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XI - Getting Started with Your Passive Solar Greenhouse

At first glance, the idea of building your own passive solar greenhouse may feel daunting. There are many decisions to make, and the process may seem complicated. But once you move through the initial learning curve, the rewards are enormous: a structure that saves money, reduces your carbon footprint, and brings joy every time you step inside on a cold, sunny winter day. Each SunCatcher is unique because every location has its own challenges and opportunities. By understanding how to apply the basic principles to your situation, you can create a greenhouse that works in harmony with the sun and your goals. This chapter offers guidance on how to begin.

Start with the big questions

The first and most important step is to clarify your goals:

- What do you want from this greenhouse? And where do you see yourself in one year, five years, and ten years?
  Some growers seek only to extend the growing season into spring and fall, while others want to produce food year-round. Some intend to grow only for family and friends, while others have ambitions to sell at market. A SunCatcher can be a decades-long investment, so your long-term vision matters.

- How much space do you have, and what else has a claim on that space?
  For example, flower/vegetable gardens, play ground, pool, outdoor kitchen.

- Is your land actually suitable?

  A SunCatcher needs south facing terrain, good sun exposure and minimum shading by trees. Without all three, the project gets harder and may not perform as well as intended.

- And finally, what is the microclimate at your site? Summers and winters at your latitude, elevation, location (urban, suburban, rural) are all different from the regional average.

Site Assessment

Site assessment is crucial because good solar access in winter determines if building a SunCatcher is even possible and, if so, how well it will perform. The first step is to determine if there are any candidate sites, and to check how much sun each site actually gets during the winter. We recommend two complementary methods:

1. Use a sun track app on your phone – walk the site and look at the simulated sun path for the Winter solstice. Apps (ex., SunCalc, Sun Tracker, SunSeeker, SunOnTrack, ...) are quick and surprisingly accurate. Another nice app is ShadeMap, which shows shade for your location by date and time of the day.
2. Photograph the actual shadows during the Winter solstice week (December 18-25 - week with the shortest days/longest nights). Stake out each candidate site and (on clear sunny days) take a photograph every hours or two, starting at 8 am and continuing until 5pm. Turn the camera's date/time stamp on so you have a record of when photos were taken. Note exactly if

and when shadows from trees, buildings or terrain for across the staked-out site. You want the site to be clear of shadows at least 70% of the time between 9am and 3pm through mid-Winter. Note that shadows from deciduous tree branches are usually not problematic.

In addition to finding a site with good solar access, you have to make long-term (November through April) observations on the physical characteristics of the intended site(s):

- Where snow accumulates, lingers and melts first.
- Spots that stay wet, where water collects/puddles, and drains poorly after heavy rains.
- Spots that remain sunny, green up quick in Spring, ...
- Ground percolation and site drainage.

Consider practical matters:

- Location of the site relative to the house, garage, barn, tool shed, garden, walkways, existing trees, playground, ...
- Access for construction equipment and delivery trucks.
- Year-round access for people, wheelbarrows, and, if relevant, walkers and wheelchairs.
- Available utilities (water, electricity, WiFi/Ethernet) and the cost of bringing each of them to the building. These questions will help you choose the best site.

Chapter XII provides more detail about site selection tools and methods.

Other Considerations

If you have determined that you do have a good, suitable site for a SunCatcher, you face other constraints. Every property has rules and restrictions. Local building codes may govern whether, where, and how you can build. Boundary offsets, easements, location of your well and septic system, and the presence of overhead or underground utility lines can all affect where you can place your greenhouse. If you live in a community with a property owners association, their rules may limit the structure's size, appearance, or placement. And, in many places, you will need permits before you begin. Ignoring these early steps can lead to headaches later, so take time to research requirements before breaking ground.

Next, consider the resources available to you:

- Finance is obvious - Do you have enough savings or need a loan? You may qualify for tax credits, and check out grant options.
- People and skills - Do you have experience in construction or will you hire help? Can friends, neighbors, or partners contribute labor or have specific skills?
- Materials - Look into donations of materials, web sites for cheap building materials (often over-purchased or unused at building sites), ReStore warehouses, etc.
- How to build - conventional stick-build or structural insulated panels (SIPs). Stick-build is cheaper in materials, but more costly in labor; for SIPs, it is the other way round.

Each of these factors influences how your greenhouse will come together. Even a well-designed PSG can fail if the builder underestimates what they can realistically take on.

Money, of course, plays a central role in planning. Costs vary widely depending on design, size, materials, and labor. In order to help sort out what might be the best-fit for you financially, we have provided a cost estimator in Appendix XX. Most greenhouse budgets divide roughly in half between materials and labor, though the balance may shift by about ten percent either way. A 16x32ft (4.84x9.7m) SunCatcher built entirely with new materials may cost around $25,000 for materials alone[1]. Adding labor, the total comes to somewhere between $40,000 and $50,000, roughly $78 to $98 per square foot. These numbers may sound steep, but remember that SunCatchers are designed to last fifty years or more, with no fuel or electricity needed for heating and cooling. Spread across its estimated lifetime of 50 years, construction costs average just $800 to $1,000 per year; a smaller 12x24ft (3.63x7.28m) version would naturally cost less, closer to $22,000 to $28,000 ($450-550/year). Either is much less than the annual heating bill for a conventional greenhouse of the same size. In an era of unpredictable and rising energy prices, conventional greenhouse heating bills are going to keep climbing.

Foundation, electrical work, plumbing, flooring and a few other elements are highly variable and depend on local code and personal preference. They should always meet code at minimum; everything beyond that is yours to choose.

A low-cost version can be built if you provide most of the labor yourself and use recycled materials (ex. from your local ReStore). At the other end of the spectrum, a fully contracted SunCatcher with a concrete slab, finished interiors, grow lights, automation, and all new materials will be more expensive. Labor alone typically accounts for 40-60% of the total regardless of whether you plan to pay labor by the hour and/or by the job; spell out in detail what is to be done and have it signed and dated.

Using prefabricated Eco-Panels can cut labor costs significantly, since the insulated interlocking panels create a tight, durable shell in far less time than stick building. A base Eco-Shell kit (walls and North roof) may start at about $19,000, and from there you can add roofing, siding, and interior finishes to suit your needs. Whether you choose stick-built or Eco-Shell construction, the underlying SunCatcher principles remain the same.

[1]The cost prices cited are at the time of writing this book, and may be different at the time you are building your SunCatcher.




EcoShell wall panels for the Hawk's Nest SunCatcher arrived in the morning, and were set up by noon. Note the shadow is directly behind the south-facing Eco-shell at local solar noon.

Decide who manages the construction

Once you have decided to build, the next decision is who will manage the project. You may serve as your own general contractor, or you may hire one. Either way, a manager is responsible for obtaining permits, coordinating subcontractors, and overseeing construction. You can:

- Design your own passive solar greenhouse from first principles explained in Chapters V through X.

The design principles in this book are not a luxury budget item. They apply to every passive solar greenhouse, regardless of cost. A DYI builder using salvaged materials can capture most of the energy efficiency of a fully contracted build, provided the principles are followed. The principles also retrofit, at least partially, onto exiting greenhouses.

- Purchase a set of SunCatcher PSG blueprints, sourcing materials and labor locally. Blueprints are available for 12x24 ft and 16x32 ft footprints, with a 45^0 or 60^0 north roof angle, in stick-built or Ecoshell versions. The blueprints include a contractor-client checklist, an example materials list with sources for hard-to-find items; an operator's manual explaining daily and seasonal management; and consulting time. These documents help bridge the gap between design and construction. Contractors can handle foundations, assembly, plumbing, electrical, and finishing work, while you decide how much to customize and what role you want to play.

- Purchase a SunCatcher Ecoshell and build out from there. This option will significantly reduce labor costs. It can be assembled quickly into a tight, well-insulated, structurally sound shell. From there you can customize siding, roofing and interior to your preferences. The kit handles the most demanding part of the build for you.

Whatever path you choose, we encourage green building practices and sourcing materials locally to support your community and reduce transport emissions. Reuse materials where it makes

sense. A SunCatcher is built to live with[in] the environment around it; the construction process should do the same. And, above all, built with durability in mind–the most sustainable building is one that lasts.

Summary

Start by clarifying your goals, study your site, assess your resources, check local regulations and make a realistic budget. Then choose your design and construction method, decide who will manage the project, and plan for durability. Even if your version is modest, applying the principles of passive solar greenhouse design will improve performance. The SunCatcher system is flexible enough to accommodate many approaches. Whatever choices you make, the journey of designing and building a PSG is a rewarding one, an act of working with nature, not against it, for decades of productivity and enjoyment.

Further reading

Schiller & Plinke, The Year-Round Solar Greenhouse, pp. 23-26.