Heirloom Seed Gardening and Propagation

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BAD IDEA!

- Some people think that they can prepare for hard times by purchasing a can of heirloom seeds, putting it in their storage, getting it out when things get tough, and using it to produce their food needs indefinitely!
- If this is your plan, YOU NEED A NEW PLAN!
- Why?
  - It does not work!

    AND
  - There is a big learning curve for this skill!
- We are about to embark on it!

Why should you produce your own seed?

GMO Seeds

- GMO = Genetically Modified Organism
- Indiscriminately combine plant, insect, animal and/or human DNA.
- Are used to produce plants that can survive when sprayed with proprietary pesticides and herbicides such as Roundup (glyphosate).
- Induce cancer and other illnesses in rats (and humans).
- Constitute a large and growing percent of current food supply.
- AVOID AT THEM ALL COSTS!

Hybrid Seeds

- Are offspring of two different parents.
- Are delicious with desirable characteristics.
- WILL NOT REPRODUCE THEIR CHARACTERISTICS IN SUCEEDING GENERATIONS (progenitors or sterile).
- MAY HAVE LIMITED VIABILITY.
- Can be patented so are profitable to sell and, consequently, constitute most of the seeds available in most grocery and home improvement stores.

Open Pollinated Seeds

- Reproduce what they are generation after generation – IF kept pure. (This is the big IF!)
- Many, many varieties, but becoming harder to find.

Heirloom Seeds

- Subset of open pollinated seeds
- Must have been introduced at least 50 years ago
- Can be viable up to 10 years depending upon
  - preservation method.
  - storage method.
  - type of seed.

Seed Sources

- Baker Creek Heirloom Seeds – www.rareseeds.com
- Reimer Seeds – www.reimerseeds.com
- Seed Savers – www.seedsavers.com
- Ark Institute – www.arkinstitute.com
- Johnny's Selected Seeds – www.johnnyseeds.com
- Caleb Warnock's Renaissance Seeds – www.renaissanceseeds.com

Seed Sources

- Seeds of Change - www.SeedsofChange.com
- Mountain Rose Herbs – www.mountainroseherbs.com
- Preparedness Sites
- Local Farm Supply Stores (IFA, Cal Ranch)

Planting Starts

- Why should you plant from starts you grow yourself rather than purchasing the starts?

Planting Starts

- Common veggies to start from starts
  - Broccoli
  - Brussels Sprouts
  - Cauliflower
  - Collards
  - Cucumbers
  - Herbs
  - Kale
  - Melons
  - Onions
  - Peppers
  - Tomatoes
  - Tomatillos
  - Squash

Propagating Seeds

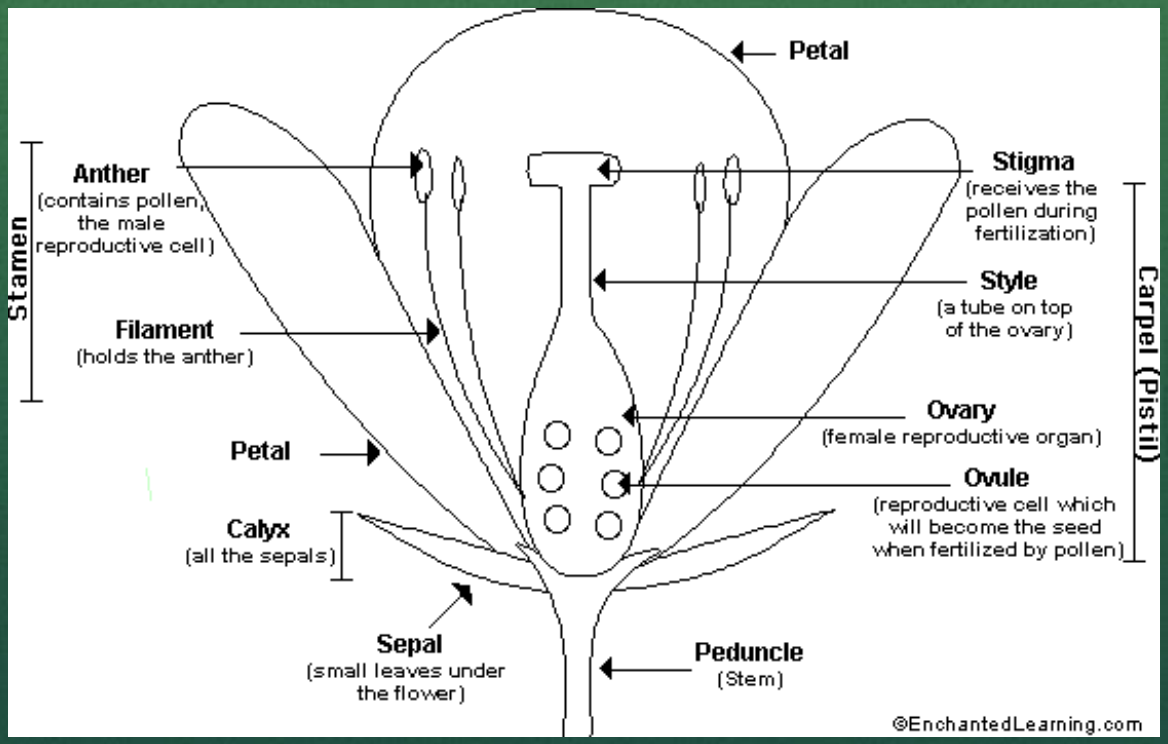
- To maintain varietal purity:
  - Isolate different cultivars of the same species
    - Distance (50 feet to 2 miles, depending on species)
    - Time – plant at different times so they flower at different times
    - Variety – only propagate one of a species each year
    - Mechanical – physical barrier
      - Screened cage that can be placed over several plants
      - Tie a cloth bag around fertile blossoms and/or tassels
      - Tape flower closed and hand-pollinate with a brush and/or bees
  - Minimum 6 plants of same variety for genetic variety

Plant Physiology

- Flower Structure
  - Male parts
    - Stamen – one or more hair-like filaments
    - Anther – produces and dispenses pollen at top of stamen
  - Female Parts
    - Pistil
      - Stigma – part of pistil that receives pollen
      - Style – pollen tube
      - Ovary – contains ovules and become the fruit or seed

Plant Physiology

- Flower Structure



Plant Physiology

- To preserve purity, only pollen from one variety may reach the stigma of the plant of that variety. All other pollen must be excluded.
- If pollen crosses, present-generation fruit will not be affected, but subsequent generations will be affected.
  - Cheets and Bard
  - Parrots and Carsnips
  - Cumelons
  - Seriously promiscuous squash (Jabba the Squash)
- Even if a particular cross is acceptable, subsequent generations will probably not be stable and may become sterile over time.

Self-Pollinated Plants

- Self-Pollinated Plants
  - Perfect Flowers
    - Have functional male and female parts in the same flower.
    - Fertilization takes place within each individual flower
    - Does not require but can be cross-pollinated with wind and/or insects
    - Inbreeding plants (fertilize self before flower opens)
      - Beans, Eggplant, Lettuce, Orach, Peas, Peppers
      - Most Tomatoes

Self-Pollinated Plants

- Self-Pollinated Plants
  - Outbreeding Plants – flower opens before self-pollination occurs, so plants can be cross- pollinated
  - Potato leaf tomatoes
    - Stupice
    - Joe's Earliest Slicer
    - German Green

Annuals

- Annuals are planted, sprout, flower, and bear seed within the same growing season.

Annuals

- Beans
- Corn
- Cucumbers
- Lettuce
- Melons (cucumis melo)
- Peas
- Radishes
- Spinach
- Solanaceae
  - Eggplants
  - Peppers
  - Tomatoes
  - Tomatillos
- Squash
- Watermelons

Inbreeding Annuals

- Have perfect flowers which self-pollinate before opening.
- Only cross pollinate occasionally.
- Very easy to propagate because they do not have to be isolated.

Inbreeding Annuals

- Beans (occasionally cross within species)
- Lettuce
- Peas
- Solanaceae (occasionally cross within species)
  - Eggplants
  - Peppers
  - Tomatoes
  - Tomatillos

Annuals – Beans and Peas

- Propagating Beans and Peas (leguminosae) (green beans, dried beans, lentils, peas)
  - Generally inbreeding, but can cross within species.
  - Leguminosae have perfect flowers which are self-pollinating, but are occasionally crossed by insects.
  - Crossing may not show up until the second generation, so store each year's seeds separately and discard the obviously crossed seeds and those of the year before if crossing becomes evident.
  - For seed purity, isolate, bag, or cage.
  - Use spun polyester bags tied in place over a flower cluster. Remove when tiny pods begin to show. Mark with string, tape, or poultry bands.

Annuals – Beans and Peas

- Harvesting Beans and Peas (leguminosae) (green beans, dried beans, lentils, peas)
  - Allow seed pods to mature and dry on plant. They can be picked and allowed to dry until crisp, too, if about to be ruined by frost.

Annuals – Beans and Peas

- Mature tepary bean pods.

Annuals – Beans and Peas

- Open pods and remove beans.

Annuals – Beans and Peas

- Place pods in bowl.

Annuals – Beans and Peas

- Be sure beans are dry.
- They can be dried in a shallow bowl. Stir several times per day until dry.
- Store in a labeled bag or envelope.
- Note: These beans can be eaten as well as used for seeds!

Annuals – Beans and Peas

- Harvesting Beans and Peas (leguminosae) (green beans, dried beans, lentils, peas)
  - Bean weevils will destroy home saved pea seeds. I have had this happen to peas but not to beans.
  - To prevent this, freeze the dry seeds for 5 days in an airtight container. When removed from freezer, allow to reach room temperature overnight before opening to prevent condensation on the seed.

Annuals - Lettuce

- Propagating Lettuce (compositae – lactuca sativa)
  - Inbreeding - Different varieties only minimally cross due to insects.
  - Flowers are perfect and are only open between 30 minutes and several hours.
  - Separate varieties by 12 to 25 feet or cage when two or more varieties are flowering.

Annuals - Lettuce

- Harvesting Lettuce (compositae – lactuca sativa)
  - Allow plants to bolt, bloom, and go to seed.
  - Slit top of head of heading varieties of lettuce to allow the seed stalk to emerge.
  - Allow seeds to ripen and harvest daily 12 to 24 days after flowering. Shake the seed heads into a large grocery sack and store in a dry area. LABEL SACKS!
  - OR Cut entire plant and stuff head first into a bag. When seeds are totally dry, grab cut ends of stems and shake vigorously into bag. Rub seed heads with palms. Sift with a sieve or fine mesh screen to minimize chaff.
  - Store for 3 years in cool, dry, dark location.

Annuals - Lettuce

Annuals - Lettuce

- Lettuce plants with seed heads

Annuals - Lettuce

- Place plant, head down in 5 gallon bucket.
- Hit head against bucket walls.

Annuals - Lettuce

- Remove lettuce plants.
- Seed remains in bucket.

Annuals - Lettuce

- Use a sieve and bowl to minimize the amount of chaff mixed with your seed.

Annuals - Lettuce

- Place the plant material into a coarse sieve over the metal bowl and shake to get rid of the coarser plant material.

Annuals - Lettuce

- Place the seed and chaff in the sieve.
- Shake vigorously over bowl, allowing the chaff to fall into the bowl.

Annuals - Lettuce

- Place the strained plant material in a smaller mesh seive.
- Shake vigorously.

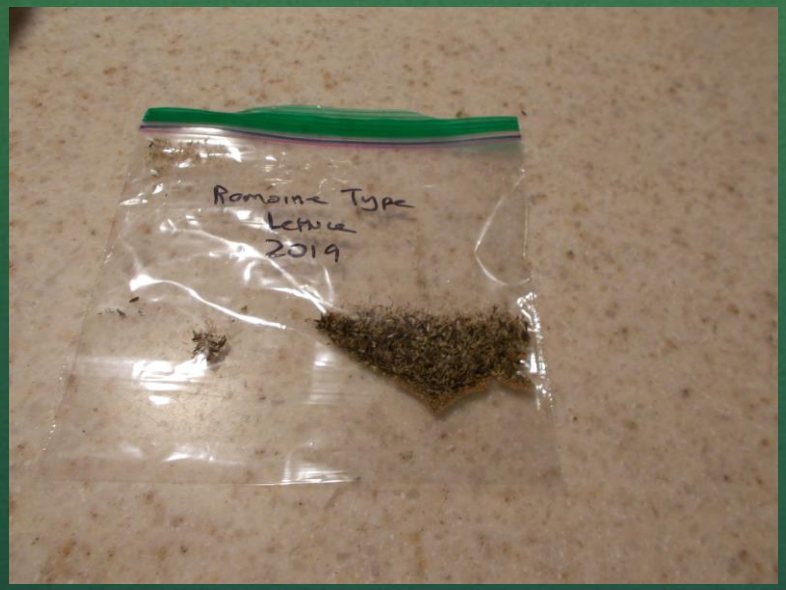
Annuals - Lettuce

- The remaining plant material will contain seeds and chaff.

Annuals - Lettuce

- Tap bowl to bring chaff on top of seeds.
- Remove as much chaff as you can with your fingers.

Annuals - Lettuce



- Place remaining material (mostly seeds) into a LABELLED bag.
  - Type of Plant
  - Cultivar
  - Date

Annuals - Solanaceae

- Propagating Tomatoes, Tomatillos, Eggplants, Peppers, and Potatoes
  - Inbreeding - Have perfect flowers, but can cross within species with wind and insects.
  - To maintain genetic purity, isolate or cage.

Annuals - Solanaceae

- Harvesting Tomatoes, Tomatillos, Eggplants, Peppers, and Potatoes
  - Allow to become dead ripe. Use finger to scrape out seeds.
  - Put seed/vegetable mixture in water and stir vigorously. Good seeds will sink and immature seeds and junk will float. Pour off junk.
  - Tomato seeds should be fermented until moldy.
  - Strain, wipe water off strainer, and pour seeds into glass or ceramic dish to dry. Stir twice daily while drying to prevent clumping.

Annuals - Solanaceae

- Harvesting Tomatoes, Tomatillos, Eggplants, Peppers, and Potatoes
  - Peppers will retain 50% germination up to three years when stored in cool, dark, dry area.
  - Store tomato seeds up to 4 to 10 years.
  - Store tomatillo seeds up to 3 years.

Annuals - Tomatoes

Annuals - Tomatoes

- Use a very, very ripe tomato for seeds – riper than you would want to eat.

Annuals - Tomatoes

- Cut the tomato open.

Annuals - Tomatoes

- Scrape out tomato seeds from the tomato and place in bowl.
- Allow to ferment in juice until moldy.

Annuals - Tomatoes

- Rinse seeds in sieve.

Annuals - Tomatoes

- Put in bowl.
- Allow to dry thoroughly.
- Store in a labeled bag or envelope..

Annuals - Tomatillos

Annuals - Peppers

Annuals - Potatoes

Cross-Pollinated Plants

- Imperfect Flowers
  - Monoecious - separate male and female flowers on the same plant
    - May be fertilized by insects and/or wind
    - Examples:
      - Corn
      - Cucumbers
      - Melons
      - Squash and Pumpkin

Outbreeding Annuals and Annuals with Imperfect Flowers

- Cannot self-pollinate, so are pollinated by wind and/or insects.
- Must be isolated to maintain genetic purity.
- Examples:
  - Corn
  - Cucumbers
  - Melons (cucumis melo)
  - Radishes
  - Spinach
  - Squash
  - Watermelons

Annuals - Radishes

- Propagating Radishes (brassica raphanus sativus)
  - Will cross with other radish varieties but no other brassicaciae.
  - Must be insect pollinated.
  - To keep genetic purity:
    - Propagate one variety per season. OR
    - Separate by ½ mile and use caging techniques.

Annuals - Radishes

- Harvesting Radishes (brassica raphanus sativus)
  - Let bolt, bloom, and go to seed (3 foot seed stalks). Allow seed pods to dry.
  - Open seed pods, empty seeds and allow to dry. (Very irritating!)
  - Gently pound stubborn pods with a large hammer or wooden maul.

Annuals - Radishes

Annuals - Radishes

- Allow pods to mature and dry before harvesting seeds.

Annuals - Radishes

- Break off pods from plants.
- Break pods up in bowl.

Annuals - Radishes

- Place pod material into strainer over bowl.
- Shake vigorously and manipulate with hands to separate pods from chaff.

Annuals - Radishes

- Pods and chaff should remain in the strainer.
- Seeds should fall through the strainer into the bowl.

Annuals - Radishes

- Collect seeds.
- Store in labeled bag or envelope.

Annuals - Corn

- Corn
  - Outbreeding - Will cross with other corn up to one mile away.
  - To maintain genetic purity, isolate or bag.

Annuals - Corn

- Corn
  - Allow corn kernels to fully develop until the kernels are "dented."
  - Allow husk to turn brown on stalk.
  - Harvest and shuck ear. Allow ear to dry for several weeks.
  - Rub kernels off ear.
  - Store in envelope in cool, dry place.

Annuals - Squash

- Propagating Squash (cucurbita) (summer squash, winter squash, pumpkins)
  - Outbreeding - 6 species – will cross within species but not outside of species
  - Species:
    - Cucurbita maxima (All Gold, Alligator, Amish Pie Pumpkin, Atlantic Giant, Atlas, Banana, Big Max, Buttercup, Hubbard, Winter Marrow, Turban)
    - Cucurbita mixta (Big White Crookneck, Cushaw, Seroria Squash, Silver Seeded Gourds)
    - Cucurbita moschata (Butternut, Cheese, Field Pumpkin, Golden Cushaw, Maryland Pie Pumpkin, Orange Cushaw, .

Annuals - Squash

- Propagating Squash (cucurbita) (summer squash, winter squash, pumpkins)
  - Species, continued:
    - Cucurbita pepo (Acorn, Cocozelle, Crookneck, Gourds, Hondo Small Sugar Pumpkin, Jack – 0 'Lantern, Scallop (patty pan), Small sugar pie, spaghetti squash, vegetable marrow, zucchini
    - Cucurbita foetidissima (calabazilla or buffalo gourd)
  - One variety from each species can be grown side-by-side.
  - Separate same species by ½ mile or hand pollinate.

Annuals - Squash

- Harvesting Squash (cucurbita) (summer squash, winter squash, pumpkins)
  - Grow until fully mature.
  - Summer squash must be left to grow until large with hard-shelled rinds that cannot be dented by a fingernail.
  - Let sit for 3 weeks or longer for more viable seed.
  - Mark seed squash with a felt pen before storing.
  - Open squash, remove and rinse seeds in colander, drain and dry.
  - Store up to 6 years in cool, dry, dark conditions.

Annuals - Squash

- This is a mature spaghetti squash.

Annuals - Squash

- Cut the squash open.

Annuals - Squash

- The seeds will be attached to the interior of the squash.
- Remove the seeds from the squash.
- Clean the membranes and fibers from the seeds.

Annuals - Squash

- Dry the seeds in a bowl.
- Store in a labeled bag or envelope.

Annuals - Melons

- Propagating Melons (cucumis melo) (muskmelon, cantaloupe, honeydew, casaba, pocket melon, Armenian cucumber)
  - Outbreeding
  - Each plant produces male and female flowers.
  - Rely on insects for pollination.
  - All within the same species will cross. Cumelons! EEEWWWW!
  - To prevent random pollination, hand pollinate as for squash.

Annuals - Melons

Annuals - Melons

- Propagating Melons (cucumis melo) (muskmelon, cantaloupe, honeydew, casaba, pocket melon, Armenian cucumber)
  - To hand pollinate:
    - For the melo species only, the plant will abort approx 80% of the female blossoms, so only 10 to 15% of hand pollinated blossoms will develop into fruit.
    - Use small pieces of masking tape (1/4" wide and 1.5" long). Pinch the tape together beside the flower but leave tip ends apart to make it easier to untape.
    - Use the first female flowers that bloom and remove non-hand pollinated fruits to improve maturation ratio.

Annuals - Melons

- Harvesting Melons (cucumis melo) (muskmelon, cantaloupe, honeydew, casaba, pocket melon, Armenian cucumber)
  - Grow fruit to full maturity and harvest.
  - Allow fruit to continue to ripen for another 20 days after harvesting.
  - Cut open fruit and remove seeds.
  - Clean off flesh and seed attachments by straining or fermenting (fermenting is better).
  - Dry seeds on rigid surface away from direct sunlight until they break in half rather than bend.
  - Store up to 5 years in cool, dry, dark location.

Annuals - Watermelons

- Propagating Watermelons (cucumis lanatus)
  - Outbreeding - All varieties of watermelon will cross
  - Isolate by ½ mile to prevent cross pollination by insects OR
  - Hand pollinate.

Annuals - Watermelons

Annuals - Watermelons

- Harvesting Watermelons (cucumis lanatus)
  - Most reliable method of determining ripeness is observing when the small tendril directly opposite the fruit's "peduncle" (stem attachment) changes from green to brown and becomes dry.
  - Seeds are mature when watermelon is ready to eat.
  - Eat watermelon, spit seeds into cup, collect cups, wash seeds gently in mild dish detergent, pour seeds into strainer, rinse thoroughly, and dry.
  - Store for up to 6 years in cool, dry, dark place.

Annuals - Cucumbers

- Propagating Cucumbers (cucumus sativus)
  - Outbreeding -All cucumbers will cross (except for Armenian cucumbers).
  - Isolate by ½ mile or hand pollinate.
  - Hand pollination is usually 85% successful.
  - Hand pollinate like squash.

Annuals - Cucumbers

Annuals - Cucumbers

- Harvesting Cucumbers (cucumus sativus)
  - Grow cucumbers for seed to full maturity – past the edible stage (e.g., golden oldie) – deep yellow or orange and soft.
  - Cut cucumbers open and scoop seeds into large bowl. Add as much water as seeds. Set bowl away from direct sunlight to ferment for 1 to 3 days. Some mold may form. Stir twice per day. Fermentation is complete when most seeds have settled to bottom of bowl and seedcases are floating on top.

Annuals - Cucumbers

- Harvesting Cucumbers (cucumus sativus)
  - Stir mass while adding water, allowing clean seeds to settle to the bottom.
  - Pour off debris with excess water.
  - Repeat until only clean seeds remain.
  - Pour seeds into strainer, wipe bottom of strainer to remove moisture, and dump seeds to dry on non-stick surface.
  - Store up to 10 years under ideal conditions.

Annuals - Cucumbers

- Harvest seeds from a very mature cucumber.
- It should be much more mature than you would want to eat.

Annuals - Cucumbers

- Cut the cucumber open.
- Remove the seeds from the pulp and place in a bowl.

Annuals - Cucumbers

- Allow to ferment for several days in the cucumber liquid.
- Rinse thoroughly and strain off water.
- Allow to thoroughly dry.
- Store in a labeled bag or envelope for up to 10 years.

Cross-Pollinated Plants

- Imperfect Flowers
  - Dioecious - separate male and female plants
    - May be fertilized by insects and/or wind
    - Examples:
      - Asparagus
      - Spinach

Annuals - Spinach

- Harvesting Spinach (spinacia oleracea)
  - Spinach bolts when daylight reaches 12.5 to 15 hours; faster if exposed to alternating cold and hot temps. Plant in very early spring or late fall.
  - Allow to bolt, bloom, and go to seed.
  - Dry seed in the field or pull plants when seed is fully formed but not yet dry OR
  - Harvest directly from plants by stripping seeds off in an upward motion and let them fall into basket or sack.
  - Dry.
  - Will retain 50% germination for 5 years when stored under ideal conditions.

Annuals - Spinach

- Propagating Spinach (spinacia oleracea)
  - Outbreeding - Plants produce either all male flowers or all female flowers. Unique. Use ratio of 1 male to 2 female plants.
  - Prickly seeded varieties produce flat leaves while smooth seeded varieties produce wrinkled leaves.
  - Will cross with other varieties of spinach.
  - Wind pollinated; separate by 5 to 10 miles or use a bagging technique (min 2 male, 4 female per cage)

Annuals - Spinach

Annuals - Spinach

Biennials

- Cannot self-pollinate, so are pollinated by wind and/or insects.
- Require isolation to maintain genetic purity.

Biennials

- Allium
  - Garlic
  - Leeks
  - Onions
- Beets and Chard
- Brassica Rapa
  - Broccoli Raab
  - Chinese Cabbage
  - Turnips
- Brassica Oleracea
  - Broccoli
  - Brussels Sprouts
  - Cabbage
  - Cauliflower
  - Collards
  - Kale
  - Kohlrabi

Biennials

- Umbelliferae
  - Carrots
  - Celery
  - Dill
  - Fennel
  - Parsnips
  - Parsley
  - (Queen Anne's Lace)
  - (Wild Fennel)

Biennials – Allium

- Propagating Allium (onions, garlic, leeks)
  - Outbreeding - Allium flowers are perfect but do not self-pollinate. Flies and bees are the primary pollinators.
  - Allium within the same species will cross-pollinate within 1 to 3 miles. Leeks, onions, and garlic do not cross with each other.

Biennials - Allium

Biennials - Allium

- Propagating Allium (onions, garlic, leeks)
  - To preserve seed purity:
    - Isolate varieties or alternate day caging.
    - Hand pollinate every day for 2 weeks to 30 days.
    - Bag with corn tassel bags and secure with removable strings or plastic twist ties at least 10 flower heads of each variety before any of the individual flowers open.
    - Each morning, between 9:00 a.m. and noon, remove bags from as many heads as can be kept free of insects. Use a camel hair brush to transfer pollen between open flowers, moving from head to head and back again. Rebag.
    - Remove bags when all the seeds have set. Tag the flower heads for identification during harvest.

Biennials - Allium

Biennials - Allium

- Harvesting Allium (onions, garlic, leeks)
  - Plant in the fall. Overwinter. The plant will flower. Collect seeds or bulbils (little bulbs at the top of the plant) as soon as the plant dries. Do not dry in a food dehydrator over 95 degrees.
  - Seeds will fall out of the pods when the heads are dry. The remainder can be removed by jogging on top of the heads or using a small seed thresher.
  - Winnow the seeds from the seedpods and debris.

Biennials - Allium

- The onion scape should be dry with mature seeds.

Biennials - Allium

- Crunch the scape with your hands to release the seeds.

Biennials - Allium

- Place crunchedd scapes in sieve over bowl and shake vigorously to separate seeds from scapes.
- Seeds will fall into bowl.

Biennials - Allium

- Place remaining material - mostly seeds into a labelled bag or envelope.
- Allium seeds only store well for 1 to 2 years.

Biennials – Beets and Chard

- Propagating beta vulgaris (chenopodiaceae) (garden beet, sugar beet, swiss chard)
  - Outbreeding - All beets and chard will cross with each other.
  - Wind pollinated; pollen can travel up to 5 miles.
  - Crop isolation should be 2 to 5 miles. OR
  - Bag or cage at least 6 plants.
    - Overwinter, either out of the ground or covered with a low tunnel or other shelter. Allow plant to bolt, flower, and go to seed. Collect seeds.

Biennials – Beets and Chard

- Harvesting beta vulgaris (chenopodiaceae) (garden beet, sugar beet, swiss chard)
  - Overwinter, either out of the ground or covered with a low tunnel or other shelter.
  - Allow plant to bolt, flower, and go to seed. (4 foot stalk)
  - Collect seeds as they mature or cut entire stalk when much of it is mature. Thresh or jog in place on bag of dried stalks.
  - Store for 6 years (50% germination) in cool, dark location.

Biennials – Beets and Chard

Biennials – Brassica Oleracea

- Propagating Brassica oleracea (broccoli, Brussels sprouts, cabbage, cauliflower, collards, kale, kohlrabi, and mustard)
  - Outbreeding - All of these will cross with each other.
  - Have perfect flowers but require insects carrying pollen from one plant to another for pollination.
  - Propagate one variety every year. OR
  - Isolate by ½ mile, cage with introduced pollinators, or use alternate day caging.
    - 1 cage per variety, remove in morning and replace in evening
    - Use trapped flies or newly hatched bees for pollinators.

Brassica Seed Pod

Biennials – Brassica Oleracea

Biennials – Brassica Oleracea

- Harvesting Brassica oleracea (broccoli, Brussels sprouts, cabbage, cauliflower, collards, kale, kohlrabi and mustard)
  - Overwinter, allow to flower and go to seed.
  - Allow seedpods to fully develop, dry, and turn light brown.
  - Seedpods tend to shatter so harvest immediately.
  - Harvest progressively over several weeks as they mature.

Biennials – Brassica Oleracea

- Allow mature pods to thoroughly dry.
- Place in a bowl.

Biennials – Brassica Oleracea

- Crush the pods to allow the seeds to fall out of them.

Biennials – Brassica Oleracea

- Place crushed pods in sieve over bowl.
- Shake vigorously and knead with fingers to release seeds from pods.

Biennials – Brassica Oleracea

- A finer sieve may be used after this to further separate seeds from chaff.

Biennials – Brassica Oleracea

- Additional chaff may be manually removed.
- Store seeds in labeled bag or envelope.

Biennials – Brassica Rapa

- Propagating Brassica rapa (turnips, Chinese cabbages, and broccoli raab)
  - Outbreeding - All of these will cross with each other.
  - Have perfect flowers but require insects carrying pollen from one plant to another for pollination.
  - Propagate one variety every year. OR
  - Isolate by 1 mile, cage with introduced pollinators, or use alternate day caging.
    - 1 cage per variety, remove in morning and replace in evening
    - Use trapped flies or newly hatched bees for pollinators.

Biennials – Brassica Rapa

- Harvesting Brassica rapa (turnips, Chinese cabbage, and broccoli raab)
  - Overwinter, allow to flower and go to seed.
  - Allow seedpods to fully develop, dry, and turn light brown.
  - Seedpods tend to shatter so harvest immediately.
  - Harvest progressively over several weeks as they mature.

Biennials - Umbelliferae

- Propagating Umbelifferae (carrots, celery, dill, coriander, carrots, fennel, parsnips, and parsley)
  - Outbreeding - Have perfect flowers but cannot self-pollinate.
  - Are insect pollinated.
  - To produce pure seed:
    - Isolate – 3 miles from same species and weeds (Queen Anne's lace and wild fennel)
    - Hand Pollinate – every day for 14 to 30 days. Bag immature umbels before flowers open. Debag between 7:00 and 11:00 a.m. and rub camel's hair brush over open flowers from head to head and back again.
    - Alternate day caging.

Biennials - Umbelliferae

- Harvesting Umbelifferae (carrots, celery, dill, coriander, carrots, fennel, parsnips, and parsley)
  - Allow to overwinter or dig, store, and replant.
  - Allow to produce seed stalks, flower, and go to seed.
  - Cut umbels from plant when seeds are fully formed. Umbels can be further dried under 95 degrees.
  - Rub umbels between hands to dislodge seeds. Sift or screen.
  - Store carrot seeds for up to 3 years.

Resources

- Books
  - Ashworth, Suzanne, "Seed to Seed"
  - Gough, Robert and Cheryl Moore-Gough, "The Complete Guide to Saving Seeds"
  - Warnock, Caleb, "The Forgotten Skills of Self-Sufficiency used by the Mormon Pioneers"
- Corn Tassel and Blossom Bags
  - Southern Exposure Seed Exchange – www.southernexposure.com
  - Native Seeds/Search - www.nativeseeds.org

Seed Storage

- Store in paper envelopes, zip loc bags, or small containers (bungee cord containers)
- Label with type, variety, year, and source (if applicable)
- Store bags in metal tins, cherry buckets, or 5 gal containers
- Prevent moth infestation with diatomaceous earth
- Store in cool, dry, dark place
- OR Freeze - once only