

## Root Cellars, Gardens & Greenhouses: ESP Slideshow

The event this evening featured a 42 minute slideshow video produced by ESP. Most of the photos were taken by Edd Blackler; layout and video production by Catherine Haug. This summary includes some, but not all, of the photos used in the slideshow.

### Yenne Root Cellar and Garden

The Yenne Homestead included a small root cellar set into the slope near the original home. The body of the cellar was a small septic tank, without a bottom. A retaining wall constructed of railroad ties and anchored with steel bars and a chain around the body of the cellar held back the slope. Over the years, the railroad ties rotted, and have been replaced with concrete blocks.



An outer and an inner door provide entrance to the cellar. The floor is dirt; the septic tank cover in the ceiling is sealed shut. A 2" aluminum vent pipe exits through the ceiling and soil cover, and elbows to prevent moisture from getting into the pipe. There is no cold air intake vent; the doors provide sufficient air leakage. Electricity has been added, for light, and also for heat if needed, in the winter. The heater is an old rusty can with a light bulb inside.

Only root vegetables are stored here, and must be covered because the cellar is very humid.

Gerry had a young crop of lettuces just emerging; he covered them with a fine nylon mesh to keep the flies from laying eggs on the tender leaves.



### Hadden Root Cellar and Garden



Dave has constructed his above-ground root cellar over the last two years. It consists of a room with concrete block walls and arched, cast concrete ceiling, and gravel floor. A mound of dirt covers the structure; eventually the mound will be terraced around the sides and back using broken pieces of sidewalk to keep the dirt from sliding down. The fir retaining wall across the front is separated about 3 feet from the concrete, with dirt between. A plastic moisture barrier was placed between wood and dirt, and the area is capped with tin.

The entrance is a single insulated door.

Inside, on the left, are shelves for storage of grain and canned goods; on the right are three wood bins for storage of root vegetables in moist sand. Garlic hangs on the walls; also a gunny sack hangs at the ready to store potatoes.



3" PVC is used to ventilate the space: cold air intake enters from the front on the lower left; warm air exhaust vent exits in the back wall near the ceiling, and extends through the dirt on the top, elbowing downward at the tip to prevent rain from entering.



The garden is enclosed by a plastic deer fence to 6', with two strips of plastic electric fence tape above to extend the height. The asparagus bed was decimated by moles last year, so he is considering a wall set 18" into the ground, at the base of the fence, to exclude the varmints.

Fixed raised beds of wood frames comprise most of the garden. Some are equipped with PVC hoops to support frost covers in the fall; others have wood and plastic cold frame covers for early starts.

His strawberry bed is an old round metal tub, which he divides into three sections. All sections are thinned each year; each is replaced in the third year.

All watering is by overhead sprinklers. They can be attached to stakes to rise above the taller plants.

### **Discussion about deer fencing:**

Some gardeners swear by metal fencing, others by plastic mesh. See the Guerrant section for their creative mix of the two.

Keith B. told us about his non-fence system: water sprinklers activated by light motion sensors. He says that deer and other critters don't need further reminders to keep them away from the area. Very sensitive to even slight movement. Refer to [Motion-Activated, Non-Fence for Deer and Other Critters](#), with information on constructing this system, from Keith.

## **Funk Garden, Greenhouse and Root Cellar**

### **Humanure Compost**

Jeffrey started his tour with his composting system. He has a large bin for composting horse manure, which he uses in his garden and orchard. Adjacent to that are two smaller bins for humanure composting.

These bins are constructed of scrap metal mesh on four sides. A sheet of old metal roofing is used on the bottom, to



keep out grass. Sticks and other coarse material are piled 12" deep on top of the roofing to provide air and drainage. Humanure, leaves and grass clippings, kitchen scraps, and yard waste are piled on top. A blanket of straw can be added in the winter, to keep the internal temperature up.

Turn a humanure composting bin only after a few years. The bin on the left has been composting 4 years and is ready to use. The one on the right was just started this spring.



Jeffrey provides a humanure toilet in his shop. It consists of a hinged wood bench with a toilet seat over the hole. A plastic pail below collects the waste (both solid and liquid).

After each use, a handful of moist, slightly composted leaves is added to the pail. As the pail fills, it can be compressed using a wood plunger designed to fit the pail. When used properly, this toilet does not stink, even immediately after use. When the pail is filled, another takes its place while the pail's contents are added to the compost bin. It is then washed and filled with more leaves before returning to the toilet area.

## Humanure Discussion

Keith B. expressed concern that the compost bin does not get hot enough to kill pathogens in human waste, citing an example of hepatitis-B infected produce from a garden fertilized with humanure. His own composting kitchen and yard waste does not get hot enough to reach the hyperthermophylic phase required to kill seeds and pathogens. Jeffrey was not present to answer this, but Catherine pointed out that infection can also be gotten from improperly composted animal manure can also be infected, or waterways contaminated by improperly processed sewer wastes.

## Funk Garden

The new garden fence is made with wire strung between cedar posts (from Chapel Cedar in Troy). It will soon be woven with chokecherry branches, to match the gate.

Inside is a raised-bed garden area surrounded by a gopher fence set 18" into the ground, and a new orchard area.



## Rodent Discussion

Several gardens have had trouble with rodents. Jeffrey attested his solution of a low metal wall around the garden that extends 18" below ground is very effective; they will not dig deeper than this. (The same idea can also be applied to a chicken run - see Guerrant section for more).

## Funk Greenhouse



The 10' x 20' greenhouse is a partially below-ground add-on to the house; a stone retaining wall was constructed below the double-pane windows. The sloped roof is triple-wall polycarbonate, which insulates as well as the windows. Doors at each end provide ventilation, as will temperature-activated, louvered polycarbonate panels above the doors.

Inside, to either side of the central pathway are earthen benches with stone retaining walls, where plants are grown. In the early spring, the house is heated passively from the greenhouse.

## Funk Root Cellar

A potato store here all winter was still solid and fresh in June.

Constructed in a narrow space bounded by three concrete walls, the root cellar is divided from a warmer, dryer storage area by an insulated stud wall. 6" PVC ventilation pipes are at the opposite end:

- Cool air intake vent opens near the floor;
- Warm air exhaust opens near the ceiling.



These vents are controlled by dampers operated together from the room above, where the thermometer is also located. They exit through the exterior wall where the warm air exhaust rises in an 8' stack; the cool air intake elbows low, to the east.

## Guerrant Greenhouse, Henhouse & Garden

### Greenhouse

This passive solar pit greenhouse was built to State of Montana specs. The 8' x 6' body of the greenhouse is totally below ground; only the plastic roof structure is above ground, giving an 8' rise from floor to peak. Each end of the roof is also plastic, with metal louvers for exhaust (they don't provide enough exhaust to keep the greenhouse cool in the hot summer, so it needs to be emptied out).

Wood counters built over earth line each side of the center path. The structure is accessed by stairs at one end.



## Henhouse & Chicken Run



The henhouse is a wood structure equipped with nesting boxes, feeding trough, and roosting rails. The outside rear of the henhouse doubles as tool storage for the garden.

Except at night when they are locked in the henhouse, the hens are free to roam the property, except the fenced tool storage, garden & orchard areas.

They contribute to the maintenance of the compost by digging and breaking it up. In addition, a chicken run, with chicken wire ceiling and walls (that extend 18" below ground to discourage invaders) surrounds the front and sides of the henhouse.

Annie rears a different breed of hens each year, so she can easily keep track of their ages. She no longer keeps a rooster, because the hens pecked her last two to death.



## Chicken Discussion

The group expressed interest in a presentation on how to raise chickens. Several in the audience have experience, from just 2 to over 30 hens; free range vs. enclosed pen; and eggs vs. meat, for a panel-led discussion. Chicken tractors would be another great topic.

Keith B. reports that chickens can be very destructive to your yard, if you allow them to free-range; on the other hand, Linda has not seen much destruction from her hens.

Hens will produce about 1 egg per day, but typically fewer in winter. After a certain age, their egg production declines. Roosters are not necessary for hens to lay eggs, only for fertilized eggs.

## Guerrant Garden & Orchard

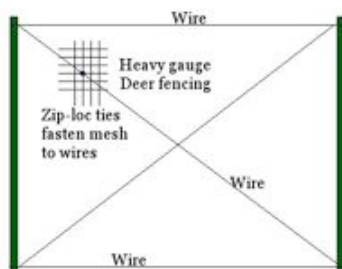


French Intensive Gardening is the method deployed in Annie's garden, and Celia Mildren was her mentor. This beautiful garden is sited on a south-facing slope, with raised, non-fixed beds in terraces across the slope, to hold heat and improve drainage. A center aisle allows access to beds; metal fence posts at the end of each row guide the watering hoses.

Celia advised the inclusion of flowers in a vegetable garden, for beauty, companionship and to attract pollinators. Iris, violas, dahlias, poppies, hollyhocks, lavender, and many others are evident throughout the garden and orchard.

Copious quantities of composted steer and llama manure are incorporated into the soil each spring. Aged silage is used as mulch, especially in the raspberry beds at the top of the slope.

An artful garden gate is made from an old iron bedstead, with a curtain of fine plastic mesh hung above it. Even though it easily moves out of the way, deer have never broached it. Above the gate a sign reads, "What sweet sweet delight to see my garden morning noon and night."



Both the garden and orchard areas are fenced to keep out deer and other invaders. Wire fencing surrounds the garden because it is what they had on-hand. A clever combination of wire and plastic fencing protects the orchard and is very wind resistant.

## Haug Root Cellar and Garden

### Revamping the Root Cellar

A 6' x 15' root cellar was included in the NW corner of the basement, when the house was built in 1949. It has floor and 3 outside walls of poured concrete, and one interior stud wall. Features included: shelves for canned foods, window for ventilation, and a sandbox for storage of root veggies in moist sand.



Unfortunately, food did not keep well, and the room smelled musty. Likely reasons were insufficient ventilation, and lack of insulation from the heated basement on the other side of the stud wall.

Improvements:

- Added blue foam insulation to stud wall and door, ceiling, and outside walls to 12" below ground level. Used fiberglass to insulate around the cross-braces in the ceiling. Plexiglass storm window was added.
- Added cold air intake vent on east end, with manual damper; and warm air exhaust vent on west end, using 4" aluminum vent pipe.



- Drilled  $\frac{3}{4}$ " holes, on 2" centers all along the back of each shelf, to allow air circulation around the shelves.
- Replaced original wall-mount incandescent light fixture with fluorescent shop light on the ceiling.



### Root Cellar Discussion

Keith B. suggests that in early spring, when the stored produce has been consumed, the space might be used for indoor seed starting, as it can provide a controlled environment ideal for spring growth.



## Garden & Orchard

These are sited in a sunny area about 30' by 120'. Apple, crabapple and pear trees comprise the orchard on the eastern end of this area. A new single raised bed garden bounded by concrete "rock" wall is at the western end, with space for two more beds reserved for the future. In addition, 4 "Smart Pot" containers are home to two varieties of potato (reds for summer enjoyment; yellow finns for winter storage), and two 3-Sisters (corn, bean or pea, and summer or winter squash).

PVC hoop frame has been added for a lightweight insect cover during the growing season, and frost cover in the fall.

## A Sampling of Ideal Storage Requirements

### Cold & Very Moist (32° - 40° F; 90 - 95% humidity)

- Carrots, Beets, Parsnips, Turnips, Leeks
- Short time: Broccoli and Brussels Sprouts

### Cold & Moist (32° - 40° F; 85 - 90% humidity)

- Apples, Pears, Oranges
- Cabbage, Potatoes (White)

### Cool & Moist (40° - 50° F; 85 - 90% humidity)

- Cucumbers, Ripe Tomatoes, Cantaloupe, Watermelon
- Sweet Peppers (45 - 55 F), Eggplant (50 - 60 F)

### Cool & Dry (32° - 50 F; 60 - 70% humidity)

- Onions, Garlic

### Moderately Warm & Dry (50° - 60° F; 60 - 70% humidity)

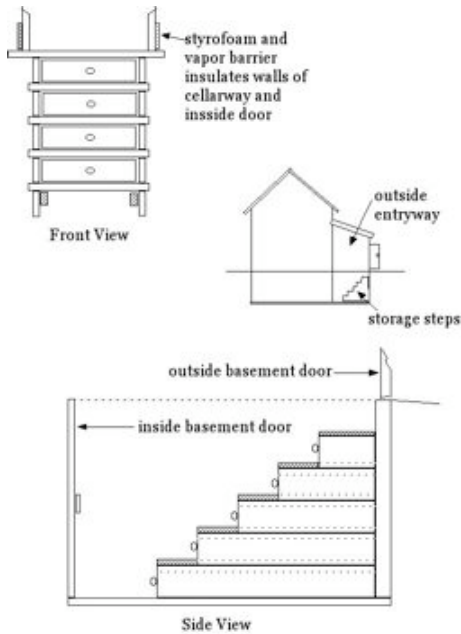
- Pumpkins, Winter Squash, Sweet Potatoes

## Storage Discussion

As shown above, five different conditions are needed for optimal storage needs. How does one provide all of these? A few ideas (Refer to More Information section for resources):

1. Take advantage of temperature differentials in the cold, damp root cellar and store those items that need the coldest conditions near the floor, and those that need slightly warmer conditions on higher shelves.
2. Moisture can be added to sand for root veggie storage, leaving the rest of the room less humid.
3. Other storage locations can also be considered, such as the cold box in a basement window (see Root Cellar Ideas section), potato clamp in a hole in the ground, or under a porch (see sources for website links).

## Root Cellar Ideas: Under the Cellar Stairs



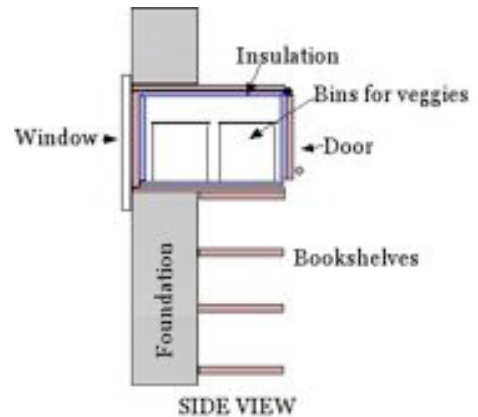
Especially in the midwest, most older homes have exterior stairwell to the cellar, covered by an outside entryway and separated from the basement by the foundation and an inner door. Because this cellar entry is unheated, it provides ideal conditions for vegetable storage. An interior stairwell may also work, if the basement is unheated and insulated from the heated space above.

Simply convert the stair risers to drawers, supported the full length by 2x4s. Insulate walls of stairwell with blue foam and cover with masonite or other vapor barrier.

(Sketch and info from *Root Cellaring* book <sup>1</sup>).

## Root Cellar Ideas: Cold Box in Basement Window

A basement window that can be opened/closed can be used to hold a small double-walled cold box. The box must fit snugly into the opening. Insulation is placed between the double walls on two sides, bottom and top, and also in the door. The side opposite the door fits against the operable window with a screen to exclude critters. If necessary, the box can be supported where it extends into the room by struts or angle irons. In addition, bookcases surrounding the box help provide support.



To operate the cold box: In the fall, open the window to cool the box. In the winter, close window as needed to keep contents from freezing.

(Sketches and info from *Root Cellaring* book <sup>1</sup>).



## Harvest & Storage: Do's & Don'ts

### Do:

- \* Harvest storage-produce in cold weather when soil is dry.
- \* Keep veggies as cool as possible between harvest & storage.
- \* Store only your best -- sound, unbruised and mature.
- \* Cut leafy tops of root veggies to within an inch of crown before packing away.
- \* Keep fruits and veggies in small piles, not heaped in large mounds.
- \* Handle produce carefully.
- \* Provide ventilation in storage space, and air circulation around shelves and containers. Raise veggie containers several inches above floor.
- \* Check stored food often; weed out questionable specimens.
- \* Pack root veggies in damp (but not soggy) sand or sawdust. If cellar is dry, may need to add moisture to packing material once or twice during winter.
- \* Keep record or map of what is stored where, especially if using multiple storage areas.

### Don't:

- \* Wash root veggies before storing them.
- \* Put veggies right on a bare concrete floor.
- \* Store insect-damaged, bruised, or immature produce.
- \* Keep onions, garlic, squash, pumpkins or sweet potatoes in a damp place.
- \* Store stemless squash or pumpkins.
- \* Give root crops or storage fruits large doses of high-nitrogen fertilizer.
- \* Seal incompletely dried nuts and grains in tightly closed containers.
- \* Feel badly if a small percentage of stored produce spoils. You're still way ahead growing & keeping your own good food.

## Sources

1. *Root Cellaring*, by Mike and Nancy Bubel (1979)
2. *The Humanure Handbook* by Joseph Jenkins
3. Mother Earth News: Store Root Veggies This Winter:  
([www.motherearthliving.com/issues/motherearthliving/organic\\_gardening/Winter-Root-Crop-Storage\\_145-1.html](http://www.motherearthliving.com/issues/motherearthliving/organic_gardening/Winter-Root-Crop-Storage_145-1.html))
4. National Gardening Association: How to Store Root Crops  
([www.garden.org/articles/articles.php?q=show&id=623](http://www.garden.org/articles/articles.php?q=show&id=623))
5. Selfsufficientish: Build a Potato Clamp & Other Ways of Storing Veggies:  
([www.selfsufficientish.com/clamp.htm](http://www.selfsufficientish.com/clamp.htm))
6. Tribe Watch: [www.tribewatch.com/rootcell.htm](http://www.tribewatch.com/rootcell.htm)