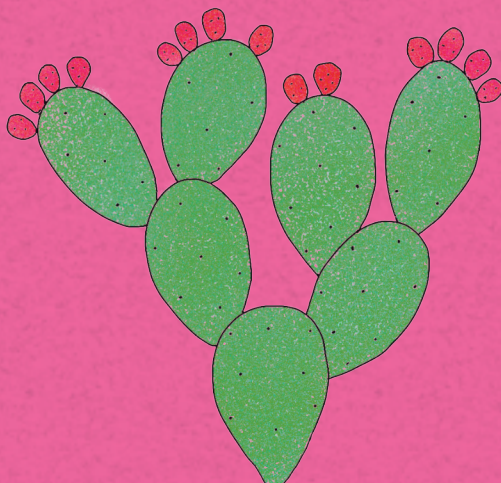




COLLEGE OF SOCIAL & BEHAVIORAL SCIENCES

Community & School Garden Program



SPROUTS™

HEALTHY COMMUNITIES
FOUNDATION



THE SONORAN DESERT
SCHOOL GARDENER'S



.. 2022 ..
ALMANAC



FOREWORD

The 2022 Sonoran Desert School Garden's Almanac is a handbook celebrating connectedness! Between these pages you'll see grandparents connecting with grandchildren, food production connecting with Sonoran Desert seasonality, and cultural traditions connecting from across the region. The end result is a publication crafted to enrich school garden programs and root learners in the nuance of seasonality, ecology, and tradition. Through this handbook we welcome local knowledge from the community into schoolyards and classrooms, and from schools back into the homes of students.

The almanac that follows is tailored to the five Sonoran Desert seasons. To grow food well you need to anticipate seasonal changes and tune your senses to subtle changes such as sunrise and sunset times, night time temperatures, and first and last frosts of the season. The seasons that follow are color coded for ease of use and the planting guide provides a boost to growing food successfully during the school year.

Use this resource with attention to mindfulness, self-reflection, and interconnection. Pay attention to how things look, feel, sound, and taste beyond the surface level descriptors. Tap into the way things make you feel and connect those feelings with other people and past experiences. Look for opportunities to express gratitude, connect with the natural world, connect with family traditions, and to connect with the people you love.

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SONORAN DESERT

ACKNOWLEDGMENT OF THE LAND

The Sonoran Desert covers a large area in the southwest U.S. and northwest México. It is a land of extreme temperatures: high evaporation, low rainfall, and little water. It can be too hot, too cold, too wet, and too dry! These extremes make living here a unique experience.

It is a harsh environment, but these conditions have created one of the most bio-diverse landscapes in the world. It has also been home to native people for thousands of years. Humans are an important part of this diversity; inhabitants of the Tucson Basin have cultivated and domesticated crops for at least 4,000 years. If you are currently residing in the Tucson Basin, you are sitting on the ancestral lands of the O'odham people. This acknowledgment calls us to recognize and honor the people who have cared for the land through generations, and learn how to be better stewards of the places we inhabit.

Over the last few centuries, people from around the world have made the Sonoran Desert their home, bringing with them new foods, technologies, and traditions further enriching this complex environment. As we move forward into an uncertain future, let's celebrate this diversity; let's allow our unique natural and cultural heritage to teach us how to live in harmony with our land.

Jesús M. García
Research Associate
Arizona-Sonora Desert Museum



O'ODHAM CALENDARS

There is not just one traditional O'odham Calendar. Different O'odham communities have different calendars serving different purposes; there are medicinal calendars and ceremonial calendars. The O'odham calendar at Manzo Elementary School (*see calendar to the left*) is an agricultural calendar and the nearby O'odham village of Chukson was an agricultural community on the Santa Cruz River.

The modern O'odham Calendar uses Gregorian Calendar months but due to climate change the months no longer align with the O'odham traditional calendar. O'odham New Year falls during Summer Solstice with the Wine Festival and welcomes in the Monsoon Season. Because of global warming monsoon rains don't always come. There are shorter winters and longer summers. Historically, harvesting native foods in the fall happened for more than a month. Now it is much shorter.

The traditional O'odham calendar lets the O'odham people know what to do throughout year. If you're a potter you know when to get your clay; if you're a basket weaver you know when to harvest yucca leaves and bear grass. The calendar helps maintain culture, identity, language, and the O'odham creation story.

Nacho Littleagle Flores
Tohono O'odham Tribal Member

SCHOOL CALENDAR

PLANT FROM :

• SEED * START – SLIP

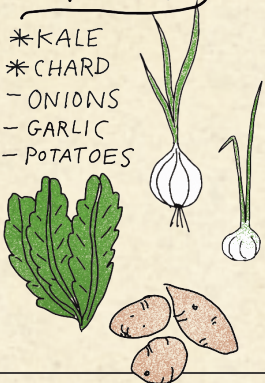

1 Q U A R T E R	<u>AUGUST</u>	<ul style="list-style-type: none"> • GREEN BEAN • SUNFLOWERS • CHILTEPIN • AMARANTH • 60-DAY CORN • MARI-GOLDS * PEPPER * TOMATO * CUCUMBER * SUMMER SQUASH * EGG-PLANT 	<ul style="list-style-type: none"> * GREEN ONION * FAVA BEAN * LETTUCE * CILANTRO * GARLIC * SPINACH * TURNIP * RADISH * SWISS CHARD * KALE


2 Q U A R T E R	<u>OCTOBER</u>	<ul style="list-style-type: none"> * BEETS * ARUGALA * CARROTS * MARI-GOLDS 	<ul style="list-style-type: none"> • LENTIL • FAVA BEANS • PEAS • SNOW PEAS • LETTUCE • SPINACH • CARROTS • MARI-GOLDS - POTATOES - ONION - GARLIC

Pro Tips

- Choose smaller varieties of fruiting crops for faster seed to harvest (ex. cherry tomatoes).
- Fruit trees with soft skin are prone to bird loss and typically ripen in the summer when schools are closed. Peaches, figs, apples and grapes produce during summer break.
- Citrus typically ripen during the school year and survive longer on the tree.
- Start cleaning out your garden in late April and turn off irrigation during summer break.

PLANTING GUIDE

3RD Q U A R T E R	JANUARY	<ul style="list-style-type: none"> * KALE * CHARD - ONIONS - GARLIC - POTATOES 		FEBRUARY / MARCH	<ul style="list-style-type: none"> * SUMMER SQUASH * PEPPERS * EGGPLANT * TOMATO * TOMATILLO * CUCUMBER • MARIGOLDS • SUNFLOWERS 	
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4TH Q U A R T E R	APRIL	<ul style="list-style-type: none"> * MINT * ROSEMARY * BASIL * MARIGOLDS 		MAY	<p>USE THIS MONTH TO CLEAN YOUR GARDENS, WEED, TURN YOUR SOIL, & TURN OFF IRRIGATION. ALSO, MOSQUITO-PROOF YOUR GARDENS FOR THE UPCOMING MONSOON SEASON BY MAKING SURE THAT ALL BUCKETS, TUBS, POTS, TRAYS, WHEEL BARROWS, AND ANYTHING ELSE THAT CAN COLLECT WATER, ARE TURNED UPSIDE DOWN OR PUT AWAY.</p>
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Favorites

- Sunflowers can be planted in August and March; great for seed saving
- Marigolds can be planted year round by seed or start; great for seed saving and pest control
- Kale and chard can be planted in September and grown until April
- Fava beans provide nitrogen to the soil and produce during March and April, after most cool season crops

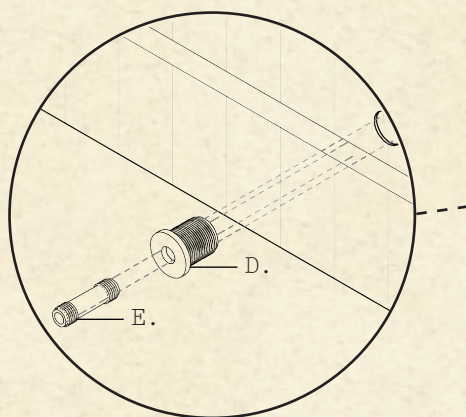
STOCK TANK GARDENING GUIDE

Materials:

- A. Stock Feed Tank (Commonly used 6'Lx2'Hx2'D,
8'Lx2'Hx2'D)
- B. Lava Rock
- C. Gardening Bed Soil
- D. Bulkhead Union 3/4 in.
- E. PVC Nipple 3 in. Long

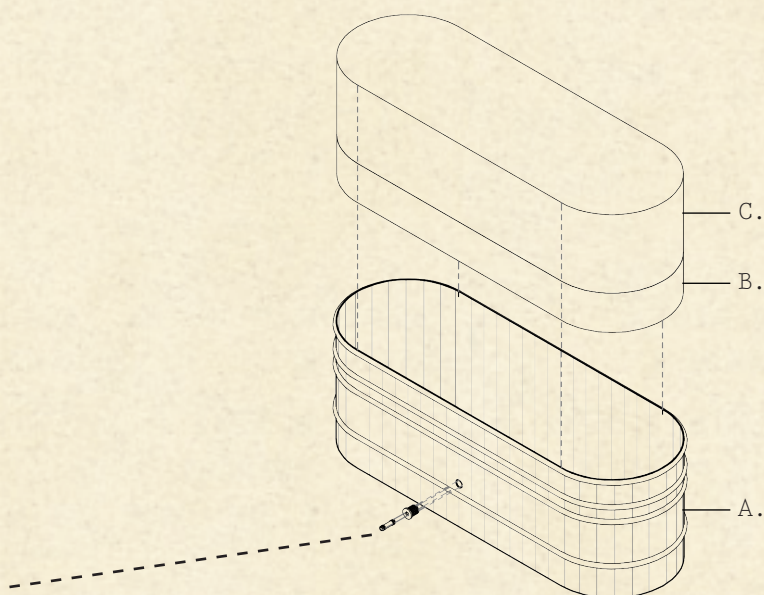
Tools:

- Hole Saw Kit
- Drill



Steps:

1. Drill a 1-1/2 in. hole approximately 8in from the bottom of the stock tank using a hole saw and drill. This will serve as your overflow and can be drilled on any side of the tank to direct water away.
2. Insert your 3/4 in. bulkhead fitting adapter into the hole. Be sure to orient the gasket so it rests inside the stock tank.
3. Thread your 3/4 in. PVC nipple into the bulkhead on the outside of your stock tank.
4. Place the stock tank in its final resting position.
5. Fill your stock tank approximately 1/3 full with lava rock and spread evenly.
6. Fill the remaining 2/3 of the tank with garden bed soil.



Benefits of Stock Tank Gardening:

- Increased water efficiency
 - Decreased water loss from evaporation
 - Water reservoir created by porous lava rock slowly waters plants over an extended period of time
- Pest and weed reduction
 - Stock tanks offer mild pest reduction by making it difficult for animals/insects to access crops
 - Weeds (especially grasses) don't migrate as easily into stock tanks
- Modularity
 - Tanks can be moved and can be distributed through a site
 - Easy to amend/maintenance
- Comfortable working height
- Increases water efficiency means less watering
 - Control
 - Allows for more control over nutrients, water levels, soil quality



1.

2.

4.

3.

5.

6.

7.



MONSOON

Local indigenous people use the dramatic monsoon to mark the beginning of the year, a season that accompanies a change in wind direction that moves warm tropical air to the Sonoran Desert region. Typically spanning July through September, the summer monsoon rains bring up to half of Arizona's yearly rainfall and are a welcome respite from the dry heat of early summer. Brief, intense storms move quickly over the landscape, often flooding roads and filling creeks and rivers. The rains bring a second wildflower bloom and a second breeding season for many desert animals. Butterflies emerge with the rains, and both amphibians and reptiles are active, particularly on rainy evenings. Prickly pear fruit begins to ripen in August. Bats move south following the agave bloom, and bird migrations reach their peak in September. Monsoon season also marks a second warm planting opportunity, with heat-adapted crops such as amaranth, beans, corn, and squash doing particularly well.

Illustrations Key:

- | | |
|-------------------------|-----------------------------------|
| 1. Lesser Long Nose Bat | 5. Sonoran Desert Toad |
| 2. Agave | 6. Summer Poppy |
| 3. Prickly Pear | 7. Pipevine Swallowtail Butterfly |
| 4. Desert Marigold | |

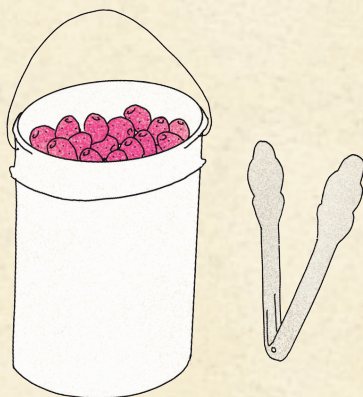


PRICKLY PEAR HARVESTING

Many varieties of prickly pear cactus and fruit (nopales y tunas) thrive in the Sonoran Desert. These plants are strong and resilient, producing fruit in abundance even in a hot and arid climate. This is part of what makes harvesting and enjoying this plant so special to those who take the time and energy to do it. It is also a fully immersive sensory experience. The color, taste, smell, and feel of the plant is all enhanced by the communal nature of the process.

Harvesting Tools:

- Metal tongs
- A knife
- A bucket to hold fruit
- Gloves (optional)



Harvesting Tips:

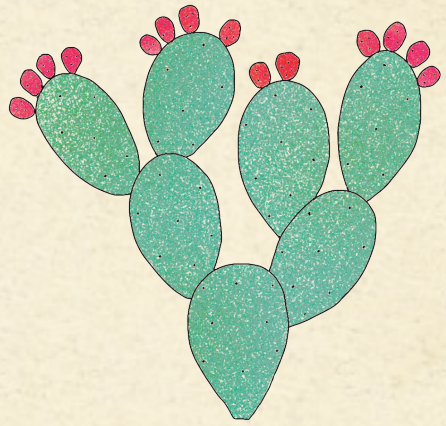
August through September is when the fruit ripens. The deeper the color and darker the fruit, the sweeter and more flavorful,

Intentional Harvesting

- Leave the fruit closer to the ground for animals, take the ones closer to the top
- Leave the fruit with damage behind for birds and bugs
- Leave an ofrenda and set intentions
 - If you take something leave something
 - You can leave water, good thoughts, express gratitude, or even sing a song

Processing Tools:

- Metal tongs
- Mesh strainer
- Blender or food processor
- Multiple mixing bowls or pitchers
- T-shirts



Steps:

- Soak and rinse the fruit, skim the excess glochids off the top of the water with a fine mesh food strainer. Next, process the fruit. The following is just one method of many.
- Using a blender or food processor:
 - Blend the entire fruit, including seeds and glochids. Gather your mixing bowls or pitchers and begin to run the blended juice through a process of filters - t-shirts are ideal. Do this multiple times until the juice is clear of floating glochids.

The Reward

You can use it fresh in recipes or boil it to preserve it. Once reduced it can be turned into a concentrate juice or syrup, or you can add pectin and it becomes a jam! A little goes a long way and it's extremely versatile. You can try adding it to lemonade, salad dressings, or even sodas.

About the Author

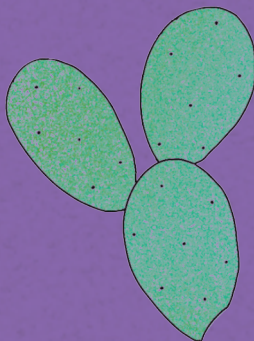
Jacob Robles is Tucson born and raised and a founding member of Flowers and Bullets Collective. Jacob uses his passion for art and food production to fight economic and environmental racism.

PRICKLY PEAR PAD STEW

Our friends at the Native American Advancement Foundation shared this delicious recipe featuring native plants of the Sonoran Desert. The recipe includes prickly pear pads as well as other ingredients like chile peppers that grow well in our desert climate. This stew is heavily textured, hearty, warming, and the multi-step nature of the recipe brings together community both in preparation and eating.

Ingredients:

- 500 Grams pork rib
- 1 Cup water
- 1 Lemon
- 1 tsp Vegetable oil
- 5 Prickly pear pads
- 2 Pasilla chile peppers
- 1 Ancho chile pepper
- 2 Cloves garlic
- 1 Tomato
- 1 tsp Onion powder
- 1/2 tsp Ground cumin



Steps:

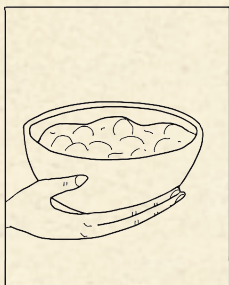
1. After harvesting prickly pear pads you will need to carefully process them. Remove all glochids and spines from the pads.
2. Gather the prickly pear pads and boil for 4-6 hours depending on the texture you enjoy - strain and cube. Set aside.
3. Cube your pork rib and add water and lemon zest. Cook the meat with the pot covered for about 10 minutes.
4. Once the meat is cooked, uncover the pot and cook until the water evaporates. Once water is evaporated, remove from heat and drain any excess grease from the bottom of the pan. Add the pork rib back to the pot.
5. In a separate pot, boil some water and add the chile peppers, garlic, and tomatoes. When the peppers and tomato become soft, remove them and liquefy them with $\frac{1}{2}$ cup of water, onion powder, and cumin.
6. Add the sauce and cubed nopal to the meat and mix well.
7. Cook everything on low heat for 10 minutes in a covered pot.

Enjoy with a tortilla!

About the Author

Adriana "Addy" Fitts is from Ajo, AZ, and is a program coordinator with Native American Advancement Foundation. Addy develops and facilitates youth educational programming in the GuVo District, Tohono O'odham Nation focusing on STEM, traditional himdag (lifeways) in the Sonoran Desert, wellness and Tohono O'odham language and culture. Addy is Tohono O'odham and Hia:ced O'odham. She originates from Desert and Sand

FOOD IS MEDICINE



Watching my nana make magic in the kitchen at a young age is when I realized that cooking is ceremonial practice, that food is medicine and our cooks are healers. She never measured ingredients and it wasn't until later that I began to understand why as I learned more about myself and culture. It's beyond

a procedure, directions and measuring cups, but more of an activation of our genetic memory and fine tuning our senses and palate, reinforcing our connection to the food and land.

The dishes my Nana prepares are reflective of our ancestry and the seasons of our homeland. "Calabacitas" to replenish the body after enduring the harsh summer heat, "Verdolagas" to celebrate the monsoons, green corn tamales, nopales, the list goes on. With each of her creations, she'd have me 'taste test' to determine what's missing, sometimes giving me hints, but other times it was nothing at all.

Our history has always been expressed through story-telling, traditionally it wasn't our way to write things down due to the lack of connection our words hold when placed upon a document as well as the fear of our intel being revealed, appropriated and weaponized against us. To this day my nana refuses to reveal certain information pertaining to our food ways and traditions as many of us are visual learners and carry our traditions through lived experience, making for my most cherished memories.

C/S

Alfonso Chavez

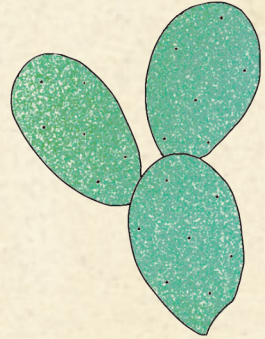




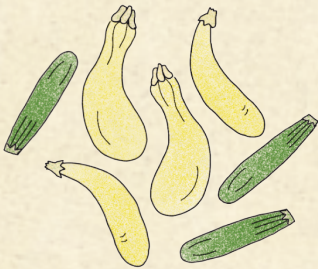
WHITE SAUCE VERDOLAGAS

Ingredients:

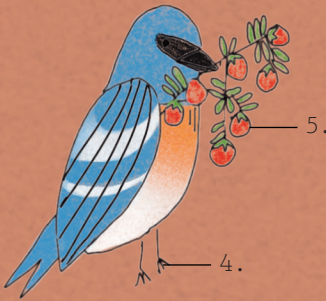
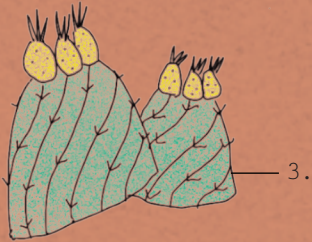
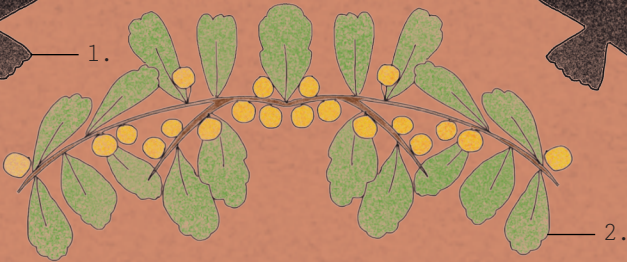
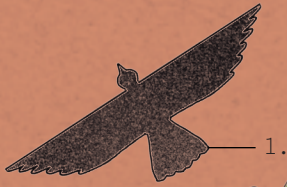
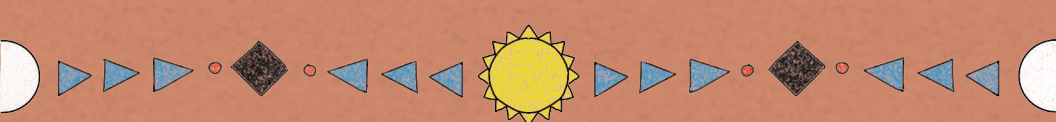
- 3 or 4 Bunches of washed verdolagas (Cut off thicker stems)
- 3/4 Cup of diced yellow or white onion
- 2 Cups milk of choice
- 1/2 Cup of cubed cheddar cheese (optional)
- 1/4 Cup of white flour (or flour of choice) and 1 cup water
- Salt to taste



Steps:

- 
1. Cook the verdolagas in a pan with 1/4 cup of water until tender then drain and place them aside.
 2. Sauté diced onion until caramelize then add the verdolagas and milk.
 3. Mix portion of flour and water as thickening agent and whisk until smooth then add to the pan with verdolagas then stir and salt to taste.
 4. Turn the heat off and place the cubed cheddar but don't mix as the cheese should still hold its form.
 5. Allow dish to rest then enjoy!

Recipe by Maria-Elena Chavez





DRY FALL

Fall in southern Arizona lasts from late September through November and is characterized by warm days and cool nights. Though it is generally a dry season, unseasonable rains sometimes fall in October, and by November, snow has typically fallen at high elevations. If there is enough rain, winter annuals begin to grow and many desert plants produce fruit, including barrel cactus, hack berries, and wolf berries, providing food for overwintering birds. Reptiles become fairly inactive over this period, and wintering hawks arrive. Fall is an ideal time to turn over warm weather gardens and plant cool season crops such as winter greens, root vegetables, garlic, onions, and broccoli before the first frost arrives, historically around the end of November, in the Tucson basin.

Illustrations Key:

- | | |
|----------------------|---------------------|
| 1. Hawk | 5. Wolf berry |
| 2. Desert Hack berry | 6. Marigold |
| 3. Barrel Cactus | 7. Lesser Goldfinch |
| 4. Lazuli Bunting | 8. Pumpkin |

CEMPOALXÓCHITL

Cempuasuchil comes from the Nahuatl word cempoalxóchitl which means “twenty-flower”: cempoal, meaning “twenty” and xochitl, “flower.” Cempoalxóchitl are also known as marigolds. These vibrant flowers are native to Mexico and were first cultivated by the Nahuatl for medicinal and ceremonial practices. They are easy to care for, enjoy full sun, and grow in any soil. Cempoalxóchitl grow well all school year long making them a school garden favorite.

Plant Cempoalxóchitl for your gallinas!



When chickens are free to roam around the farm or garden space we see that they are as curious as we are. They love to dig up bugs, pick through the compost, and feed off of wild greens. Having a diverse diet is instinctual--it's what they prefer!

A few years ago I had the incredible opportunity to work on a 75 acre farm and care for over 300 chickens! I met an inspiring mentor and elder from Jamaica who passed on some chicken wisdom he acquired over the years.

In the greenhouse while seeding trays, I shared with him a little about our Miccailhuitontli (dia de los muertos ceremony) and the cempoalxochitl.

We talked about how special our ancestors are to us, how we honor the ones who traveled to Mictlan, and what rituals and ceremonies connect us with them. I remember showing him pictures of altars and he was curious about the bright orange flowers. After exchanging some quick facts about companion planting and benefits of these medicinal edible works of art, he shared how the chickens would graze on the fields eating cempoalxóchitl. I was absolutely shocked. “Is it safe for them to eat?” I asked. He laughed and talked about the flower’s antibacterial properties and how it supports chicken immune systems.

If you ask any grower about cempoalxóchitl they’ll confirm that it is commonly planted near other crops to deter pests. It makes sense how those medicinal properties could have a similar effect internally. In fact, scientists later “validated” this Indigenous practice by isolating the chemical compounds and including it in commercial feed. It is now an industry best practice for raising chickens amongst other antibacterial regiments.

What other farming strategies do you practice that are also found in nature?

About the Author

Dora “Zeliatl” Martinez, (Ella/she/her/hers)
Dora is a mother, a cultural worker, a farmer and a birth worker based in unceded Tohono O’odham and Yoeme territory. For the last decade she’s organized in her community through land based practices, storytelling, art and political education.



CHILTEPIN HARVEST

The Mother of all Peppers

Whether you call it Isiburi, a'al kokli, chiltepectl, or amash, the Chiltepin pepper is a pepper like no other. Chiltepin is often referred to as "The Mother of all peppers". It is the parent of the species *Capsicum annum* which includes varieties like Jalapenos, Serranos, and even Hungarian Wax Peppers. The pepper is native to the Sonoran desert and is a special part of Mexican and Indigenous culture and cuisine. During dry fall, many rural communities set up harvesting camps collecting a year's worth of peppers and bonding with their families in the process. The pepper has become an important crop in regional trade for Raramuri (Tarahumara) communities living in hilly regions of northern Mexico. Professional Chiltepin harvesters called Chiltepinos can collect up to 30 tons of pounds of Chiltepin each season in Sonora, Mexico!

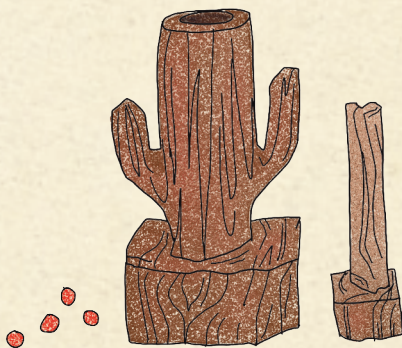
Chiltepin is used as a spice in many dishes. Its heat is sharp with a distinct smoky flavor. Sun dried chiltepins are frequently kept on the table during meals in Mexican and Indigenous communities where they are crushed prior to eating. The intense properties of Chiltepin are thought to treat symptoms associated with tiredness and slowness. The Raramuri combine wild herbs with Chiltepin to treat the common cold, fever, stomach pain, and to ward off snakes and harmful magic.





Growing Chiltepin

Chiltepin is seldom farmed, as wild peppers are the most sought after and they can be difficult to reliably germinate. When planting seeds, ensure adequate warmth and allow up to a month for germination. Remember, wild chiltepins grow under nurse plants such as mesquite or palo verde and care should be taken to mimic those conditions. These plants bush up to 5 feet and should be grown in filtered light or heavy shade. In addition, chiltepin plants do not tolerate frost or extreme heat. Given a good monsoon season, chiltepin will set fruit in early fall.



Climate Change/Urban Development

Climate change has begun to affect the tradition of harvesting chiltepin, altering the timing and amount of rain in the summer monsoon season. Peppers with little water fail to produce matured fruits. On top of that, wild chiltepin plants are becoming increasingly scarce as urban areas expand into native lands. Efforts have been made to ensure the survival of wild chiltepin. The Coronado National Forest has reserved 2500 acres dubbed the “Wild Chili Botanical Area” to create a reserve for these plants.

About the Author

Caleb Ortega works with CSGP and is a descendant of Tarahumara and Yaqui peoples.

CALABAZA EN MIEL



Ingredients:

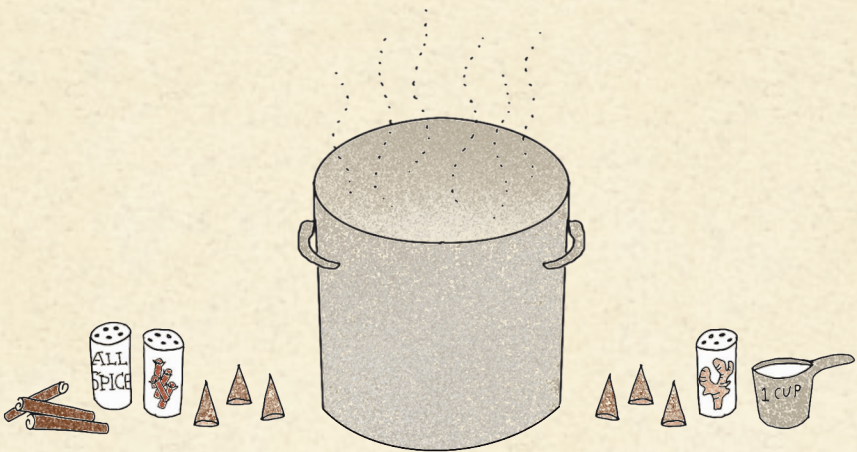
- 1 Large pumpkin
- 6-9 Cones of piloncillo (unrefined pure cane sugar - it can be found at your local mexican food market)
- 3-4 Cinnamon sticks (canela)
- 1 tbsp Ground ginger
- 1 tbsp Ground cloves
- 1 tbsp Allspice
- Water
- 1 Cup milk or milk alternative

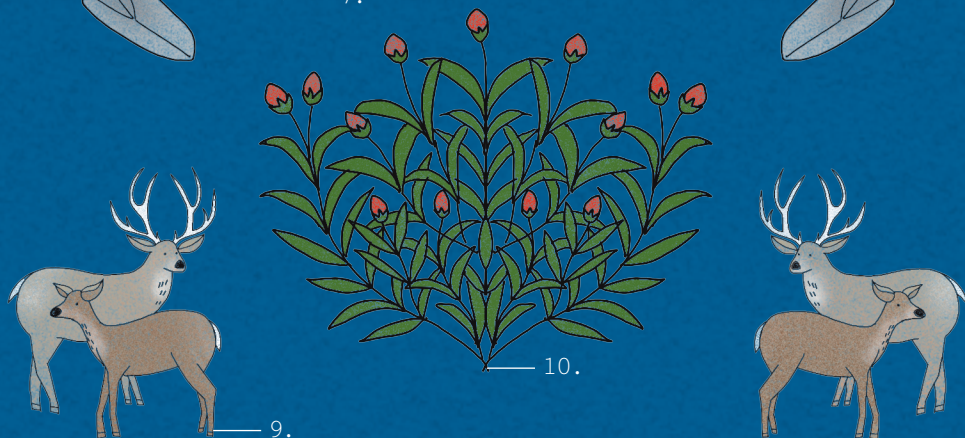
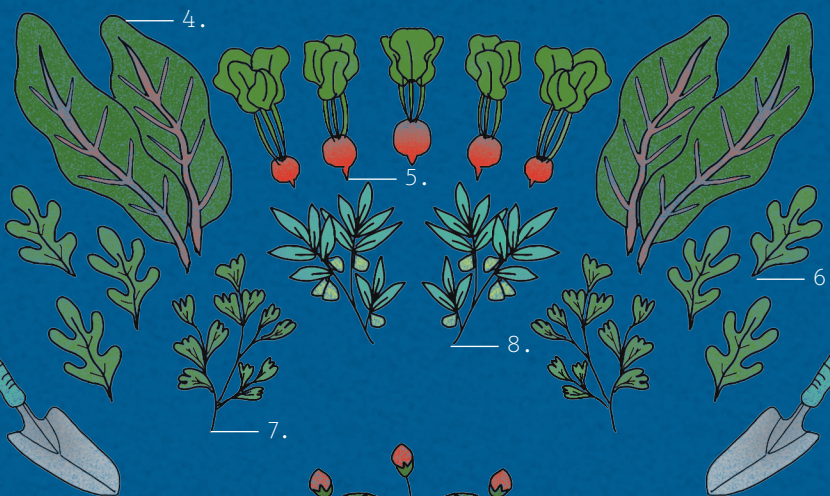
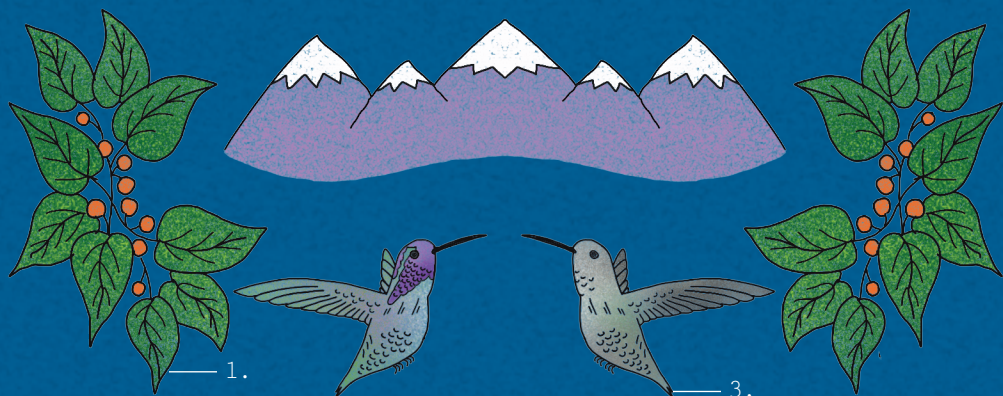
About the Author

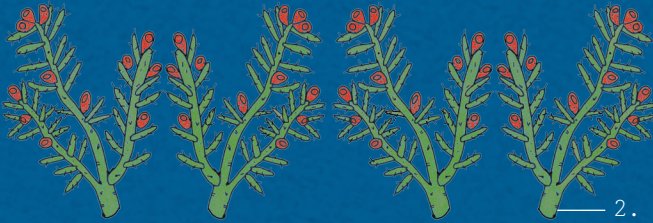
This recipe was shared by Joe Palomarez, grandfather to CSGP team member Brittney Palomarez. Joe was born in Amado, AZ then later moved to Tucson with his wife Bertha where they raised 8 children. He now carries forward the food traditions shared by Bertha with his 20 grandchildren and 31 great grandchildren. This is one they look forward to enjoying with him every year.

Steps:

1. Clean the pumpkin and remove the seeds. You can clean and roast the seeds later!
2. Cut the pumpkin into 4 by 4 inch pieces and begin laying the pieces in a deep stock pot with the skins facing upward.
3. Once you cover the bottom of the pot with your first layer of pumpkin, add 2-3 cones of piloncillo and one cinnamon stick. Add another layer of pumpkin, skin side facing upward, and repeat.
4. Once your pot is full of the alternating layers of pumpkin and piloncillo and cinnamon sticks, add your water until everything is completely submerged.
5. Add the ground ginger, ground cloves, and allspice.
6. Cook until the top layer of pumpkin is tender and sweet and all of the piloncillo has fully dissolved.
7. When it is finished cooking, serve by gently pulling a piece from the pot while still warm, placing it in a bowl and topping with warm milk or milk alternative. Enjoy!







WINTER RAINS

Winter lasts from December through early February. Temperatures drop, and gentle winter rains occur intermittently, driving the spring wildflower bloom. Days are mild, and by later in February, temperatures may warm to spring-like conditions. Higher elevations experience frequent below-freezing temperatures and consistent snow. During the winter, some desert plants, such as mistletoe, netleaf hack berry, and Christmas cholla boast ripening fruit, which provide food for mammals and wintering birds. Many desert birds enter mating season, including curve-billed thrashers, mockingbirds, cactus wrens and various hummingbirds, and mule deer begin rutting. Depending on the intensity of the winter rains, the spring bloom may begin in late February, with Mexican gold poppies, lupines, and owl clover the first species to emerge. Despite the unpredictability of frosts, a few cold-weather crops may be planted from mid-January through February, including arugula, chickpeas, cilantro, winter greens, onion, kale, and radish. Seedlings and frost-sensitive plants need to be protected from cold temperatures which could persist through the end of March.

Illustrations Key:

- | | |
|-------------------------|---------------|
| 1. Neat Leaf Hack berry | 6. Arugula |
| 2. Christmas Cholla | 7. Cilantro |
| 3. Costa's Hummingbirds | 8. Chickpeas |
| 4. Swiss Chard | 9. Mule Deer |
| 5. Radish | 10. Chiltepin |

GREENS & BEANS

Ingredients:

- 1 lb Spinach (or quelites*)
- 1 1/4 Cup cooked pinto beans
- 1/2 Cup of yellow onion
- Salt to taste

Steps:

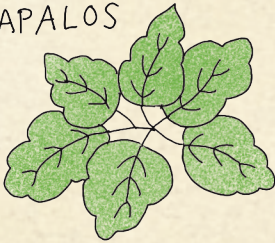
1. Blanch the greens. Bring water to a rolling boil and submerge them for 30 seconds, until tender but not too soft. Strain the greens and place them in a bowl of cold/iced water (This will stop them from cooking, maintaining their color and texture.). After 30 seconds in cold water, strain again and set them aside.
2. In a pan, Sauté 3/4 cup of diced onion with butter or oil of choice. When onion has begun to caramelize, work in about 3 tablespoons of white flour or that of choice, while constantly stirring.
3. When the roux becomes smooth, gradually add greens and beans, then stir until evenly mixed. If the dish is too dry, it may burn so add bean juice to the pan and continue to stir.
4. From here the flavors should mix as the onion provides an aromatic foundation while combining flavors with the beans that is all absorbed by the spinach, a simple and satisfying meal. Have fun with this and try new spices and peppers.
5. Allow this to cool down and enjoy!

Feeds 3 as a main dish or 6 as a side

Quelites

*Quelites (pronounced “keh-lee-tez”) comes from the Nahuatl word quiltil, which means “edible plant or weed.” The wild species have long been a meaningful part of local Mexican and Indigenous diets, providing important vitamins, minerals and proteins. You can usually find them growing near crops that require a lot of water, next to rivers and streams, or straight out of the sidewalk during and after monsoon season. Between 300-500 wild plants fall under the category of quelites! Some examples include malacote, papalo, epazote, and verdolagas. You can find a recipe for verdolagas on page 21.

PAPALOS



EPAZOTE

SPINACH



VERDOLAGAS



MALACOTE

About the Author

Alfonso Chavez, a local artist and founding member of Flowers and Bullets, shared this special recipe that was made for him by his Nana. Learn more about Flowers and Bullets at www.flowersandbullets.com.

ROPE MAKING

Making rope is a fun physics activity and botany lesson all in one! It also offers an opportunity to explore traditional knowledge in your classroom. This skill is used worldwide and the technology continues to be used in the same way today to make rope and cordage.

Traditional Tools and Fibers

- Tarabilla
- Hook crank
- Agave fibers
- Yucca fibers
- Raffia fibers
- Horse hair
- Human hair



Traditional Uses


- Sandals (Kumeyaay)
- Baskets (Tohono O'odham)
- Netting (Kumeyaay)

Supplies and Tools

- Roll of brown paper towels
- Water
- A bowl or bucket
- Optional: Hook crank

About the Author

Jesús García is a Conservation Research Associate and Director of the Kino Heritage Fruit Trees Project at the Arizona-Sonora Desert Museum. Jesús was born and raised in a ranching and farming community near Magdalena, Sonora, Mexico. Jesus is the bearer of many Sonoran Desert traditional skills and knowledge representing a blend of both Indigenous and European knowledge.



Steps:

Part 1 - On your own

1. Add a few cups of water to your bowl or bucket.
2. Pull about a 2-foot long piece of paper towel from the roll.
3. Take the paper towel and submerge it in the bowl/bucket of water. Gently wring out the paper towel.
4. Open up the paper towel to its original size, then fold it in half, hamburger style, and again until it is small enough that you can gently rip it evenly in half. You should now have two 2-foot long pieces of paper towel.
5. Open both pieces up to their original size again. Begin to fold them now hotdog style, and again until it is about an inch in width. Do this for both pieces.
6. Hold each end of your folded paper towel so that it is taut. Begin spinning clockwise with your right hand only. Set the first piece of paper towel aside and follow this same step for the second piece.
7. Once both pieces are spun, bring the ends together, then tie a knot on one end.

Part 2 - Find a Partner!

1. One person will hold the end with the knot, while the other person begins to twist the two hanging pieces of paper.
2. Opposing forces hold the rope together. Individual strands are spun clockwise, the 2 strands are spun and entwined together by wrapping counterclockwise over one another. After a few motions, you will begin to see rope forming.
3. You should now have a rope! Tie a knot at the end. To make the rope extra strong you can double it up by folding your final piece in half and using a hook crank to create a 4 strand rope.

KALE CHILTEPIN PESTO

Kale is a brassica in the mustard family and a school garden favorite to grow, see seed planting calendar. The older leaves of the plant can be harvested while allowing the rest of the plant to continue to grow. It produces throughout the majority of the school year and can be eaten raw in salads, cooked in soups, baked into chips, or used to bulk up pesto recipes like the one below.

Ingredients:

Yield: 2 Cups

- 1/2 Cup pumpkin seeds (see seed planting calendar)
- 1/2 Cup pine nuts
- 2 oz Cilantro
- 3 oz Kale
- 1/4 Cup fresh grated Parmigiano Reggiano
- 4 Chiltepins, crushed
- 6 oz Olive oil
- 2 Garlic cloves
- Salt and pepper to taste
- Zest and juice of 1 lemon





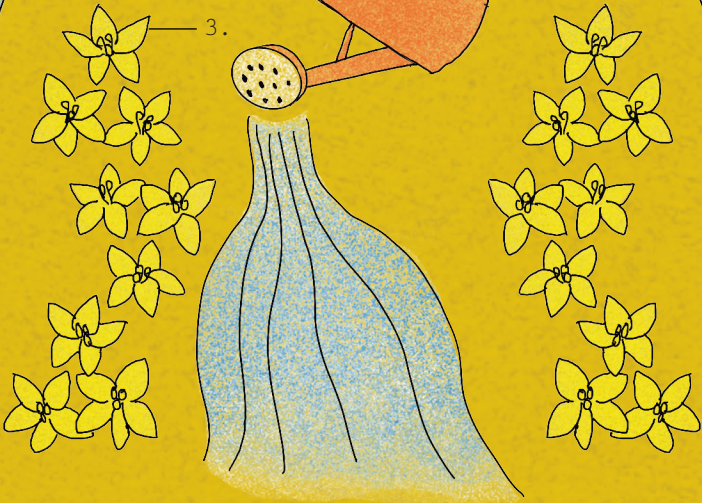
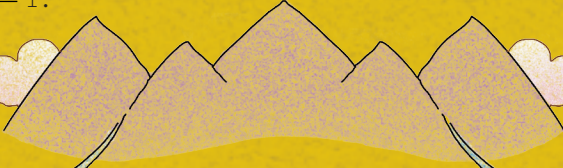
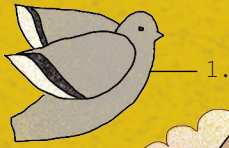
Steps:

1. Toast the pumpkin seeds and pine nuts in a preheated 350 F degree oven for 7 minutes to bring out their oils and flavor
2. In a food processor or mortar and pestle, grind the pumpkin seeds, pine nuts, and garlic until fairly fine, but not powdery, add the cilantro and kale until completely combined, then the chiles, and Parmigiano Reggiano.
3. Add the lemon zest and juice, then stream in olive oil while the food processor is running, and season with salt and pepper to taste.

This pesto can be added to tacos, used as a pizza sauce base, a sandwich spread, or even dipping sauce!

About the Author

Devon Sanner was born and raised in Tucson and is a lifelong lover of food. Devon attended the University of Arizona as a Flinn Scholar and National Merit Scholar, went on to train at the Scottsdale Culinary Institute, and now serves as CO-Owner and Executive Chef of Zio Peppe.





SPRING BLOOM

From late February through April, southern Arizona is alive with spring. Days are sunny and mild and the nights are cool. It rains only rarely, and the warming temperatures mean that the snow at elevation begins to melt, filling creeks and creating short-lived waterfalls and pools in the high country. Early spring is wildflower season, with dozens of species bursting into bloom. Shrubs bloom too, and are joined in April by legume trees - palo verde, mesquite, acacia - and cacti, including prickly pear, cholla, and hedgehog. The dominant bloom color in April is yellow, which accounts for the Tohono O'odham name of Uam Masad - "Yellow Month" or "Desert-in-Bloom Month." Many animals breed in the spring; owls, songbirds, desert tortoises, hawks, lizards, bobcats, foxes, and coyotes all look for mates and begin to raise offspring. Turkey vultures and white-winged doves return to southern Arizona, and butterfly activity increases. Warm-weather crops can be planted in the spring garden, including peppers, beans, corn, cucumbers, tomatoes, eggplants, squash, and melons.

Illustrations Key:

- | | |
|----------------------|--------------------|
| 1. White Winged Dove | 4. Hedgehog Cactus |
| 2. Parry's Penstemon | 5. Desert Tortoise |
| 3. Palo Verde Blooms | 6. Coyotes |

CREOSOTE SALVE

The creosote bush is a native Sonoran Desert plant used for its many medicinal qualities as it has antibacterial, anti-fungal, and antimicrobial properties. Creating a salve with creosote is one way to make use of

the benefits of this plant and has been used for small wounds, dry skin, and bug bites. Other fragrant plants can be combined or substituted in this recipe with examples being lavender, sage, or thyme.



Harvesting and Drying Techniques

Remember to practice sustainable harvesting! You can learn more on page 54 in the sun tea section.

Begin harvesting stems from the base of the plant, being sure to remove no more than 1/3 of the creosote bush. It has been encouraged to provide an offering such as water, for example,

in exchange for taking its leaves. Dry the stems by placing them on a flat baking sheet in a dry, sunny area. Any moisture left on the leaves or stems could introduce bacteria into the infusion and should be avoided.



Recipe

Ingredients:

- 1 Cup of dried creosote leaves
- 1 Cup of sunflower oil
- 3 tbsp of Cosmetic grade beeswax

Tools:

- Crockpot or double boiler
- Mesh strainer
- Ladle
- 1 Quart mason jar
- 2 oz Metal tins



Steps:

1. Pack a clean quart mason jar with dried creosote leaves, cover with sunflower oil, and set aside for up to a month to be thoroughly infused
2. After the oil has been infused, strain all leaves and stems through a mesh strainer
3. Combine the infused oil and cosmetic grade beeswax in a crock pot or double boiler until melted. Using a ladle, carefully pour the mixture into metal tins until cool and solidified

NATIVE POLLINATORS OF THE SONORAN DESERT

On a dark spring night in the Sonoran desert, a yucca flower the color of the moon opens wide. With wings soundlessly beating the air, a Yucca Moth dives in to reach the nectar, pollinating the flower in the process. Yucca moths and yucca plants have evolved so that each depends on the other for survival. The yuccas give the moths a place to lay their eggs and food for their larvae and caterpillars. The moths in turn pollinate yucca flowers when they bloom in late spring, and by feeding on the seed capsules, helping them to germinate.

There are thousands of pollinators in southeastern Arizona, including bees, butterflies, moths, beetles, bats, hummingbirds and wasps. Each one has a unique relationship with the flowering plants they pollinate and each type of animal has special adaptations to pollinate only certain groups of flowering plants.



MONARCH
BUTTERFLY

Hummingbirds

Hummingbirds prefer tubular flowers- their long bills and even longer tongues can reach nectar deep in tubular flowers that many other species cannot. Costa's hummingbirds nest in early spring and during that time feed on chuparosa and desert honeysuckle. Many migrate south when the ocotillo blooms, providing food for their springtime travels in the Sonoran and Mojave deserts.



Moths

WHITE-LINED SPHINX MOTH

Moths such as the yucca moth prefer long, tubular white flowers which they pollinate at night. Their long proboscis acts like a tongue to reach inside the flowers and drink the nectar. They brush upon the flower's pollen-covered anthers and then carry that pollen to the next flower they visit, brushing the pollen against the flower's stigma, which pollinates it.

Butterflies

The monarch butterfly depends on its host plant, milkweed, not only as a safe place to live as caterpillars, but also to help it survive as a butterfly. When the monarchs are larvae, they eat milkweed leaves, which in turn makes them toxic to many predators. Like many other species that are colorful, their bright orange wings warn predators of their toxicity.



COSTA'S HUMMINGBIRD



Bats

The monarch butterfly depends on its host plant, milkweed, not only as a safe place to live as caterpillars, but also to help it survive as a butterfly. When the monarchs are larvae,

they eat milkweed leaves, which in turn makes them toxic to many predators. Like many other species that are colorful, their bright orange wings warn predators of their toxicity.



LESSER
LONG-NOSED
BAT

Bees

Bees are important pollinators for many wildflowers and cacti, as well as plants that we grow in the garden!

Sweat bees are found in Arizona February through October and pollinate crops like chiles, tomatoes, and eggplant.

Cactus bees burrow in the ground to make their nests and pollinate prickly pears and cholla in the spring.

Digger bees are active from spring to fall and are major pollinators of palo verde and creosote trees, as well as crops in the bean and nightshade family.

Sonoran Bumblebees are most active in the spring, summer, and fall and pollinate crops like tomatoes, eggplant and beans, as well as many wildflowers.

Spanish names for bees: abeja (bee), jicote, abejorro (bumblebee, carpenter bee)

How to Plant a Native Pollinator Garden: 3 Tips

1. Think about which pollinators you'd like to attract. Make sure that the plants will have the shade, soil and access to water it needs to survive.
2. To create a good habitat, choose a variety of native plants that will bloom at different times of the year, and that will provide for all stages of the pollinator's life. For example, if you create a butterfly habitat, include plants that will support both the butterfly and the caterpillar.
3. Plant your garden and take care of it. Observe the pollinators that come to visit, and enjoy!



SONORAN
BUMBLE BEE



CACTUS
BEE



DIGGER
BEE



SWEAT
BEE

About the Author

Carly Pierson comes from a place where the mountains meet the desert. Whether picking chokecherries in the mountains or eating prickly pear fruit in the desert, she is reminded that nearly all our food is a product of animal pollination.

PHENOLOGY PORTRAIT

Phenology is the timing of life cycle events in plants and animals. We can document these events by exploring our gardens and collecting different leaves, flower petals, and seed pods during a specific season.

Create a Phenology Portrait:

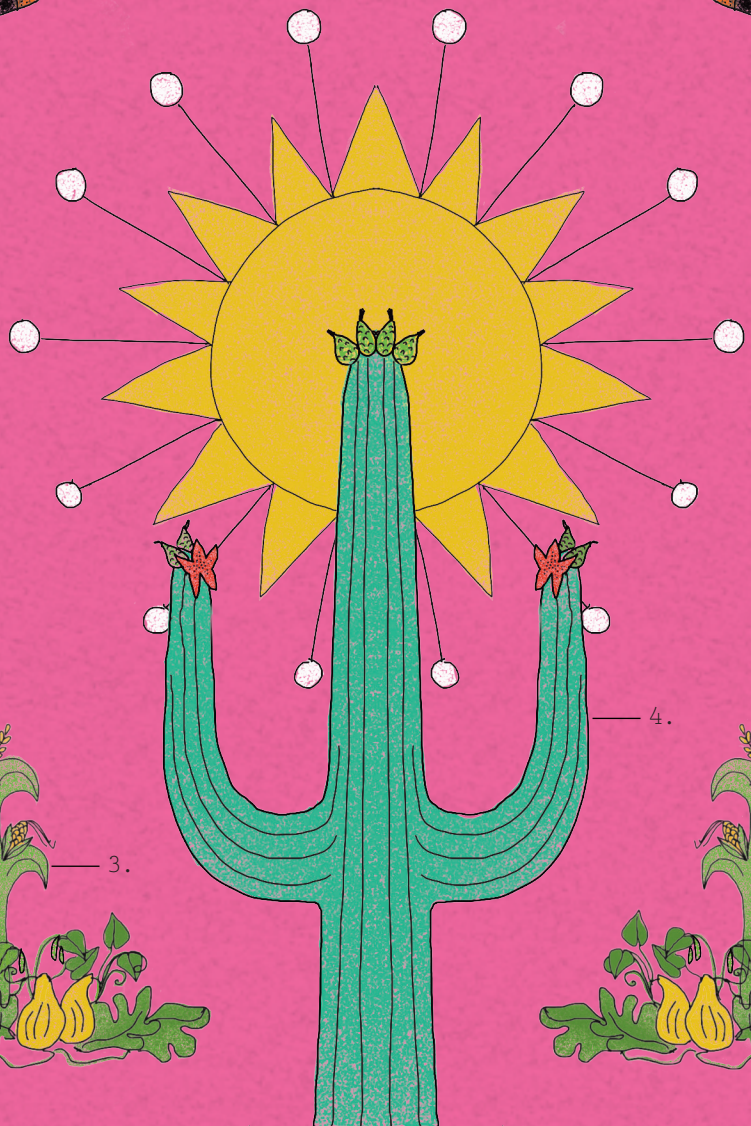
1. With a partner, collect as many different natural textures and colors as you can from your surroundings, being mindful not to disturb any insects or animals in the process.
2. Sitting across from one another, begin by examining one another's facial features and find which items you have collected remind you of their eyes, nose, mouth, and hair!
3. On white paper, place these items to create a portrait of their face.

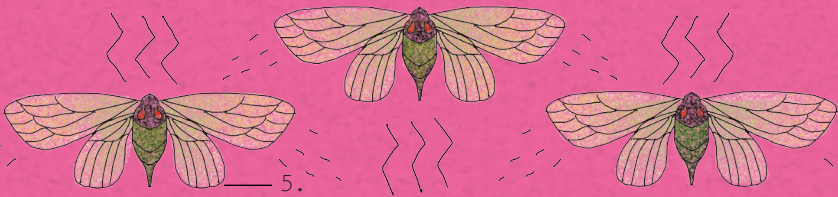
Try creating a phenology portrait for each season to see how they change!



About the Author

Paloma Jacqueline is a native Tucson filmmaker, ceramic artist and gardener. She graduated from the U of A, with a BFA in Film and Television Studies. Working with people of all ages to build creativity through art and nature is something she is very passionate about.





DRY SUMMER

The months of May and June in southern Arizona are known as dry summer or foresummer. During this time, the area experiences high temperatures and very low humidity. In most years it does not rain. The first day over 100° F usually happens in May, and June boasts many hot days past this threshold. While most desert plants and animals tend to lie low during this time, there are a number of notable exceptions. Saguaro cacti begin fruiting and ironwood trees come into bloom. Yuccas may also bloom, while seed pods ripen on legume trees. Nectar-feeding bats migrate from Mexico during dry summer, and as a result, hummingbird feeders can mysteriously empty overnight. Gila monster eggs hatch, while several snake species either lay eggs or give birth to live young during this season. The trills of cicadas are a familiar sound that signals the beginning of the driest season. Many warm weather plants like squash, basil, beans and corn will be ready to harvest, though with the high temperatures, it is not an ideal time to plant. Crop plants like tomatoes that produce flowers during the hottest times may never set fruit, as high heat sterilizes pollen, rendering it infertile.

Illustrations Key:

- | | |
|--------------------------|----------------------|
| 1. Gila Monster | 4. Saguaro with Tuna |
| 2. Mojave Rattlesnake | 5. Cicada |
| 3. Corns, Beans & Squash | |

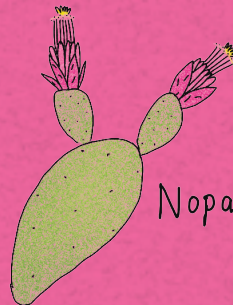
NOPALES

Along with the mesquite and agave, the nopal forms the trio of sacred plants of Mexico. When the first settlers arrived and lived as nomadic hunters and gatherers, they found several groups of cacti that became staples in their diet. This “plant of life” was important in identifying a place to settle. While being rich in fiber, vitamins and minerals, its meaning represents much more than nutrition. It is a symbol of hope and endurance that is even depicted on the flag of Mexico.

Nopales make up the largest plant group with over 300 species! Specialists divide them into two groups: *Opuntia* and *Nopalea*. Although the stems of both groups are very similar, the shape of the flowers is different. Those of the genus *Opuntia* are pollinated by native bees, those of *Nopalea* are pollinated by hummingbirds. It's white, orange, red or purple flowers bear a fruit, the prized prickly pear. What differences can you see in the flower shape?



Opuntia



Nopalea

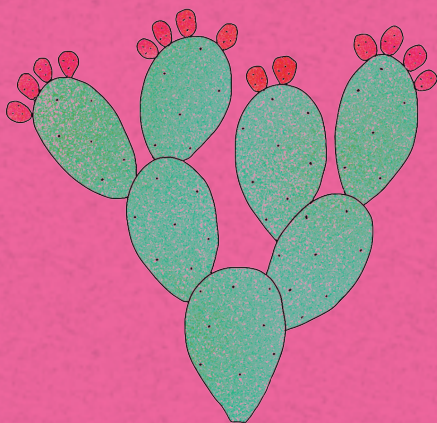
Hair and Skin Moisturizer

The water used to cook the nopales will contain slime, or mucílago, from the nopal. The water has been used as a skin humectant or hair moisturizer by applying it directly or mixing it into skin or hair products.

Salsa de Nopal

Ingredients:

- 1 Cup nopales, cooked and diced
- 1 Tomato, diced
- 1/2 Onion, finely diced
- 1 Bunch of cilantro, finely chopped
- 1 Serrano chile, diced
- 1 tsp Cumin
- 1 tsp Dried oregano
- 1/2 Lime, juiced
- Salt and pepper, to taste
- Pinch of baking soda



Steps:

1. Add nopales to a pot with a pinch of baking soda. Cook for 10 minutes or until they change color and are soft. Rinse and drain. This will get rid of the sliminess, or mucílago, nopales have. *Note: The water with slime has a history of being used as a hair and skin moisturizer!*
2. Finely dice the onion, tomato, and chile serrano.
3. Place everything in a bowl and season with cumin, oregano, salt, pepper, and lime juice. Mix well and refrigerate.
4. Serve with tortilla chips and enjoy!

About the Author

This piece was written by CSGP team member Selene Leyva from Nogales, Sonora in collaboration with her grandmother Maria Lourdes Leyva aka “nana Lulis”. The Salsa de Nopal recipe was created by Selene’s mom Elda Santiago, a family favorite during Summer cookouts!

COCHINEAL WATERCOLOR



What is carmine?

Carmine is a natural red dye that comes from the cochineal bug. Depending on the process used, it can produce a range of vibrant colors from light orange to deep purple. In Mesoamerica, objects dyed with carmine date back as early as the twelfth century.

The red dye made from the cochineal is the most colorfast natural colorant (resists fading in sunlight and does not wash out). Cochineal is a parasitic insect that lives on nopal cacti (prickly pear cactus), where it feeds and produces carmic acid. Carmic acid tastes bad to predators, but produces a brilliant red dye, highly prized by artists for centuries. The color red symbolized power and wealth.

About 70,000 insects are needed to produce a pound of dye. Cochineal was so valuable in the 16th century that it was second only to silver.

About the Author

Chelsea Farrar, University of Arizona Museum of Art. Chelsea has called the Sonoran Desert home for over 20 years. She has just recently figured out how to grow a garden in it and looks forward to what more she can learn.



Make carmine watercolor:

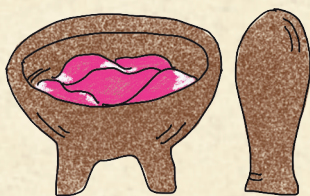
You can change the color of carmine by adjusting its pH (the measure of how acidic or basic a solution is). It is this sensitivity that has allowed artists to create a range of colors with the cochineal. Below is a recipe to make your own watercolor with dried cochineal.

Ingredients:

- Distilled water
- Lemon juice
- Baking soda
- Dried and cleaned cochineal (you can order from online or harvest from nopal)
- Mortar and pestle (or spoon and a shallow bowl if you don't have one)
- Three cups (for mixing watercolor)

Steps:

1. Grind about a tablespoon of cochineal into a fine powder
2. Add $\frac{1}{3}$ of that powder to 1 cup of distilled water and mix
3. Add $\frac{1}{3}$ of that powder to a second cup of distilled water and add a few drops of lemon juice
4. Add $\frac{1}{3}$ of that powder to a third cup of distilled water and add $\frac{1}{4}$ teaspoon of baking soda



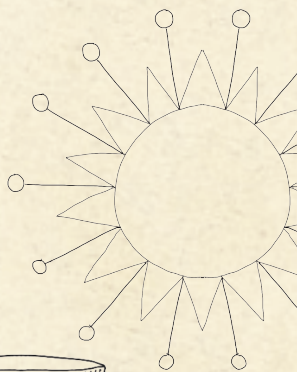
Compare the colors of all three. How did the acid change the color of the original carmine? What about the base (baking soda)?

Once you have your carmine watercolors, paint something inspired by our bountiful desert landscape!

SUN TEA RECIPE

Sun Tea

Sun tea is a great way to make a large batch of iced tea for summer without having to turn on your stove top during the hottest time of the year! Our desert offers some incredibly refreshing and medicinally beneficial plants for sun teas. From ocotillo flowers to desert willow, and even Marigolds you can create a beautiful and restorative summer drink by harvesting and drying these flowers when in bloom - typically late spring through early summer.




Harvesting and Drying Techniques

Make sure to harvest only bloomed flowers, not buds, and to leave enough on the plant for our pollinator friends to enjoy. Offer gratitude for any flowers harvested. Once harvested, spread evenly on a breathable surface in a dry place for at least a week. You can use an oven or dehydrator to speed up the process of drying.

If you don't have a place to lay the flowers for drying you can create a garland and hang dry them. You will string each individual flower on a piece of twine or thick thread using a blunt sewing needle. You can even use them to decorate your space until they are fully dried.

Once dry, keep the flowers in an airtight, labeled jar and store in a dark place for up to a year.



Ingredients:

- 1 Cup dried flowers of your choice, or a mixture
 - Ocotillo
 - Desert Willow
 - Marigold (see page 24)
- 1 Gallon Water
- Honey or Agave nectar to taste

Steps:

1. Take a gallon sized jar and fill it with room temperature water.
2. Add one cup of dried flowers. Mix the flowers into the water gently so they become submerged.
3. Place the jar in direct sunlight. Allow the flower tea to steep for anywhere between 2-3 hours, depending on how hot it is outside and how intense a flavor you desire.
4. Once you bring in your tea, taste it and decide if you would like to add sweetener. We recommend honey or agave nectar. You can run the tea through a strainer to avoid petals. For an extra pop, add some sliced lemon or lime or even a sprig of mint from your garden.

Plant Facts!

Desert willow flowers are a favorite food of the desert tortoise. The trees also provide great shade for a desert tortoise habitat. The entire ocotillo plant is medicinal - from its bark to its flowers! It has long been used in remedies by the Seri tribe of northern Mexico to ward off many types of infections including a sore throat.

REVITALIZING OUR ROOTS

Creating life with an idea. The idea which formed creativity. Knowledge and strength working together to build a reality. Watching day by day how it reforms! Within the mind and soul of all who witness. What joy and comfort Mother Nature can bring. The peaceful abyss each individual experiences; Not only us humans but any creature helping or intake they gain from this area. It may be a small surrounding but with all of the above, we create the opportunity to turn back and futurize what we have lost and can gain again with the wisdom of today's society. This is what Ruth's Garden in GuVo, AZ has brought to many.

- Adriana Fitts

COLORING PAGES



