

## GUIDE INFORMATION

# *Tillandsimania*



## Why a PDF?

It was intended to offer the publication as a print on demand book. But as it grew to such a large size, the cost would have been prohibitive, making it beyond the reach of many Tillandsia enthusiasts and those new to these amazing plants - so I decided to make it affordable and accessible by offering it as a series of interactive PDFs ebooks. This allows me to keep working on the project and offering an a new version on a regular basis. While it loses the feel of a book it offers other features that a hard copy book can not.

# Extensive information on Tillandsias

Consequently, the 2019 version is broken into 6 separate documents, and when ordered you will receive the very latest version. Each is a interactive PDF E book that links to the other documents. This means key words are linked to relevant information on other pages, so the document is easy to navigate and find information.

Contents includes:

- Over 1100 pages
- Over 300 plant entries
- Over 1000 photographs
- Over 140 illustrations and renders
- Over 50 maps
- Over 50 sound files
- And 11 charts

Introduction - Diversity & range - Tillandsias and the Bromeliad Family - Taxonomy- The subfamily Tillandsioideae - Evolution of Tillandsias - A changing climate & adaptation - Collecting Tillandsias - Growing Tillandsias - Tillandsia pests - Tillandsias sunburn, rot & dehydration - Out door culture - Indoor culture - Light - Air movement - Tillandsia morphology - (plant parts) - Biology of Bromeliads - Cam Cycle - crassulacean acid metabolism) - Leaf shape & cross-section - Tillandsia flowers - Pollinating Tillandsia flowers- Tillandsia seeds - Seed germination - Asexual reproduction - Stimulating flowering - Transporting Tillandsias - Mounting Tillandsias - Mounting methods - Fragrant Tillandsias Fertilizer - A little bit of history - Tillandsia gallery installations - Living plant sculptures - Urban experiments - Architectural applications - A selection of Tillandsia species - A selection of Tillandsia hybrids -

# Comments on the 2019 version

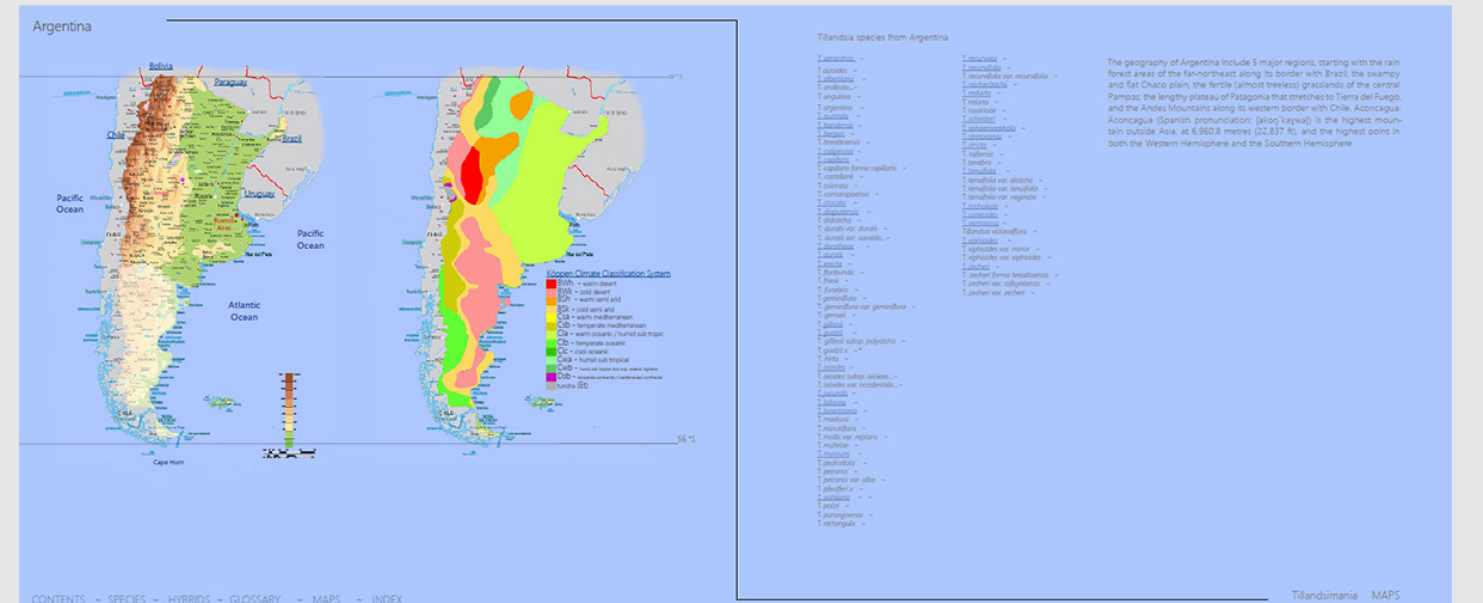
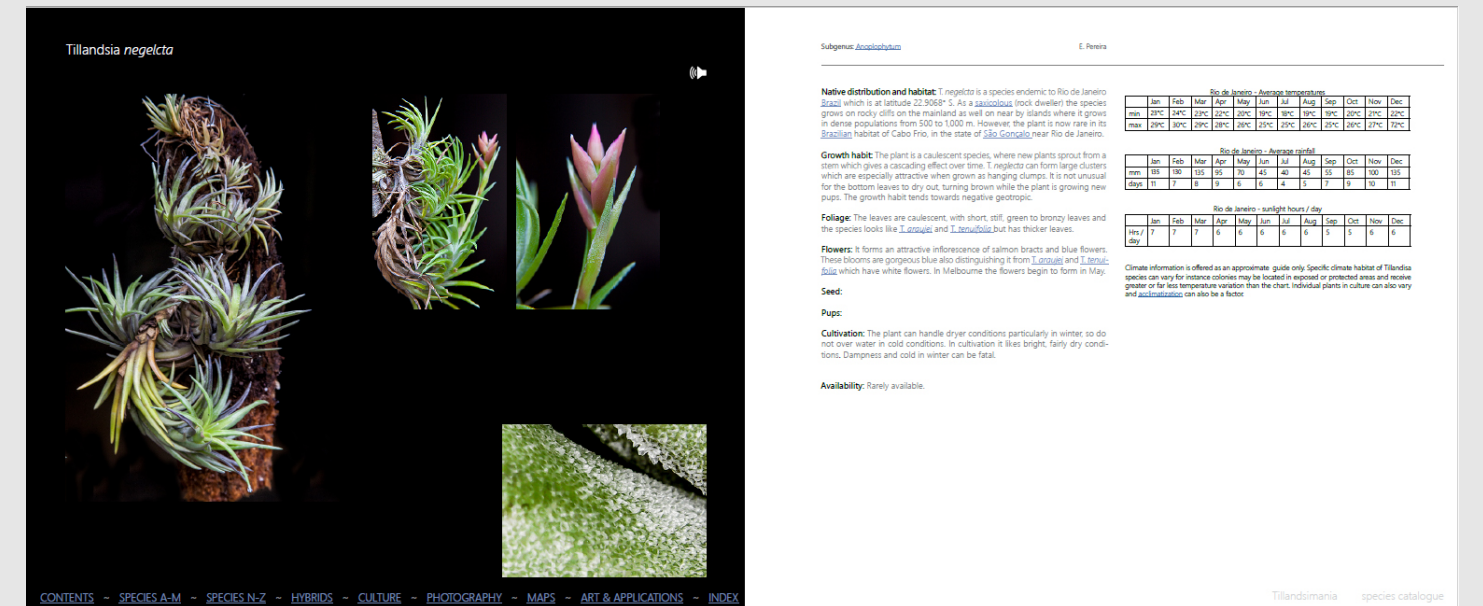
O M G - what a sensational work you have put together here. The download worked fine and I am just in awe of the information you have collected and preserved in this publication. Michael Cubitt

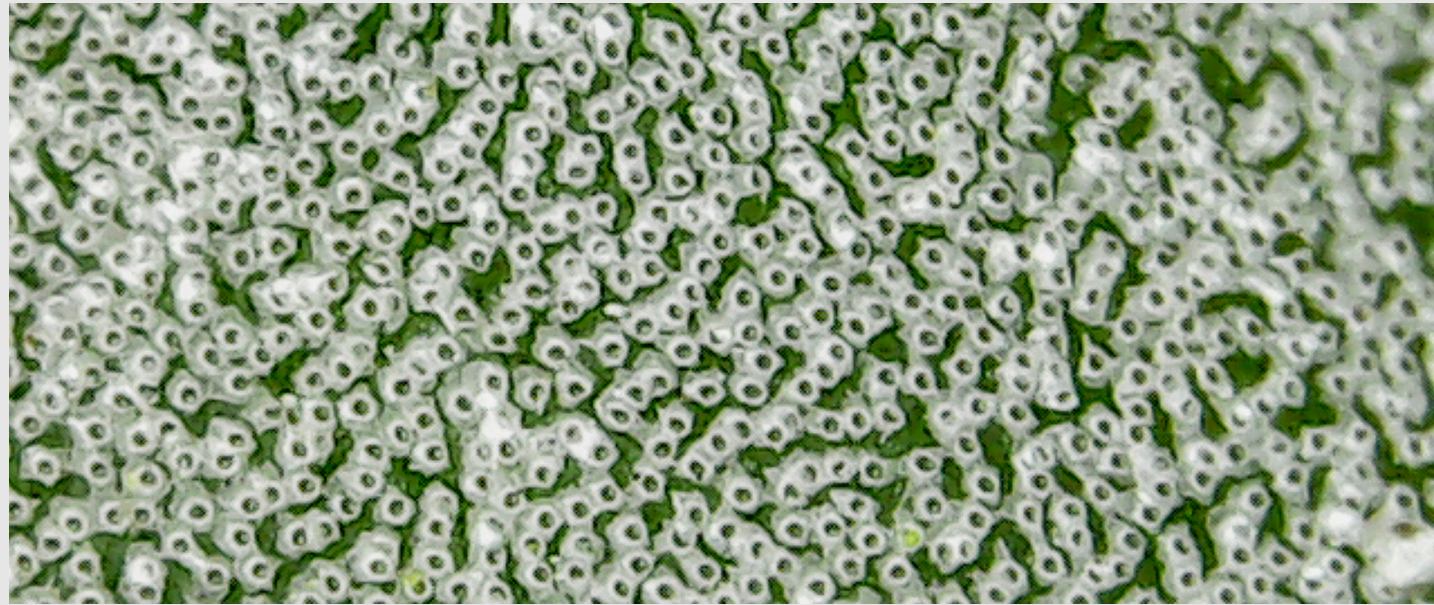
Brilliant work. Keep it up. - Graham Besgrove

thanks for your amazing book!!! - keehee

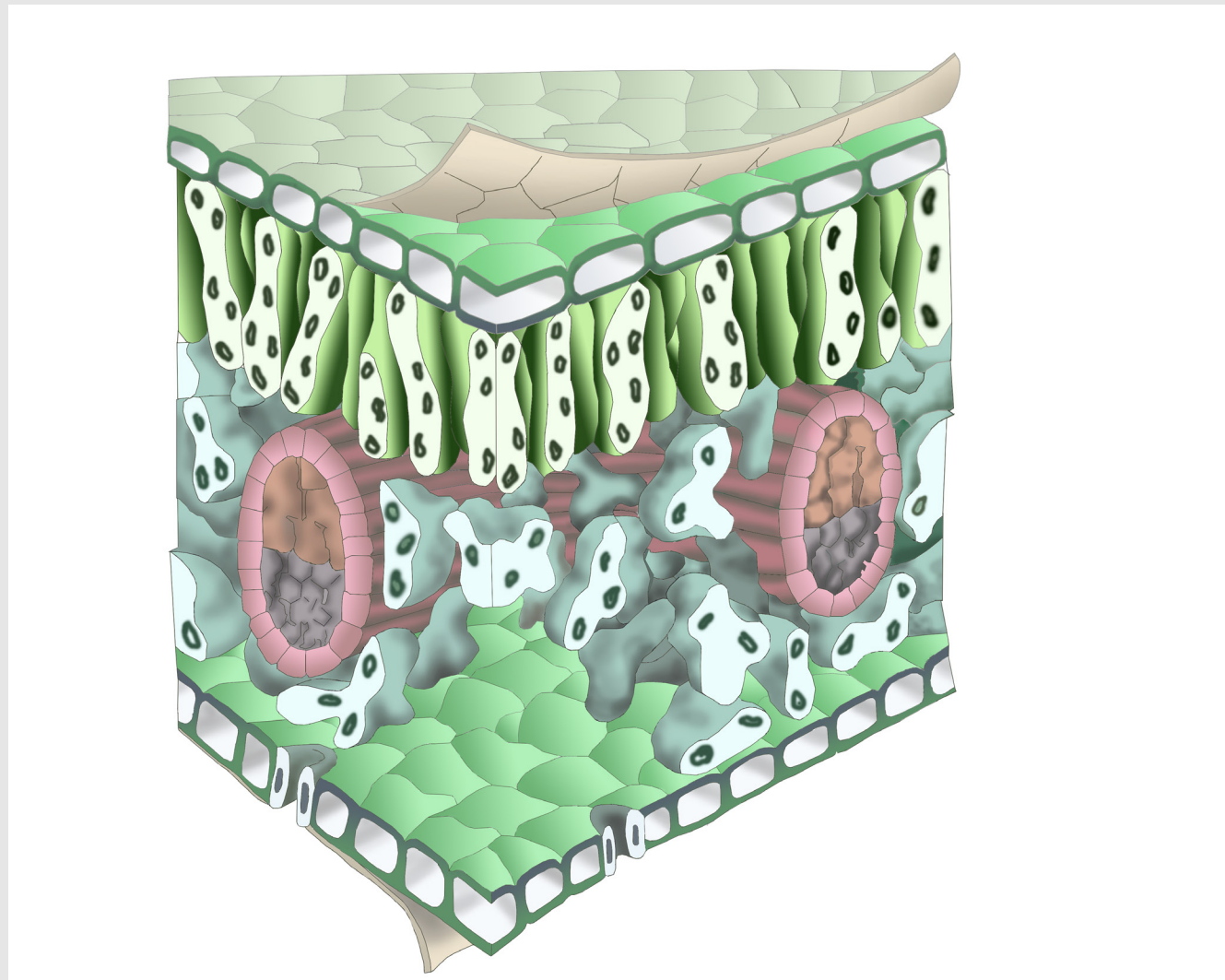
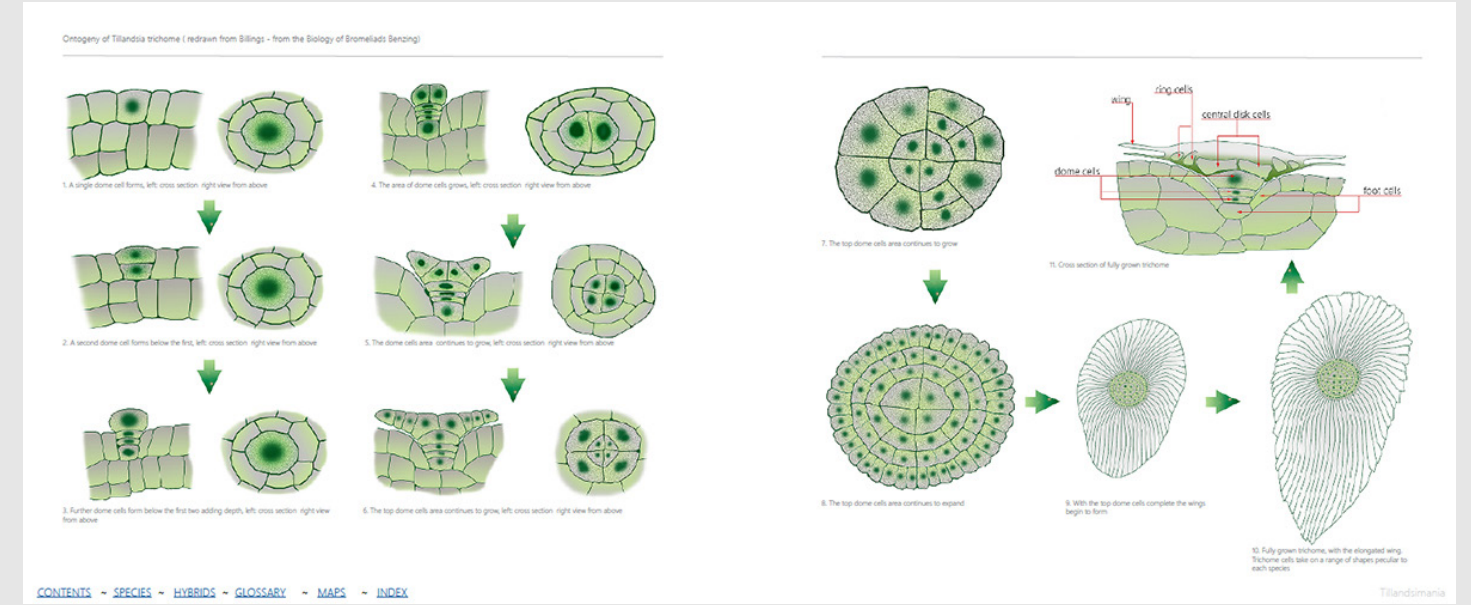
Wow Lloyd, this is amazing! Thank you!! - Megan Collis

## Examples of double page spreads





Microscopic images of Trichome patterns



Detailed illustrations

### CAM Cycle

The other biological trick Bromeliads and some other plants like succulents, cacti and some orchids have evolved is a CAM cycle (crassulacean acid metabolism), whereby they actually grow at night. This is a reason succulents and cacti work well on many roof gardens where they are subjected to harsh daytime conditions.

All plants have a stomata which takes in CO<sub>2</sub> and releases oxygen, however as a by-product of this purifying gas exchange, moisture is transpired from the plant tissue into the atmosphere. Most plants have this cell open during the day and consequently, on a hot, windy day the plant may not be able take enough water through the root system to maintain the required transpiration at the leaf, the foliage dehydrates and in extreme situations dies. However by using a CAM cycle, the stomata is closed during the heat of the day and only opens at night when there is less heat and radiation from the sun.

This means that unlike most plants, CAM cycle plants capture carbon and produce oxygen at night in the process they are very efficient at water retention. Potassium levels in cities peak in the evening with the return commutance and plants fail to uptake CO<sub>2</sub>, so CAM plants can offer a great contribution in maintaining urban air through a 24 hour cycle.

All plants have a stomata, which is an open cell they use to uptake CO<sub>2</sub> and release oxygen.

As part of this gas exchange, water is transpired, this is why many plants dehydrate in hot windy weather during the day.

In most plants the stomata is continually open or close at night and they uptake CO<sub>2</sub> during daylight hours but close when darkness comes. This is a reason pollution levels in cities rise at night.

CAM plants like Bromeliads close their stomata during the day to retain water within their cells.

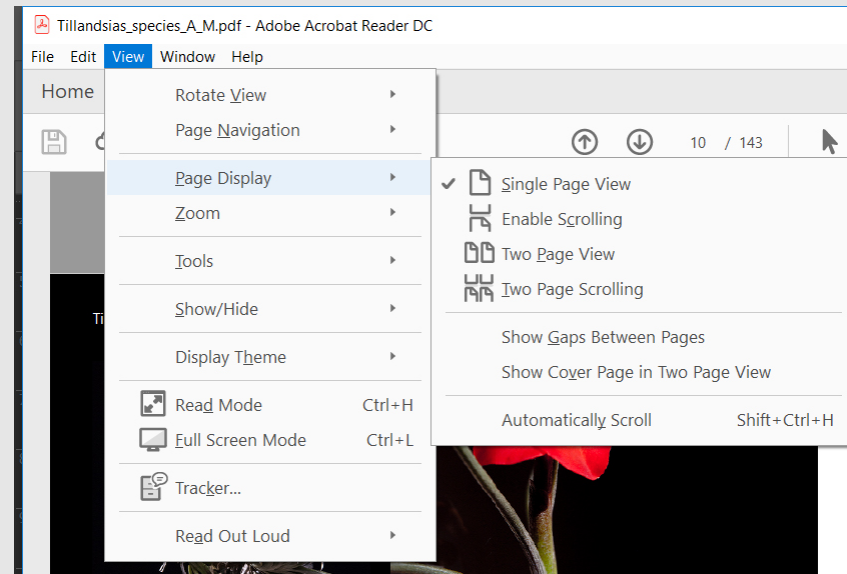
Then at night CAM plants like Bromeliads open their stomata during the night and consequently reduce transpiration significantly.

CONTENTS - SPECIES - HYBRIDS - GLOSSARY - MAPS - INDEX

Tillandsiamania

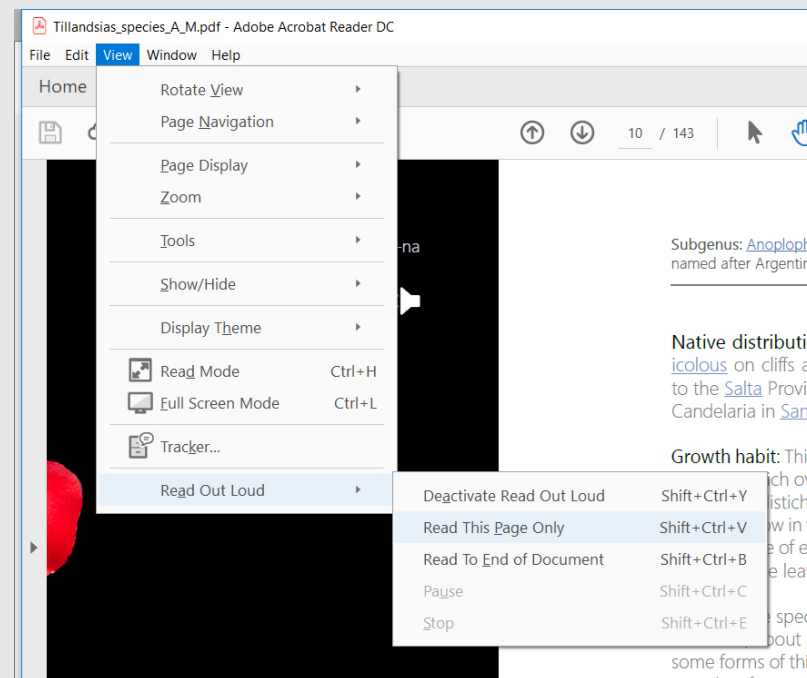
# Viewing a Document

You can alter how the pages, cover and spreads are presented on the screen. Go to VIEW > PAGE DISPLAY then select the appropriate option.



# Read out loud

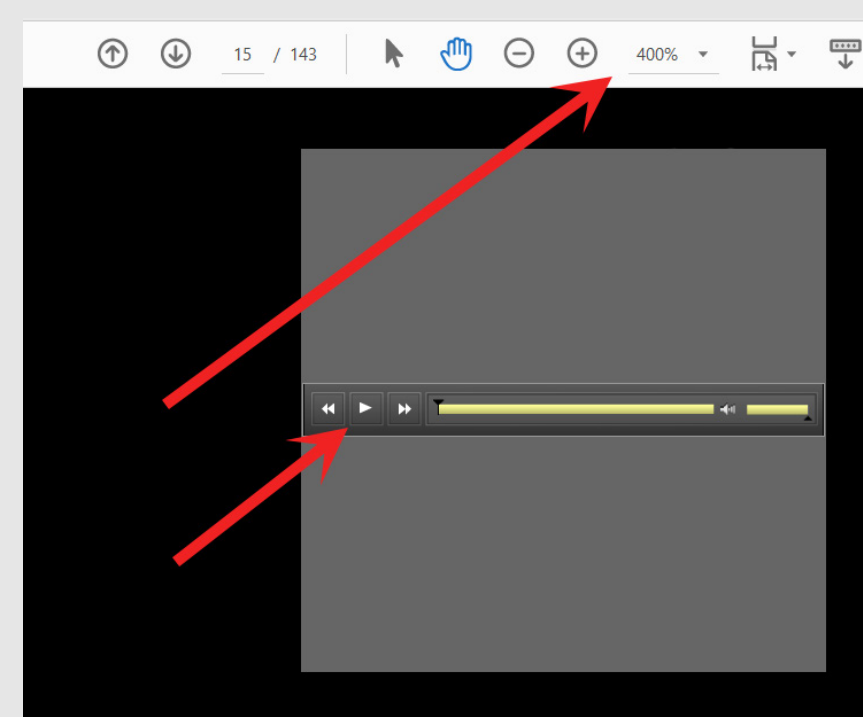
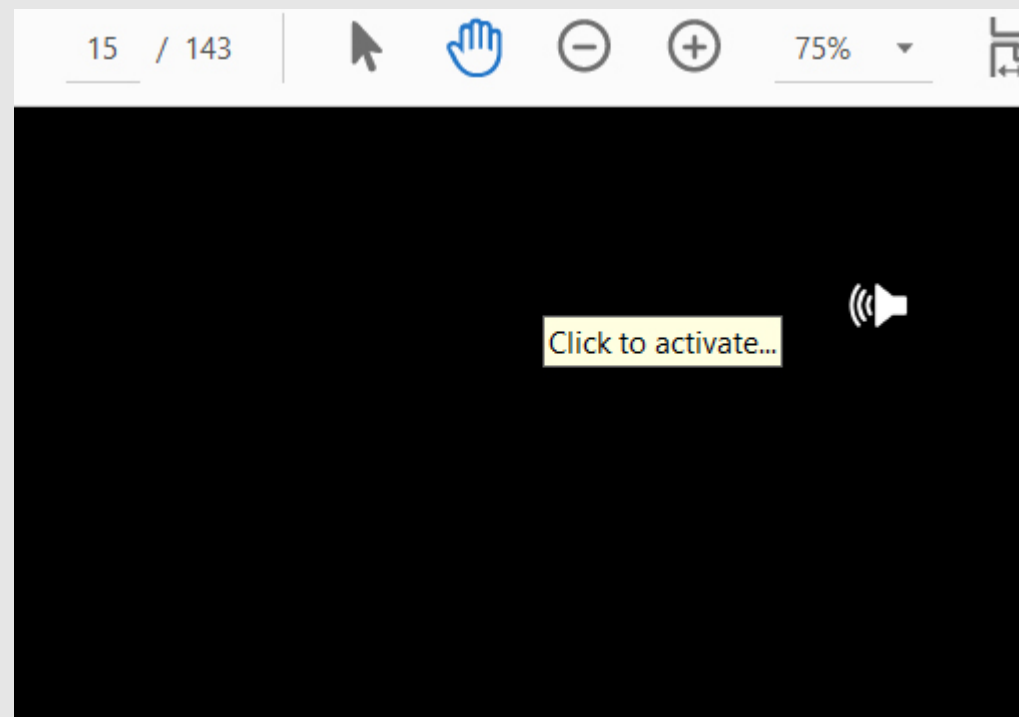
If you do not want to read the text, you can even have the document read out to you. The voice is a bit robotic but it works surprisingly well. Select VIEW > READ OUT LOAD > READ THIS PAGE ONLY - OR READ TO END OF DOCUMENT



# Sound files

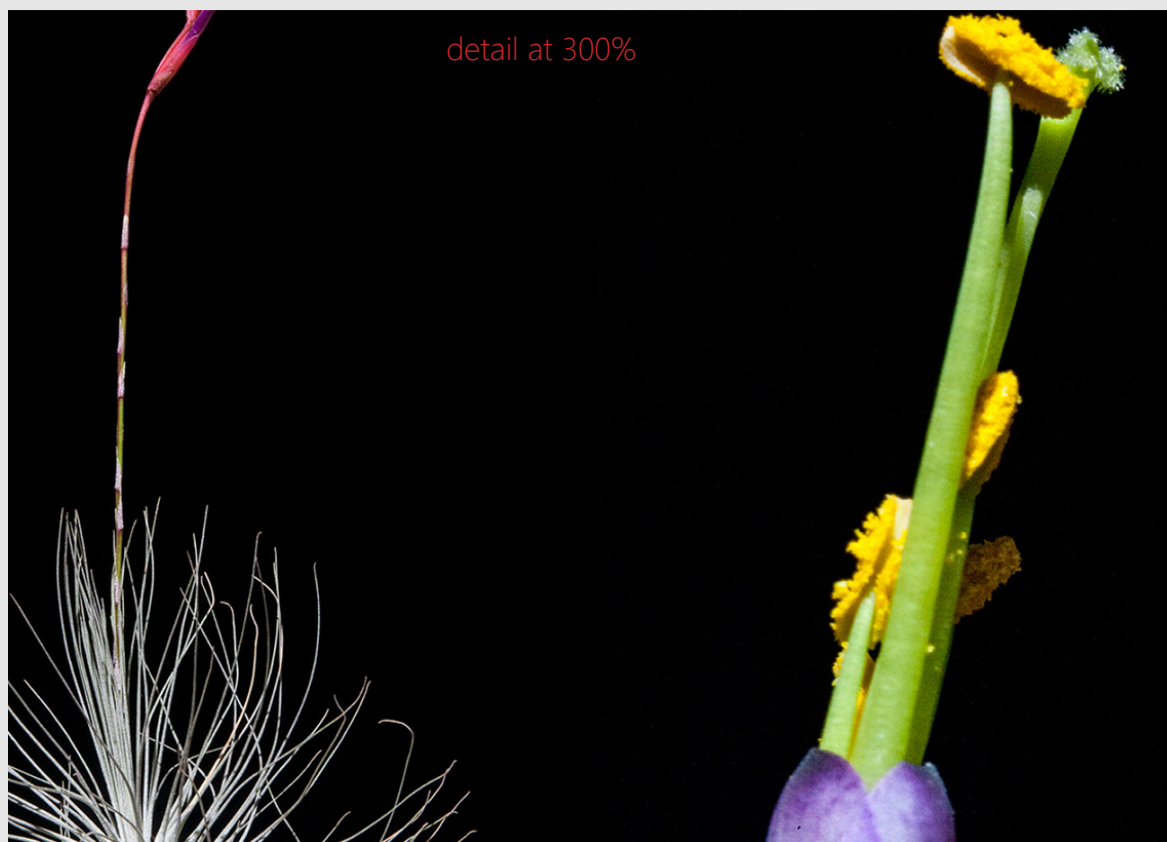
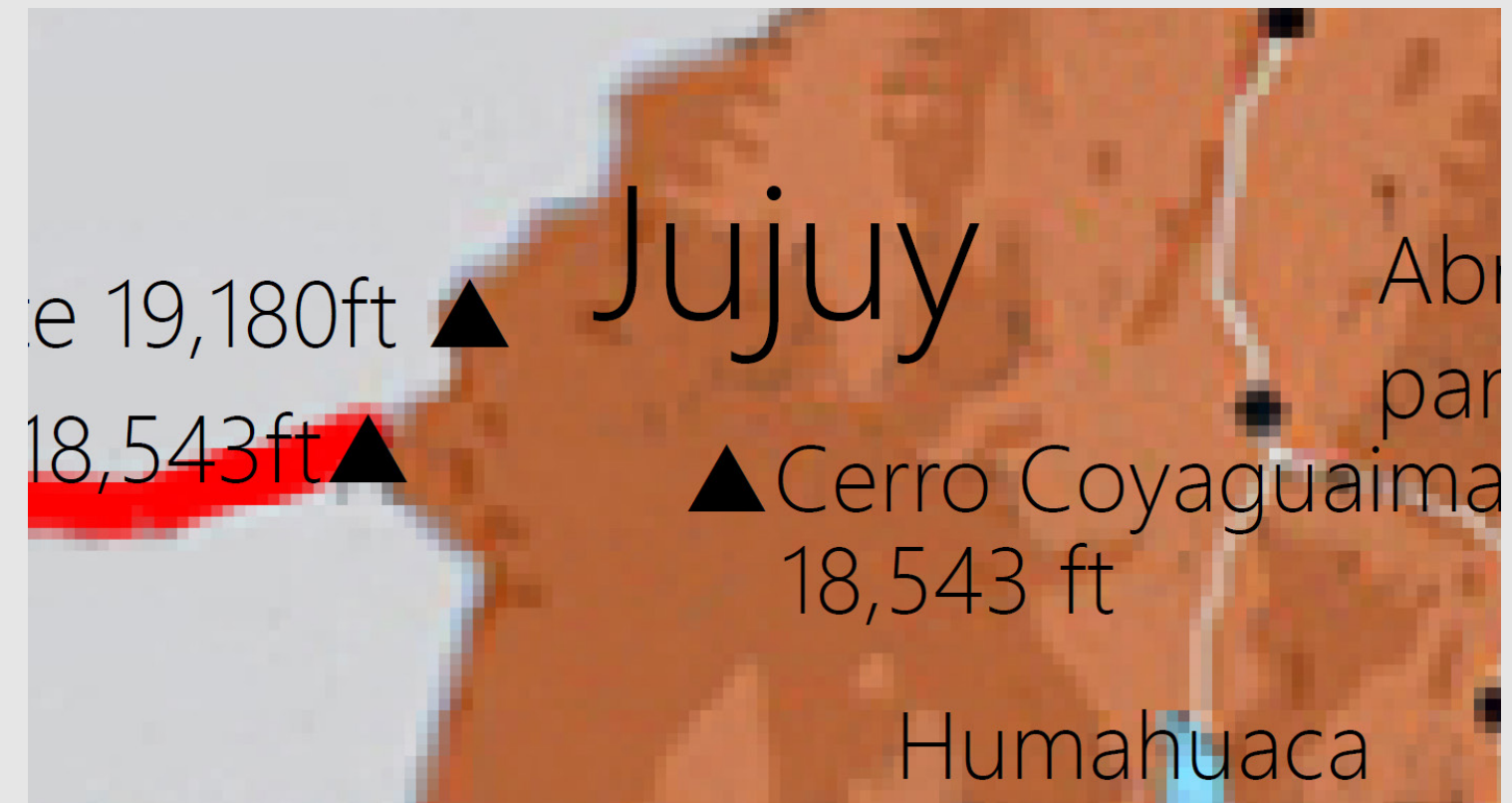
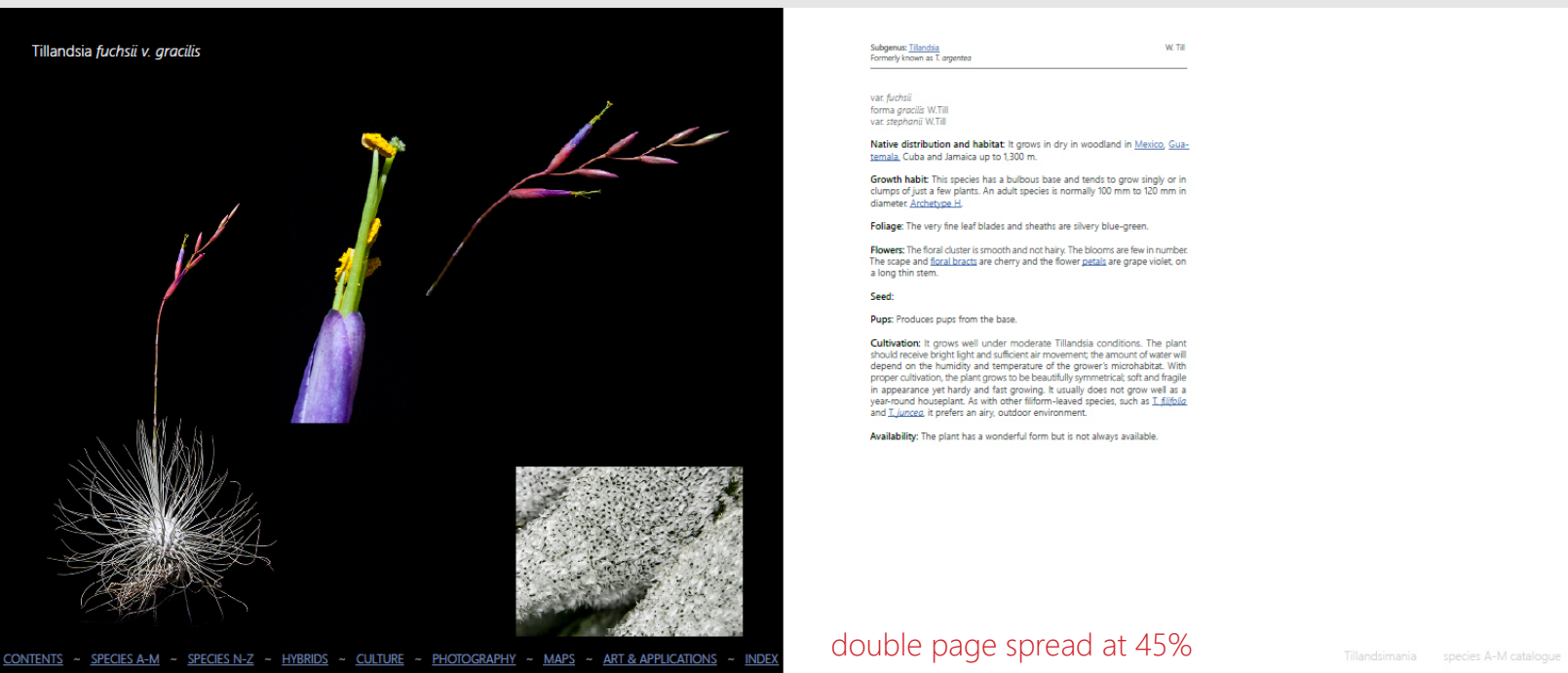
Some of the plant entries have a small sound file embedded which can be activated to offer an indication of the pronunciation. This feature only works for the interactive documents, not the low resolution files.

Click on the speaker icon to activate. The player will activate - it is easier to use at a larger magnification - 400% - Click the + or - button.



# Flexible enlargement

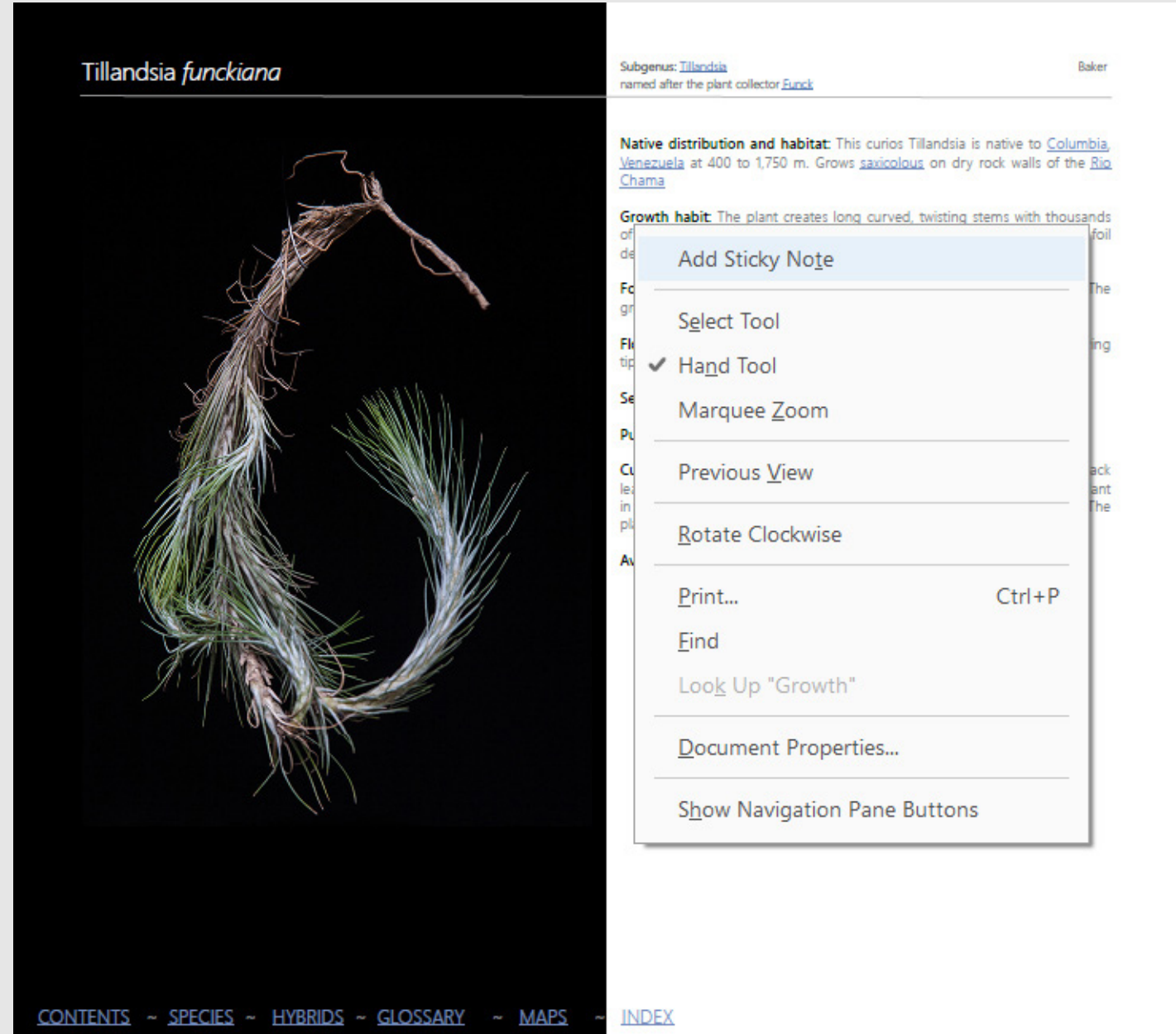
As a high resolution PDF the document can be enlarged from 1% to 6400% which offers great flexibility and the ability to read the text without reading glasses.



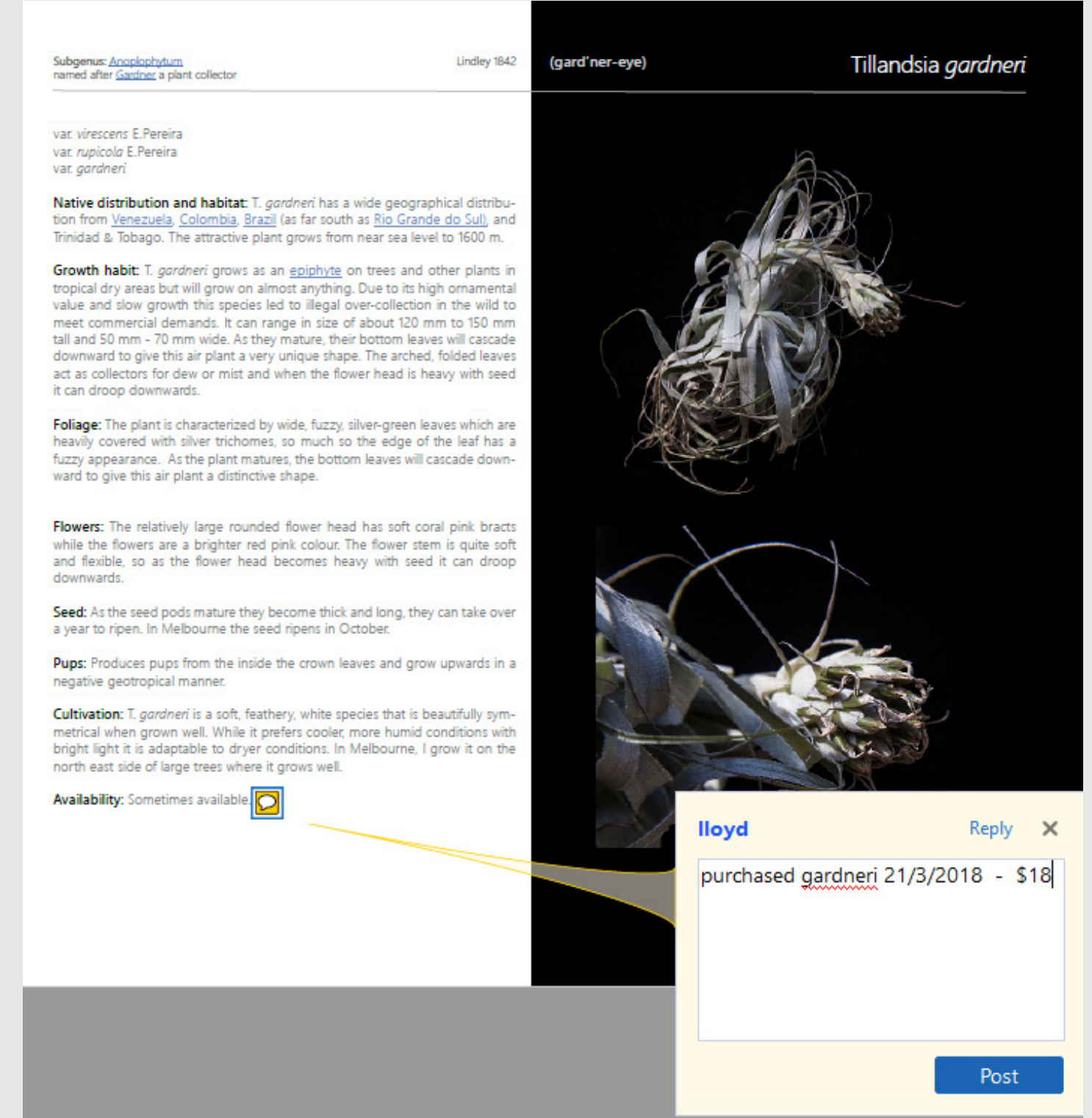
At 300ppi, the resolution is as high as possible, the images are Lossless which allows enlargements to 300-400% to look at the detail of the images. The texts are vector files which means they can be viewed at any enlargement (6400%) and remain perfectly sharp which is great for maps.

# Add your own notes

At any point in the document you can right click and add a "Sticky note". This might be to add your own notes and information or to identify plants you have in your collection. You can also edit these notes at any time in the future. But if you add a note remember to SAVE the document rather than close it.



The screenshot shows the page for *Tillandsia funckiana*. The title is *Tillandsia funckiana*. The subgenus is *Tillandsia*, named after the plant collector *Funck*. The author is Baker. The native distribution and habitat is: This curious Tillandsia is native to *Columbia*, *Venezuela* at 400 to 1,750 m. Grows *saxicolous* on dry rock walls of the *Rio Chama*. The growth habit is: The plant creates long curved, twisting stems with thousands of foil. A context menu is open over the page with the following options: Add Sticky Note, Select Tool, Hand Tool (checked), Marquee Zoom, Previous View, Rotate Clockwise, Print... (Ctrl+P), Find, Look Up "Growth", Document Properties..., and Show Navigation Pane Buttons. At the bottom, there are navigation links: CONTENTS ~ SPECIES ~ HYBRIDS ~ GLOSSARY ~ MAPS ~ INDEX.



The screenshot shows the page for *Tillandsia gardneri*. The title is *Tillandsia gardneri* (gard'ner-eye). The subgenus is *Acropiphytum*, named after *Gardner* a plant collector. The author is Lindley 1842. The varieties listed are: *var. virescens* E.Pereira, *var. rupicola* E.Pereira, and *var. gardneri*. The native distribution and habitat is: *T. gardneri* has a wide geographical distribution from *Venezuela*, *Colombia*, *Brazil* (as far south as *Rio Grande do Sul*), and *Trinidad & Tobago*. The attractive plant grows from near sea level to 1600 m. The growth habit is: *T. gardneri* grows as an *epiphyte* on trees and other plants in tropical dry areas but will grow on almost anything. Due to its high ornamental value and slow growth this species led to illegal over-collection in the wild to meet commercial demands. It can range in size of about 120 mm to 150 mm tall and 50 mm - 70 mm wide. As they mature, their bottom leaves will cascade downward to give this air plant a very unique shape. The arched, folded leaves act as collectors for dew or mist and when the flower head is heavy with seed it can droop downwards. The foliage is: The plant is characterized by wide, fuzzy, silver-green leaves which are heavily covered with silver trichomes, so much so the edge of the leaf has a fuzzy appearance. As the plant matures, the bottom leaves will cascade downward to give this air plant a distinctive shape. The flowers are: The relatively large rounded flower head has soft coral pink bracts while the flowers are a brighter red pink colour. The flower stem is quite soft and flexible, so as the flower head becomes heavy with seed it can droop downwards. The seed is: As the seed pods mature they become thick and long, they can take over a year to ripen. In Melbourne the seed ripens in October. The pups are: Produces pups from the inside the crown leaves and grow upwards in a negative geotropical manner. The cultivation is: *T. gardneri* is a soft, feathery, white species that is beautifully symmetrical when grown well. While it prefers cooler, more humid conditions with bright light it is adaptable to dryer conditions. In Melbourne, I grow it on the north east side of large trees where it grows well. The availability is: Sometimes available. A sticky note is posted over the bottom right of the page with the text: "lloyd purchased gardneri 21/3/2018 - \$18". The sticky note has a "Reply" button and a "Post" button.

# Easy navigation

The high resolution documents are cross-referenced with active hyper links similar to a web site, which allows easy access from one aspect of the document to another, and between documents. As long as the document files are in the SAME FOLDER the links will move across documents.

## Index

<a href="#">Abortive inflorescence pup growth</a> ~	<a href="#">Calilegua, Argentina</a> ~	<a href="#">Dotterer</a> ~
<a href="#">Abra pampa, Argentina</a> ~	<a href="#">Camanchaca</a> ~	<a href="#">Durat</a> ~
<a href="#">Acrotonal pup growth</a> ~	<a href="#">Camen de Patagones, Argentina</a> ~	<a href="#">E6000 Clear Glue</a> ~
<a href="#">Air-plant</a> ~	<a href="#">CAM Cycle</a> ~	<a href="#">Ebay</a> ~
<a href="#">Alberto Castellanos</a> ~	<a href="#">Cárdenas, Martín Hermosa</a> ~	<a href="#">Ehlers, Renate and Klaus</a> ~
<a href="#">Alcantarea</a> ~	<a href="#">Carnation of the air</a> ~	<a href="#">Eldorado, Argentina</a> ~
<a href="#">Alcohol</a> ~	<a href="#">Castellanos, Alberto</a> ~	<a href="#">Elias Tillands</a> ~
	<a href="#">Catacamas, Honduras</a> ~	<a href="#">Eastern Spine Bill</a> ~

For instance the [INDEX](#) offers a direct link to the exact text on a specific page in the right document.

**Native distribution and habitat:** The species is native to [Minas Gerais](#), [Brazil](#) and found at elevations up to 800 m

If the document is viewed at or greater than 100% the link will go directly to that page with the exact text at the very top right as in the screen shot below for Minas Gerais. However if the enlargement is less than 100% the link will just go to the page.



# Load a low resolution copy to your phone

The high res PDF files are large - Depending upon the power of your computer this means the file may run slow. But included on the DVD is a low res version at 72ppi with the "Lossey" images which reduces the quality considerably - but the file is considerably reduced. As a handy reference you can also copy the file to your phone or other device and have with you at all times which allows readable information on any public transport or a plant to be checked when purchasing.



# Work in progress

As an open digital document it is something I work on regularly. Undoubtedly you will find areas uncompleted, mistakes, etc. For instance at the moment I am working on the maps. In time I hope to fill any existing holes and dig entirely new ones. An updated PDF will be offered at the beginning of each year.

# Layout

The layout for the book is a single page cover with double spread - that is 2 pages on a screen. So what looks like a single page is actually two pages or the double page spread. No text runs the entire width of both pages so if you enlarge the page to 100% you should easily be able to read the text body. To make reading easier, the text body on each page is broken into 2 columns and is designed to read down the left column then the right. Off course you will need to navigate the document by scrolling across to the adjacent page or scrolling down as needed.

## Tillandsia Pigmentation

While some plant families may have a great genetic diversity between individual plants, species and populations may vary in this regard some genera of Bromeliads are known for their genetic diversity. We see this in the hybridization of Neogeleon and other wild bromeliad species like the parent plant. These plant expression of anthocyanin pigments can be exquisite with a huge range of blue, or violet pigments possible. Like the range of green in the chlorophyll is also varied from light green to deep almost black green. Leaf colour range from almost black, maroon, bright red, pink through shades of green to gold. But a more spectacular feature of many plants in the exotic combination of pigments, where leaves have striking patterns. Varieties may have leaves with yellow, white and cream variations. Others may be spotted with purple and cream, while others have different colours on the top (adaxial) to the bottom (abaxial) of the leaf, stripes that run down the leaf length or across the leaf.

But in Tillandsia the colour variations are much less, and any pigmentation differences tend to be more uniform.

These colours are formed by pigmentations in the leaf, but as another dimension to the aesthetics of the Bromeliad leaf. Some can be invisible, or show as a thick white dust, or distinct silver bands, patterns or as in some Tillandsia even cover the entire plant in a silver fuzz. In some plants, trichome patterns can differ considerably from the upper side of the leaf to the bottom side. The trichomes is not a pigment, it is a small cell on the surface that has the ability to uptake water and also reflect light.

Different plants within the family can look quite different. In some plants, exposure to high light levels can enhance the saturation of these pigments, while in other plants high light levels can bleach the colour, and even burn the leaf. Further to this, leaf shape can alter with differing exposure to sunlight, in bright light the leaves can be shorter and wider, while in darker situations the leaves can be longer and more strap like.

Leaf pigmentation patterns can take many forms: On some plants these pigmentation patterns form through the entire thickness of the leaf and reveal a similar pattern top and bottom, while in other plants the top of the leaf can be completely different to the bottom. It should be remembered that any terms are simplified definitions when plants combine a range of these colour expressions within a single plant, or even a single leaf, particularly in new hybrids.

The primary function of pigments in plants is photosynthesis, which uses the green pigment chlorophyll along with several red and yellow pigments that help



A pure white pigment would reflect all of the light energy striking it, however most pigments are not pure white reflecting all light, there is always some absorption.

White plants occasionally mutate and produce albino plants with no green and red pigments, it is the green, red, yellow pigments that absorb the light energy. As these mutant plants gain their energy from the parent plants off shoots never succeed through future generations because they cannot photosynthesize properly.

On a more complex level, plant pigments include a variety of different kinds of molecules, including porphyrins, carotenoids, anthocyanins and betalains.

The principal pigments responsible for the colours we see are:

**Chlorophyll** is the primary pigment in plants; it is a chlorin that absorbs yellow and blue wavelengths of light while reflecting green. It is the presence and relative abundance of chlorophyll that gives plants their green color. Although there is chlorophyll a, b, c, d and a higher plant forms like Bromeliads possess two forms of the pigment: chlorophyll a and chlorophyll b. You might well ask: what is the difference between chlorophyll a and b?

**Chlorophyll a**  
The principal photosynthetic pigment that absorbs energy from blue violet and orange light.  
Blue when in pure state  
Emission all photographs with bacteria being the exception  
Formula is C<sub>55</sub>H<sub>72</sub>O<sub>6</sub>N<sub>4</sub>Sg  
Molecular weight of 873

**Chlorophyll b**  
Accessory photosynthetic pigment that collects energy from green wave lengths and passes it on to chlorophyll a.  
Olive green in pure state  
Emission all photographs other than diatoms, cyanobacteria and algae.  
Formula is C<sub>55</sub>H<sub>70</sub>O<sub>6</sub>N<sub>4</sub>Sg  
Molecular weight of 867

Once the plant has flowered the all the leaves of the parent plant slowly die and the energy either transformed to produce viable seed or into new plant production. The energy transference process might take 18 months or more. As the energy is transferred, the trichomes fall, moisture is shut off to the leaf and all the pigments, green, yellow, orange and red fade because of this lack of moisture. Then the leaf becomes brown in colour dry and crumby. This is the reason dried leaves pressed between heavy weights lose their colour.

The key aspect when looking at the aesthetics of Tillandsia is that Chlorophyll a and b produce slightly different colours within the leaf.

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Tillandsimania

# Tillandsimania Supporter

Through purchasing the DVD you become a supporter of this ongoing Tillandsia research project.

# Copyright

As you can appreciate there have been many 1,000s of hours work in the production and as a PDF it is easy to copy and pass on to other Tillandsia enthusiasts. However, it would be appreciated that you respect the copyright and rather than pass on free, encourage others to purchase a personal copy. This gives me the funds and incentive to keep working on the project and refine it in the future.

## Supporter discount

When you purchase, you become a valued supporter to the project. This also affords you a discount on the updated version of the ebook released at the beginning of the year.



Lloyd Godman was head of the photographic section of the Dunedin Art School for 20 years and then taught at RMIT for a further 9 years. From 1996, his work moved from camera based images to explore light sensitivity where he grew images into the leaves of Bromeliad plants. Then followed a series of gallery installations with plants which evolved into his current work with Tillandsias and the built environment. Now, he is seen as a leading ecological artist with The AGE newspaper referring to him as an ecological artist and extreme gardener. He is an experienced photographer and highly skilled in the use of Adobe Photoshop and Indesign which have been used extensively for this project.

You can find PDFs of his many [art projects here](#).

Thank you for reading and I trust you enjoy the book.

**Contact**  
**Order your copy - lloydgodman at gmail.com**