COCONUT PALMS IN THE WORLD PRODUCING OVER 40 BILLION COCONUTS EACH YEAR**

**OF THOSE 1 BILLION TREES 2/3 ARE 60+ YEARS OLD**

**THE COCONUT IS THE MOST WIDELY DISTRIBUTED PALM WORLD WIDE**

**THE SEED CAN FLOAT IN SALT WATER UP TO 200 DAYS BEFORE IT DIES**

**MOST VERSATILE PLANT IN THE WORLD**

**( THE COCONUT PALM)**



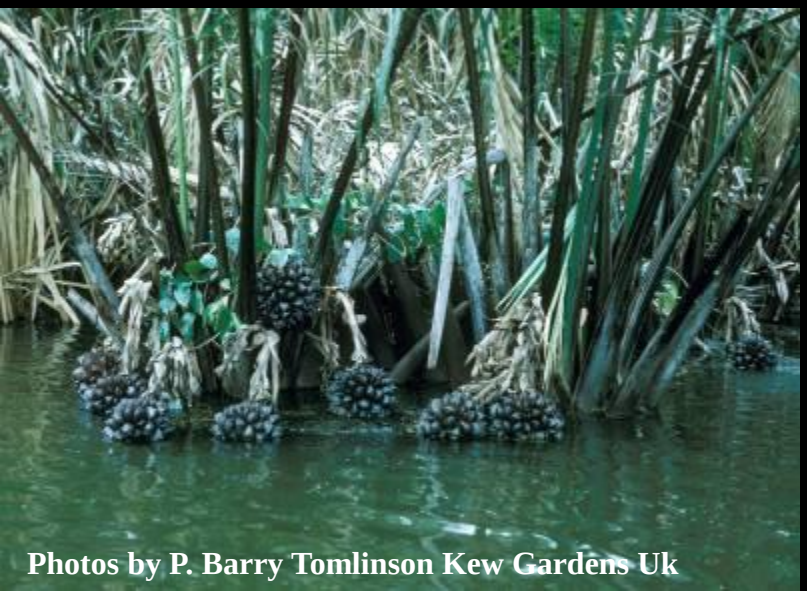
**COCONUT GUIDE TO TRADITIONAL AND IMPROVED VARIETIES PALMS VOL.51(2)2007**


THERE ARE OVER 100 USES FOR THE DATE
INTERESTING PALM FACTS
OVER 105 MILLION DATE PALMS (1,984,000 ACRES) IN THE WORLD
250,000 IN THE USA
THE DATE PALM IS DISTRIBUTED THROUGH OUT THE WORLD MOSTLY IN THE DESERT AND SEMI DESERT CLIMATES

2,000-year-old seeds were discovered in 1963 inside an ancient jar in Israel. They were planted in 2005 and a tree that had been extinct for over 1800 years sprouted.

*NYPA FRUTICANS*

PAPUA NEW GUINEA



Photos by P. Barry Tomlinson Kew Gardens Uk

# ECOLOGICAL DIVERSITY

## SWAMP FORESTS …..

## MANGROVES

## FRESHWATER SWAMPS

*METROXYLON RUMPHII*

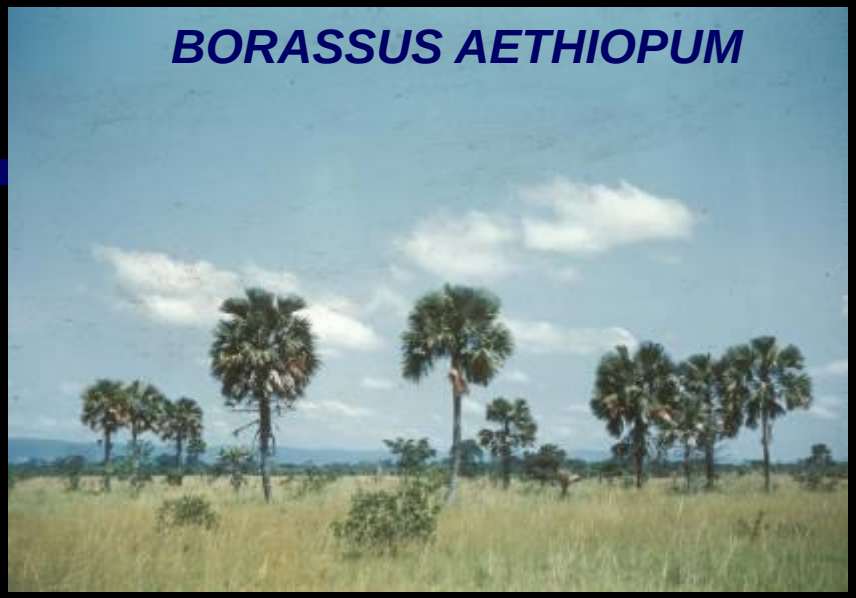
PAPUA NEW GUINEA

## VARZEA (SEASONALLY INUNDATED)

## ……RHEOPHYTES ……. ETC.

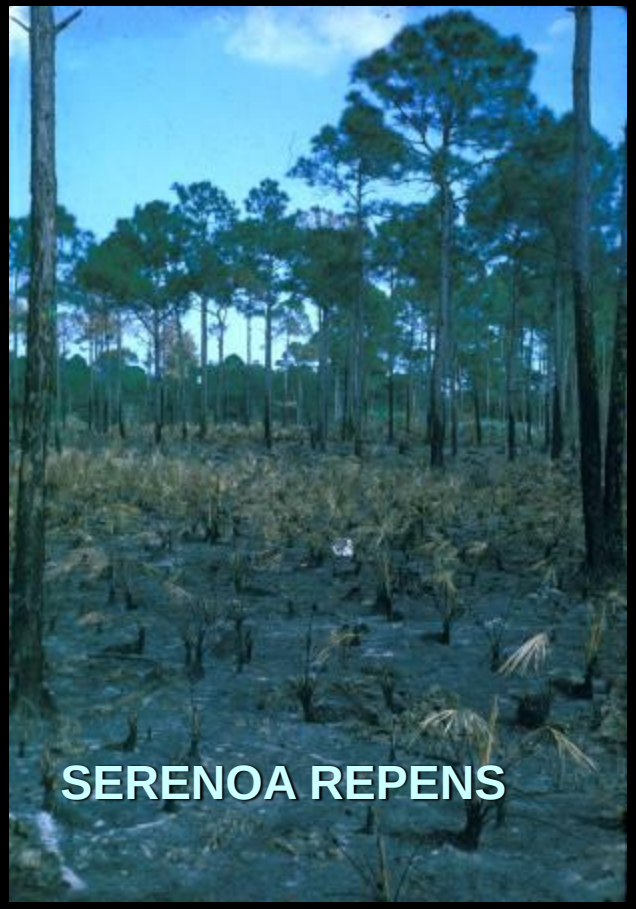
# ECOLOGICAL DIVERSITY

## FIRE- DETERMINED HABITATS




ACCRA PLAINS, SAVANNA,

GHANA, WEST AFRICA




PINELANDS,

SOUTH FLORIDA

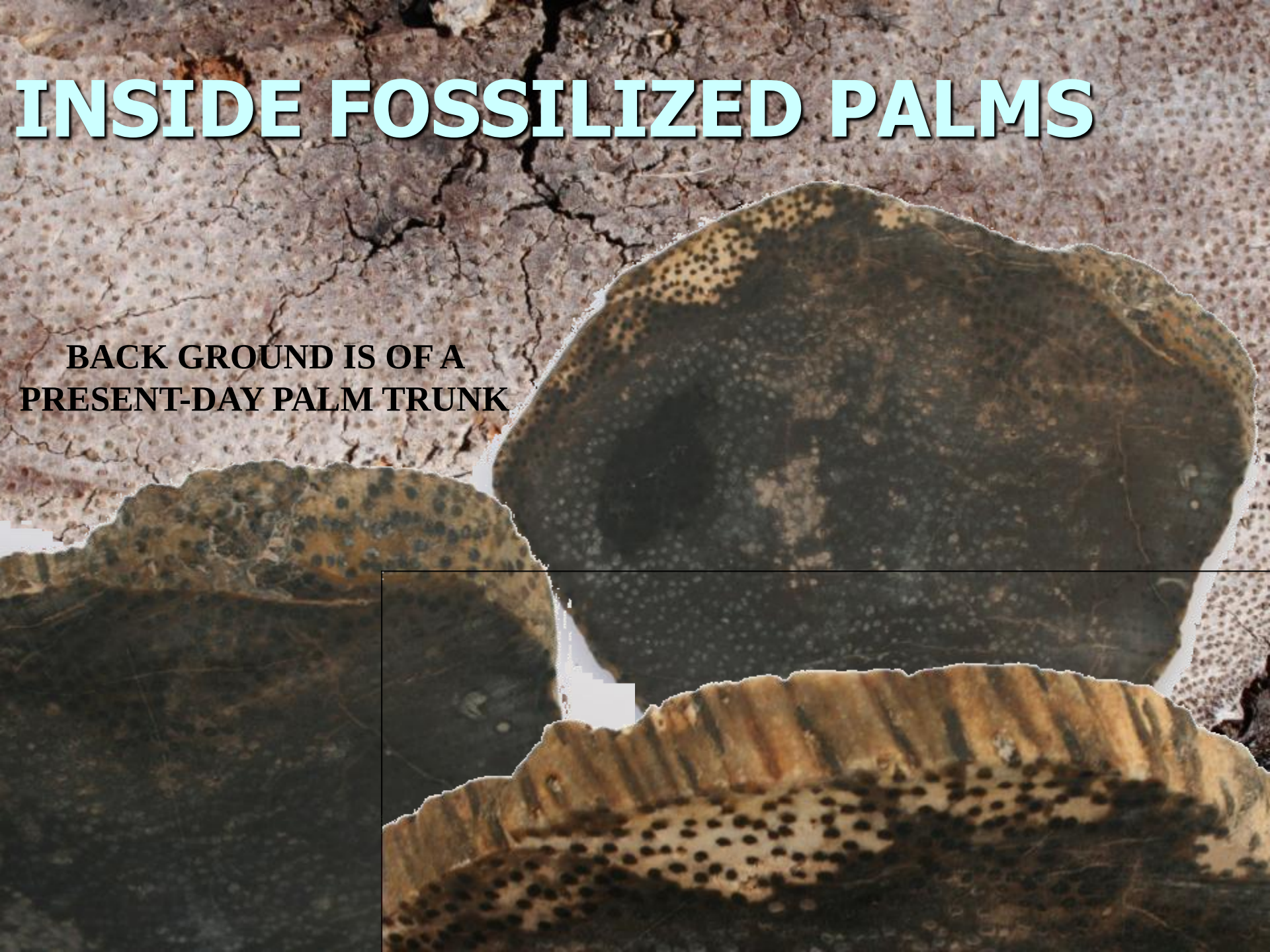


Photos by P. Barry Tomlinson Kew Gardens Uk

# PALMS HAVE BEEN AROUND FOR MORE THAN 80 TO 90 MILLION YEARS

OVER 500 SPECIES IN FOSSIL RECORDS

# INSIDE FOSSILIZED PALMS



BACK GROUND IS OF A
PRESENT-DAY PALM TRUNK

# 50 MILLION YEAR OLD FOSSILIZED PALM LEAF

Photo by Jeff Anderson

PHOTOS TAKEN AT THE DENVER MUSEUM

# ARE THERE ANY NATIVE NEVADA PALMS ?



# History of desert fan palm hard to determine

## Grower's native stance opposes pioneer theory

By Mary Manning
LAS VEGAS SUN

MOAPA VALLEY — Common knowledge about the desert fan palm trees growing in Warm Springs says they are migrants, brought by Mormon settlers a century ago. But an amateur palm grower believes the palms are natives.

Most botanists and residents of the Moapa Valley, about 58 miles northeast of Las Vegas, tell of Mormon pioneers bringing palm trees to the valley from Arizona around the turn of the century. Further proof is found in Mormon diaries and journals.

When Will Spencer lived in the Moapa Valley for a couple of years in the 1960s, he heard the stories and developed a passion for the palm trees, known as Washingtonia filifera.

The late Chic Perkins, curator of the Lost City Museum in Overton, believed that the palm trees were brought to the valley recently. Spencer befriended him and began to learn about the history of the area, including how the Paiute Indians came to the valley at least 1,000 years ago.

Spencer, a graphics illustrator who moved to Stockton, Calif., began serious research into the desert fan palms about three years ago, after a fire swept through Warm Springs, charring the towering trees.

Besides reading the scientific literature, Spencer talked to Moapa Paiute members such as Evelyn Tamalar, 77, who was born and raised in the Moapa Valley.

Tamalar's grandfather was a Paiute medicine man and visited the hot springs, she said, drawing the warm water for purifying himself. "We used to have to act a certain way when we went to the Warm Springs, because this was a very sacred place," Tamalar said.

Spencer learned that pits carved into the stone of the nearby mountains allowed Paiutes to grind palm seeds into a kind of gravy with which they supplemented their diets of mesquite beans and vegetables grown there.

LORI GAIN/LAS VEGAS SUN

**BILL SPENCER,** left, a former Overton resident, shows Howard Hight, a member of the Archaeo-Nevada Society, how the palms in the Warm Springs area and Moapa Valley resemble ancient petroglyph drawings. Moapa Paiute Indians ate the seeds of the palm tree, which are shown above.

Instead of being immigrants to the valley, riding in the saddle bags of settlers, the palm trees have been living along the hot waters flowing from deep within the Earth along earthquake faults, Spencer's theory goes.

Spencer is trying to save the palm trees as well as the Moapa Paiute's history. "I'm more concerned now that a Moapa tribal history is dying," he said on a recent visit to the palm groves. "We're letting their history slip away while we excavate earlier ruins. We can't forget the ones that are still living."

Helen Mortensen, a longtime member of the Archaeo-Nevada Society, couldn't agree more with Spencer.

"Archaeo-Nevada is supporting the cultural renaissance of the Moapa Valley people," Mortensen said. Rather than telling the story through settlers' eyes, the society plans to help the Indians record their tales in their own words.

"Who knows how deep and far that language goes back?" Mortensen asked.

Paiute concerns are new to many researchers who have spent time preserving and managing rare fish and plants in the desert springs.

About 16 acres of Warm Springs has been exchanged by Del Webb Corp. for lands to develop in the Las Vegas Valley. The old Plummer ranch cradles some of the thousands of trees that drink from the hot springs there.

"We're an island of wet in a sea of dry," said Bruce Lund, who lives at the U.S. Fish and Wildlife Service and helps to save rare and endangered species such as the Moapa Valley dace, a warm-water fish. Lund works for The Nature Conservancy.

"I would say the palms here were brought in by the Indians or the settlers," he said. "That's what botanists would say."

There's no good way to date a palm tree, Lund said. The trees don't grow rings and they can grow rapidly in ideal conditions, or survive in times of drought or cold weather.

However, Lund did not close the door that memories of Paiute elders are wrong. "You can find people who will tell you both stories," he said.

Teri Knight, a botanist for The Nature Conservancy, agreed with Lund.

"I wouldn't say they're wrong," she said of Spencer's idea that the trees have been there for thousands of years. "I'm saying I'm not sure."

Spencer and the Archaeo-Nevada Society plan to tell both sides of the story, to save the palms and to save a culture that has lived in the valley for at least 1,000 years.

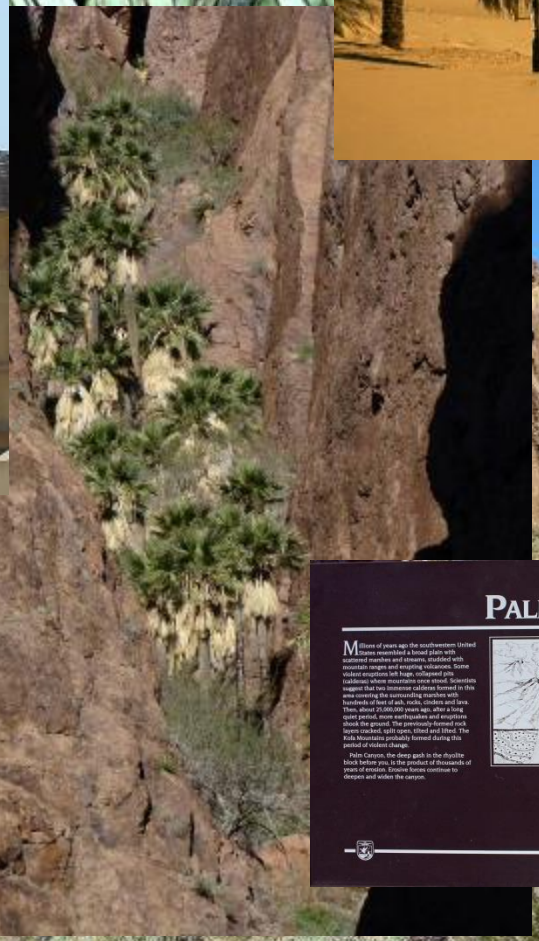

MOAPA WASHINGTONIA
PALMS

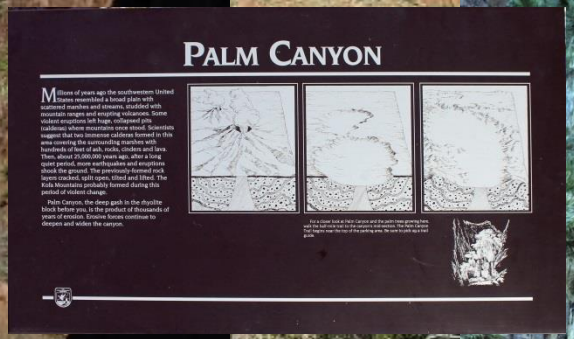

PALMS ARE TOUGH


FROM URS CYCAD


MS AR


FROM A SUD DEL MONDO.




PALM CANYON


PALMS ARE TOUGH
SABALS GROWING
OUT OF AN ASPHALT
PARKING LOT

# PALMS ALONG THE LAS VEGAS FREEWAY

# PALMS ALONG THE LAS VEGAS FREEWAY

# PALMS ARE TOUGH

**IRRIGATION IS JUST 4 SMALL EMITTERS**

# WASHINGTONIA GROWING IN THE COLORADO RIVER

# WASHINGTONIA GROWING IN THE COLORADO RIVER

# AFTER HURRICANES MOST OF THE TREES STILL STANDING ARE PALMS

# PALM BASICS

IN LAS VEGAS

FEWER THAN 10 SPECIES ARE USED IN LANDSCAPING

AND 15 SPECIES ARE USED INDOORS

# DIVERSITY OF CLIMATE



10/24/2017

Dr. Gian-Reto WALTHER

Dr. Gian-Reto WALTHER

By Kiril Donov Bulgaria

DENVER

By Kiril Donov Bulgaria

JD Sitka Alaska

# PALMS IN THE SWISS ALPS, BULGARIA, DENVER AND ALASKA

# PALMS IN LAS CRUSES NM AND LONG ISLAND NY

PHOTO BY JEFF ANDERSON

PHOTO FROM MULE PALM NURSERY

# LAS CRUSES NM

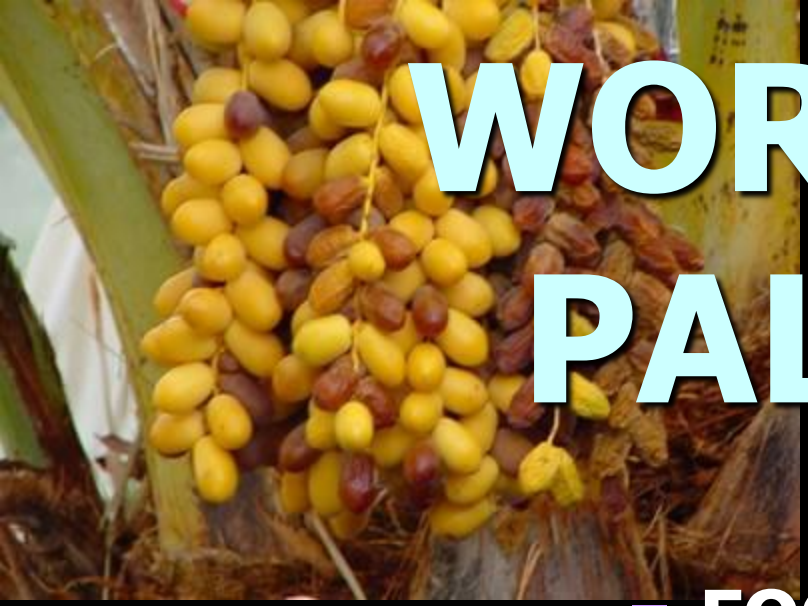
10/24/2017

PHOTOS BY JEFF ANDERSON

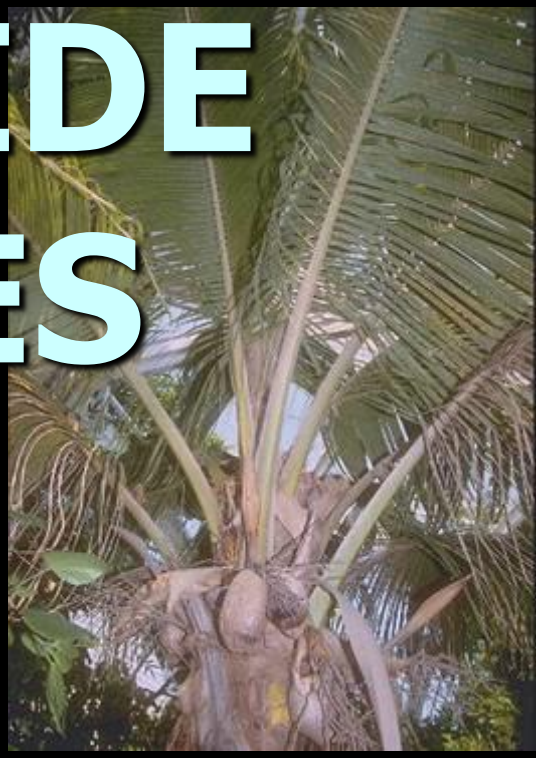
# PALMS SUGGEST THE EXOTIC OR OASIS

THERE IS AN OLD MEDITERRANEAN SAYING THAT "THE GODS MADE PALMS SO MAN WOULD KNOW WHERE TO LIVE." THEY INDICATE THE PRESENCE OF WATER AND A WARM CLIMATE.

# THE PALM FAMILY IS SECOND ONLY TO THE GRASS FAMILY IN ECONOMIC IMPORTANCE WORLDWIDE.



# WORLD WIDE PALM USES



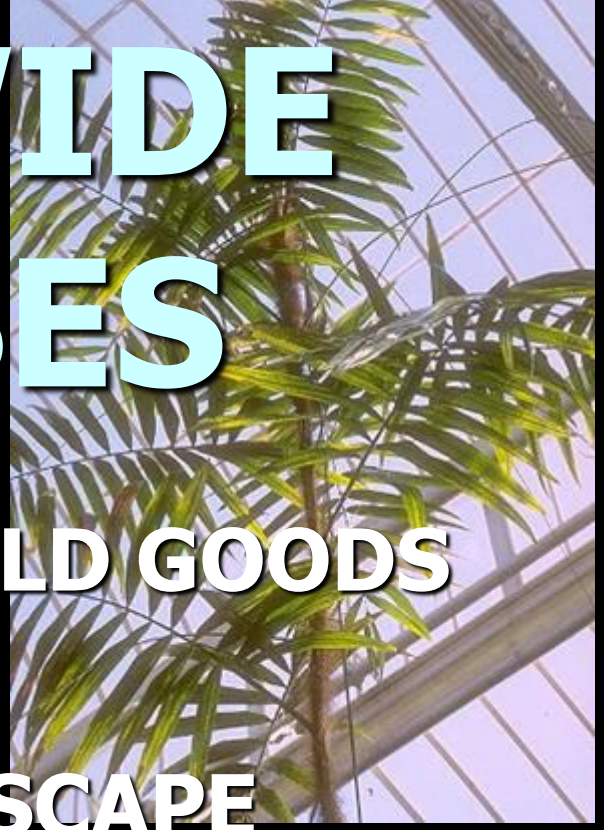
- FOOD
- COCONUT PALM
- PEACH PALM
- DATE PALM
- SUGAR
- OIL
- VINEGAR


# WORLD WIDE PALM USES


- FOOD
- COCONUT PALM
- PEACH PALM
- DATE PALM
- SUGAR
- OIL
- VINEGAR

WAX PALMS


# WORLD WIDE PALM USES



- SHELTER & HOUSEHOLD GOODS
- RATTAN FURNITURE
- ORNAMENTAL/ LANDSCAPE

**PALMS** play a very important part in tropical areas. The trunks are used for building and pipes, the leaves are used for roofing & walls, clothing, & paper. The fruit, pulp, & sap are used for food & drink. Commercial uses include palm oil, palm hearts, dates, carnauba wax, fiber, soap, & of course, coconut.

# COIR POTTING SOIL (PEAT REPLACEMENT)

# COIR SHOES


COIR PLUS
MEDIA
It is 100% natural and biodegradable, derived from world best grade of coconut fiber found in southern part of India. It has excellent elasticity properties and is used in geo-textile applications and as hop yarn.


COIR PLUS

# INTERESTING PALM USES MEDICAL

**RATTAN PALM STEMS FUSED WITH CERAMIC MATERIAL ARE USED TO MANUFACTURE ARTIFICIAL SCAFFOLDING BONES**

**THE POROSITY OF THE RATTAN PALM STEM ALLOWS NEW BLOOD, NERVES AND REAL BONE TISSUE TO FORM AND TRAVEL THROUGH**

*MAKING FISH NETS*

# ART


# ART

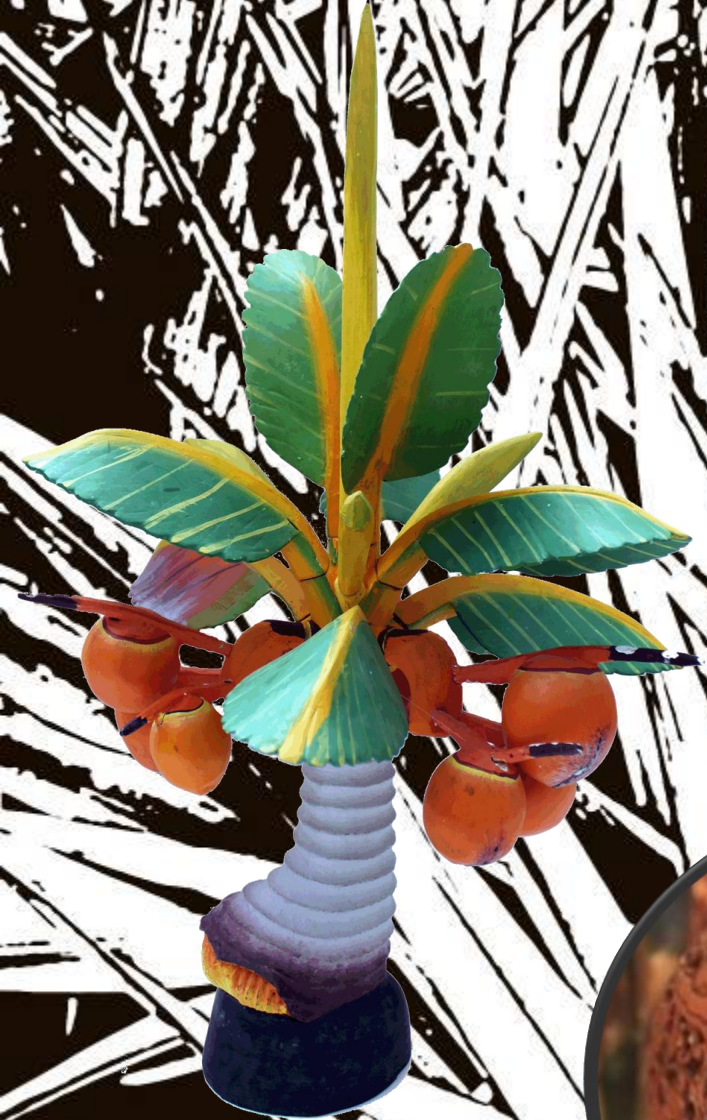
# ART AND PRODUCTS

# ART

# ART

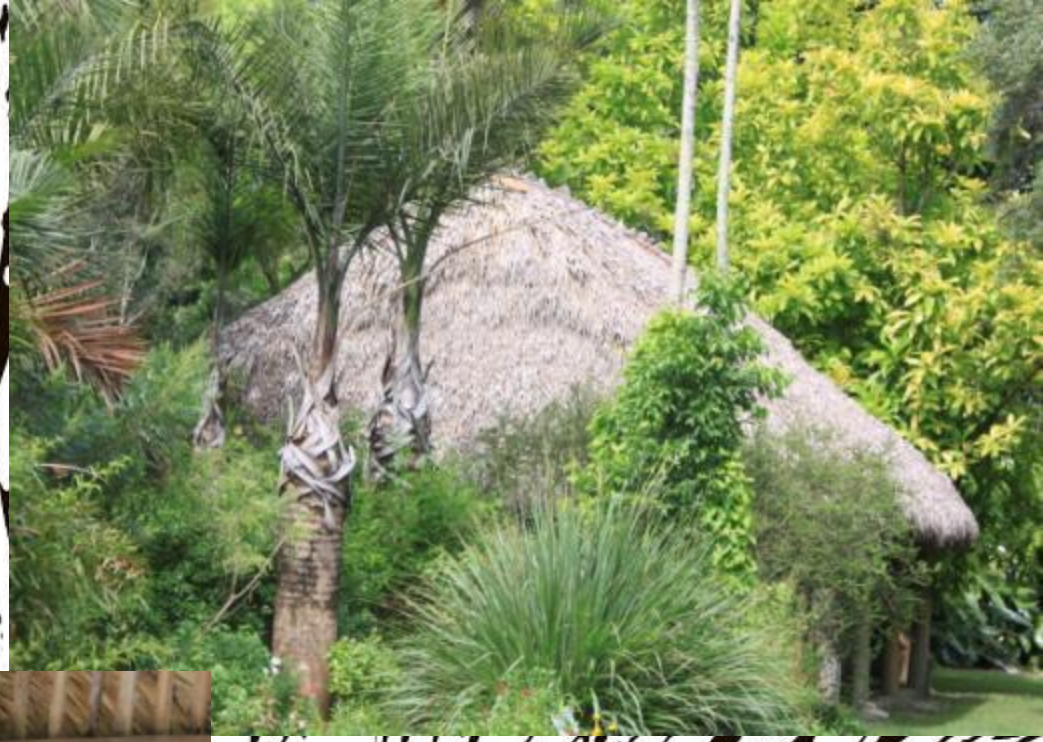
# ART


# ART



# ART AND HATS

# BUILDING



# BUILDING

# MAIL BOX HOLDERS

# WORLD WIDE PALM USES


**TELECOMMUNICATION**

**PHOENIX TELEPHONOUS**

**WASHINGTONIA CELLPHONIANUS**


IDENTIFICATION

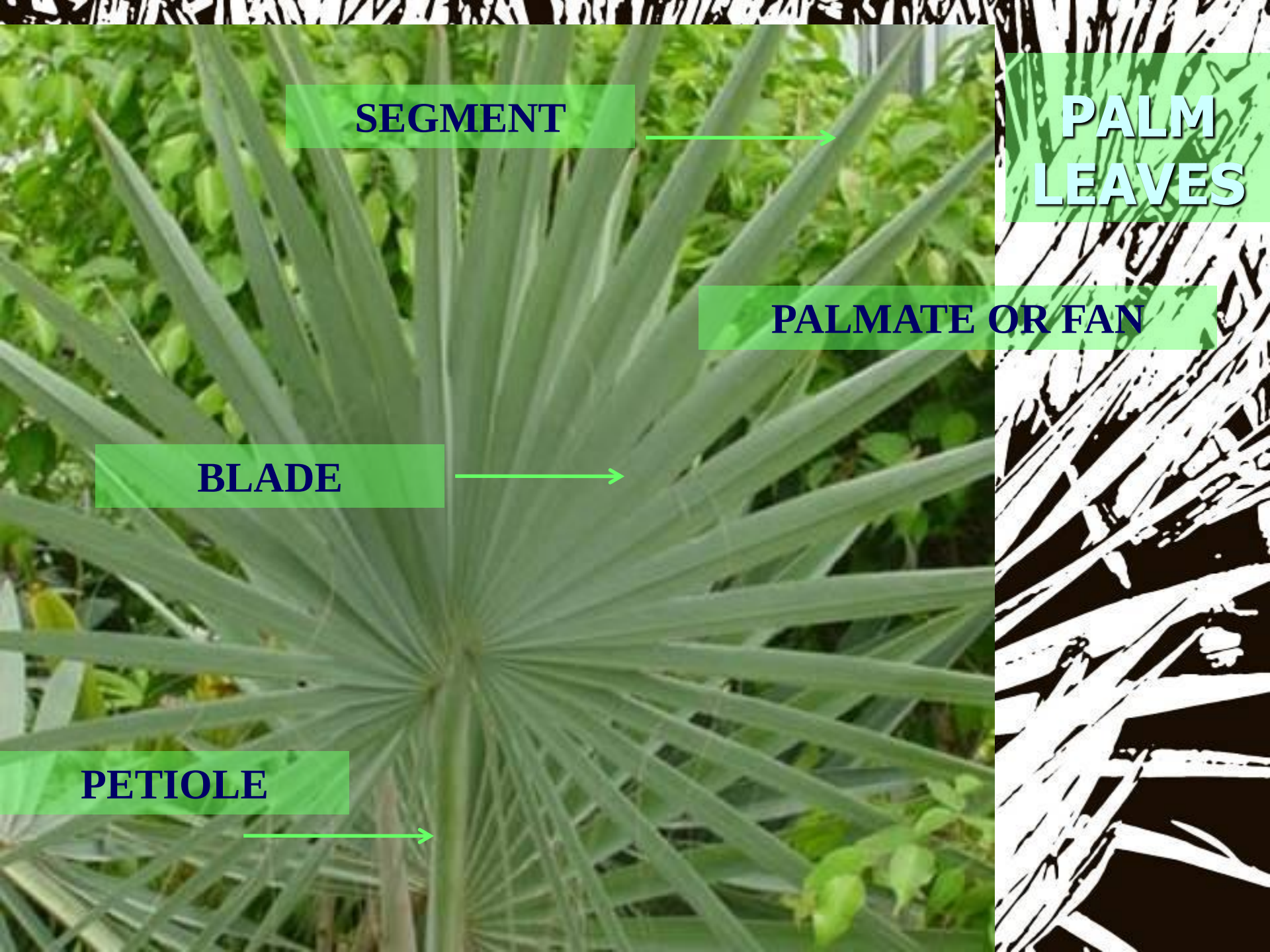
# LEAVES OR FRONDS

- ALL PALM LEAVES HAVE

1. A BLADE
2. A PETIOLE
3. A LEAF BASE OR BOOT

- THERE ARE 3 MAIN CLASSES OF PALM LEAVES

1. PALMATE OR FAN
2. PINNATE OR FEATHER
3. BIFID OR ENTIRE


SEGMENT
PALM LEAVES
PALMATE OR FAN
BLADE
PETIOLE

TERMINAL LEAFLETS

BLADE

ARMAMENT OR SPINES

PETIOLE

LEAF BASE, SHEATH OR BOOT

# PALM LEAVES

# PINNATE OR FEATHER


BIFID OR ENTIRE LEAF
ARMAMENT OR SPINES

# PALM TRUNKS AND GROWTH HABITS

- PALM TRUNKS

1. SINGLE STEMMED OR SOLITARY
2. MULTISTEMMED OR CLUSTERING

- PALM GROWTH HABITS

1. TREE PALMS TALL FOREST CANOP
2. SHRUB SHORTER UNDERSTORY PALMS
3. ACAULECENT OR WITHOUT VISIBLE TRUNKS
4. CLIMBING OR VINING PALMS


From Facebook at Palmiersdanslabeauc

# PARTS OF A REPRESENTATIVE PALM

# PARTS OF A REPRESENTATIVE SINGLE-STEMMED (SOLITARY) PALM

# TYPES OF PALM TRUNKS

**SINGLE SOLITARY TRUNK**

# TYPES OF PALM TRUNKS

**MULTISTEMMED OR CLUSTERING PALM**

# MULTI-TRUNKED DATE PALM

# TYPES OF PALM TRUNKS

## PROSTRATE TRUNK OR STEM

## SERENOA REPENS

# TYPES OF PALM TRUNKS

## SUBTERRANEAN TRUNK OR STEM

## SABAL SP.

Picture used with permission **palmswholesale coconut clinber eBay**

# HYPHAENE THEBAIA

## 12 YEARS FROM A 5 GAL.

## 21 YEARS

# OTHER PALMS CAN HAVE MULTIPLE HEADS

# OTHER PALMS CAN HAVE MULTIPLE HEADS

# SPINES ON PALMS CAN BE

**EXTERNAL STRUCTURES**

- **MODIFIED LEAFLETS**

1. **PINNAE AS FOUND ON PHOENIX**
2. **MIDRIB AS FOUND ON ELAEIS**
3. **ROOTS AS FOUND ON CRYOSOPHILA**

- **PETIOLE MARGINS REMAIN AFTER SOFT SURROUNDING TISSUE FALLS OFF, AS ON CHAMAEROPS, ACOELORRAPHE AND WASHINGTONIA**



ADAPTED FROM ORNAMENTAL PALM HORTICULTURE PAGE 18

# SPINES ON PALMS CAN BE

**INTERNAL**

- **SPINE FORMATION FROM VASCULAR BUNDLES OR FIBERS**

1. **VASCULAR BUNDLES AS FOUND ON ZOMBIA, TRITHRINAX AND RHAPIDOPHYLLUM**
2. **FIBER AS ON SYAGRUS, BUTIA AND ELAEIS**



ADAPTED FROM ORNAMENTAL PALM HORTICULTURE PAGE 18

# AGE
# HOW LONG CAN PALMS LIVE ?

IT IS RARE FOR A PALM TO REACH OLD AGE (MOST DIE OF DISEASE, INSECT DAMAGE, ADVERSE ENVIRONMENTAL CONDITIONS SUCH AS COLD, DROUGHT, WIND, FLOODING, LIGHTNING, ADVERSE URBAN CONDITIONS, ETC.)

VEGETATIVE GROWTH IS MINIMAL, THE TRUNK DIAMETER TAPERS AND THE CROWN (LEAF AREA) BECOMES SMALLER

# THE AGE OF A PALM

- PALMS DO NOT HAVE RINGS TO COUNT TO TELL THEIR AGE LIKE DICOT TREES

1. THE TOTAL LEAVES BASES (BOOTS), AND SCARS CAN BE COUNTED AND DIVIDED BY THE ESTIMATED AVERAGE NUMBER OF LEAVES PRODUCED EACH YEAR TO DETERMINE. APPROXIMATE AGE OF THE PALM
   - UNDERSTORY PALMS ARE ESTIMATED TO LIVE 60 TO 100 YEARS
   - CANOPY PALMS CAN LIVE 100 TO 700 YEARS OR MORE

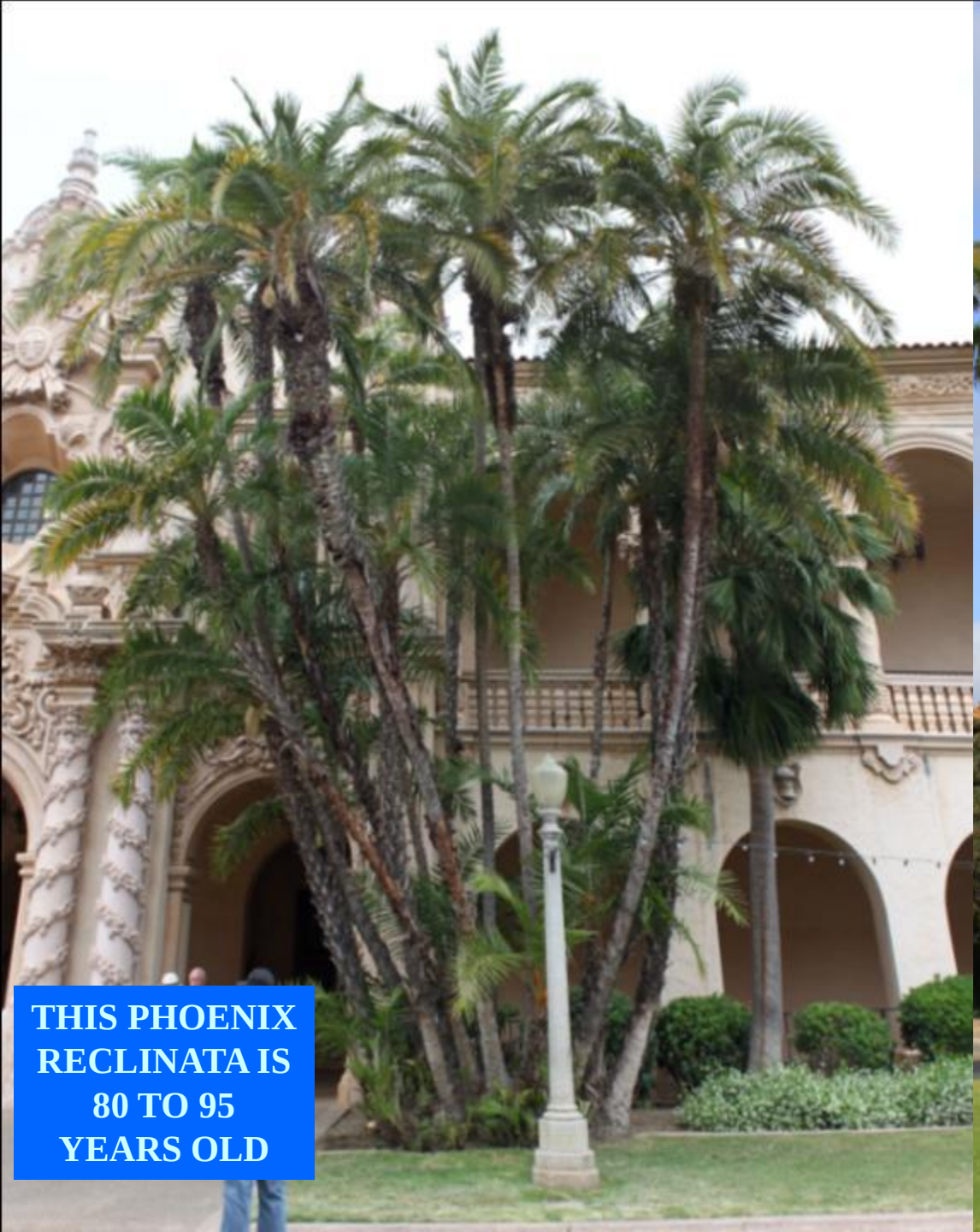
# HOW LONG DO PALMS LIVE?

**85 YEAR OLD DATE PALMS 65 FT. TALL AT CHINA RANCH CA.**

**SOME DATE PALMS ARE KNOWN TO BE 100 TO 150 YEARS OLD**

160 years old Kew Gardens UK

**THE CHILEAN WINE PALM IS 50 YEAR OLD BEFORE IT BLOOMS**



THIS PHOENIX RECLINATA IS 80 TO 95 YEARS OLD

THIS CHILEAN WINE PALM IS OVER 50 YEAR OLD

THIS LIVISTONA WAS PLANTED BY SEED 25 YEARS AGO


THESE PALMS WERE ALL PLANTED 6 YEARS AGO FROM 5 GAL. POTS. ONE GROUP WAS FERTILIZED AND WATERED REGULARLY THE OTHER WAS NOT

# BOTH PALMS ARE 25 YEARS OLD

# HOW LONG DO PALMS LIVE?

**Research has been conducted on native Serenoa repens (the Saw palmetto) growing on the Mid-Florida Ridge that bisects the middle of the state of Florida. When sea levels were 50 m higher, a chain of small islands formed in this ridged area during the Pliocene and early Pleistocene. These islands were refuges for plants and animals. The sandy soil that form this area are low in and plant growth is slow. The growth rate of these palms is somewhere between .88cm( .4 inches) to 2.2cm. (.9 inches) a year. It should be taken into consideration that during years of low rainfall less to no growth occurs. It has been found that younger wild Serrano repens grow more slowly than adult plants . Some of these palms could be as much as 500 years old.**

Extensive clonal spread an extreme longevity in saw palmetto, a foundation clonal plant.

**Molecular Ecology (2011) 20, 3730-3742**

# HOW LONG DO PALMS LIVE?

**Add to this the fact that Serenoa repens are also clonal colony plants. Most Serenoa grow prostrate or horizontally with their trunks on the ground (some do grow upright). As trunks grow along the ground, they root. Over time, new plants form on the mother trunks and begin growing. In time the mother plant dies and rots, severing ties with the daughter plants. New genetic analyses has shown that these clonal colonies can be very large. It is estimated that some of these colonies are 1200 to 5200 years old. Researchers believe that some of the clonal colonies could be over 8,000 years old.**



Extensive clonal spread an extreme longevity in saw palmetto, a foundation clonal plant.

**Molecular Ecology (2011) 20, 3730-3742**

# HOW OLD IS THIS PALM ?

## I HAVE VISITED THIS PALM FOR MORE THAN 50 YEARS


GROWTH
RATE

# GROWTH RATES OF PALMS HOW FAST DO PALMS GROW

- IT DEPENDS ON THE CONDITIONS, WATER, SOIL, NUTRIENTS, LENGTH OF GROWING SEASON, NIGHT TEMPERATURES
- DATE PALMS 10 TO 20 INCHES/YR.
- ARENGA & CARYOTA 4 FT./YR.
- RATTANS 7-8 FT./YR.
- WASHINGTONIAS 1 TO 3 FT./YR.
- PALMYRA PALM 4 IN./YR.


PALM TRUNKS

# HOW DO PALMS GROW?

- **BUD GROWING POINT OF THE PALM**

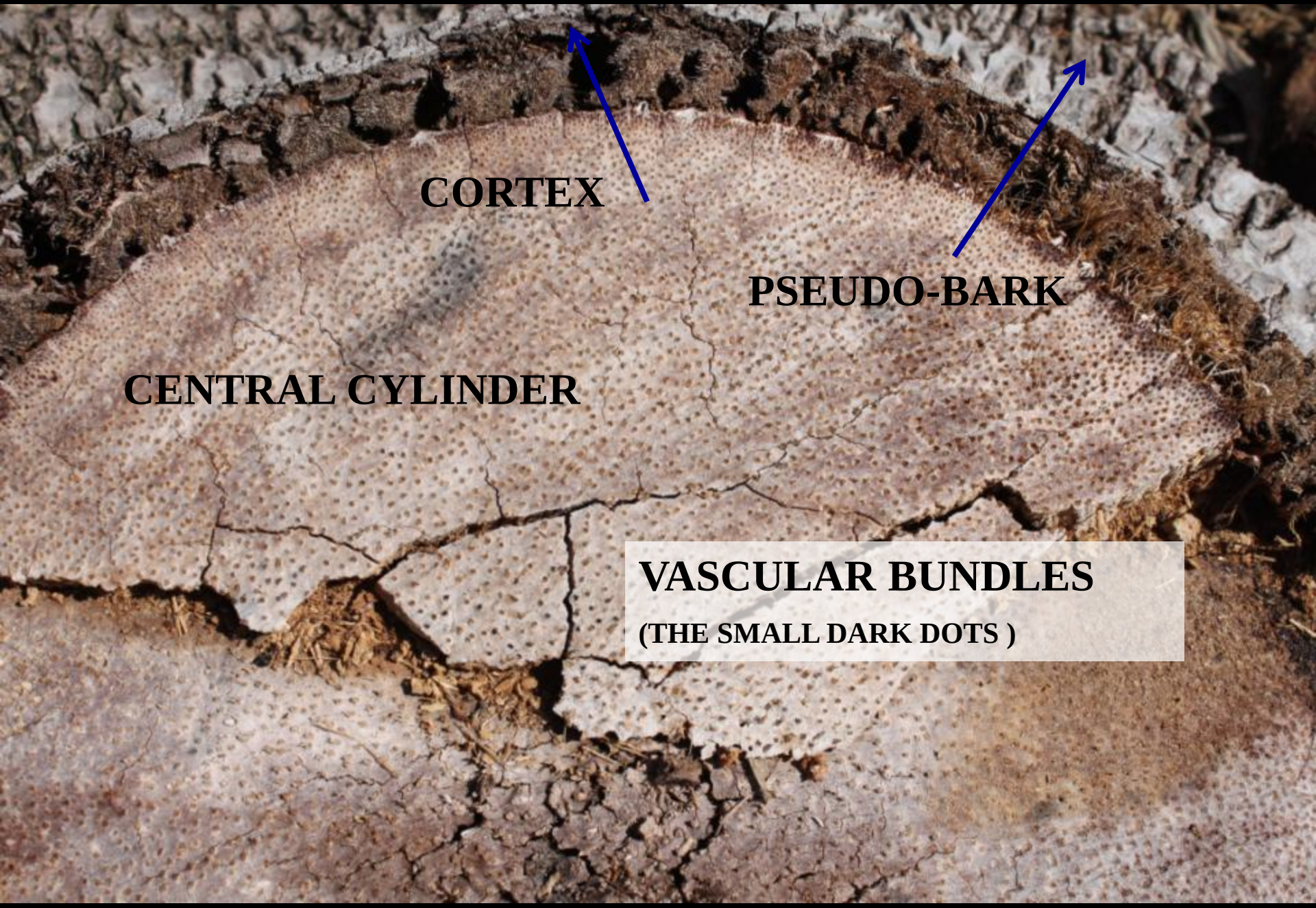

**A HEALTHY PALM SHOULD HAVE THE SAME NUMBER OF GREEN LEAVES AS LEAVES THAT ARE DEVELOPING INSIDE THE TRUNK**

# HOW DO PALMS GROW?

- ROOT GROWING POINT OF THE PALM

# HOW DO PALMS GROW?

- PALMS DO NOT HAVE RINGS ONLY VASCULAR BUNDLES
- YOU CAN'T COUNT THE RINGS TO TELL A PALM'S AGE
- A 1 FT. DIAMETER TRUNK OF A COCONUT PALM CONTAINS OVER 18,000 VASCULAR BUNDLES


CORTEX
PSEUDO-BARK
CENTRAL CYLINDER
VASCULAR BUNDLES
(THE SMALL DARK DOTS )

# INSIDE OF A PALM TRUNK

THE XYLEM AND PHLOEM (STEEL RODS) ARE SURROUNDED BY PARENCHYMA CELLS (CEMENT) THINK OF A PALM TRUNK LIKE A CEMENT POLE WITH THOUSANDS OF SMALL REINFORCING RODS

THE XYLEM (WATER CONDUCTING TISSUE) AND PHLOEM ( CARBOHYDRATE CONDUCTING TISSUE) ARE ENCASED IN THE SAME BUNDLE AND ARE FOUND THROUGHOUT THE TRUNK

# PALM STEMS

- WOODY
- ONLY ONE GROWING POINT
- NO

1. CAMBIUM
2. SECONDARY GROWTH
3. STEM THICKENING
4. COMPARTMENTALIZING OR PSEUDO HEALING

- STEM CELLS THICKEN AND STRENGTHEN WITH AGE
- VASCULAR SYSTEM REPETITIVE AND DISPERSED THROUGH THE TRUNK
- NO BARK ONLY PSEUDO BARK OFTEN COVERED WITH OLD LEAF BASES

# PALM TRUNKS

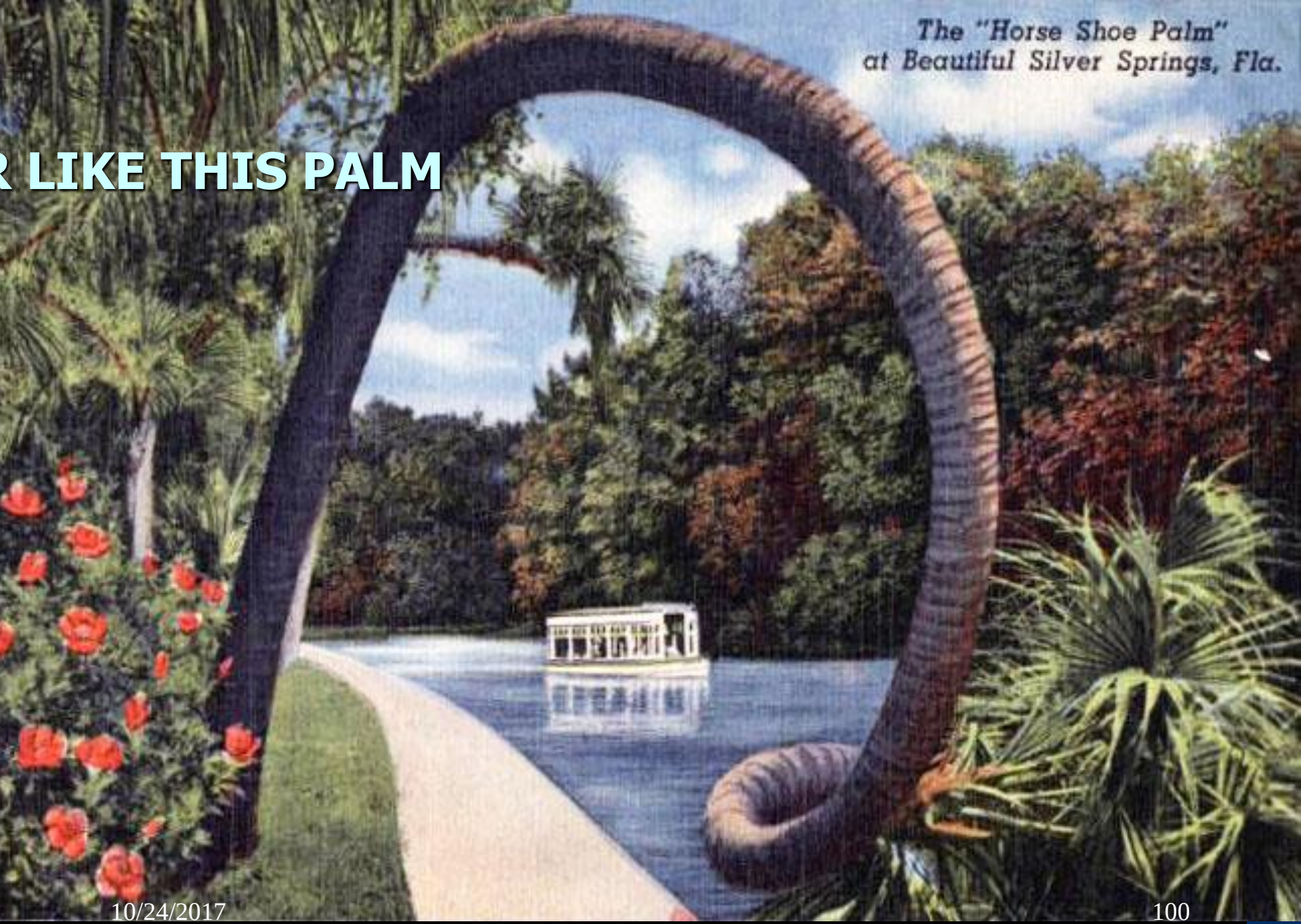
# PALMS ARE OVER BUILD MECHANICALLY AND HYDRAULICALLY

- **AS PALMS GROW OLDER AND TALLER THEY GROW STRONGER BECAUSE OF THE DESIGN OF THEIR TRUNKS**
- **FOR THE FIRST YEARS OF A PALMS LIFE THE STEM OR TRUNK IS JUST OVER LAPPING LEAF BASES SHIELDING THE MERISTEM**

# BECAUSE OF THE STRUCTURE OF A PALM TRUNK IT CAN GROW VERY DIFFERENTLY THAN OTHER PLANTS AND STILL BE STRONG



## OR LIKE THIS PALM




# R LIKE THIS PALM



OLD POSTCARD OWNED BY AUTHOR



PHOTO FROM WOW Amazing

# PALM TRUNKS WITH HOLE
# 15 YEARS OLD

# HURRICANE HARVEY AND PALM


Esther Robinson Walker


ROOTS

# PALM ROOTS

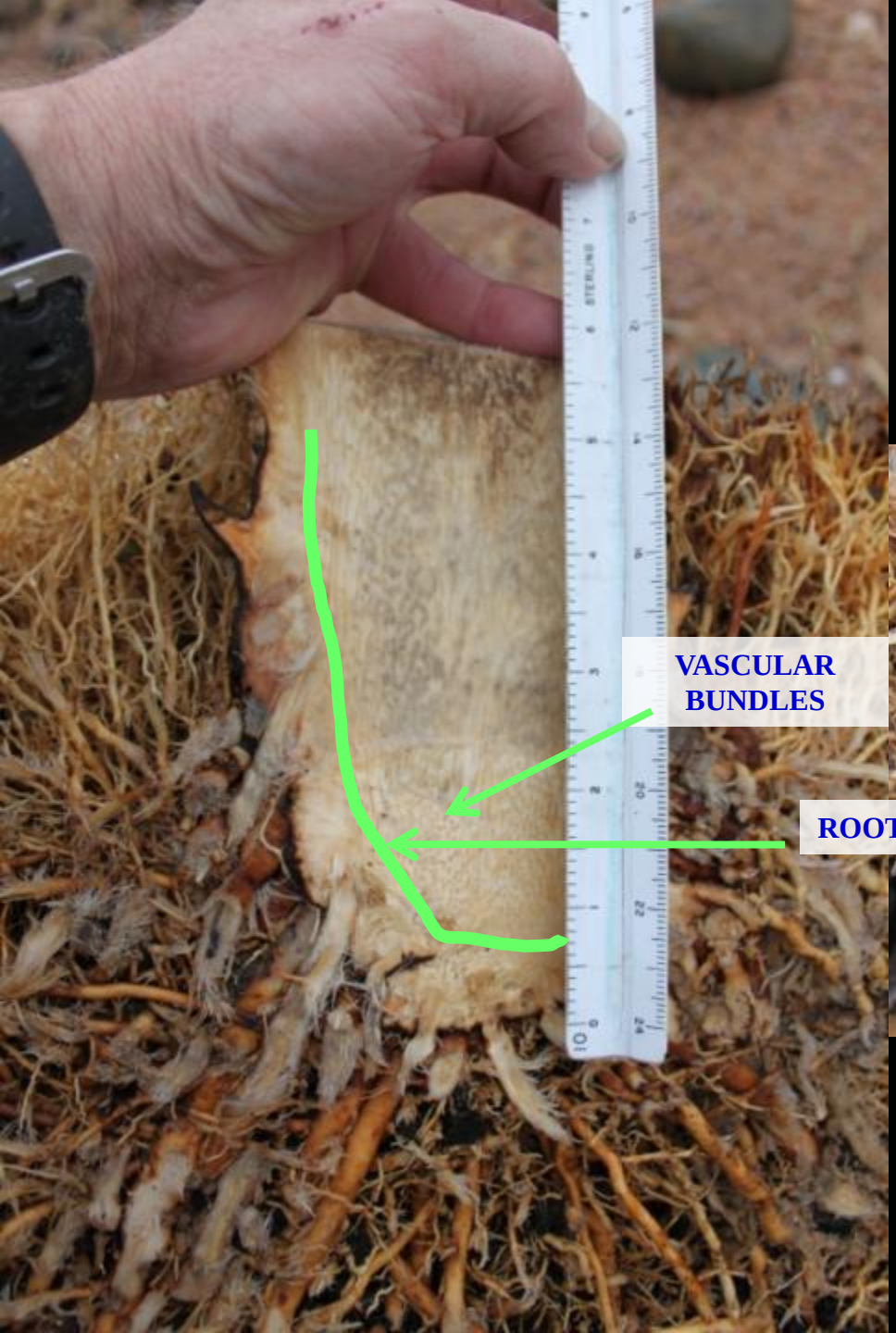
- WHERE DO THEY COME FROM?

# PALM ROOTS

- INSIDE

WELL DEVELOPED ROOT CAP

# PALM ROOTS




# PALM ROOTS

- ROOT INITIATION ZONE IS A SPECIALIZED AREA AT THE BASE OF THE STEM (TRUNK)
- ALL PALM ROOTS ARE ADVENTITIOUS BECAUSE THEY GROW FROM THE STEM
- PALM ROOTS HAVE NOT ROOT HAIRS BUT THEY DO HAVE VERY SMALL CAPILLARY (LESS THAN 2 CM LONG AND .5 MM IN DIAMETER) ROOTLETS
- THERE IS NO SECONDARY ROOT THICKENING



(TIM BROSCHAT, UNIVERSITY OF FLORIDA, FLREC)

# PALM ROOTS

- NO ROOT GRAFTING (IMPORTANT IN DISEASE TRANSMITTAL BETWEEN PLANTS)
- LATERAL GROWTH CAN BE 50 TO 100 FEET FROM THE TRUNK
- ABOVE GROUND ROOTS ARE CALLED ARRESTED ROOTS BECAUSE THEY STOP GROWING
- PALMS WITH SUBTERRANEAN OR PROSTRATE TRUNKS (SABAL AND SERENOA DEVELOP ROOT ALONG THE TRUNK BELOW GROUND AND ALONG THE GROUND SIDE OF THE PROSTRATE TRUNK)



(TIM BROSCHAT, UNIVERSITY OF FLORIDA, FLREC)

# PALM ROOTS


# ARRESTED ROOTS

**A QUEEN PALM WITH ARRESTED ROOTS 6 FEET UP THE TRUNK**

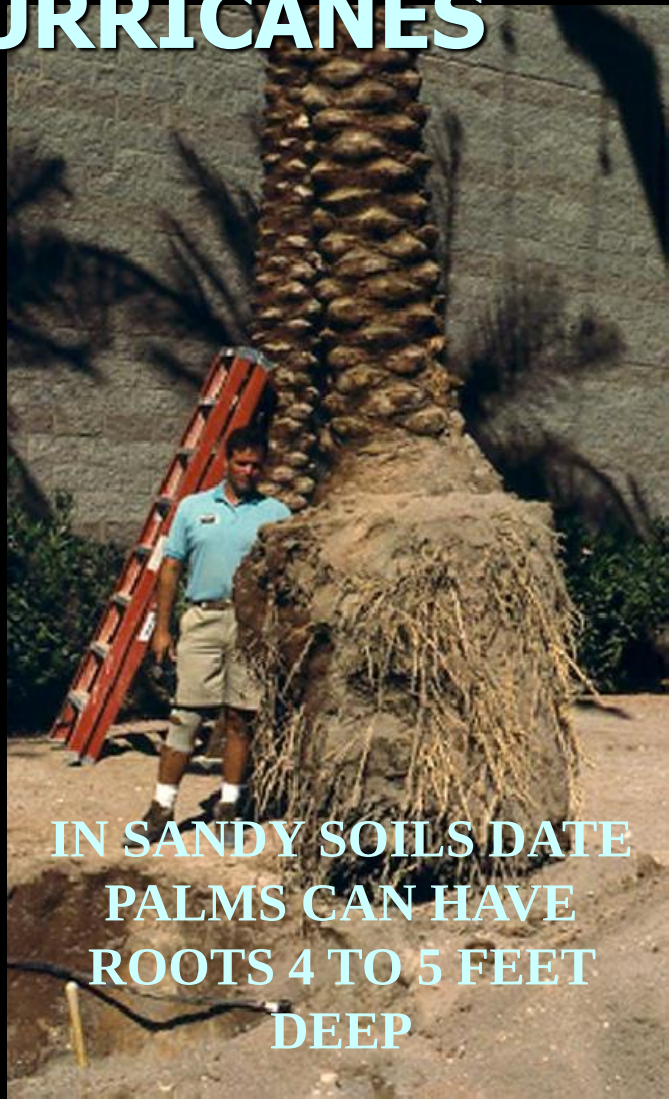
# PALM ROOTS

**IN TIME PALM ROOTS WILL ESCAPE WHEN PLANTED IN THE GROUND IN A POT**

**(NOT RECOMMENDED)**

# PALM ROOTS CAN GROW 20 TO 50 FEET EXTENDING BEYOND THE CANOPY HOLDING THE PALM IN PLACE EVEN IN HURRICANES

SABAL PALMS FORM A SUBTERRANEAN TRUNK FIRST THEN AN ABOVE GROUND TRUNK



IN SANDY SOILS DATE PALMS CAN HAVE ROOTS 4 TO 5 FEET DEEP

# LIKE OTHER PLANTS, PALM ROOTS WILL GROW WHERE WATER, AIR, AND NUTRIENTS EXIST

AND DIE IF THEY DRY OUT

PALM ROOTS GROWN IN A CONTAINER

# PALM ROOTS

PALM ROOTS GROWN IN A LARGE MASS 2 TO 3 FEET FROM THE TRUNK THEY SPREAD OUT UP TO 30 TO 50 FEET


**OVER 12 FEET**

**ADVENTITIOUS PALM ROOTS WILL CONTINUE TO GROWN IF THE CONDITIONS ARE FAVORABLE SUCH AS BETWEEN THIS WALL AND THE TRUNK**

# PALM ROOTS AND SIDEWALKS

**PALM ROOTS IN A CONFINED AREA CAN DEVELOP A SUCH A LARGE MASS TO LIFT A SIDE WALK**

# PALM ROOTS IN A CONTAINER


CHOOSING A
PALM FOR THE
LANDSCAPE

# KNOW YOUR PALM

- KNOW ITS NATIVE AREA

  TROPICAL ,SUBTROPICAL, DESERT, OR TEMPERATE ?
- HUMID OR DRY AREAS ?
- WHAT IS THE MATURE SIZE; ULTIMATE HEIGHT?
- WHERE AND HOW WAS IT GROWN?
- TYPE OF PALM – SINGLE-TRUNKED,

  MULTI-TRUNKED, OR SEVERAL PLANTS IN THE SAME CONTAINER ?

# PHOENIX ROEBELENII

## PYGMY DATE PALM

**THIS IS A DATE PALM**

**WOULD YOU GROW IT LIKE OTHER DATE PALMS?**


COMMON
PALMS OF
SOUTHERN
NEVADA


CAN YOU SEE HOW MANY PALMS THEY HAVE AND WHAT SPECIES

# PINNATE

**BUTIA CAPITATA**

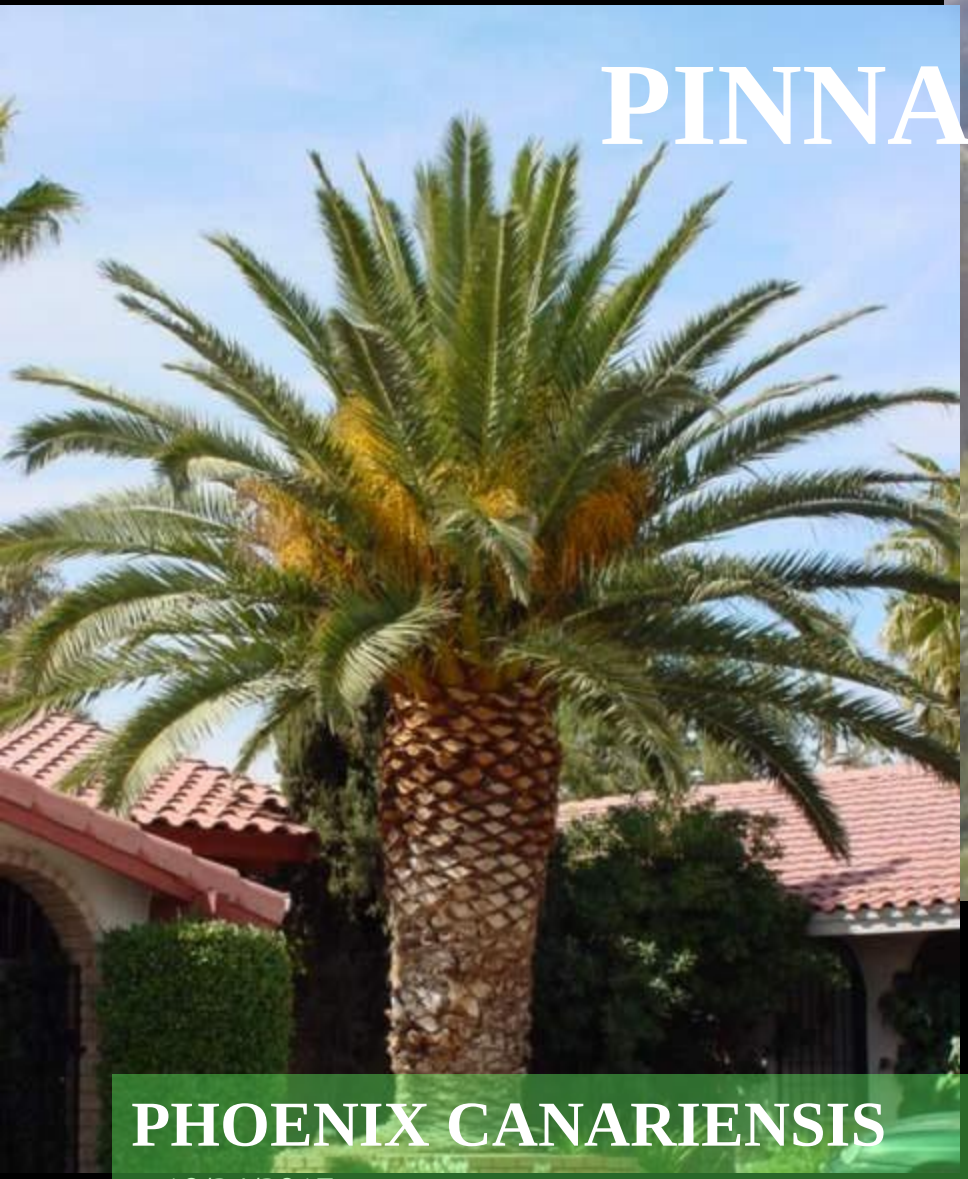
**PINDO PALM**


OLD BUTIAS
FLORIDA

# BUTIA FRUIT

10/24/2017

# PINNATE



**PHOENIX CANARIENSIS**

**CANARY ISLAND DATE PALM**

**PHOENIX DACTYLIFERA (HYBRID?)**

**DATE PALM**




# PHOENIX CANARIENSIS CANARY ISLAND DATE PALM

**PHOENIX RECLINATA**
**HYBRID**

**PHOENIX RECLINATA**
**80 YEARS OLD**

10/24/2017

**PHOENIX RUPICOLA**
**CLIFF DATE**
**80 YEARS OLD**
10/24/2017

**PHOENIX SYLVESTRIS**
**WILD DATE PALM**

**PHOENIX THEOPHRASTII**
**GREEK OR CREATEN DAT**

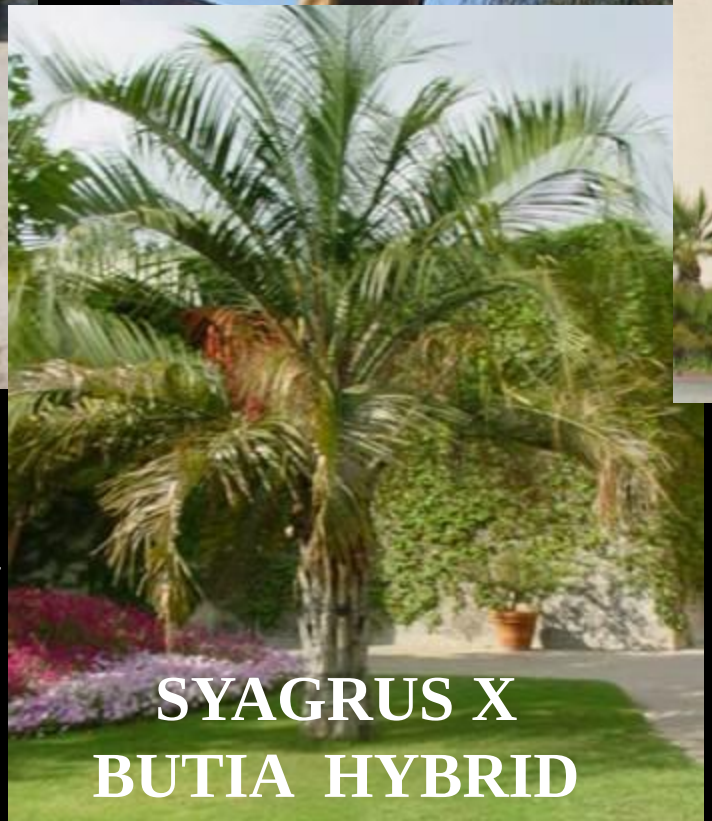

PHOENIX DACTYLIFERA
DATE PALM IN THE WILD

# PINNATE


**SYAGRUS ROMANZOFFIANA**

**QUEEN PALM**

**(NOT RECOMMENDED)**



**SYAGRUS X BUTIA HYBRID**

**SYAGRUS ROMANZOFFIANA**

**QUEEN PALM**

**IN SOUTHERN CALIFORNIA**

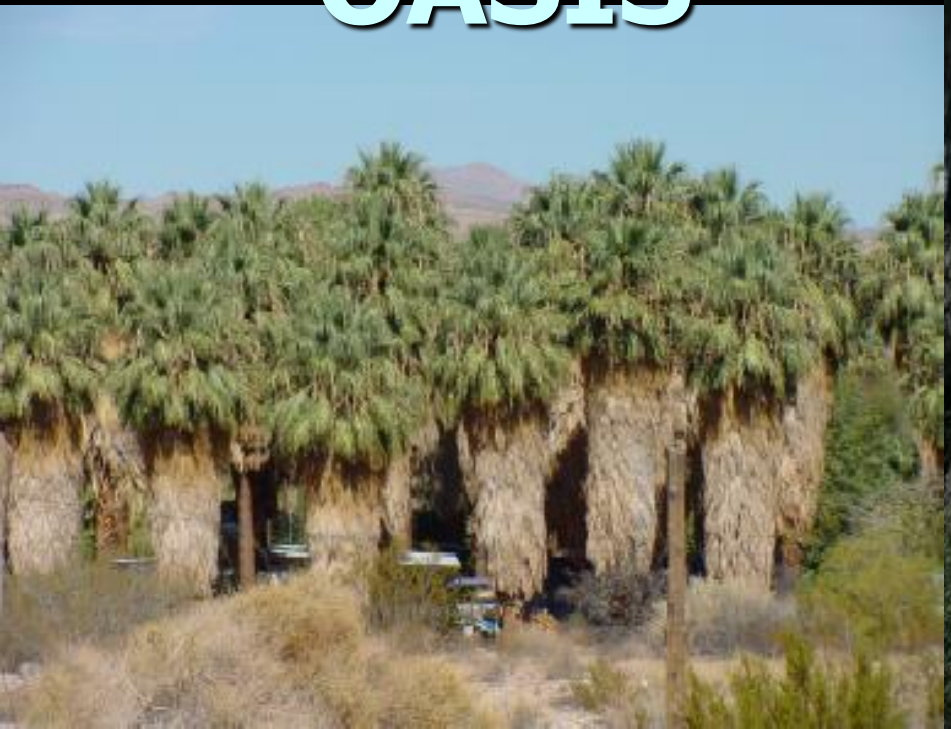
# PALMATE

60 + FEET TALL

**WASHINGTONIA FILIFERA**


**WASHINGTONIA ROBUSTA**

# WASHINGTONIA FILIFERA IN NEVADA AND CALIFORNIA OASIS



# PALMATE

## BRAHEA ARMATA

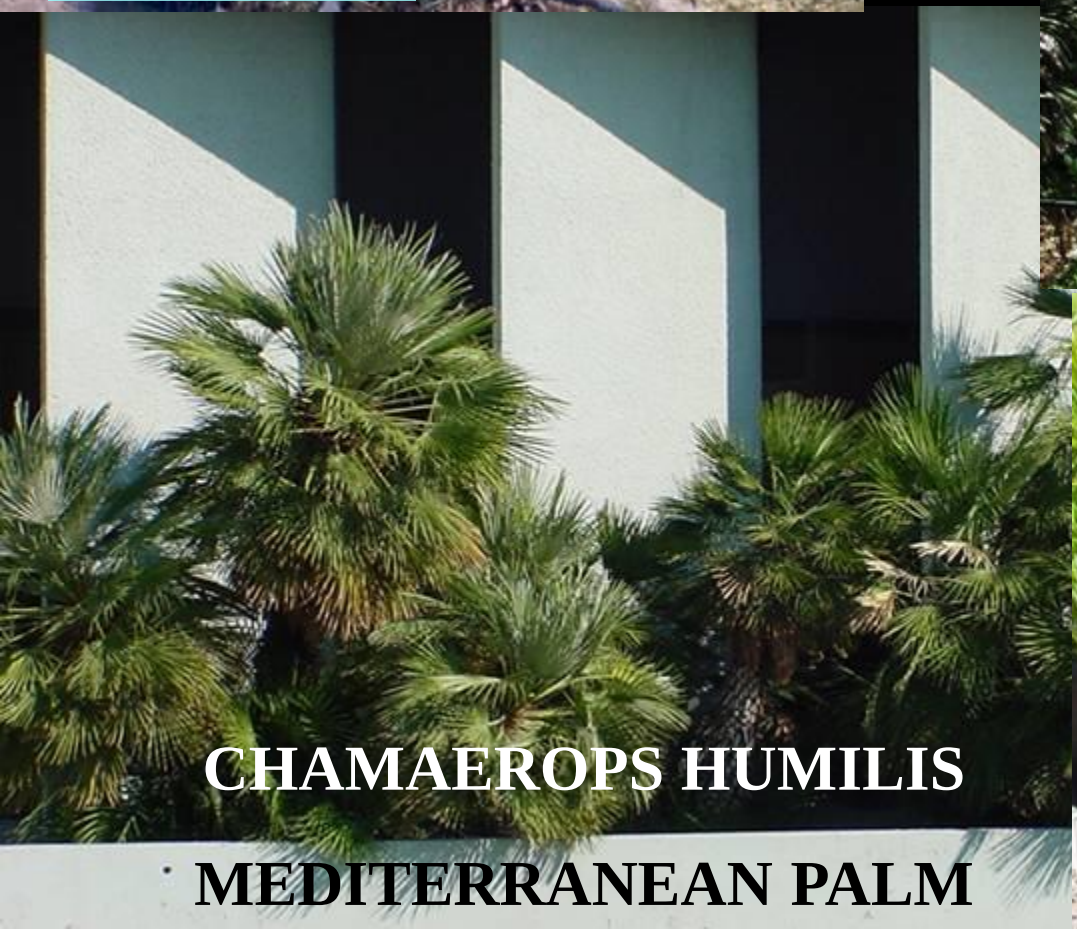
## BRAHEA DECUMBENS

## BRAHEA EDULIS


BRAHEAS IN LAS VEGAS
NEVADA


BRAHEAS IN NATURAL
HABITAT

CHAMAEROPS
HUMILIS CIRIFERA

# CHAMAEROPS HUMILIS

# MEDITERRANEAN PALM

**CHAMAEROPS HUMILIS CERIFERA (Argentea ) FROM THE ATLAS MOUNTAINS OF MOROCCO ( 5,000 FT + )**

# CHAMAEROPS HUMILIS

**CHAMAEROPS HUMILIS VOLCANO DWARF PALM FROM ISLANDS NORTH OF SICILY**

**CHAMAEROPS HUMILIS IS SALT TOLERANT**

**AS SEEN HERE ON A BEACH**

FROM FACE BOOK JAVIER GARCIA PUA.

# CHAMAEROPS HUMILIS IN THE WILD

# LIVISTONAS

LIVISTONA CHINENSIS

LIVISTONA DECIPIENS

LIVISTONA AUSTRALIS

# LIVISTONAS

LIVISTONA CHINENSIS

LIVISTONA SARIBUS

LIVISTONA RIGIDA

# NANNORRHOPS RITCHIANA

# NANNORRHOPS RITCHIANA

JUST MOVED 2014

2017

10/24/2017

# RHAPIS EXCELSA

GROW IN SHADE AND OUT OF THE WIND
THEY SHOULD BE KEPT MOIST AND THE SOIL SHOULD BE HIGH IN ORGANIC MATTER

# PALMATE

**TRACHYCARPUS FORTUNEI**

**WINDMILL PALM**

# PALMATE

## TRACHYCARPUS TAKIL KUMAON


## TRACHYCARPUS NANUS

## YUNNA DWARF PALM

# PALMATE

**TRACHYCARPUS FORTUNEI**

**WINDMILL PALM**

**INTERIOR PLANTS**

**GROWING IN KEW GARDENS LONDON**

**GROWING IN SALT LAKE CITY UTAH**

# SABAL PALMS

# NANNORRHOPS RITCHIANA

# JUBAEA CHILENSIS
# CHILEAN WINE PALM

# JUBAEA CHILENSIS CHILEAN WINE PALM

**KEW 160 YEARS**
**OLD 60 FEET TALL**

**RHAPIDOPHYLLUM**
**HYSTRIX**
**NEEDLE PALM**

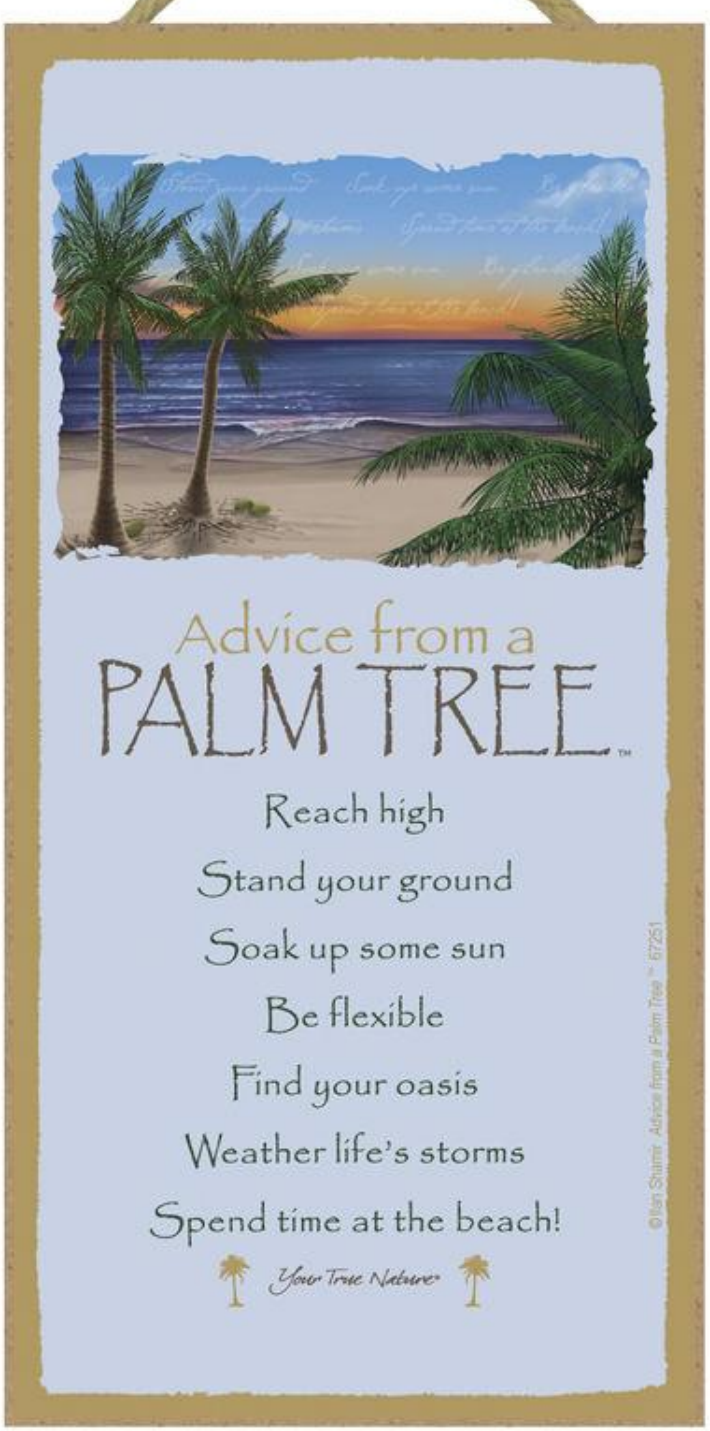
10/24/2017

**SERENOA REPENS**
**SAW PALMETTO**

10/24/2017

**SERENOA REPENS SAW PALMETTO**

10/24/2017


Advice from a
PALM TREE™
Reach high
Stand your ground
Soak up some sun
Be flexible
Find your oasis
Weather life's storms
Spend time at the beach!
Your True Nature

# GENERAL INFORMATION

# PALMS IN THE LANDSCAPE

# PALMS SUGGEST FAR AWAY PLACES


WHEN IT IS ONLY A POOL
IN MESQUITE, NEVADA

# PALMS IN THE LANDSCAPE
# LAS VEGAS


PALMS SUGGEST FAR AWAY PLACES
COLORADO RIVER

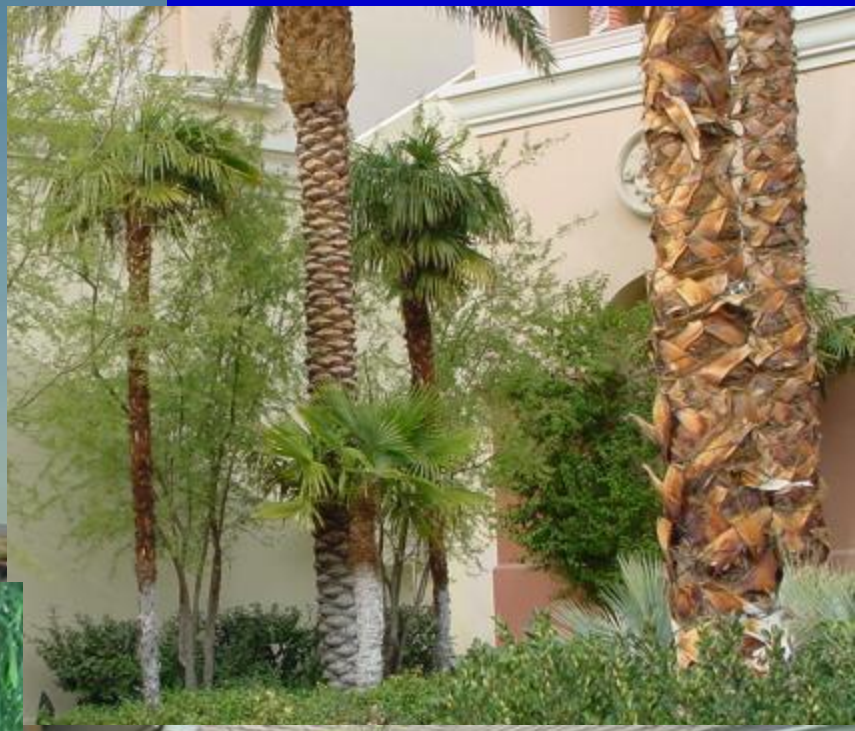
# PALMS IN FORMAL LANDSCAPES

# PALMS HAVE MANY USES IN THE LANDSCAPE

# PALMS HAVE MANY USES IN THE LANDSCAPE

# PALMS HAVE MANY USES IN THE LANDSCAPE

HEDGES



# PALMS AS THE PREDOMINANT PLANT IN SOUTHERN NEVADA LANDSCAPES

10/24/2017

# PALMS AS THE PREDOMINANT PLANT IN SOUTHERN NEVADA LANDSCAPES


10/24/2017

# PALMS AS THE PREDOMINANT PLANT IN SOUTHERN NEVADA LANDSCAPES


10/24/2017


redrock

# DESERT LANDSCAPES

# PALMS AS THE PREDOMINANT FLOWERING PLANT IN THE LANDSCAPE


Radisson
Radisson
Radisson Suites
Tucson

# PALMS AS THE PREDOMINANT PLANT IN SOUTHERN NEVADA LANDSCAPES

10/24/2017

# PALMS AT NIGHT IN THE LANDSCAPE

# SUB TROPICAL LANDSCAPES

# BACK YARD BEACH WITH PALMS

**YOU CAN BUILD A CONSERVATORY FOR YOUR PALMS**

# PALMS IN COMMERCIAL LANDSCAPES

# PALMS IN COMMERCIAL LANDSCAPES LAS VEGAS NV

# PALMS IN A MIXED HOME LANDSCAPE

10/24/2017

# EVEN IN DEATH THEY ADD TO THE LANDSCAPE

# EVEN WHEN IT SNOWS

By Kiril Donov Bulgaria

By Kiril Donov Bulgaria

# PALMS ARE GROWN EVERYWHERE



## Effect of Microclimate Variation on Cultivation of Cold-Hardy Palms in Southwestern Ohio

DAVID A. FRANCKO
*Department of Botany*
*Miami University*
*Oxford, Ohio 45056 USA*

**Although the great majority of palms are tropical to subtropical in distribution, several cold-hardy genera are being grown successfully in warm-temperate gardens world-wide (reviewed by Gibbons & Spanner 1999). The term 'cold-hardy palm' is subjective and can be used to describe plants that survive brief exposure to light frost to those that are leaf-hardy in sub-zero (Fahrenheit) temperatures (Riffle 1998). In this paper, I focus on cold-hardy palms that have been reported to survive approximately -15 to -29°C (ca. 5 above zero to -20°F) temperatures.**

Not surprisingly, most of the literature dealing with cold-hardy palm horticulture in North America focuses on plants grown in USDA Zone 7b and south (reviewed in SFEPS 1994, Riffle 1998), and even in Zone 7b palms are still considered somewhat of a novelty by most landscapers and the gardening public. Nonetheless, the references above, numerous (mostly website, newsletter publications (e.g., *Rhapidophyllum*) and published reports from a few individual growers (e.g., pioneering work of Myers 1985) provide evidence that several palm species may be grown in Zone 7 and even farther north, provided that attention is given to site selection, proper cultural practices and some winter protection.

Despite these insights, there remains a dearth of primary literature that critically evaluates the success of cold-hardy palms in the context of microclimatic variations in USDA Zones 6a through 7a. Here I report data on first-year survivorship and vegetative growth of several cold-hardy palm species and varieties at the Hasty Palm Demonstration Plot of Miami University, Oxford Ohio (USA), and replicated plots at my somewhat cooler home garden a few km southwest, with specific relationships to winter season microclimatic variation at each site.

### Materials and Methods

*Study Sites.* The Miami University Main Campus in Oxford is located in Butler County, southwestern Ohio (39° 30' N, 84° 42' W) approximately 30 km northwest of Cincinnati and 35 km north of the Ohio River. This area has primarily an USDA Plant Hardiness Zone 6a through urban areas and the immediate Ohio River valley are classified Zone 5b (USDA 1990). The growing season in Butler County ranges from approximately 180-195 days depending on





4 (above). The same large needle palm and *S. minor* as in Fig. 3, plus seedlings of the same species and a seedling *Trachycarpus* (far right) in June 1999. 5 (below). The alcove area of the HPDP in June 1999, with 1998 plants plus new specimens of *Sabal palmetto*, *S. minor*, *S. bermudana*, *Washingtonia filifera*, *Butia capitata* and *Trachycarpus fortunei*.

Taken from Palms the Journal of the International Palm Society

# THERE ARE OVER 5,000 PALMS IN VANCOUVER, CANADA

# AND EVEN MORE IN ST. GEORGE, UT

# WHEN SELECTING A PALM KNOW ITS MATURE SIZE

# KNOW THE MATURE SIZE OF A PALM

FROM THIS TO THIS

60 TO 75 FEET TALL

# IS IT ARMED?

# PLANTING PALM TREES SITE SELECTION AND PREPARATION

- CHOOSE A PALM THAT WILL FIT IN THE LANDSCAPE IN 10-15 YEARS
- AVOID OVERHEAD UTILITY WIRES, BURIED CABLES, AND IRRIGATION LINES
- WILL THE PALM POSE A HAZARD IN A WIND STORM?
- IS THERE TOO LITTLE OR TOO MUCH EXPOSURE TO SUN?

# PLANTING PALM TREES SITE SELECTION AND PREPARATION

- FOR SMALL LOTS AND ONE STORY HOUSES CHOOSE A SMALL TO MEDIUM SIZED PALM
- IF SPACE ALLOWS, PLANT PALMS IN ODD NUMBERED GROUPS (3,5,7)
- TEST THE SOIL pH, TYPE AND MOISTURE

# PREPARING THE SOIL

- DIG THE HOLE AT LEAST TWICE AS LARGE AS THE ROOT BALL IN DIAMETER, BUT ONLY AS DEEP AS THE ROOT BALL
- FILL THE HOLE TWICE WITH WATER AND TIME DRAINAGE RATE
- DON'T AMEND THE BACK FILL UNLESS YOU REDO THE ENTIRE BED
- COVER WHOLE PLANTING AREA WITH ORGANIC MULCH KEPT 3 TO 4 INCHES DEEP AT ALL TIMES

# NEW RESEARCH ON TRANSPLANTING PALMS

- RESEARCH FROM THE UNIVERSITY OF CALIFORNIA SUGGESTS THAT ADDING SOIL AMENDMENTS IS NOT BENEFICIAL TO THE ESTABLISHMENT OF THE PALMS. THE FIVE SPECIES IN TWO TYPES OF SOIL SHOWED NO RESPONSE.

(HODEL ET AL, 2005)

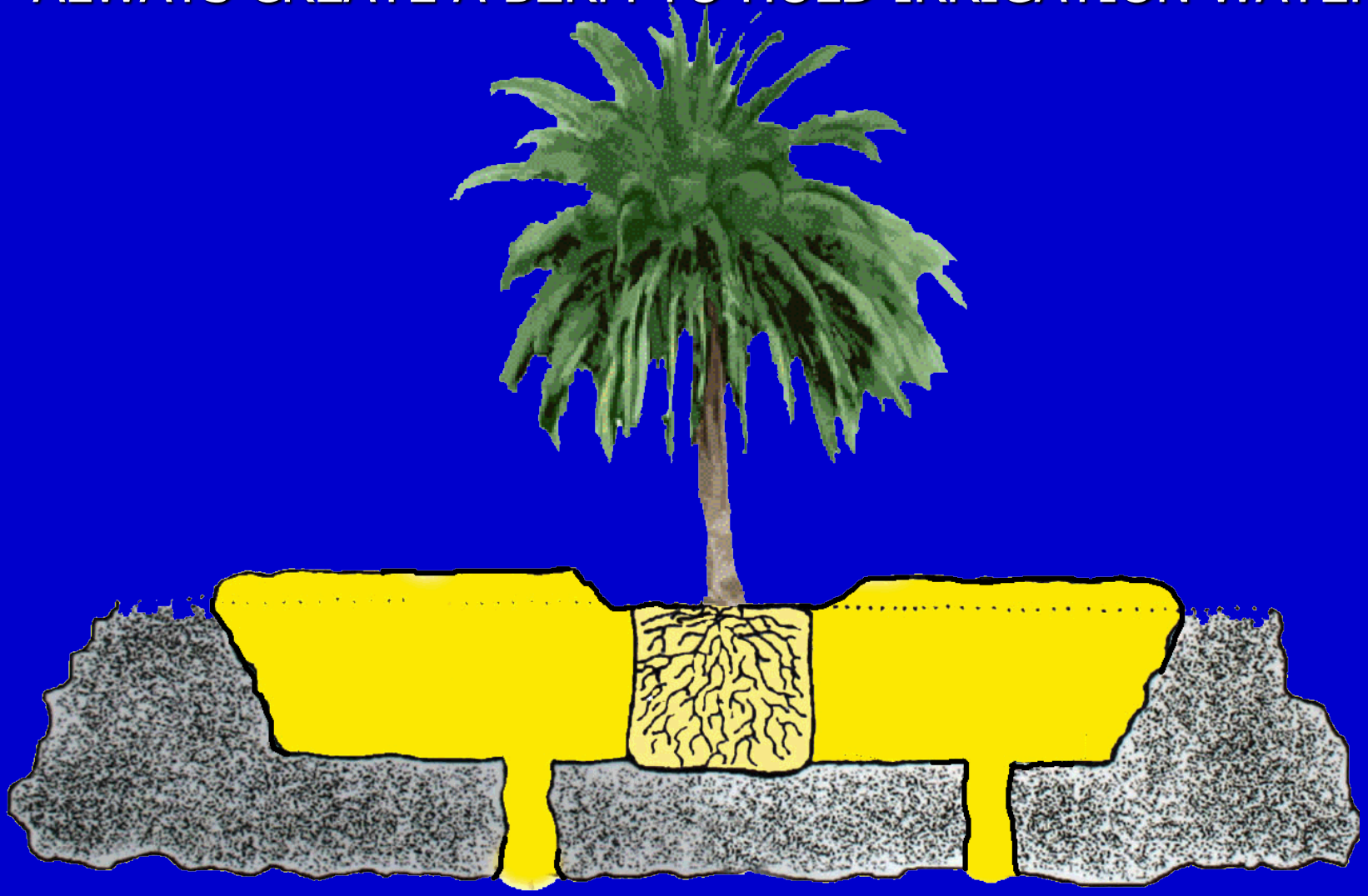
# NEW RESEARCH ON TRANSPLANTING PALMS

- **RESEARCH FROM THE UNIVERSITY OF CALIFORNIA ON 16 SPECIES OF PALMS FOUND THAT THE OPTIMUM SIZE OF A ROOT BALL FOR MOST PALMS IS 12 INCHES FROM THE TRUNK IN ALL DIRECTIONS**

  **(LARGER IS BETTER BUT ADDS TO THE WEIGHT OF THE PALM )**

  **( HODEL ET AL, 2005)**

# ALWAYS CREATE A BERM TO HOLD IRRIGATION WATER



IF THE DRAINAGE IS POOR USE ONE OR TWO CHIMNEYS FOR DRAINAGE

# TRANSPLANTING A PALM TREE

# A BERM WILL HELP HOLD WATER AFTER TRANSPLANTING PALMS

# RESEARCH ON TRANSPLANTING PALMS

- ROOT PRUNING 4 TO 8 WEEKS BEFORE DIGGING MAYBE HELPFUL ON RARE AND HARD TO TRANSPLANT PALMS BUT NOT FOR MOST (TIM BROSCHAT UNIVERSITY OF FLORIDA, FLREC )
- THE GREATEST LOSS OF WATER FROM TRANSPLANTED PALMS IS THROUGH THE LEAVES YOU CAN REMOVE UP TO 50% OR MORE OF THE OLD LEAVES (BEST TO LEAVE ONE-THIRD TO ONE HALF OF NEW LEAVES) (TIM BROSCHAT UNIVERSITY OF FLORIDA, FLREC )
- KEEP SOIL AND ROOT BALL EVENLY MOIST FOR UNTIL ESTABLISHED (NEVER LET THE ROOT BALL DRY OUT BEFORE OR AFTER PLANTING) 6 MONTHS TO 2 YEARS FOR ESTABLISHMENT DEPENDING ON THE SIZE OF THE PALM

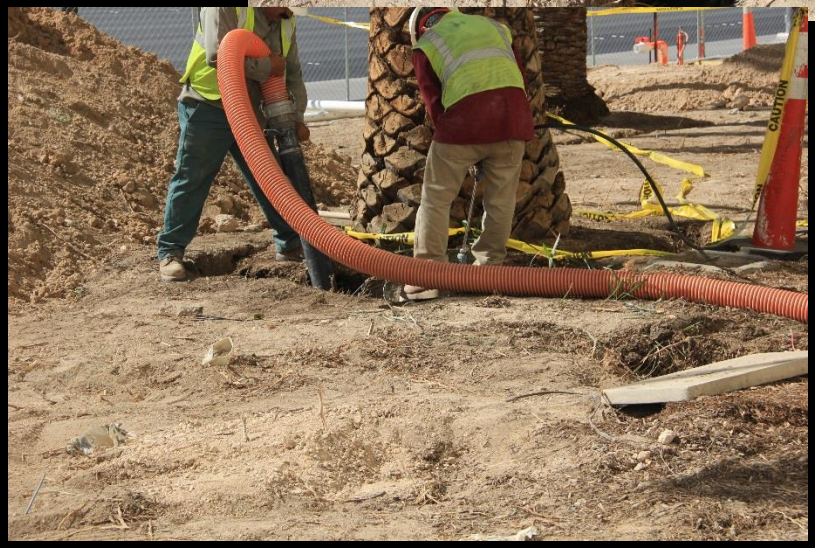
# RESEARCH ON TRANSPLANTING PALMS

- RESEARCH FROM THE UNIVERSITY OF CALIFORNIA SUGGEST THAT THAT MULCH SUCH AS EUCALYPTUS AND TURF GRASS CLIPPINGS ARE BENEFICIAL FOR NEWLY PLANTED PALMS. (DOWNER AND HODEL ET AL, 1992)
- RESEARCH HAS ALSO SHOWN THAT LEAVING TURF GROWING AROUND PALMS IS HARMFUL. (DOWNER AND HODEL ET AL., 1992)

# DIGGING PALMS WITH A DITCH WITCH

10/24/2017

# DIGGING PALMS WITH HIGH PRESSURE WATER



$100,000 to move 9 palms
Each weighed 20 to 30,000 pounds
Rent for the water chisel $2500 per day
Rent for a crane $1,000 per hour


PLANT PALMS IN GROUPS
WITH OPEN MULCHED AREA
FORMING A BED

# PLANT PALMS IN GROUPS

**FLARED BASE**

**STRAIGHT BASE**
**TOO DEEP**

10/24/2017

# WHEN PLANTING PALMS IN GROUPS DON'T PLANT TOO CLOSE

# PLANTING PALMS

**PALMS COME IN ALL SIZES**

# PLANTING PALMS

**PALMS COME IN ALL SIZES**

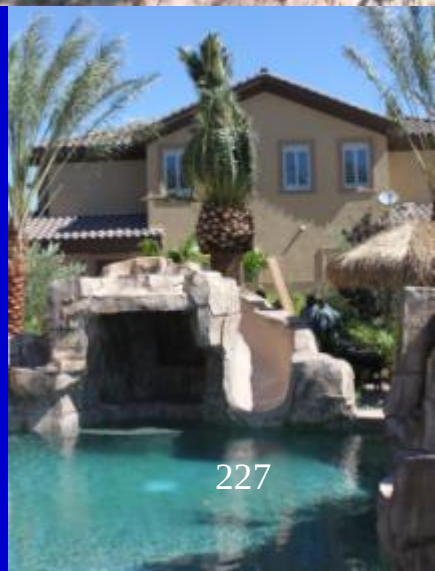
**LARGE PALMS CAN WEIGH FROM 4,000 TO 10,000 + LBS**


# PLANTING PALMS

**IT TAKES HEAVY EQUIPMENT TO PLANT LARGE PALMS**

**LARGE PALMS CAN WEIGH FROM 10,000 TO 24,000 LBS**

# MOVING AND PLANTING A LARGE PALM



# PLANTING PALMS

**NEVER LET THE ROOT BALL DRY OUT**

# PLANTING DEPTH

**ALWAYS PLANT AT THE SAME DEPTH THE PALM WAS GROWING**

# DETERMINE IF A PALM IS PLANTED TOO DEEP



**4 FOOT DEEP ROOT BALL WITH WET HEAVY SOIL**

**THE PALM DIED IN 11 MONTHS**

# PLANTING PALMS



# USELESS PIPES


PLANTING
THE RIGHT
PALM IN THE
RIGHT PLACE

# PLANTING THE RIGHT PALM IN THE RIGHT PLACE

**NO ROOM FOR ROOTS TO GROW**

# PLANTING THE RIGHT PALM IN THE RIGHT PLACE


# WHAT IS WRONG WITH THIS PICTURE?

# KNOW THE SIZE OF A MATURE PALM

THIS CHAMAEROPS HUMILIS IS A BETTER CHOICE
IT IS
- SLOW GROWING
- SMALL AT MATURITY
- MULTI TRUNKED (TRUNKS TOO TALL CAN BE REMOVED)

# PALMS PLANTED IN THE WRONG PLACE



# PALMS PLANTED IN THE WRONG PLACE


**14 PHOENIX CANARIENSIS IN A 10 BY 20 FT AREA**

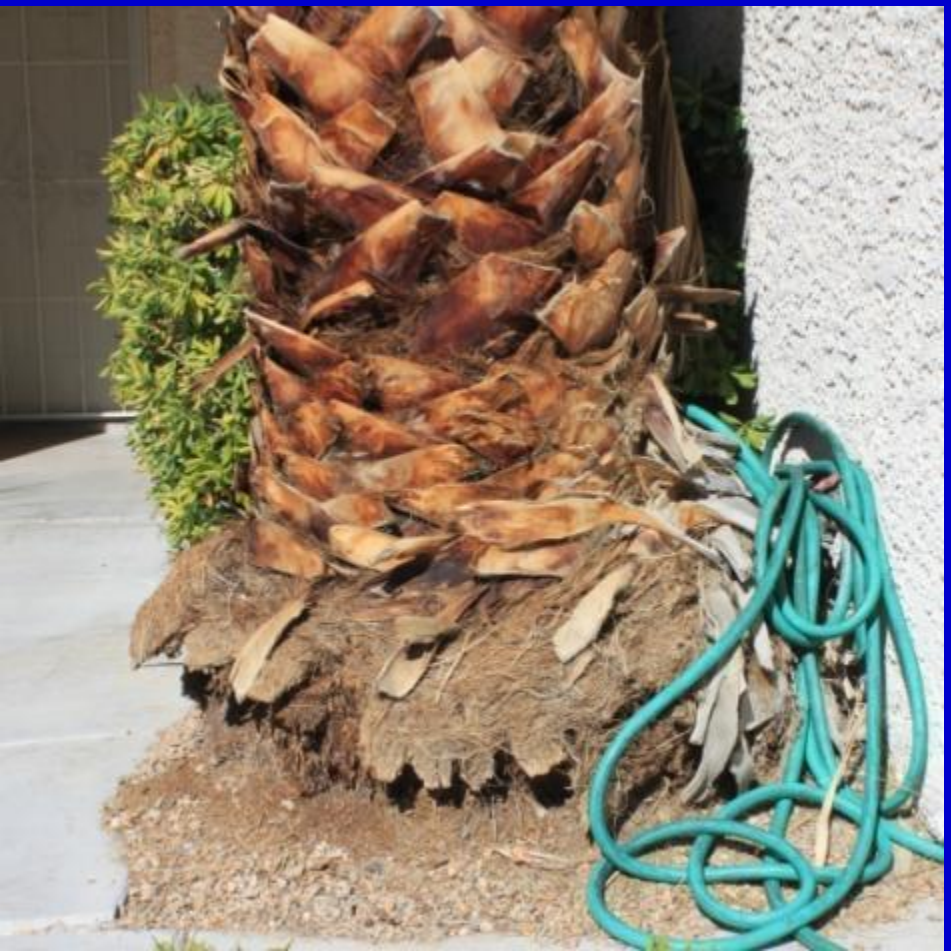
10/24/2017

# PALMS PLANTED IN THE WRONG PLACE


# PALMS PLANTED IN THE WRONG PLACE

# PALMS PLANTED IN THE WRONG PLACE

# PALMS PLANTED IN THE WRONG PLACE



# PALMS PLANTED IN THE WRONG PLACE


PLANTING THE RIGHT PALM IN THE RIGHT PLACE
DO NOT PLANT TROPICAL PALMS IN FULL SUN IN THE DESERT

**BUY ONLY HEALTHY WELL GROWN PALMS THIS ONE IS NOT BARGAIN EVEN ON SALE**

**REMEMBER JUST BECAUSE A PLANT OR PALM IS SOLD HERE**
**IT DOES NOT MEAN IT WILL GROW HERE**

**1/2 OFF**

10/24/2017

# PLANT PALMS IN THE RIGHT PLACE AND CLIMATE

NOT ON A ROOF IN A USDA ZONE 5

OR IN SOUTHERN NEVADA

**A LARGE PALM WILL WEIGH FROM 4,000 TO 10,000 LBS OR MORE**

# RESEARCH ON TRANSPLANTING PALMS

- RESEARCH HAS SHOWN THAT THERE IS NO BENEFIT TO LEAVING PALMS TIED UP AFTER TRANSPLANT.

(HODEL ET AL., 2003)

- NO BENEFIT TO OVERHEAD MISTING OR IRRIGATION OF NEWLY PLANTED PALMS, IN FACT IT CAN ENCOURAGE DISEASE ESPECIALLY IF LEFT TIED UP
- DON'T FERTILIZE WHEN PLANTING

# RESEARCH ON TRANSPLANTING PALMS

- HARD TO TRANSPLANT PALMS CAN BE ROOT PRUNED 6 WEEKS BEFORE DIGGING (6 INCHES SMALLER THAT THE FINAL ROOT BALL SIZE)
- DESERT PALMS HAVE DEEPER ROOT BALLS
- LEAF REMOVAL CAN BE HELPFUL TO SURVIVAL DEPENDING ON THE PALM SPECIES

# CUTTING FRONDS BACK FOR TRANSPLANTING


REMOVE TIES AFTER TRANSPLANTING

THERE IS NO BENEFIT TO LEAVING THEM TIED UP

# PALMS TIED UP TOO LONG


PLANT A PALM,
YOU CAN'T
GO WRONG

# THE DOUBLE COCONUT


THE WORLDS LARGEST SEED

# SPOT SAYS IT IS TIME FOR A BREAK

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# PHOTOS

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