AUSTRALIAN ORCHID FOUNDATION

Essay Competition 2012 2nd Prize Winner

# Orchid Conservation at Home

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## What is conservation?

There are many misconceptions about the term 'conservation'. What does it mean? What does it mean in relation to growing orchids at home?

Biodiversity is likewise a great word we use without thinking much about it. Australia has its own 'Biodiversity Policy', called 'Australia's Biodiversity Conservation Strategy 2010 - 2030', so I guess even our Government recognizes that the two are connected – biodiversity **and** conservation.

But what has that got to do with Orchids? My personal problem with the strategy was and is that it is designed to protect and preserve Australia's native biodiversity. It ignores exotic species; ignores current and future land use for growing food and fibre; ignores the changes that must take place if humanity is to survive on this earth and generally applies blinkers to any real attempt at conservation.

Most orchid growers wouldn't recognize an Australian native (terrestrial) even if the tripped over it! Probably a bit harsh but if we are going to talk about 'conservation' we need to understand what we mean by the term when we relate it to growing orchids at home.

So does 'conservation' mean much when most of us concentrate on growing exotics anyway? If it doesn't, then this competition is meaningless, and I don't think that is so.

A few definitions of 'conservation':

1. The Concise Oxford Dictionary, 4th Edition, 1951 – *'principle that total quantity of energy of any system of bodies (including the universe) is invariable'*
2. Macquarie Pocket Dictionary, 3rd Edition, 1998 – *'the act of conserving, especially of natural resources; care for and preservation of rivers and forests'*
3. Australia's Biodiversity Conservation Strategy 2010 – 2030 -

   **Conservation**—In relation to biodiversity, conservation is the protection, maintenance, management, sustainable use, restoration and improvement of the natural environment; in relation to natural and cultural heritage, conservation is, generally, keeping in safety or preserving the existing state of a heritage resource from destruction or change.
4. WordDictionary.com (2012) gives us three definitions:

   n 1: an occurrence of improvement by virtue of preventing loss or injury or other change [syn: preservation]

   2: the preservation and careful management of the environment and of natural resources

   3: (physics) the maintenance of certain quantities unchanged during chemical reactions or physical transformations

Just with those four definitions, we can see the dramatic change that has taken place since 1951 – from a genuine physical principle, to something related to rivers and forests, to a definition that aims to PREVENT change in our natural environment - preservation.

As responsible orchid growers, we wish to avoid waste; ensure the conservation (continued survival both in the wild and in cultivation) of the plants we grow; minimize any adverse impacts on our environment; avoid over-use of any resources; and generally enjoy our hobby.

## What can we conserve?

Before we start, we need to acknowledge that growing orchids, particularly exotic orchids, is not an activity that is compatible with the term 'conservation' as it is normally applied to our 'natural' ecosystems. We are growing in an artificial environment; generally growing plants outside their known habitat; using techniques that are not natural; and we gain great enjoyment from doing this.

For orchid growers, conservation will generally relate to the energy and resources we use in continuing our hobby.

1. Total energy – electricity; gas; etc.
2. Manufactured resources – shade cloth; plastic covers; glass; etc.
3. Possible contaminants of the environment – fertilisers; pesticides; excess water; etc.
4. The growing medium – bark; coco chips; sphagnum moss; Perlite; charcoal etc.
5. Water

All of these items can be over-used, wasted, or even be miss-used. Most of us associate conservation with energy – electricity and gas and perhaps with water. But it should be wider and include the matters mentioned above and more.

As a professional trained in environmental management, I do a lot of thinking about these issues and how my hobby can be improved. There are some issues pertaining to conservation that I have experimented with. These include assessing the amount of fertilizer orchids can use; how to more efficiently multiply our Australian terrestrial orchid tubers; and how our terrestrials respond to different media and surface mulches. These issues are important for our conservation effort for our native orchids.

Let's have a look at what we might achieve in terms of conservation and growing orchids at home.

## Conservation possibilities at home

**Total energy – electricity, gas**

The potential for energy conservation will vary greatly depending where you live and what you grow. Those of us who live in cold areas probably recognize this better than those who live along the warm, moist coastal strip. I have gas heaters in all my houses; back-up electric heating if gas supply fails; and one wood stove. I try and keep all houses above 4 degrees and one above 8 degrees. Heating bill (gas) is in the vicinity of $1,200 to $1,500 a year or about 35 cents per plant per year!

In summer, we can have temperatures in the 40's. At the same time we experience very low humidity compared to the luxury, high humidity of the coastal strip. Humidity

levels of 2% to 4% are regular. Keeping the humidity level up in the hothouse can be quite a challenge in these conditions. Fans are a must and air flow has to be good to avoid burning of the plants.

Electricity and gas are rising in cost.

What have I done to reduce this massive energy cost for my 'hobby'?

1. Construction and location of the hot house.
    - North/south alignment allows best sun access – warmer in winter (hotter in summer); more light, less need to heat on cold days and nights - reduced heating costs for winter but increased cooling costs in summer;
    - Shade cloth in summer and good air flow using pedestal type fans. Most fans run on about 50 watts of power for a 40cm fan. That's about $115 per year per fan - $25 to $30 a quarter for 24/7 operation.
    - Use a double skin lining to the hothouse, the gap filled with air for insulation. This gains me about 2 degrees overnight if the temperature is above zero. A little less as the temperature drops below zero;
    - Add bubble wrap sheet under the 'skin' of the house. This reduces heat loss significantly - 1.5 to 2.0 degrees warmer at night.

Figure 1 - Small pump for double-skin Lining

Figure 2 - Bubble Wrap Applied to Inside of Hot House

2. Heating in winter.

    This is my major cost. I use - or am considering - the following:

    - Use the construction options discussed above;

- Use the most efficient heating option I can.
    - Electric heaters – These are perhaps the most inefficient of all options. Any heater that converts electricity into heat can produce no more than 3.6MJ per kilowatt hour of electricity. The simple $20 fan heater is one of the best units to distribute heat efficiently.

      To provide 10 kilowatt hours (about 4 or 5 fan heaters running at maximum) of electric heating for say 12 hours a day for 6 months of cold weather, uses 21,600KW at $0.26 per KW = $5,600. A single fan heater running at half setting (800 to 1200 watts) generates about 1,750KW and costs about $450 a year.
    - Air conditioners or Heat Engines – air conditioners use electricity to run a series of pumps and fans. They are considerably more efficient than electric heaters because they literally transfer heat (or cold) from one side to the other. Choose a good one (4 or 5 star) and you can get 4 to 5 times the output of an electric fan heater. This is **very** significant. But many do not work well at lower temperatures. Some will just freeze up and shut down. If you live in a cold climate, you need to be very careful what you buy and be sure it will work at low temperatures.

      If the air conditioner is 4 times as efficient as a fan heater, the cost drops to $1,400 pa.
    - Gas heaters – Use flued heaters if you can.

To provide 36MJ (the equivalent of 10 kilowatt hours) of heating for 12 hours a day for 6 months, uses 78,000MJ (the equivalent of 21,600KW) at $0.016 per MJ = $1,250.

3. Ventilation and cooling in summer

Cooling can be achieved in several different ways. I need cooling for only about 3 months of the year and then I really only need to drop the inside temperature by about 5 to 10 degrees. Assuming cooling for 8 hours a day for 100 days, I need to allow for 800 hours of cooling.

- Air flow – Either natural cross ventilation or fan forced. A simple 40cm fan is quite efficient for small orchid houses and uses little electricity. I use about 8 fans which run 24/7 to provide air movement in winter as well as some cooling in summer. At 50 watts each, and 8,760 hours a year, the annual consumption is about 438KW at $0.26 or $115 per year per fan.
- A water wall – For those very hot days, I have installed a simple water wall in one house. It consists of normal dripper hose wrapped in several rounds of hessian at the top of the wall and then hessian hanging down the centre of the house. Water drips from the hose and dribbles down the hessian. A fan blows across the wet hessian and evaporates the water. Very cheap, uses only a few litres of water a day. Drops the inside temperature by 4 or 5 degrees. Cost is negligible.

Figure 3 - A Simple Water-Wall - Water dripping over a Hessian Skirt

Figure 4 - An Efficient Evaporative Cooler

- Evaporative cooling – For my main hot house, I have installed an old second hand evaporative cooler (the type you install on the roof). I turn it on when the temperature exceeds 30 degrees inside. It generally runs for about 5 hours a day for 20 or 30 days a year. A total of 150 hours a year. The motor is about 400 watts (low) to 900 (high) watts. On normal low setting, the cost should not exceed $150 a year. A very cheap and effective cooling method.

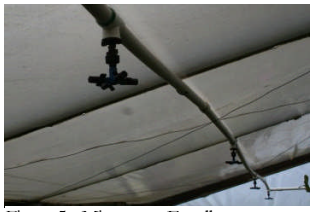

Figure 5 - Misters are Excellent at Cooling the Hot House

- Misting – I have misters in one hot house. These operate on timer and temperature sensor. They start to operate when the inside temperature exceeds 35 degrees and run for just 7 seconds every 20 minutes. Cost is again negligible.

**Table 1 –Annual Cost Savings from Conservation Measures**

| Issue | Without Conservation | With Conservation | Saving |
|---|---|---|---|
| Heating | Electric heating $5,600 | Gas heating $1,250 | $4,350 |
| Cooling | Air conditioning $400 | Evaporative cooling $150 | $250 |
| Totals | **$6,000** | **$1,400** | **$4,600** |
| Cost per plant per year | **$1.50** | **$0.35** | **$1.15** |

**Manufactured resources – shade cloth; plastic covers; glass; etc**

Most materials exposed to our Australian sun tend to wear out or break down over time. Maintenance and replacement must be allowed for. The main materials I use and their effective life is set out in the table below.

Selecting quality materials designed for their use is perhaps the most important conservation decision here.

- Use agricultural grade plastic covers - treated for UV light protection
- Use UV treated bubble wrap if available
- Remove shade cloth when not needed and store in a dry place protected from UV radiation
- Clean watering systems regularly, replace damaged heads immediately.

**Table 2 – Annualised Maintenance Costs**

| Material | Expected life | Replacement cost | Annual cost |
|---|---|---|---|
| **Agricultural Grade Covers** | 10 to 12 years | $5,000 or more | $400 to $500 |
| **Shade Cloth** | 5 to 10 years | $3,000 | $300 to $600 |
| **Benches (timber and steel)** | 10 to 12 years (timber)<br>15 to 20 years (Steel and aluminium) | Not calculated (use scrap materials wherever possible) | N/A |
| **Bubble Wrap** | 2 to 4 years | $500 | $125 to $250 |

| Material | Expected life | Replacement cost | Annual cost |
|---|---|---|---|
| **Watering systems** | 15 years plus if regularly maintained | Not allowed for | |
| **Totals** | | **$8,500** | **$825 to $1,350** |

So my total annualized maintenance costs amount to $800 to $1,300 or about $0.20 to $0.32 per plant per year.

Add the cost of heating and cooling and I need **$0.55 to $0.70 per plant per year** to keep my orchids alive and growing.

**Possible contaminants – fertilisers; pesticides; excess water; etc**

Growing orchids in a sheltered hot house or shade house can increase pollution of our environment.

Protected from wind and rain, pesticides can remain active for longer than normal. Regularly applying fertilizer and allowing the excess water to run off can increase salt levels downstream from your orchid collection. Excess water can increase soil moisture levels well above their normal regime and cause a change to the local ecology downstream from your orchid houses.

Pesticides and fertilisers can be dangerous if abused. A few simple conservation rules should always be applied:

- Use hands and eyes as the first method of catching and destroying pests.

- ✓ Wipe scale and mealy bug off with your hands – only use pesticide if it keeps coming back;
- ✓ Search for snails and slugs at night or early morning.
- ✓ Search for caterpillars when they are around

- Design your house to keep pests out. They love a safe sheltered habitat without their normal predators.
  - ✓ Side walls should reach the ground and preferable be buried into the ground to prevent snails and the like
  - ✓ Use a fully closing door to stop flying insects from getting in
  - ✓ Make sure you clean the floor regularly to remove dead and decaying material
- Only use pesticides when absolutely necessary. NEVER exceed the manufacturer's recommended rates.
- Check where the run-off from your orchid house goes – is the area always wet? Has the grass died? Adjust watering and fertilizing rates till there is minimal runoff or contamination. Don't waste water or fertilizer.

**The growing medium – bark; coco chips; sphagnum moss; Perlite; charcoal etc**

All our growing materials cost money. A few simple rules will help you save money here and will significantly reduce the impact on the environment. All potting materials come from the environment one way or another and we need to use them responsibly.

- NEVER repot ALL orchids into a new medium just because someone said it works better. Do a small trial first – just a few pots of different species and see how it works over the next 6 months or so
- Repot only when necessary
- Make sure your potting mix is clean and free from pests, slugs etc. I wash my mix as soon as I open each bag, allow it to dry and then sieve out the fines before using it.
- Store unused media in a clean, shaded location and protect from infestation by pests.
- Re-use bark, chip and perlite media. I collect all my old media, remove dead roots, moss etc., and sieve to remove decomposed particles and fine material. Then leave it open to the sun and weather for 3 or 4 months. Sunlight is a great disinfectant and sterilizer and will leave your medium clean and healthy as newly composted material. (But of course badly decomposed or mushy stuff should be thrown out and not re-used). My final re-processed material is generally a grade finer but I have never had any problems with it. I find about 40 to 50% can be re-used.

**Water**

I rarely use town water because my tanks supply nearly all I need. I have 15,000 litres of storage for 4,000 orchids and we get 640mm of rain a year on average. To cover a bad drought year, you need to assume you will catch only 10% of the average rainfall – 64mm in my case!

For a 200 m2 roof, the equation becomes:

200m2 x 0.64m x 0.1 x 1,000 = 12,800 litres yield

In a drought year, I will have to buy water. In a normal year, my tanks are full most of the time.

## Conservation of Orchids

For us Australians, I think our 'hot topic' should be the preservation of our Australian native orchids – especially the terrestrials.

Our epiphytic orchids are already very popular and are grown widely. But few grow the terrestrials ('Is **that** the flower? REALLY?'). Our knowledge of growing, propagating and hybridizing is very limited. Many growers quickly succeed in killing any they purchase just because they know so little about how to grow them.

As you would expect, our native orchids are beautifully adjusted to our natural climatic conditions. This means they understand about dry, hot summers and extended droughts; the occasional flood; regular bushfires and all those other things that would kill most of the other orchids we grow.

Our Australian terrestrials normally hide underground in summer to avoid the heat and reduce moisture loss; some rely on the gasses generated by bushfire to activate growth.

Collecting in the wild (picking) is not generally an option. A license to 'pick' is needed and will state what can be collected, by whom, and how the collected plants can be used. It is relatively easy to buy approved plants or tubers.

Most of the suitable habitat has been cleared or developed. We need to learn how to grow and propagate terrestrials before they ALL end up on the rare or endangered list.

I have obtained a picker's license on two separate occasions now and still have most of the species tubers I was able to collect then. Many have multiplied; some died; some just faded away. But I have been able to learn so much and most of what I now have will survive and increase. Those I have purchased from other licensed growers will likewise grow and increase.

In the long term, unless we learn how to grow our terrestrials in captivity, we will lose them. If you get the chance, join an ANOS club or a bush walking club; get to know what grows in your area; obtain approved plants and learn how to grow them at home.

## Conclusion

Orchid conservation at home must be directed at the total conservation effort, not just at individual orchids or orchid species. We need to better understand how to manage our hobby at home to reduce wider environmental impacts and encourage total conservation.

Over and above this, we as Australians need to apply more of our conservation effort to our native orchids, especially our terrestrials.

Our various state and federal Societies need to encourage and promote research into all aspects of growing and propagating our orchids and improving their survival both in the wild and in our nurseries.