

Sustainable Building & Water Conservation Tour



Made possible by:

Coconino County Sustainable Building Program
Amanda Acheson, Manager

City of Flagstaff Sustainability Program
Nicole Woodman, Manager

Willow Bend Environmental Education Center
Cassandra Roberts, Program Manager

USGBC Northern Arizona Branch
Governing Council

Transportation provided by NAIPTA

Event partners include the American Solar Energy Society and the AZ Solar Center

Packet compiled by:

Peter Moorhouse, CCSBP Program Assistant

McKenzie Jones, City Sustainability Specialist

Gideon Burdick, City Sustainability Aide

The Sustainable Building and Water Conservation Tour team would like to thank all our tour participants, sponsors, building professionals, and homeowners for sharing their knowledge and time.



1. Willow Bend Environmental Education Center

creating "a world we want our children and grandchildren to inherit."



As a great example of sustainable design, Willow Bend is the perfect kick-off location for the tour. The non-profit center has been in practice since 1978, but constructed its passive solar and strawbale building in 2002. Children and young adults in pre-K through 12th grade are introduced to the environment, science, and sustainability at the Center or in their classroom. Not only does the Center practice sustainability in its built environment, but the organization ensures sustainability for the future by educating children, teens, and adults with field trips, family science events, teacher workshops, community events, and adult education opportunities.

Featuring:

- + passive solar design with south facing windows
- + strawbale construction-efficient, renewable and highly insulated building material
- + 3 Tromb  walls provide passive solar heat collection with transmission of warmth during cool times
- + 6.2 kWh per day solar photovoltaic power system donated by Prometheus Renewables
- + low water native gardens
- + Willowbend transportation is a BioBug (VW) powered by vegetable oil
- + on demand hot water heater
- + composting system installed
- + rainwater catchments with diversion to landscape
- + blown-in fiberglass insulation in ceilings for an R-50
- + energy efficient lighting using CFL's and day lighting strategies

Award Certification Level : Advanced (2004)

Builder : Ed Dunn, Solar Design and Construction

Architect : Paul Moore

2. Jones / Glotfelty Residence

"repurposed for life and sustainability"



Inspired by passing trains hauling colorful shipping containers, the owners envisioned reusing some for their Southside home. They worked with Ecosa Design to complete the design, purchased 6 shipping containers from a facility in Phoenix who performed preliminary modifications, then shipped them to Flagstaff and placed them on 40 concrete piers. Walls were furred out in steel lumber and insulated with high density foam on the inside and reflective ceramic coating on the outside. Construction took two years and was completed in June 2011.

Featuring :

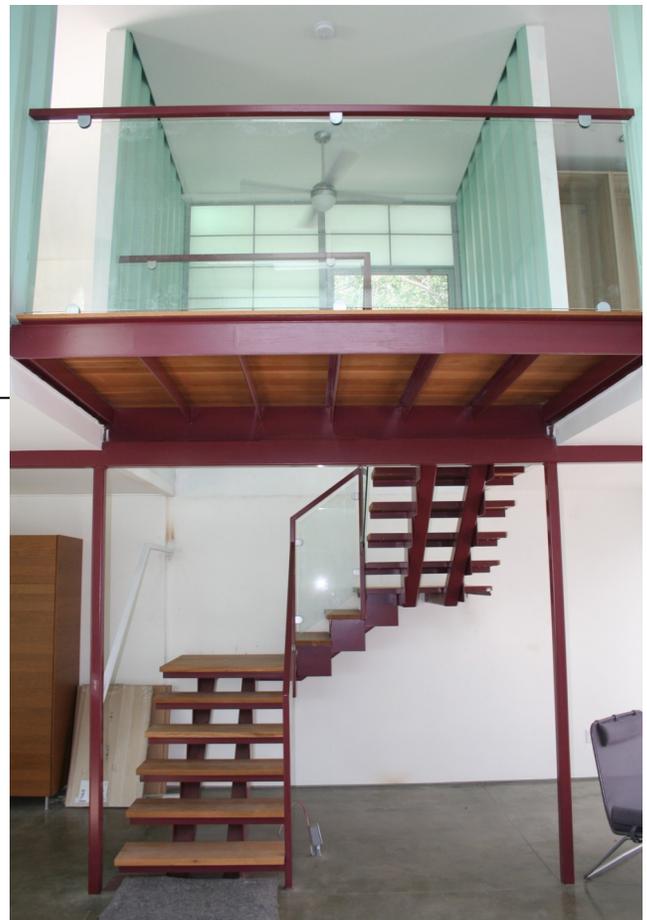
- + railroad inspired design built from recycled steel shipping containers
- + decking extends the outdoor livable area
- + 16 photovoltaic panels totaling 3.5 kilowatts supplying most of the home's electrical needs, remote monitoring technology to control the energy systems with smartphones
- + Energy Star appliances
- + 4,000 gallon rainwater harvesting storage system for on site distribution to vegetation
- + grey water reuse system in place
- + passive solar design with maximum day lighting featuring
- + Kalwal clerestory and translucent walls
- + no chemical pesticides or herbicides used on site
- + durable metal roofing finish
- + FSC certified wood products
- + radiant floor heating split into 4 zones
- + smart wiring system
- + re-use of concrete waste as "urbanite" rock for landscaping

Award Certification Level : Intermediate (2010)

Builder : Dan Miller, Cornville

Designers / Owners : Marie Jones & Marvin Glotfelty

Architect : Anthony Brown & Tom Hahn ECOSA Design



3. Hilltop Gardens

"the perfect mix of high density and sustainability"



The first of its kind in the community, Hilltop Gardens, located at the corner of Franklin and Fontaine near NAU and downtown Flagstaff, consists of five, three-bedroom, three-bath Energy Star rated homes, each with two-car garages and two private decks with breathtaking views of the San Francisco Peaks. The homes range in size from 1,800 to 2,200 square feet.

Featuring:

- + five, three-bedroom, three-bath Energy Star rated homes, each with two-car garages and two private decks with breathtaking views of the San Francisco Peaks.
- + 1,800 to 2,200 square feet
- + infill development incorporating current infrastructure
- + insulated concrete floor slabs, polished concrete- finished floors
- + advanced framing to save lumber and maximize insulation efficiency
- + low-E glazed thermal pane windows
- + high density spray foam roof insulation; recycled cellulose wall insulation
- + 96% efficient Vertex hot water heaters; heat recovery and fresh air ventilation systems; 95% efficient furnaces
- + construction waste reduction, recycling, and down-cycling program
- + low chemical emitting paints;
- + energy Star appliances
- + water saving plumbing fixtures; 3,000 gallon rain water reclamation system for toilet flushing and irrigation for the entire building; 2KW solar panel system for each unit; HERS (Home Energy Rating System) score of 38.

Award Certification Level: Advanced (2009)

Builder: Hope Construction, Inc

Owner: David and Jennifer Carpenter

4. Museum of Northern Arizona Easton Collection Center

"culture and history in LEED Platinum"



The Museum of Northern Arizona's Easton Collection Center is home to most of the Museum's expanding collections. The building was designed to preserve special artifacts by incorporating fire suppression, temperature and humidity controls, and insect protection systems. The museum received the highest LEED rating of Platinum. The creators agree that the center provides a shining example of a collections facility that preserves the past of the Colorado Plateau and its peoples.

Featuring:

- + local masonry & steel construction (durable materials)
- + Northern Arizona's largest living roof provides insulation, cooling in summers, minimizes storm runoff and depletes carbon dioxide
- + hydronic in-floor heating and cooling
- + 23,000 KW annual production photovoltaic power system
- + passive solar design
- + high thermal mass inside building's envelope
- + high insulation ratings
- + low E windows for high insulation values and mitigating heat loss
- + dual flush and low flow toilets
- + xeriscape yard
- + low VOC paints and sealants for healthy indoor air quality
- + 75% of construction waste has been reused or recycled
- + surrounding area and building site was not disturbed during construction
- + high efficiency fixtures and lighting
- + day lighting use (solar tubes)
- + received US Green Building Council's rating of LEED Platinum

Award Certification Level: Advanced

Architect: Robert Jones Associates, Inc

Builder: Kinney Construction Services

Living Roof Consultant: Rana Creek Living Architecture



5. Ponderosa High School

"student focused sustainability and water conservation"



The Sustainability Demonstration Project site at Ponderosa High School is a place where students are able to gain hands-on educational experience in sustainable land stewardship practices as part of the school's science curriculum. There are many passive water conservation elements on the site, but perhaps our proudest moments are the three curb cuts (the first legally permitted at a public site through the City of Flagstaff) installed last summer with the help of the Tucson based Watershed Mgmt Group. The students reflect the broad cultural diversity found in Coconino County. Each semester sees new and returning students. They each contribute to a cultural legacy of land stewardship that aims to serve the entire community.

Featuring:

- + greenhouse centered on 2400 gallon cistern
- + wind and solar energy
- + fruit and vegetable gardens
- + cold frame greenhouse
- + compost systems
- + vermiculture (worm farms)
- + water wise earthworks
- + diverse animal habitat (frogs, horny toads, gopher snake, pocket gophers)
- + curb cuts harvesting water into three retention basins, capturing and filtering street pollutants and recharging ground water
- + Sustainability Project provides students a place to gather and learn, grow food and solve problems

6. Wachowski Residence

"KISS at work: Keep It Simple & Sustainable"



Welcome to the Western Star. This solar-centric home represents the homeowner's first effort in passive solar, sustainable design & building, and was intended to show that passive solar designs do not have to look like greenhouses, and that sustainable homes do not have to be "funky" looking, or built from exotic materials, to perform well and minimize the impact on our planet, and natural resources. The passive-solar nature of the design provides approximately 70% of our heat. The remainder is made up by a high-efficiency, condensing boiler, which feeds an in-floor heating system. Our long-term plan includes adding solar hot water panels or evacuated tube arrays to the South roof, to further reduce or eliminate our propane usage. Knowing our water bills are our second highest expense, after heating & cooling, I designed the house with simple, minimalist rooflines, and a metal roof, allowing us to harvest rain & snowmelt, year-round, for domestic use.

Featuring:

- + high efficiency boiler
- + Sierra Pacific, Sustainable Forest Initiative Certified unique "Butterfly" windows allow for effective ventilation by maximizing wind flow and pressure
- + glycol hydronic system
- + low flow water fixtures
- + passive solar design and thermal blinds
- + structurally Insulated Panels (SIPs) integral wall system
- + ambitiously met upcoming energy code
- + de-coupled walls for thermal and sound barriers
- + rainwater harvesting for domestic use
- + xeriscaping
- + blow-in cellulose ceiling insulation
- + in-floor radiant heating
- + durable metal roofing
- + donated excess construction materials

Award Certification Level : Community Model

Designers : Scott and Darcy Wachowski

Builder Support : Matt Robinson, Western Strawbale



7. Woodman Residence

"sustainable retrofit close to downtown"



The Woodman residence, built in 1973, has undergone significant upgrades to make the home more efficient, comfortable and sustainable. The Woodman's, in choosing to renovate an older home near to downtown, enjoy both the ability to make an existing home more energy and water efficient as well as the convenience and sustainability of public transport and walkability.

The 2,300 square foot house includes 3 bedrooms, 2 baths, and 1 office.

Featuring:

- + dual comfort control 95% efficiency gas furnace
- + seal foam insulated crawl space
- + energy management
- + high-efficiency windows
- + evacuated tube solar thermal hot water heating system
- + insulated window treatments
- + high-efficiency appliances and fixtures
- + 1,750 gallon rainwater collection systems (1,650 gallons tied into landscaping irrigation system)
- + low water use landscape

8. Anderson Residence

"environmentally conscious comfort"



The Anderson residence is an owner designed home near the end of Elden Lookout Road. This home was designed with an attention dedicated to building a comfortable, long-lasting, affordable and environmentally conscious home.

Featuring:

- + located near open space
- + minimized disturbing surrounding natural ecosystems during construction
- + permeable walkways and driveways to allow rainwater to seep into underground aquifer rather than being wasted in run off
- + low Landfill usage, 4 trips in a flatbed pickup during entire build
- + no chemical pesticides or herbicides used
- + outdoor living area included (ie: patio)
- + effective lighting strategy with CFL, some LED and solar tubes
- + efficient electric hot water system installed with mini tanks under sinks and radiant floors
- + 10,000 gallon rainwater collection and storage system installed with on-site irrigation to landscape
- + rainwater treatment system installed for domestic use
- + two pipe system installed for future gray water use
- + passive solar home design with PV array planned for the future
- + efficiently insulated envelope, walls and roofs SIPS 10" thick roofs = R-50 and 8" thick walls = R40
- + composting system
- + donated excess materials to non-profit building organization
- + durable finishes like the metal roof and local stone veneer siding
- + no HVAC air handling system in garage
- + low VOC materials used (ie carpeting, paints, sealants, finishes etc)
- + some local beetle kill pine used in the structure

Award Certification Level : Advanced

Architect : Wayne Anderson

Builders : All Services



Resources

Coconino County Sustainable Building Program

The mission of the CCSBP is to educate, encourage, support and help develop sustainable and energy efficient building practices throughout northern Arizona: www.coconino.az.gov/sustainablebuilding

City of Flagstaff Sustainability Program

The Sustainability Program is dedicated to promoting sustainable living and providing practical solutions to the Flagstaff community. <http://flagstaff.az.gov/sustainable>

City of Flagstaff Water Conservation Program

The City of Flagstaff Water Conservation Program promotes using the City's water resources wisely and implements educational opportunities for the community. <http://www.flagstaff.az.gov/index.aspx?NID=31>

Willow Bend Environmental Education Center

The nonprofit center's mission is to provide education outreach services that build environmental awareness and an ethic of responsible stewardship of our natural and cultural resources. www.willowbendcenter.org

Northern Arizona Branch of the US Green Building Council: www.usgbcaz.org

Northern Arizona University Office of Sustainability: <http://home.nau.edu/sustain>

Northern Arizona University Sustainable Energy Solutions: <http://ses.cefn.nau.edu>

Coconino Community College Alternative Energy Technology Degree

<http://www.coconino.edu/collegcatalog/0506/AASALTENERGY.htm>

Coconino Community College Sustainable Green Building AAS Degree

http://www.coconino.edu/academics/curriculum/collegcatalog/Pages/AAS_SustainableGreenBuilding.aspx

Coconino Plateau Water Advisory Council: <http://www.cpwac.org>

American Solar Energy Society: <http://ases.org/>

American Wind Energy Association: <http://www.awea.org>

Tax Incentives-Utility Rebate Programs

Residential and non-residential rebate and incentive programs exist through utility providers such as Arizona Public Service (APS), Salt River Project (SRP), and Unisource Energy Services (UES). Please refer to their websites for information.

APS: <http://www.aps.com/main/green/choice/default.html>

SRP: <http://www.srpnet.com/environment/earthwise/solar/Default.aspx>

UES: <http://uesaz.com/Green>

City of Flagstaff: <http://www.flagstaff.az.gov/index.aspx?nid=1030>

Listing of State and Federal Tax Incentives

<http://www.dsireusa.org>



Don't forget to recycle this packet! Or pass it on to an interested builder, homeowner, gardener, or student!