YMCA @ Virginia Tech

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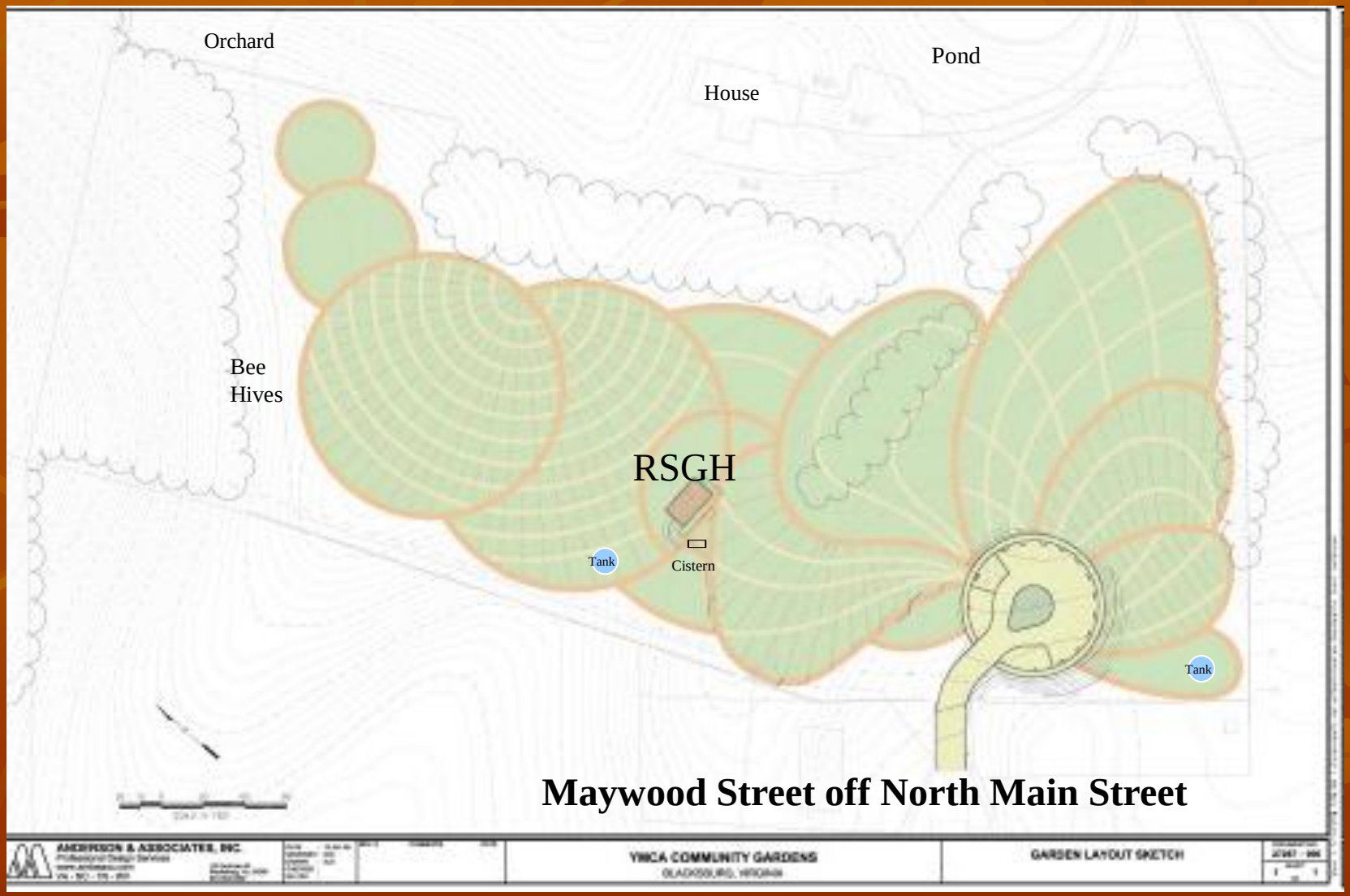
L. David Roper

http://arts.bev.net/RoperLDavid

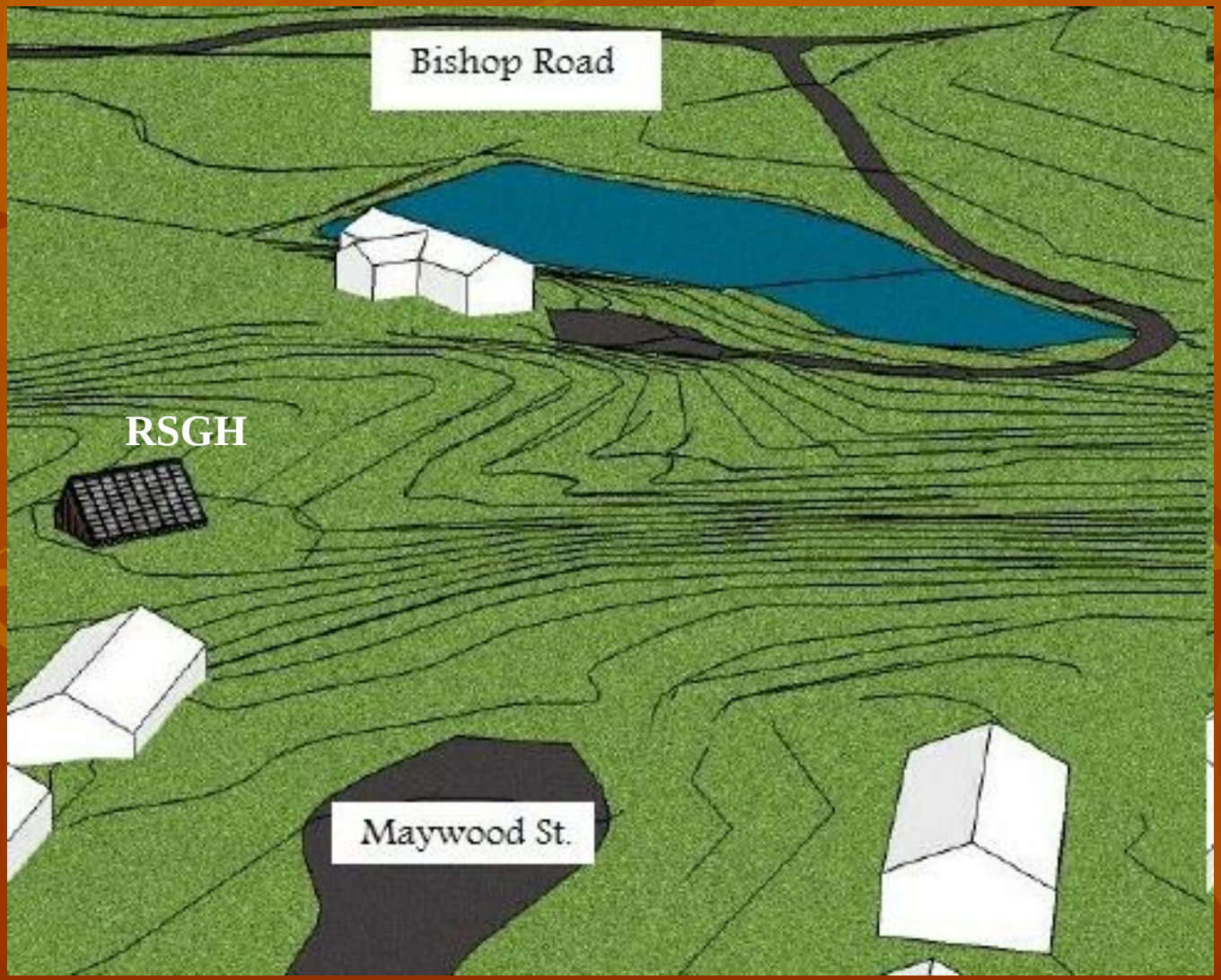
http://www.roperld.com/science/YMCASolarGreenhouse.htm

http://www.roperld.com/science/YMCASolarGreenhouse.ppt

YMCA @ Virginia Tech Community Gardens



YMCA @ Virginia Tech Community Gardens




09.11.2009

April 2010

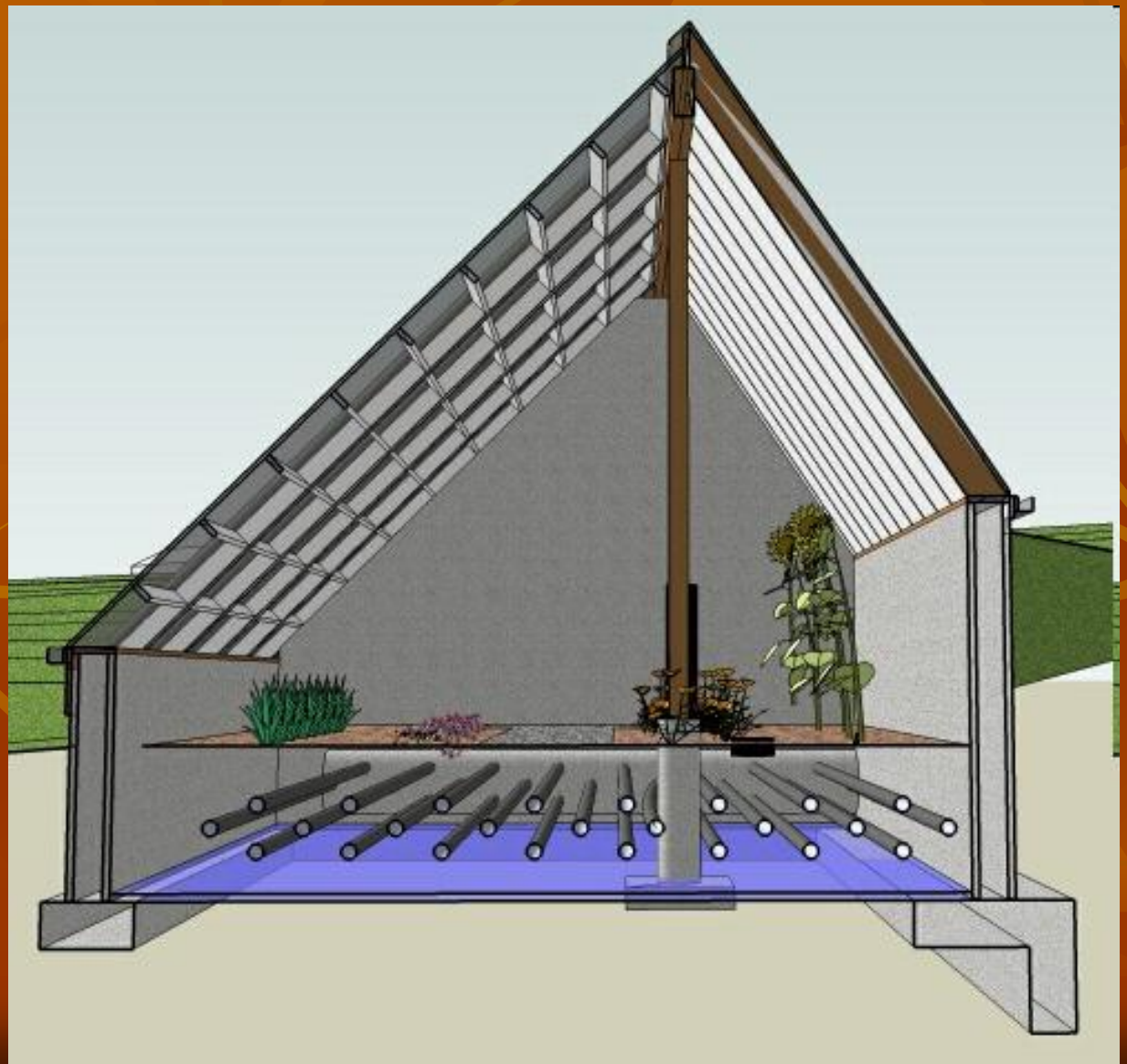
July 2010

YMCA @ Virginia Tech
Solar Greenhouse

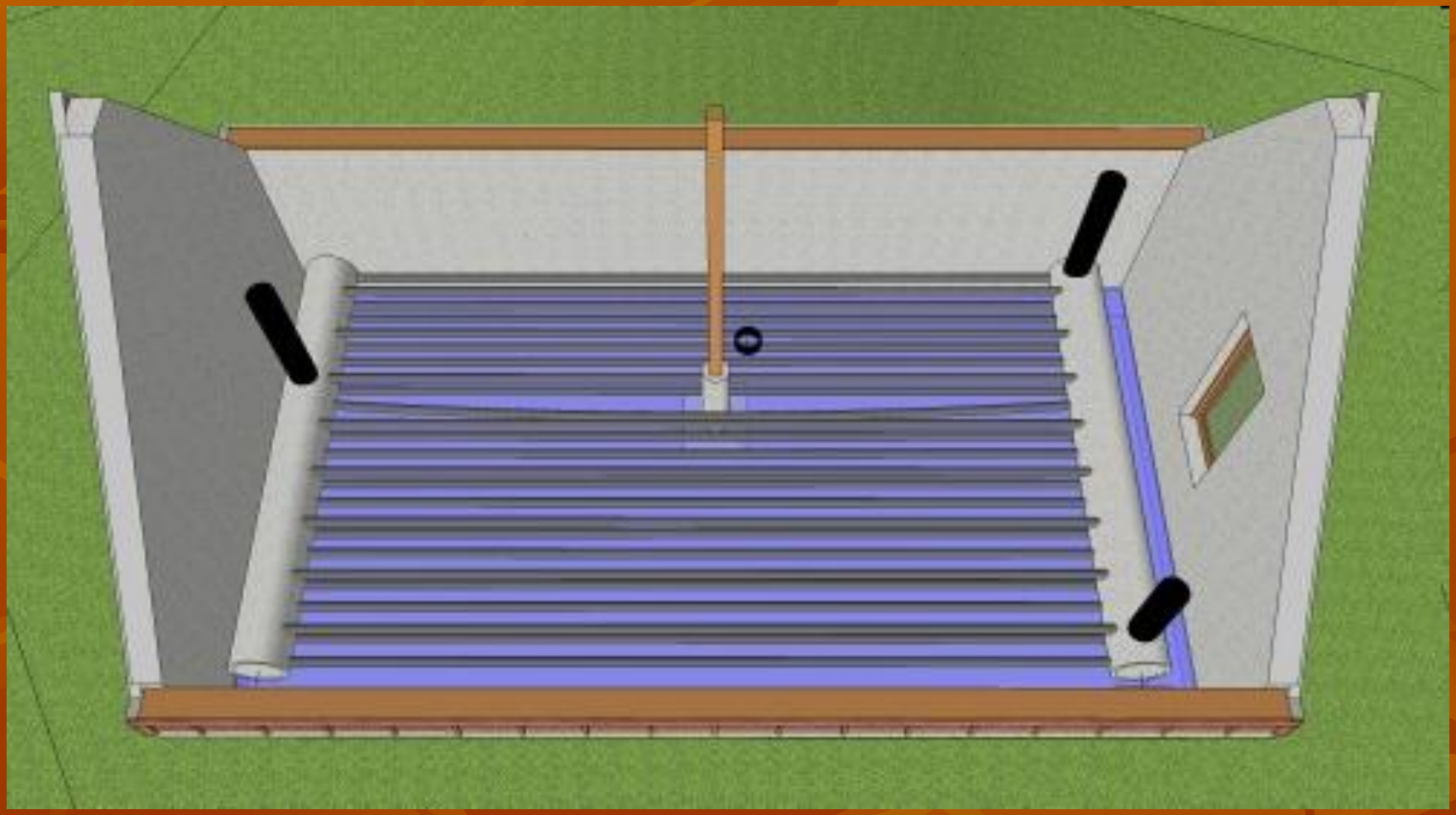
Conceived in late 2006.
Colley Architect's drawings approved in July 2008.

Architecture by Colley Architects

YMCA @ Virginia Tech
Solar Greenhouse



Heat Sink



- Air flow ~4ft/sec through 4” slotted drain pipes. (395 cfm)
- Move 5 times the SGH volume per hour. (500 cfm)

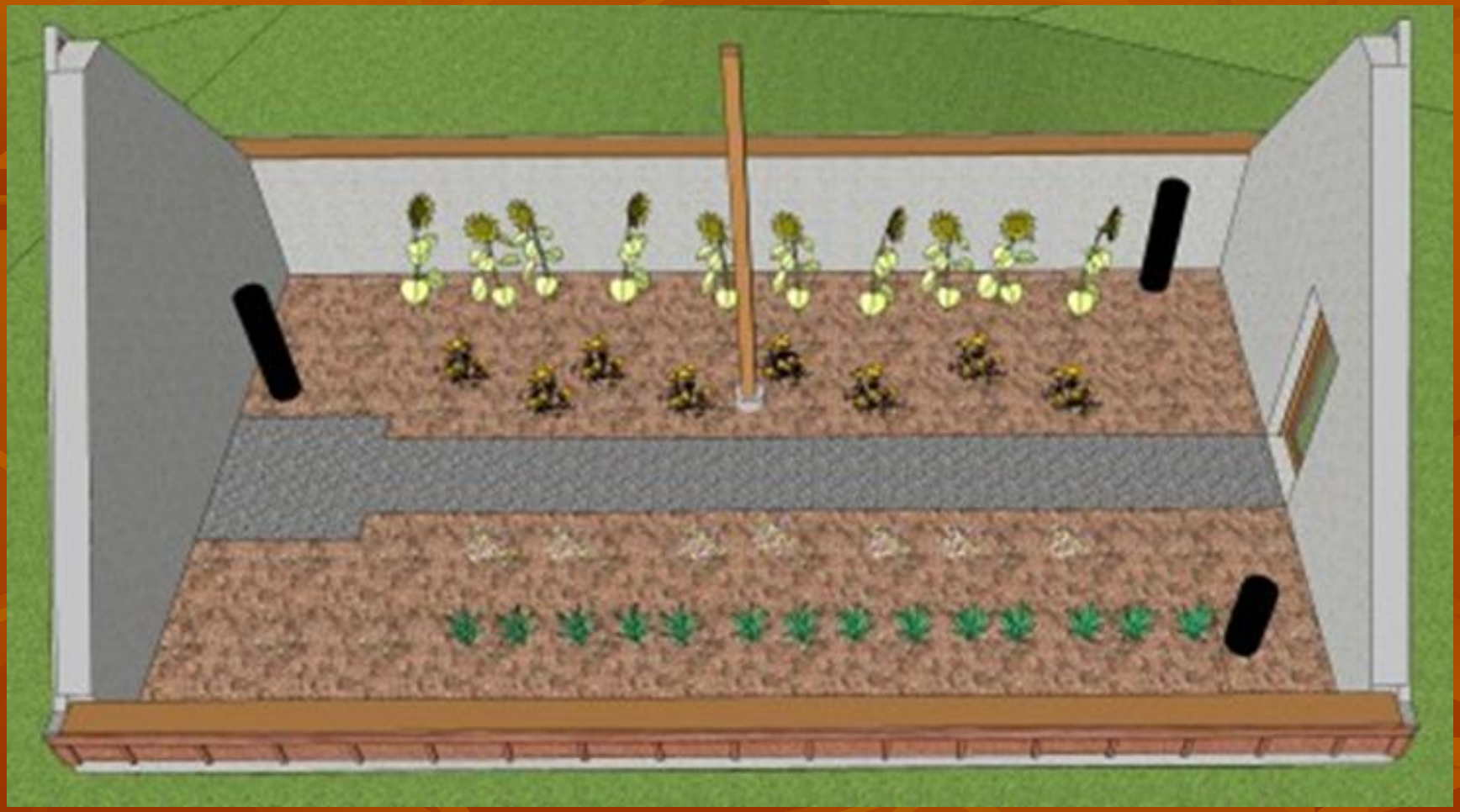
Traditional Solar Greenhouse Heat Sink

Traditional Solar Greenhouse Heat Sink

Omega Lane Farm near Rural Retreat VA uses rectangular honey cans.

Blue promotes vegetative growth.
Red promotes flowering.

Planting Beds



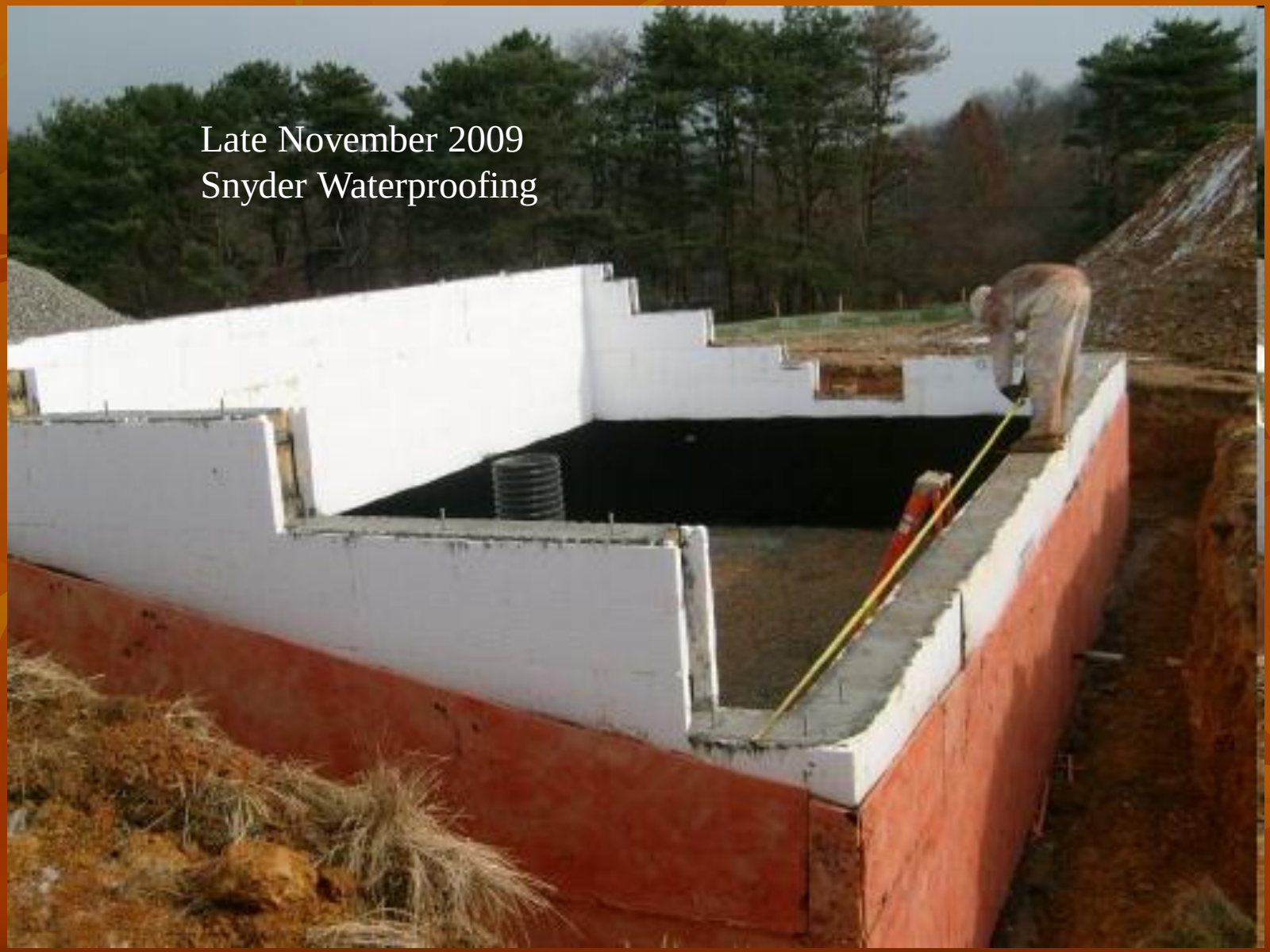
Excavation

Excavation & Footers

Insulated Concrete Forms (ICF)

Pouring Concrete into ICF

Insulation Inside & Outside



Heat Sink Insulation

6-mil polyethylene on bottom; 2” insulating board; 6-mil polyethylene on top.

Heat Sink Structure

Heat Sink

Installing Rafters

North Roof

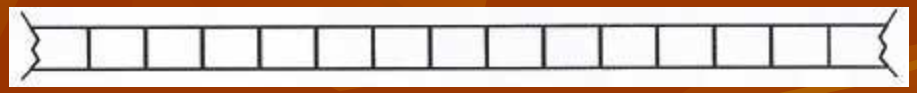
West End

East End

Installing Polycarbonate

Polycarbonate On

20’ long x10-mm thick double-walled polycarbonate with ribs separated by 1 cm.



Closed-Cell Foam Insulation

Wall panels outside and inside are Hardie Board, a cement-fiber composite.

Inside Hardie Board

Painting


Middle April 2009
Virginia Tech students
Gail Billingsley
VTYMCA

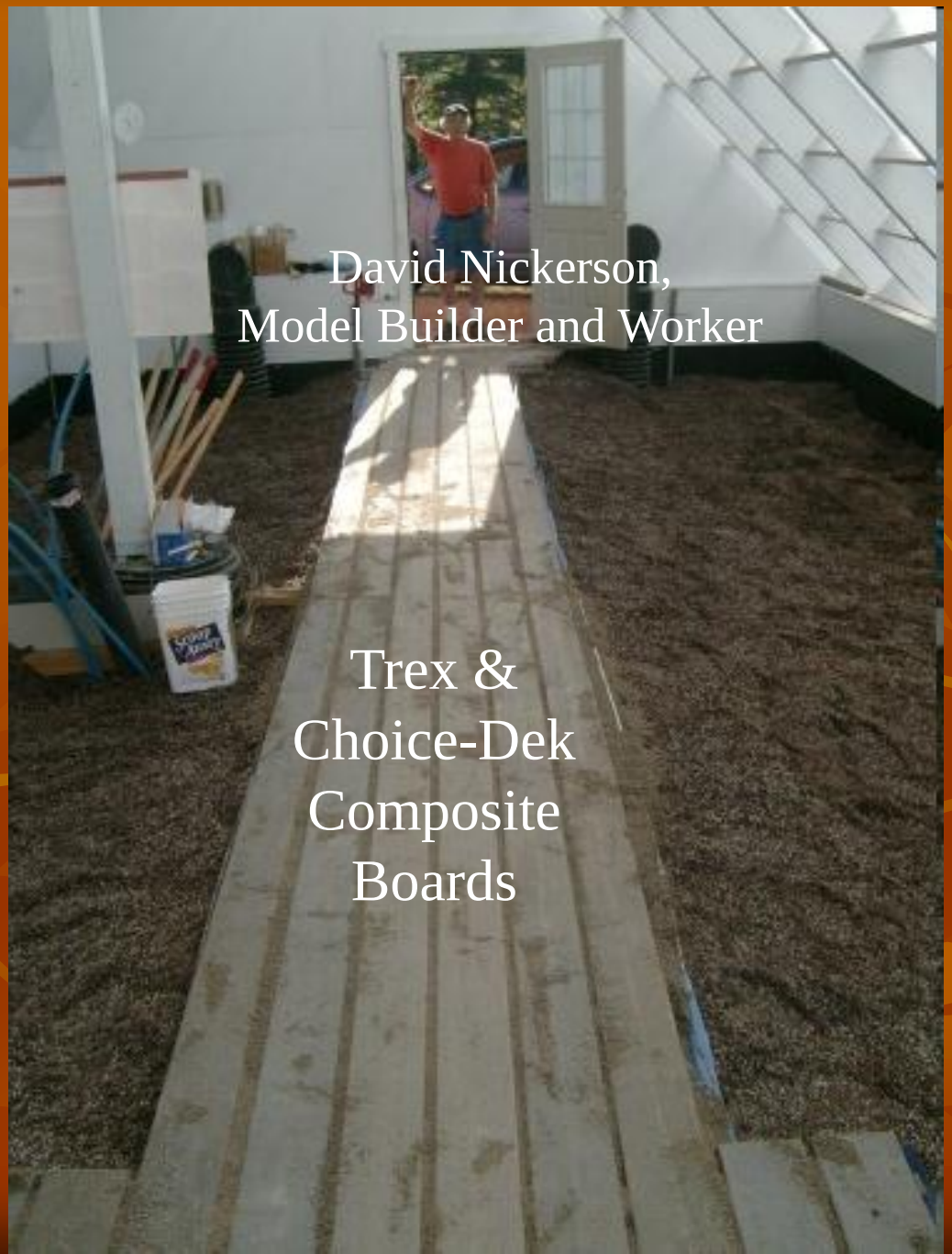

Abi Convery
VTYMCA

Building Soil & Walkway

Electrical

May 2009
Chris Roberts of Baseline Solar

2090-Gallons Cistern


David Nickerson,
Model Builder and Worker
Trex &
Choice-Dek
Composite
Boards

Heat-Sink Inlet & Shelves

Vent Windows & Openers

Water System

Control Panel

Chris Roberts
Baseline Solar

Heat-Sink Fan Thermostats

Heat-Sink Fan Variable-Speed Switch

Window Fan Thermostat

Window-Openers Thermostats & Switch & 120V AC->24V DC Converter

Thermostats

- **Heat-Sink Cooling**: fan on at 70 degrees, off at 61 degrees.
- **Heat-Sink Heating**: fan on at 50 degrees, off at 59 degrees.
- **Window Opener**: Opens at 70 degrees, closes at 50 degrees.
- **Window Fan**: On at 85 degrees, off at 65 degrees.

Roper Solar Greenhouse at night.
3 lights on left are LEDs.
3 lights on right are CFLs.

Payne Shelter

Changes I Would Make

- Do not insulate the inside of the concrete walls; instead double the insulation outside the concrete walls. Gives more thermal mass.
- Install much larger vent windows for more cooling.
- Connect the ends of the 4” slotted drain pipes closer to each other at the 24” end pipes.
- Better brace the Hardie-board that separates the rocks under the walkway from the planting soil.
- Not put the soil in until all inside structure is built.

Winter of 2009-2010

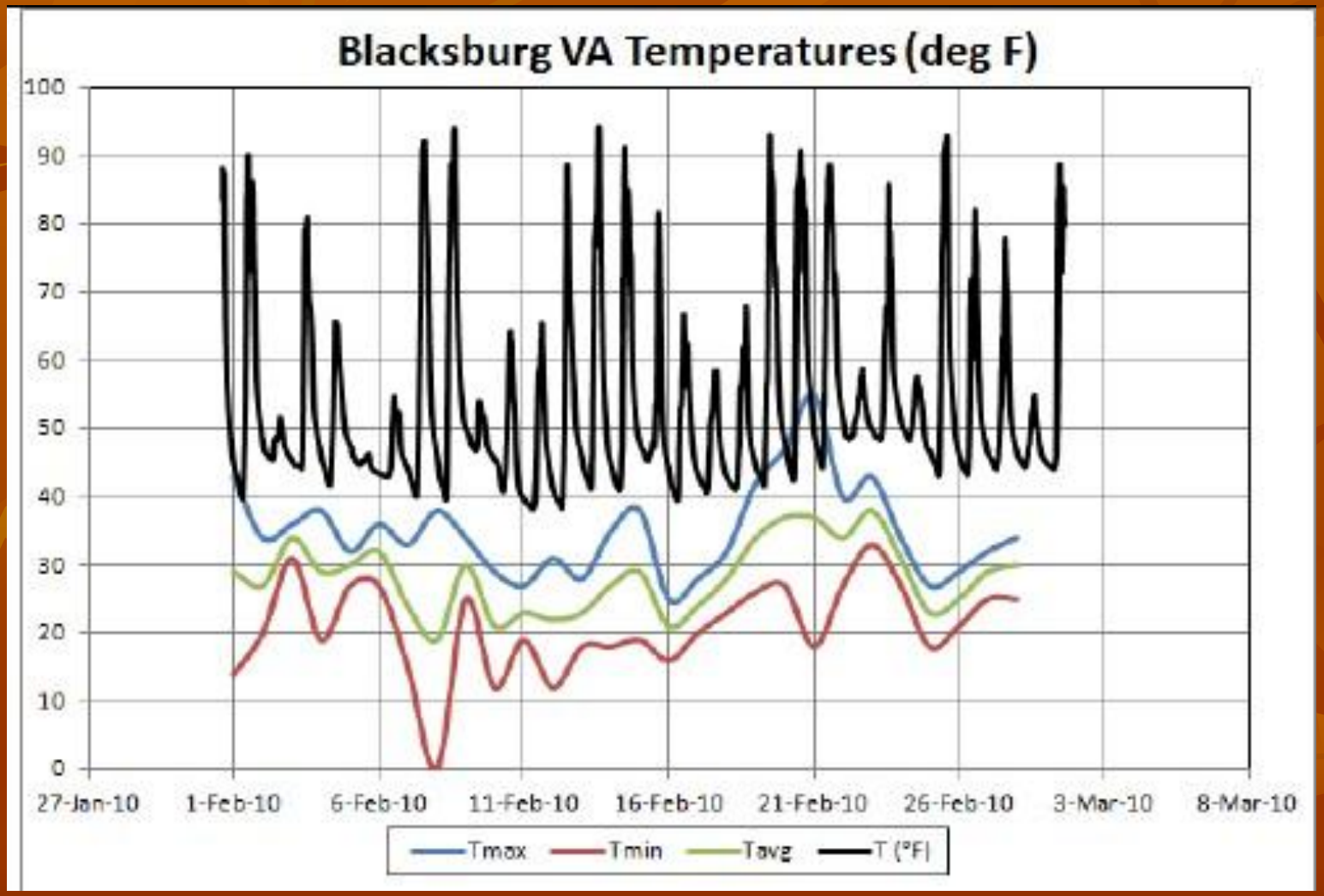
- Middle school students at Blacksburg New School planted in west half. Tried some plants that are known to not grow well in solar greenhouses, such as tomatoes.
- John Ogburn organized 8 gardeners to plant in east half on 4’x7’ plots. I was one of them.
- Greens did very well with bumper crops.
- Aphids appeared. Eventually controlled with ladybugs.

North-East Quadrant in November

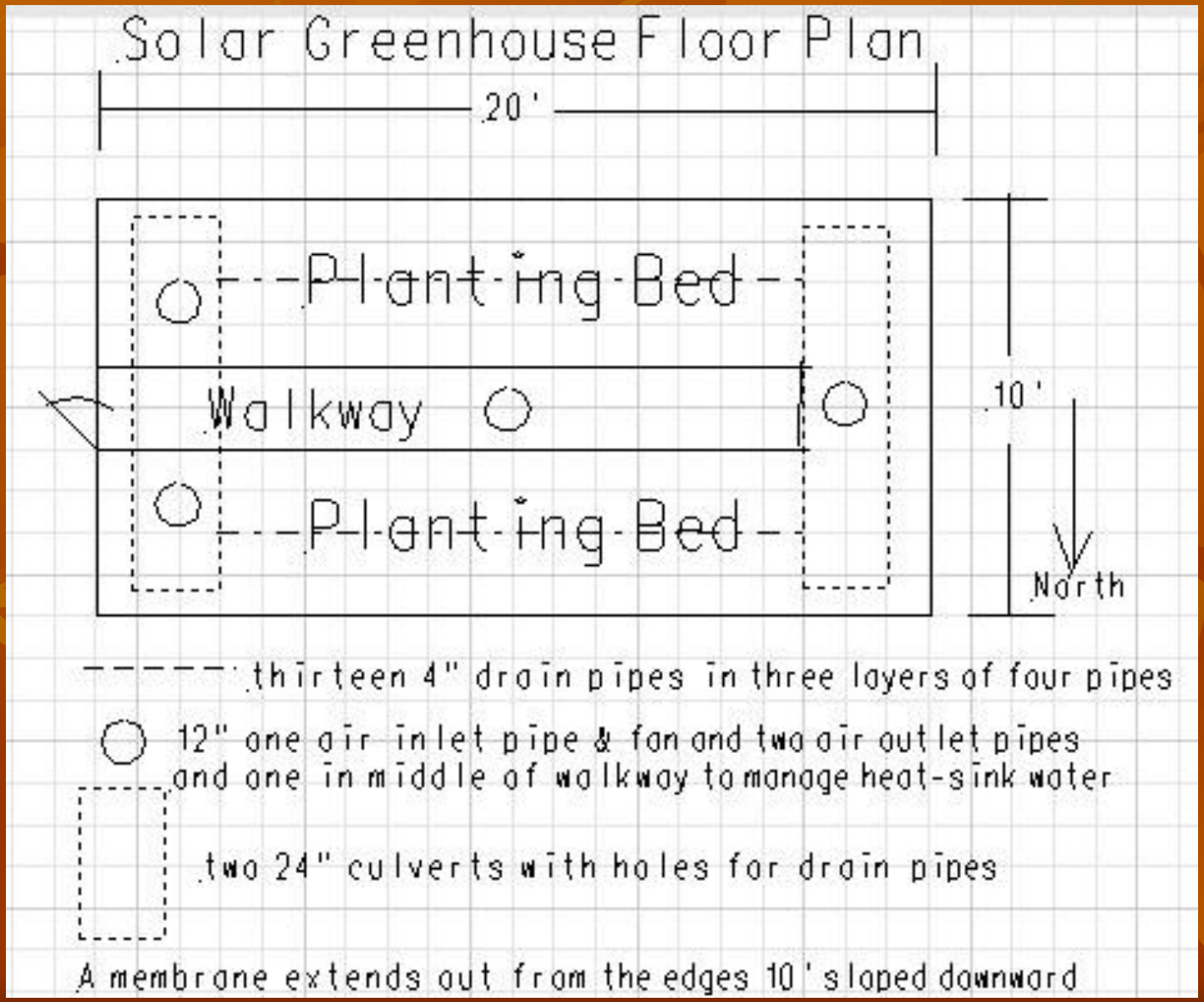
South-West Quadrant in November

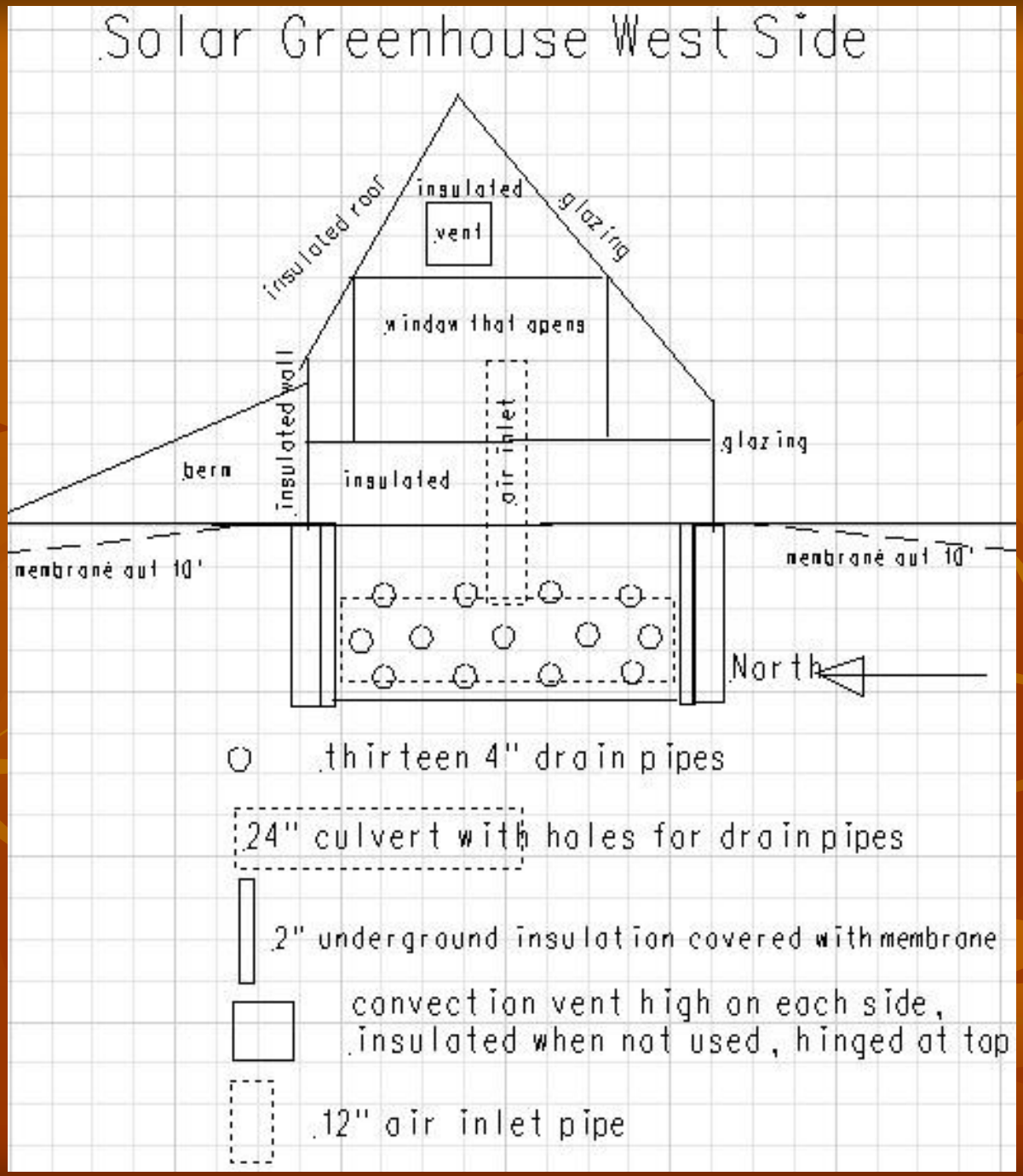
Roper Plot in February

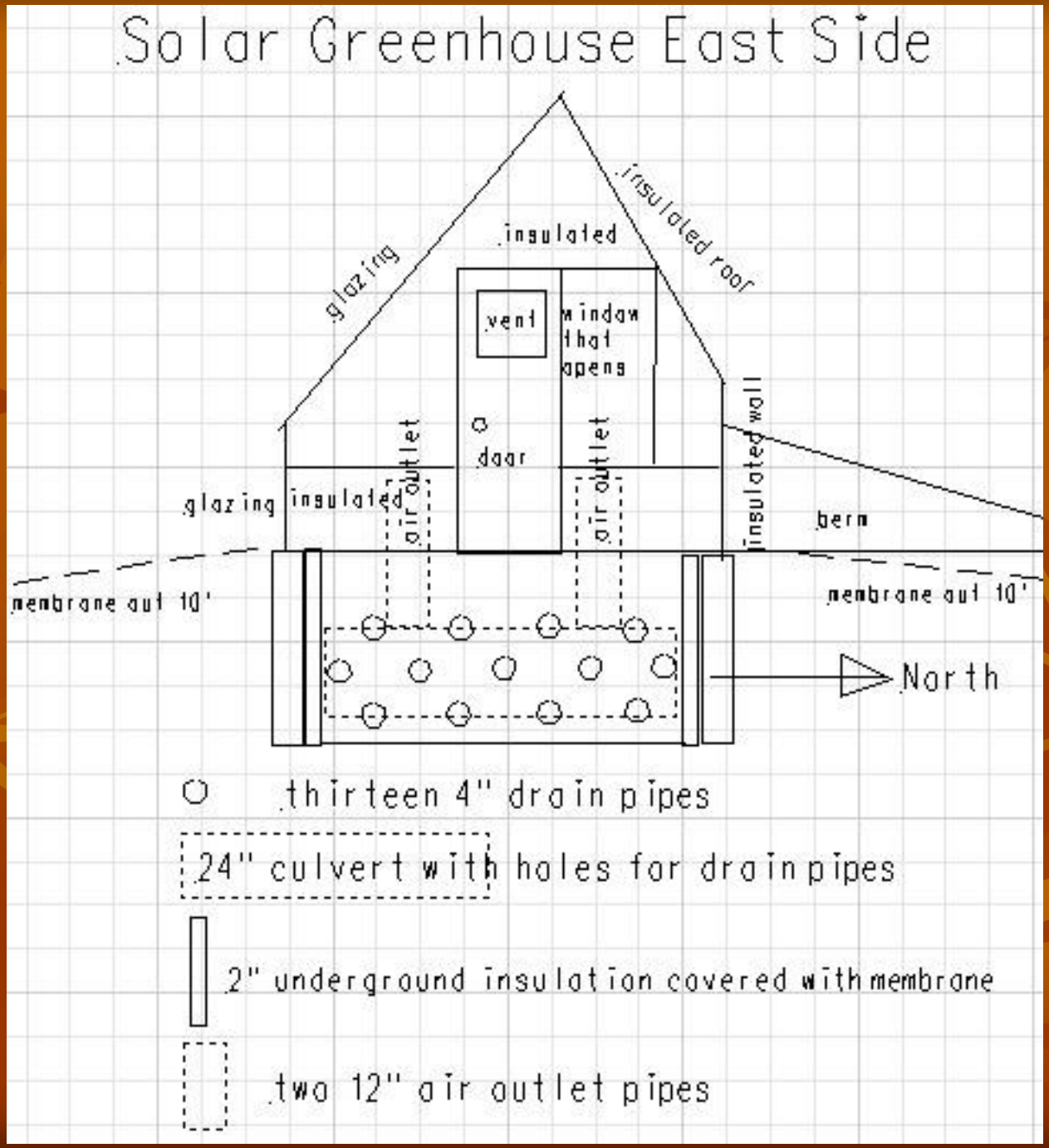
Temperatures in February 2010



Back Yard Solar Greenhouse




Solar Greenhouse West Side
insulated roof
insulated
glazing
vent
window that opens
insulated wall
air inlet
glazing
berm
insulated
membrane out 10'
membrane out 10'
North
thirteen 4" drain pipes
24" culvert with holes for drain pipes
2" underground insulation covered with membrane
convection vent high on each side,
insulated when not used, hinged at top
12" air inlet pipe


Solar Greenhouse East Side
glazing
insulated
insulated roof
vent
window that opens
door
air outlet
air outlet
insulated wall
glazing
insulated
berm
membrane out 10'
membrane out 10'
North
thirteen 4" drain pipes
24" culvert with holes for drain pipes
2" underground insulation covered with membrane
two 12" air outlet pipes

What to Grow in a Solar Greenhouse

- Mostly greens
  - Lettuces
  - Chard
  - Collard
  - Kale
  - Spinach
  - Nasturtium/Tropaeolum
  - Arugula
  - Endive
  - Mustard
  - Beet greens
- Radishes
- Green Onions
- Broccoli
- Beet root
- Cauliflower (takes too much space?)

Thanks!

Gail Billingsly, YMCA
Arlean Hale Lambert, land
Pat Bixler, producer
Tim Colley, architect
Travis Rookstool, architect
Jordan Truesdell, engineer
David Nickerson, model
Justin Boyle, Green Valley Builders
Jason Boyle, Green Valley Builders
Jeff Ligon, excavation

Thanks!

Doug & Tim Hoback, ICF
Naraine Persaud, soil
Richard Reid, carpentry
Tom Bowden, carpentry
John Sullivan, carpentry
Alex Lawrence, excavation
Chris Roberts, electrical
Abigail Convery, YMCA
John Ogburn, grower organizer
Deborah Wiley, soil

Thanks!

Holly Scoggins, soil

David King, cistern and water system

Master Gardeners, landscaping

UXB International, parking lot

Want More Information about the SGH Project for the NRV?

Web page:

http://www.roperld.com/science/YMCASolarGreenhouse.htm

This slide show is available on the Internet:

http://www.roperld.com/science/YMCASolarGreenhouse.ppt